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DE LA

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et la Société suisse de Zoologie

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La préférence sera donnée aux travaux concernant les domaines suivants: Biogéographie,
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The Scaphidiidae (Coleoptera) of the Nepal Himalaya¹

by

Ivan LÖBL²

With 191 figures

ABSTRACT

The Scaphidiidae are remarkably diverse in the Himalaya. Its more than 200 species represent approximately 15% of the total known world fauna. Most of the species are found in the wetter eastern part of the Central Himalaya and most of its presumably endemic taxa are found at altitudes ranging from 2000 m to 3500 m. Collections made in the West Himalaya are not representative for the regional fauna, and almost no data are available from the East Himalaya. The following taxa are new to science: *Ascaphium ochripes* sp.n., *Episcaphium unicolor* sp. n., *Scaphidium gurgung* sp.n., *S. holzschuhi* sp.n., *S. melanogaster* sp.n., *S. nepalense* sp.n., *S. thakali* sp.n., *Pseudobironium bicolor* sp. n., *P. ineptum* sp.n., *P. rufitarse* sp.n., *Baeocera cribrata* sp.n., *B. crinita* sp.n., *B. errabunda* sp.n., *B. laminula* sp.n., *B. martensi* sp.n., *B. mustangensis* sp.n., *B. reducta* sp.n., *B. schawalleri* sp.n., *B. sordidoides* sp.n., *B. thoracica* sp.n., *B. tuberculosa* sp.n., *Scaphisoma adjacens* sp.n. *S. alacre* sp.n., *S. aurorae* sp.n., *S. baloo* sp.n., *S. bhareko* sp.n., *S. clavigerum* sp.n., *S. coalitum* sp.n., *S. fatuum* sp.n., *S. fratellum* sp.n., *S. fulcratum* sp.n., *S. inquietum* sp.n., *S. interjectum* sp.n., *S. invalidum* sp.n., *S. jado* sp.n., *S. kanchi* sp.n., *S. nepalense* sp.n., *S. nima* sp.n., *S. pinnigerum* sp.n., *S. praesigne* sp.n., *S. sikkimense* sp.n., *S. simplicipenis* sp.n., *S. varians* sp.n., *Baeotoxidium yeti* sp.n., *Scaphobaeocera zdenae* sp.n., *Toxidium spectabile* sp.n., *Xotidium* gen.n. *uniforme* sp.n, and *Bironium nepalense* sp.n. New synonymies are: *Yparicum* Achard, 1920 with *Cyparium* Erichson, 1845, *Scaphidium grande* var. *inimpressum* Pic, 1920 and *S. grande* var. *subannulatum* Pic, 1915 with *Scaphidium grande* Gestro, 1879, and *Baeocera pseudolenta* Löbl, 1979 with *Baeocera lenta* (Löbl, 1971). *Ascaphium minor* Pic, 1956 is raised to species level. *Baeocera montanella* is a new name proposed to replace *B. montanum* Löbl, 1971 (nec

¹ Some specimens used in this study are the results of the Himalaya Expeditions of J. Martens, No. 177. – For No. 176 see: *Senckenbergiana biol.*, 72 (4/6) 1992. – J.M. sponsored by Deutscher Akademischer Austauschdienst and Deutsche Forschungsgemeinschaft.

² Muséum d'Histoire naturelle, Case postale 434, CH-1211 Genève 6.

Baeocera montana (Pic, 1955)). New combinations are: *Scaphidium vernicatum* (Pic, 1956) from *Scaphium*, *Scaphidium dureli* (Achard, 1922) and *S. coomani* (Pic, 1925) from *Scaphidiolum*, *Cyparium yunnanum* (Achard, 1920) from *Yparicum*, *Xotidium pygmaeum* (Löbl, 1971), *X. montanum* (Löbl, 1971) and *X. notatum* (Löbl, 1977) from *Toxidium*. Diagnostic characters are given for all species of *Scaphidium*, *Hemiscaphium*, *Cyparium*, and *Pseudobironium* occurring in the area studied. Lectotypes are designated for *Scaphidium arrowi* Achard, *S. coomani* (Pic), *S. harmandi* Achard, *S. semilimbatum* Pic, *S. baconi* Pic, *S. assamense* Pic, *Hemiscaphium brunneopictum* Achard, *Pseudobironium almorani* Achard, *P. castaneum* Pic, *Scaphisoma minutissimum* Champion, *S. cribripenne* Champion and *S. bedeli* Achard. The genera and species occurring in the Himalaya, in the Meghalaya and in Pakistan are keyed out, as well as all Asian species of *Ascapthium*, *Episcaphium*, *Scaphoxium*, *Toxidium* and *Xotidium*. Distributional data are presented for all Nepalese species, and additional data are given for numerous Indian species.

INTRODUCTION

Mycophagy is a common feature within the Coleoptera. About half of the beetle families include mycophages species and in several families all species are possibly fungivores (LAWRENCE 1989). This trophic guild is particularly diverse in the tropics. In the Dumoga-Bone National Park in north Sulawesi 23.4% of all sampled Coleoptera were fungivores, while only 17.4% phytophages (HAMMOND 1990). Obviously all Scaphidiidae feed on fungi (NEWTON 1984), and they are decidedly more diverse and abundant than sometimes assumed (PAULIAN 1949; 1988). In samples of forest litter arthropods I have made in different parts of Asia (e.g., in Sri Lanka, India, Thailand, Indonesia, Malaysia) the scaphidiids represent 2 to 6% of the total number of beetles. Surprisingly, this is true also for collections I have made in the mountains of north India in which temperate elements (e.g., Carabidae: *Trechus*, Staphylinidae: *Micropeplus*, *Quedius* and *Tachinus*, Latridiidae: Corticariini, Cryptophagidae: *Cryptophagus*, *Atomaria*) are well represented.

Most of the previous north Indian collections came from the Darjeeling district of West Bengal, and from various localities in Kumaon and Garhwal. Nepal which became accessible on a regular basis for field research since 1949, remained until recently a "terra incognita" located between these two areas with better documented scaphidiid fauna. This circumstance, and the encouragements of my friend Ales Smetana, with whom I undertook three trips to Nepal Himalaya, were significant for realising this paper. It is hoped that it increases substantially the knowledge about the scaphidiids of the Central Himalaya.

As far as the more western portion of the Himalaya is concerned, recent collections from Himachal Pradesh and from north Pakistan, i.e., from the Hindu Kush and Kohistan ranges, provide both fairly significant data. Unfortunately, almost nothing is known about the scaphidiids (and about other cryptic forest litter Arthropoda as well) from areas east of the Darjeeling district, i.e., from Bhutan and from Arunachal Pradesh. Hopefully, field research will become possible in these areas before the human activity significantly alters the natural ecosystem.



In the beginning was field work...

The descent from Phulcoki to Godawari. The author with samples of sieved forest litter in and on his rucksack (above). Camp in Induwa Khola Valley. Samples are placed in the "Winkler-Moczarski" devices (below).

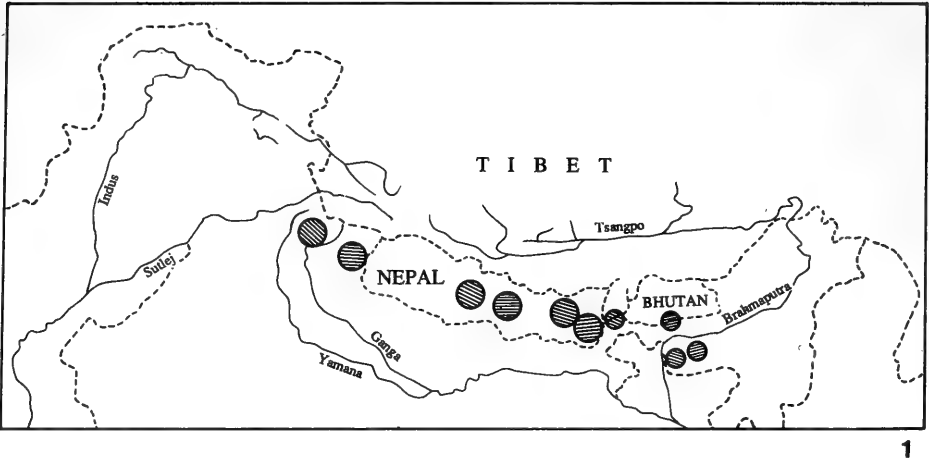
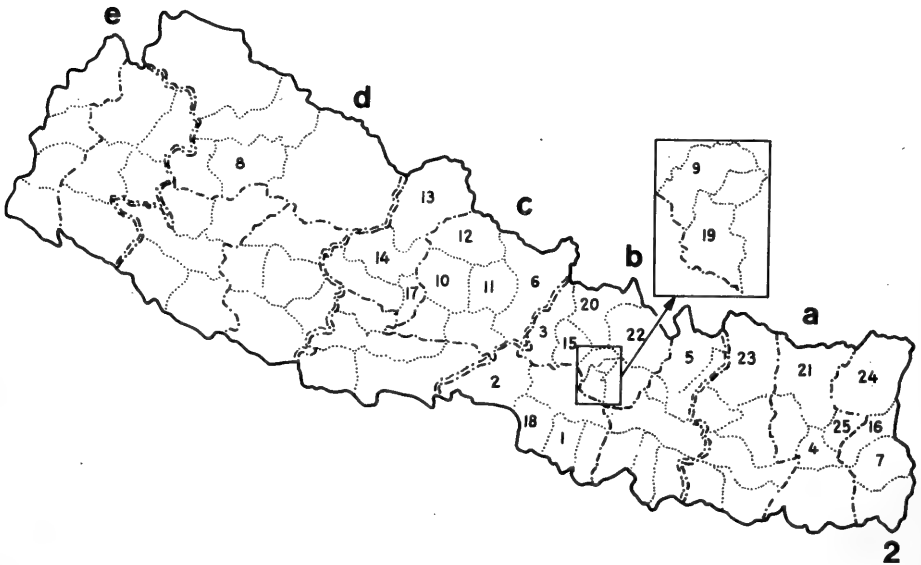


FIG. 1.

Himalayan region. Circles indicate areas from which significant collections of Scaphidiidae have been made.



TECHNIQUES

MATERIAL

This study is based on adults exclusively. Most of the material studied was collected by sifting forest litter and extracted from the samples by means of the "Winkler-Moszarski" devices (see BESUCHET & al. 1987).

This method was used not only by Ales Smetana and me, but also by H. Franz, J. Martens & W. Schawaller, and S. Vit. A smaller portion of the scaphidiids was taken from fungi on dead logs, under bark or under decaying pieces of wood on the forest floor. Several specimens, mainly *Scaphidium*, were swept from vegetation or found in Malaise traps. The flight interception traps have been used only once in Nepal by A. Smetana during his 1985 trip. It is possible that this method may provide additional information, especially on *Cyparium* species, which were found in large number in flight interception traps in South and North America by S. & J. Peck. In Thailand, P. Schwendinger used pit-fall traps for collecting arachnids and other forest litter arthropods. They proved to be successful for sampling scaphidiids, although I am not aware of any scaphidiids obtained by this method in the Himalaya.

I have tried to accumulate material from all known sources. The only more important Himalayan collection I know of that was not examined, is that housed in the Forestry Institute in Dehra Dun. It appears not to be accessible for revision.

The Himalayan material available amounted to about 8000 specimens, half of them from Nepal.

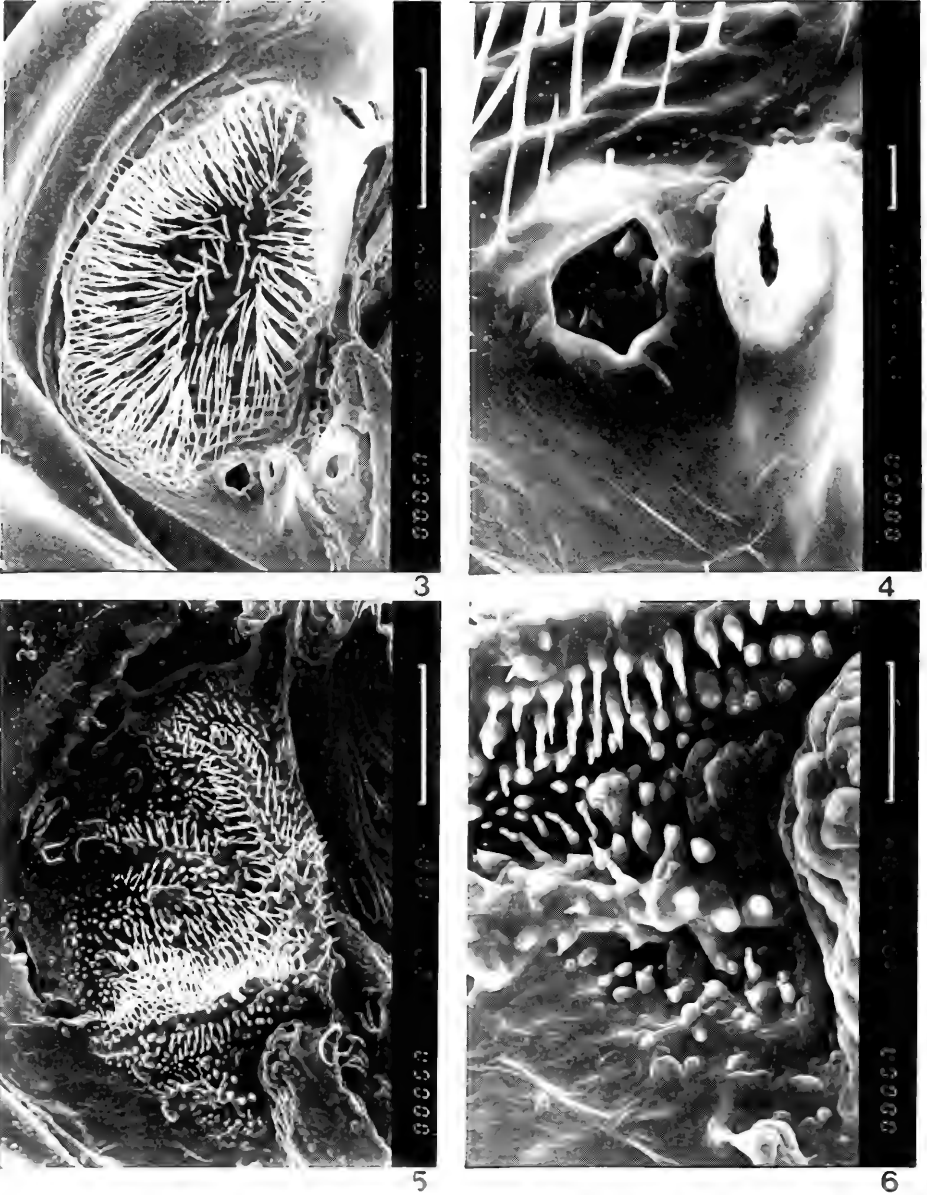
I have published several papers on the Himalayan scaphidiids (LÖBL 1970; 1977; 1984; 1986a; 1986b; 1986c; 1987a; 1988; 1990a), in which a number of taxa have been described. Information on several other species occurring in the Himalaya have been given in those relating to the scaphidiids of other areas (e.g. LÖBL 1981; 1990b). The diagnostic characters of all these taxa are not repeated in the present study, except for characters used in the keys. All Himalayan members of *Scaphidium*, *Hemiscaphium*, *Cyparium*, and *Pseudobironium* were inadequately described, and were not at all, or only briefly, treated in my previous papers. Therefore, the diagnostic specific characters in these genera are discussed in greater detail.

The acronyms of institutions which loaned material or in which material is housed are listed below.

BMNH	The Natural History Museum, London
CNCC	Canadian National Collection of Insects, Ottawa
IZK	Institute of Systematic and Experimental Zoology, Krakow
MCSN	Museo Civico di Storia Naturale, Genova

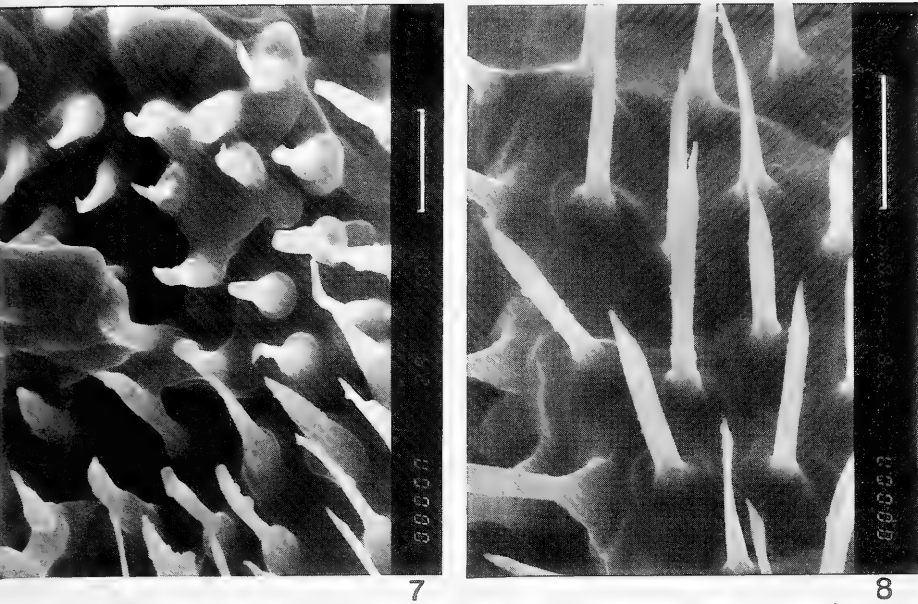
FIG. 2.

Political division of Nepal. Only districts in which treated material was collected are numbered. District boundaries dotted, Zonal boundaries in simple broken lines, boundaries of Development Centres in double broken lines. a: Eastern, b: Central, c: Western, D: Far Western, e: Extreme Western Development Centre: 1. Bara; 2. Chitawan; 3. Dhading; 4. Dhankuta; 5. Dolakha; 6. Gorkha; 7. Ilam; 8. Jumla; 9. Kathmandu; 10. Kaski; 11. Lamjung; 12. Manang; 13. Mustang; 14. Myagdi; 15. Nuwakot; 16. Panchthar; 17. Parbat; 18. Parsa; 19. Patan; 20. Rasuwa; 21. Sankhua Sabha; 22. Sindhupalcok; 23. Solukhumbu; 24. Taplejung; 25. Terhathum. Synonymies and alternative transcriptions of district names: Chitawan = Chitwan; Patan = Lalitpur; Sankhua Sabha = Sankhuwasawa, Sankhuwasabha.



FIGS 3 TO 6.

Prothoracal cavity with "pocket" covered by spinose structures; 3 and 4, *Baeocera* sp., 5 and 6, *Baeocera pubiventris* Löbl.



FIGS 7 AND 8.

Spinose structures of prothoracic cavity in *Baecocera*, detail.

MHNG	Muséum d'Histoire naturelle, Geneva
MNHN	Muséum National d'Histoire naturelle, Paris
NMB	Naturhistorisches Museum, Basel
NMP	National Museum, Prague
NSNT	National Science Museum, Tokyo
SMNS	Staatliches Museum für Naturkunde, Stuttgart
ZSI	Zoological Survey of India

These acronyms, the names of private collections, and the names of collectors are given in paranthesis, when referring to the material studied.

AREA

Most of the material treated in the present study was collected within the political boundaries of Nepal. Additional material comes from Himachal Pradesh, and in much lesser extent from Sikkim or other areas. All identified taxa are keyed as are a few additional unidentified ones, known to occur in the Himalayan region.

The Himalaya comprises the ranges between the rivers Indus and Brahmaputra. The Karakorum and Kohistan - Baluchistan ranges in the west, and the Arakan - Chin - Yoma fold belt and the Mogok belt in the east are of the same orogenesis (MOLNAR & TAPONNIER 1977, MASCLE & al. 1990). While a reasonable set of data is available from some portions of the western ranges, hardly anything is known about the Scaphidiidae of the two eastern fold belts. Therefore, the few species described to date from Burma are not treated in this

paper. For practical reasons, the Scaphidiidae from the Garo and Khasi Hills in Meghalaya, and those from Pakistan, are included in the keys, as well in the discussion on the biogeography. Most of the collected material has been found in areas shown in the Fig. 1.

DISTRIBUTIONAL RECORDS

Nepal occupies a central position within the Himalaya. Since 1980 it is divided into five macro-regions: Eastern, Central, Western, Far Western, and Extreme Western Development Regions (MAJUPURIA & MAJUPURIA 1983). Each of them is sub-divided into two or three Zones (listed sometimes as Provinces) which include a various number of Districts (Fig. 2). This administrative division is respected in the present study, although it does not reflect biogeography.

Indeed, it is often extremely difficult to locate data from locality labels which record the provenience of specimen as "E.Nepal" or "C.Nepal" in combination with a name of a small village, as frequently seen in different collections.

An attempt has been made to arrange the records in east-west or west-east direction. The names of the political units are given once only in the respective material section. The data under "type material" do not appear under "material examined". To avoid misleading information, only one kind of transcription of geographic names is used throughout, regardless of the original spelling on locality labels. Thus all specimens from "Phulcauki" or "Lete" are quoted as from Phulcoki or Lete.

The difficulties in listing Nepalese material are due to inadequate maps, different ways of transcription and misinterpretation of local information. However, the localities of the numerous expeditions made by J. Martens & al. have been shown on maps in MARTENS (1987) and in SCHAWALLER (1991). The collecting sites of A. Smetana and me are shown on maps in SMETANA (1988). For more information see the above papers.

All data are based on material I have examined.

DIAGNOSTIC CHARACTERS

The length of the specimens is measured from the middle of the apical pronotal margin to the inner apical angle of the elytra. Width is measured at the largest point. Size and colour pattern of teneral specimens was not taken in account. The relative length of antennomeres is measured at the same magnification (see LÖBL 1974; 1990b). In *Scaphisoma*, the level of inner and outer apical angles of elytra is compared in dorsal view. The indicated size of the metepisternum refers to the free visible portion. Abdominal sterna are counted from the beginning of the first visible free segment, i.e., 3rd sternum. Mouthparts and genitalia are mounted in Canadian balsam. For more details see LÖBL (1990b).

The presence or absence of the microsculptured patches on the 6th abdominal tergum is not examined for the diagnostic purpose. It is covered by the elytra and the wings, and not easy to see. The characters of the mouthparts are not used below genus level and potential species characters in chaetotaxy have not been investigated.

The prothorax includes a pair of internal cavities (or pockets) covered by dense spinose or setose structures (Figs 3 to 8) in several genera. NEWTON (1984) was the first to record the presence of this unusual feature in scaphidiids, and thought that they may function as mycangia or spore-retaining structures. These cavities are usually distinct when viewed under a stereoscopic microscope, when the prothorax is separated from the mesothorax. The fine structure as seen in scanning electron micrographs shows significant differences among the species of same the genus (i.e., *Baeocera*, Figs 3 to 8). I have not

seen these cavities in any of the examined species of the *Scaphium-Scaphidium* groups, neither in *Cyarium*, *Scaphisoma*, *Caryoscapha*, *Afroscaaphium*, *Toxidium*, *Scaphischema*, *Scaphicoma*, *Sapitia*, and *Baeoceridium*. They are present in all the specimens of *Pseudobironium*, *Baeocera*, *Scaphobaeocera*, *Scaphoxium*, *Baeotoxidium*, *Xotidium*, *Brachynopus*, *Brachynoposoma* and *Zinda* examined, and are particularly well developed in *Pseudobironium*. It is likely that the internal thoracic cavities evolved independently in different groups, as these genera do not form a holophyletic group.

The anapleural suture separating the metasternum from the mesepisternum is always distinct in Scaphidiidae. Most members of the group exhibit a subparallel ridge or stria joined to the anapleural suture more or less close to the mesocoxal cavity (but never reaching its margin), delimiting a small area believed to be the mesepimeron by previous authors. A.F. Newton, Jr. (pers. comm) suggested that this area cannot be the mesepimeron, because of the absence of a corresponding internal suture, and because it never extends to the coxal cavity. The examination of the internal surface of the mesothorax I have made in several scaphidiids confirms his observation. However, the relative length of the visible ridge (or stria) is an useful species character in some groups, especially in *Scaphisoma*. It is named "mesepimeral ridge" in this paper.

Primitively, the parameres of the aedeagus are facing the ventral side of the body. In some groups the aedeagus has rotated 90 degrees (e.g., in *Scaphium*, *Baeocera*, *Scaphobaeocera*), with dorsal side facing the right side of the body. In this study the ventral/dorsal/lateral sides are referred to as their plesiomorphic position. Similarly, the "right" and "left" sides of the aedeagus are referred to as primitive within the abdomen which is inverted in the figures. The ventro-apical wall of the basal bulb of the median lobe is strongly sclerotized, being the site of the attachment of the parameres. This area is often more or less protruding, or even forms an apophysis longer than the basal bulb in some species of the *Scaphisoma unicolor* group. In this study this structure is referred as the ventral process.

NATURAL HISTORY AND ECOLOGY

The occurrence of sporophores is unpredictable and often ephemeral. Thus, there is a tendency toward polyphagy in fungivores. In addition, polyphagy in mycophagous insects may be explained by its low cost (HANSKI 1989). The scaphidiids, which are putative primary fungivores, are generally found on living fungi (e.g. KLIMASZEWSKI & PECK 1987), although exceptions may occur. Large numbers of *Scaphium castanipes* Kirby have been attracted to traps made from an assortment of fungi in the Yukon Territory (Smetana, pers.comm.), and the polyphagy in scaphidiids has been reported several times, e.g., ASHE 1984, HAMMOND & LAWRENCE 1989, LESCHEN 1988, LESCHEN & al. 1990, NEWTON 1984, NUSS 1975. Obviously, most species feed either on fruiting bodies of slime moulds (*Baeocera*, *Scaphobaeocera*), or on hyphae of Polyporaceae and Agaricales. Gilled fungi are source for few groups only, e.g., *Scaphium castanipes*, *Cyarium* (ASHE 1984, NEWTON 1984). The only biological data on Himalayan scaphidiids are given in NEWTON & STEVENSON, 1990.

Details of the life history of any scaphidiid species have yet to be established. Most species seem to lay a single egg (pers. observation). Information on morphology of immature stages is summarized in NEWTON 1991, and additional pertinent information is

given in ASHE 1984, KOMPANTSEV & POTOTSAKAYA 1987, LAWRENCE & NEWTON 1980, and LESCHEN 1988. Three larval instars are recorded for *Caryoscaptha americanum*. The larval development in *Baeocera* is very rapid, taking only a few days (NEWTON 1991), pupae in *Scaphisoma* and *Caryoscaptha* were observed after 11 days, and adults emerged 17 to 41 days after collecting date (LESCHEN 1988).

Scaphidiids occur from spring to winter in temperate climate (LÖBL & STEPHAN 1993; pers. observation). Usually, Himalayan records are from samples made during the spring and in autumn. This tends to reflect the sampling activity rather than the phenology: heavy snowfall at higher elevation and drought at lower altitudes make collecting difficult, if not impossible in winter. Collecting mycophagous beetles such as scaphidiids is harder during the summer monsoon rainfall.

The altitudinal records indicate highest diversity of the Himalayan scaphidiids between 1000 and 2500m, but several species were found above 3000m (e.g., *Scaphidium biundulatum*, *Baeocera microptera*, *B. crinita*, *B. thoracica*, *B. errabunda*, *Scaphisoma inquietum*, *S. aurorae*, *S. jado*, *S. clavigerum*, *S. sikkimense*, *S. bhareko*), and one (*Baeocera microptera*) is found at 4000 m. Since Myxomycetes have been recorded at 4800 m in Khumbu Himal (POELT 1967) the *Baeocera* may occur above 4000 m. In my opinion, the relative paucity of data from lower elevations (Terrai, Siwaliks, Dum-valleys), is due to greater interest in the study of higher altitude habitats with, presumably, endemic species, an unfavourable climate repelling researchers, the short period in year favourable for sampling, and difficulties in locating suitable sampling sites.

Scaphidiids often aggregate and several species may cohabit on a single fungus growth (LÖBL 1986b). Unlike many other fungivorous beetles (e.g., Ciidae, Pterogeniidae, Tenebrionidae) they have not developed any secondary sexual characters which are correlated with food or mating competition.

SYSTEMATICS

TAMANINI (1969) subdivided the scaphidiids in two groups of family level, the Scaphidiidae and the Scaphisomidae. This has not been followed by any subsequent worker. To the contrary, KASULE (1966) reduced the scaphidiids to a subfamily of the Staphylinidae, and several modern authors (e.g., KASULE 1968, LAWRENCE 1982, HAMMOND & LAWRENCE 1989) treated them as a subfamily. LAWRENCE & NEWTON (1982) considered the scaphidiids as a possible member of the oxyteline group. NAOMI (1985) retained the family rank for scaphidiids, and considered them to be the sister group of the scydmaenids with which they constitute the sister group of his Oxyporidae. For practical reasons, I prefer to treat the group as a family, in view of the still insufficient knowledge of the phylogeny of the Staphylinoida. The classification and suprageneric names proposed by ACHARD (1924a) are not used here, as in any of my previous papers.

Geographic variation has been little examined and clines are unknown within the scaphidiids. Only three species have been found to be polytypic. Two of them, *Baeocera mussardi* and *Scaphisoma assimile*, are represented each by a subspecies in the studied area. The polytypy in these species is based on minor discontinuous morphological characters. Their aedeagi do not exhibit any distinguishing characters compared with the nominate subspecies (e.g., Fig. 149). For more detail see LÖBL (1963; 1979). The taxonomic treatment in these cases reflects rather typological than biological thinking.

KEY TO THE GENERA OF SCAPHIDIIDAE OF CONTINENTAL ASIA
(genera not recorded from the Himalaya in parenthesis)

- 1 Segments of antennal club symmetrical. Scutellum large, visible. Robust species. Procoxal cavities closed apically 2
 – Segments VII to XI always, XI often, asymmetrical. Scutellum not visible, or only small apical portion point exposed. Usually small, graceful species. Procoxal cavities open apically 7
- 2 Eye not notched 3
 – Eye notched 4
- 3 Occipital region visible. Basal segment of metatarsus short. Elytron with longitudinal striae. Prosternum long. Tibiae without rows of spines *Scaphium* Kirby
 – Head retracted into thorax to eye margin. Basal segment of metatarsus long. Elytron without longitudinal striae. Prosternum narrow. Pro- and mesotibia with rows of spines *Cyparium* Erichson
- 4 Base of elytron impressed to receive extended basal angle of pronotum. Centre of metasternum pubescent in male. Head retracted into pronotum 6
 – Base of elytron not impressed, basal pronotal angle not prolonged apically. Metasternum glabrous in both sexes. Head with occipital region visible 5
- 5 Elytral disc with rows of longitudinal, deep, punctate striae *Ascaphium* Lewis
 – Elytral disc without striae *Episcaphium* Lewis
- 6 Mesosternal keel bifid basally *Scaphidium* Olivier
 – Mesosternal keel simple *Hemiscaphium* Achard
- 7 Third antennomere short, triangular 8
 – Third antennomere elongate, subcylindrical 11
- 8 Body appearing glabrous, setae usually restricted to punctures 9
 – Body conspicuously pubescent 10
- 9 Apical segment of maxillary palpus slender, tapering, without any stria
 *Scaphisoma* Leach
 – Apical segment of maxillary palpus flattened, triangular, with striate outer margin..... *Caryoscapha* Ganglbauer
- 10 Mesepimeral ridge distinct (*Sapitia* Achard)
 – Mesepimeral ridge absent *Mystrix* Champion
- 11 Basal pronotal angle almost always extended to or beyond level of anapleural suture. Mesepimeral ridge distinct. Antennal insertion situated near clypeal suture12
 – Basal pronotal angle never extended apically and not reaching level of anapleural suture. Mesepimeral ridge usually obsolete. Antennal insertion situated more or less far from clypeal suture 14
- 12 Meso- and metacoxae distant *Baeocera* Erichson
 – Meso- and metacoxae strongly approximate 13
- 13 Elytron with parasutural stria, discal surface usually distinctly microsculptured *Scaphobaeocera* Csiki
 – Elytron without parasutural stria, and disc not microsculptured ... *Baeotoxidium* Löbl
- 14 Body narrow. Meso- and metacoxae approximate 15
 – Body wide. Meso- and metacoxae distant 18
- 15 Third antennal segment curved. Hypomeron explanate basally, with margin distinctly convex *Scaphoxium* Löbl
 – Third antennal segment straight. Hypomeron not explanate basally, with margin almost straight16
- 16 Meso- and metatarsus notably longer than respective tibia *Scaphicoma* Motschulsky

- Meso- and metatarsus about as long as respective tibia 17
- 17 Elytron with basal stria entire, joined to sutural and lateral striae. Labial palpus 2-segmented *Xotidium* gen. n.
- Elytron with basal stria usually interrupted laterally, sutural stria shortened. Labial palpus 3-segmented *Toxidium* Le Conte
- 18 Legs and antennae conspicuously long. Antennal segments III to XI very thin. Antennal insertion situated near upper margin of eye *Bironium* Csiki
- Legs and antennae moderately long. Antennal segments III to XI robust. Antennal insertion situated near clypeal suture 19
- 19 Antennomere XI asymmetrical, moderately longer than preceding segment, segments VII to X elongate *Pseudobironium* Pic
- Antennomere XI symmetrical, conspicuously long, longer than two preceding segments combined, segments VII to X short (*Amalocerosomorpha* Pic)

Scaphium Kirby

Scaphium Kirby, 1837; type species: *Scaphium castanipes* Kirby, 1837, by monotypy.

This genus includes four species: the Nearctic *S. castanipes* Kirby, the Asian *S. quadraticolle* Solsky, *S. immaculatum* (Olivier) from Central Europe and Mediterranean area, and *S. ferrugineum* Reitter of presumed South African origin (REITTER 1880). *Scaphium vernicatum* Pic from China is hereby transferred to *Scaphidium*, comb. nov.

Scaphium quadraticolle Solsky from ex "Soviet Central Asia" has been recently recorded from northern Pakistan (LÖBL 1986b). A new record is "Naltartal, Umg. Jagot, 1-4.VIII.1974 F. Gartner", one specimen found by the Austrian Karakorum Expedition (Coll. H. Franz). It is possible that the range of this species extends to the Himalaya.

Ascaphium Lewis

Ascaphium Lewis, 1893; type species: *Ascaphium sulcipenne* Lewis, 1893, by present designation.

Members of *Ascaphium* have conspicuously striate elytra as those of *Scaphium*, but they differ from the latter by the elongate basal segment of the metatarsus. The genus includes five species and one "variety" which is here elevated to species rank. An additional species occurs in Nepal. The range of *Ascaphium* extends from Japan, China and North Vietnam to Central Himalaya.

KEY TO THE SPECIES OF *Ascaphium*

- 1 Elytron with sutural, marginal, and six discal striae ending almost at same level near elytral apex 2
- Elytron with four inner discal striae ending far from apical margin, outer stria or striae reduced 5
- 2 First and third discal striae joined near elytral apex, beyond second stria *tonkinense* Achard
- Elytron with discal striae not joined apically 3
- 3 Row of sub-basal pronotal punctures sparse, more or less interrupted, not impressed in middle. Body and femora black, tibiae, tarsi and antennae bright ochreous *ochripes* sp.n.

- Pronotum with impressed dense row of sub-basal punctures. Femora and tibiae uniformly dark, or apical portion of tibiae somewhat paler than femora 4
- 4 Second and third elytral striae starting at base and joined with basal stria *sulcipenne* Lewis
- Second and third elytral striae starting beyond base and not joined with basal stria *sinense* Pic
- 5 Pronotal disc very finely punctate, punctures on pronotal centre much smaller than those on frons *minor* Pic (status nov.)
- Pronotal disc and frons about equally, coarsely punctate 6
- 6 Length 3.2 - 3.5 mm. Antennal club dark with distinctly paler apical segment. Mesosternal keel low, with straight horizontal margin in lateral view .. *apicale* Lewis
- Length 3.8 - 4.5 mm. Antennal club unicolorously dark or with apical portion of last segment somewhat paler. Mesosternal keel high, with sinuate margin in lateral view..... *tibiale* Lewis

***Ascaphium ochripes* sp.n.**

Holotype, female: Nepal, Sankhua Sabha distr., Chichila, 2200m, 24.IV.1984 (Löbl & Smetana) (MHNG).

D i a g n o s i s . Large-size species with ochreous tibiae and tarsi (Fig. 9). Subbasal row of pronotum sparse. Elytral disc with 1st and 2nd striae not joined with basal stria, 3rd joined with basal stria, 1st and 2nd striae joined apically. Metasternal grooves long, approximate.

D e s c r i p t i o n . Length 6 mm. Body, head and femora black. Apex of abdomen, tibiae, tarsi, antennae and palpi bright ochreous. Frons at narrowest point 0.31 mm, with fine and sparse punctation becoming denser and coarser apically, vertex with punctures larger than intervals. Antennae long, with segments VII to X about 2.5x as long as wide, and XI almost 3x as long as wide. Pronotum at base 2.6 mm wide, with lateral margin oblique in basal half, arcuate in apical half (dorsal view); sub-basal row of punctures irregular, sparse, in central portion more or less interrupted, laterally impressed. Elytron with straight basal stria and six deep discal striae (in addition to sutural and marginal striae): 1st and 2nd starting just beyond basal stria and not joined with latter, joined together apically; 3rd joined with basal stria, 4th starting laterally of basal stria, 3rd and 4th weakly incurved and somewhat longer than 1st or 2nd; 5th and 6th starting almost at same level behind humeral callosity, not or barely incurved apically and almost as long as 4th. All striae distinctly punctate, extended to narrow, irregularly punctate apical area of elytron. Intervals convex, very finely punctate. Apical area not flattened, with fine and shallow punctures. Mesosternal keel gradually lower toward apical margin, with ridge horizontal in apical half (lateral view). Metasternal median grooves long, approximate, moderately convergent, each delimited by elongate apical impression. Protibia straight, mesotibia weakly sinuate, metatibia weakly incurved.

R e m a r k s . This species may be readily distinguished by its colour pattern in combination with the sparse row of the sub-basal punctures of the pronotum. It shares long lateral elytral striae and the large size of body with *A. sulcipenne*, *A. sinense*, and *A. tonkinense*. The remaining species, *A. apicale*, *A. tibiale*, *A. minor*, and undescribed species from Burma and Taiwan represented in the MHNG, have reduced lateral striae and shortened four discal striae. *Ascaphium minor* was described as a variety of *A. sinense* (Pic, 1956) although it differs conspicuously from the latter in many characters, including in the much smaller size.

Episcaphium Lewis

Episcaphium Lewis, 1893; type species: *Episcaphium semirufum* Lewis, 1893; by monotypy.

This is a small genus confined to Asia. The type species occurs in Japan, the second member, *E. saucineum* (Motschulsky) in Sri Lanka, and *E. unicolor* sp.n., described below, in Eastern Nepal.

KEY TO THE SPECIES OF *Episcaphium*

- 1 Elytron pale, with dark transverse fasciae in centre and along apical margin. Median process of mesosternum not margined, mesosternal transverse keel-line absent *saucineum* (Motschulsky)
- Elytron uniformly reddish-brown 2
- 2 Head, pronotum and elytra unicolored. Middle portion of 1st ventrite not microsculptured *unicolor* sp.n.
- Head black, thorax black or reddish, elytra and abdomen reddish or ochreous. Entire first abdominal ventrite microsculptured *semirufum* Lewis

Episcaphium unicolor sp.n.

Holotype, male: Nepal, Sankhua Sabha distr., Arun Valley, Lamobagar Gola, 1000 - 1400 m, 27.V. - 3.VI.1980 (Holzschuh) (MHNG).

Paratype, male: Nepal, Taplejung distr., SE Yamputhin to Yamputhin, 2000 - 1650 m, mainly Alnus forest, 26. and 30.IV.1988 (Martens & Schawaller) (SMNS).

D i a g n o s i s . Body and legs uniformly reddish-brown. Metasternum with two small apico-median tubercles. Middle portion of first ventrite with obsolete microsculpture.

D e s c r i p t i o n . Length 3.2 - 3.6 mm. Body and legs reddish-brown, antennomeres I to VI ochreous, following segments dark brown to blackish. Punctuation on frons finer than that on vertex. Pronotum with lateral margins weakly sinuate in dorsal view, disc almost evenly arcuate in lateral view, not impressed near base; sub-basal row formed by coarse punctures. Elytron with four or five discal rows of moderately large punctures, intervals finer and irregularly punctate. Apical area flattened, bearing shallow large punctures situated very closely to each other. Median mesosternal process with raised, keel-like margins extended laterally and forming transverse keels joined with apico-lateral margins of mesosternum. Metasternum entirely very finely punctate, with two small elongate medio-apical tubercles; surface flat between and laterally tubercles, impressions absent. Abdominal segments sparsely and very finely punctate, with microsculpture consisting of punctures, except middle portion of 1st ventrite lacking microsculpture. Meso- and metatibia incurved. Segments 1 to 3 of male protarsi distinctly enlarged. Aedeagus 1.12 - 1.19 mm long. Median lobe with curved apical portion and robust ventral process. Internal sac bearing pair of bifid, slender sclerites situated at base of thin laminar structure. Latter narrowed and incurved apically. Membranes of internal sac extremely finely denticulate apically, with setose structures in centre, and with extremely fine scale-like proximal structures.

R e m a r k s . *Episcaphium unicolor* shares the margined mesosternal process and the transverse mesosternal keel with *E. semirufum*. It may be distinguished from the latter species by the colour pattern, the vertex with punctures coarser than those on the frons, the

finer punctures of the sub-basal pronotal row and of the elytral rows, and by the obsolete microsculpture on the middle portion of the 1st abdominal ventrite.

Scaphidium Olivier

Scaphidium Olivier, 1790; type species: *Scaphidium quadrimaculatum* Olivier, 1790, designated by Leach 1815.

Isoscaphidium Achard, 1922 (sg); not validated by designation of type species.

Hyposcaphidium Achard, 1922 (sg); not validated by designation of type species.

Pachyscaphidium Achard, 1922 (sg); type species: *Scaphidium arrowi* Löbl, 1920, by monotypy.

Parascaphidium Achard, 1923; type species: *Scaphidium optabile* Lewis, 1893, by monotypy.

Scaphidium with over 200 species is distributed over all major regions but absent from oceanic islands and from areas with cool climate. ACHARD (1922a) defined four subgenera, all based on overall similarities. He failed to place most of the species validly described to that date in any of these subgenera. They were used in papers dealing with the Japanese species (SHIROZU & MORIMOTO 1963, LÖBL 1967) but ignored by most of the other authors (i.e., CHAMPION 1927, MIWA & MITONO 1943, LÖBL 1975b and 1976a). Actually, roughly 90% of the species of *Scaphidium* have not been assigned to any subgenus. In absence of defined species groups based on autapomorphies the subgeneric names are not used for the 20 Himalayan species treated below. Three of these species, *S. biundulatum* Champion, *S. gurung* sp.n. and *S. nepalense* sp.n., all with obviously restricted ranges at higher altitudes, are possibly relatives of *S. quadrimaculatum* Olivier. *Scaphidium arrowi* Achard from "British Bootang" belongs likely to the same group. This species and *S. dureli* Achard have not been found in any modern collection, and I have not located their type localities.

The remaining species were collected at lower altitude and are or seem to be widely distributed.

Scaphidium incrassatum Achard from Burma is represented in the MHNG by a specimen labelled "Assam". The species is not included in the key but may be easily recognised by colour pattern of the elytra (Fig. 12). *Scaphidium clatratum* Achard and *S. ocellatum* Achard from "Assam" are not included in this study.

KEY TO THE HIMALAYA SPECIES OF *Scaphidium*

- | | | |
|---|---|-----------------------------|
| 1 | Pronotum and elytra unicolored | 2 |
| – | Pronotum and/or elytra bicolored | 8 |
| 2 | Dorsal surface of body ochreous | 3 |
| – | Body blackish-brown to black, elytra and pronotum sometimes with bluish or violaceous shine | 4 |
| 3 | Thorax ochreous ventrally | <i>cinnamomeum</i> Champion |
| – | Thorax black ventrally | <i>melanogaster</i> sp.n. |
| 4 | Meso- and metafemur black with reddish transverse fascia. Species 6 to 7 mm long | <i>grande</i> Gestro |
| – | Femora uniformly dark. Smaller species | 5 |
| 5 | Elytra and pronotum violaceous or bluish, remaining surface of body black | <i>cyanelum</i> Oberthür |
| – | Elytra and pronotum blackish brown or black | 6 |

- 6 Elytral disc with distinct longitudinal rows of coarse punctures *biseriatum* Champion
 - Elytral disc without trace of rows of coarse punctures 7
- 7 Length 6 mm. Lateral pronotal margin sinuate in dorsal view. Male profemur not keeled *dureli* (Achard)
 - Length 4.5 mm. Lateral pronotal margin not sinuate in dorsal view. Male profemur keeled ventrally *thakali* sp.n.
- 8 Elytron black or blackish-brown, with single reddish sub-basal fascia 9
 - Colour pattern of elytron different 10
- 9 Male profemur with ventral tooth *syhetense* Achard
 - Male profemur with several ventral tubercles *holzschuhi* sp.n.
- 10 Elytron black or blackish, with two ochreous or yellowish fasciae or spots 11
 - Colour pattern of elytron different 16
- 11 Pronotum uniformly black 12
 - Pronotum black with reddish pattern 15
- 12 Elytron with wide fasciae or spots covering more than half of total surface 13
 - Elytron with narrow fasciae or spots covering less than third of total surface 14
- 13 Margins of anterior elytral fascia strongly dentate. Pronotal punctures fine, smaller than intervals *biundulatum* Champion
 - Margins of anterior elytral spot weakly dentate. Pronotal punctures fairly coarse, as large as or larger than intervals *arrowi* Achard
- 14 Apical half of male protibia evenly thick *nepalense* sp.n.
 - Inner margin of male protibia angulate in apical half, tibia narrowed towards apex *gurung* sp.n.
- 15 Elytron with anterior fascia strongly narrowed in middle, posterior fascia not reaching apical margin *harmandi* Achard
 - Elytron with anterior fascia almost evenly wide, posterior fascia extended to apical margin *coomani* (Pic)
- 16 Elytron yellowish, with base, sutural, lateral and apical margins black *rubritarse* Pic
 - Elytron ochreous, with black or brown spots and/or fasciae 17
- 17 Elytral disc entirely very finely punctate *semilimbatum* Pic
 - Elytral disc with rows of coarse punctures 18
- 18 Elytral disc with two long and two short rows of coarse punctures *baconi* Pic
 - Elytral disc with one long and one short row of coarse punctures 19
- 19 Pronotal spots not reaching basal margin. Elytron with wide central and apical fasciae, and with small humeral spot *septemnotatum* Champion
 - Pronotal spots reaching basal margin. Elytron with humeral spot absent species indet.

Scaphidium cinnamomeum Champion

Scaphidium cinnamomeum CHAMPION, 1927: 270.

D i a g n o s i s . Length 3.2 - 3.4 mm. Head and body ochreous. Femora and antennomeres I to VI as body, tibiae darker, antennomeres VII - XI dark brown to blackish. Frons narrow. Pronotum strongly vaulted above level of elytra and strongly inclined apically, sub-basal row of punctures broadly interrupted in middle, lateral margins distinctly sinuate, discal punctation very fine. Elytron vaulted, with impressed sutural area; discal punctation fine with exception of two longitudinal rows of coarse punctures and several additional coarse punctures situated laterally. Male profemur incurved, ventrally flattened, with anterior and posterior ventral edge distinct, basal half bearing ventral row of erected setae; subapical tubercle minute. Meso- and metafeur slender in both sexes.

Male protibia slender, somewhat incurved and weakly thickened apically, meso- and metatibia distinctly incurved and thickened apically. Aedeagus (Figs 45,63) with median lobe weakly narrowed apically in dorsal view, ventral wall suddenly tapering apically. Parameres each sinuate in apical half, with rather strongly enlarged apex. Internal sac complex (Fig.83).

Type material. Holotype, female, labelled "W. Almora Divn. Kumaon U.P. nov. 1918, H.G.C." (BMNH).

Material examined, 5 specimens: India, Himachal Pradesh, 10 km NW Sarahan, 1700 m, 7.X.1988 (Vit) (MHNG).

Distribution. North India, Uttar Pradesh: Kumaon and Himachal Pradesh.

Remarks. This species was found under oak bark, on stump with fungi, and in decaying plant debris.

Scaphidium melanogaster sp.n.

Holotype, male: India, Himachal Pradesh, Kulu Valley, Vashisht Baths N Manali, 1990m, 13.X.1988 (Vit) (MHNG).

Paratypes, 4: India, Himachal Pradesh, 10km NW Sarahan, 7.X.1988 (Vit) (MHNG) 2 females; Uttar Pradesh, Mussoorie, Rabbit Farm, 1300 m, 10.VII.1989 (Riedel) (SMNS) 1 female; Nepal, Sankhua Sabha distr., above Sheduwa, 2550 m, 30.III.1982 (A. & Z.Smetana) (MHNG) 1 female.

Diagnosis. Small-sized species with ochreous dorsal surface and black ventral side of thorax. Elytral punctation very fine. Male profemur and protibia without conspicuous sexual characters.

Description. Length 3.3 mm. Head, pronotum, hypomera, elytra, and abdomen uniformly ochreous. Ventral surface of thorax, hypomera excepted, femora, tibiae, and antennal club black. Tarsi dark reddish-brown, antennal segments I to VI ochreous. Frons rather narrow. Pronotum vaulted above level of elytra, rather strongly inclined anteriorly, with lateral margins distinctly sinuate; sub-basal row of punctures interrupted in middle, punctures relatively small, joined by striae; discal punctation almost obsolete. Elytron vaulted, with sutural area flat and impressed; punctures along sutural stria relatively small, about as large as basal punctures; discal punctation very fine, somewhat more distinct than that of pronotum; in addition, disc with two longitudinal rows of coarse punctures; apical area of disc weakly flattened, with enlarged but extremely shallow punctures. Pygidium and propygidium evenly very finely punctate, both bearing microsculpture well visible at 50x magnification. Male with metasternal pubescence short and sparse. Profemur weakly thickened, without conspicuous sexual characters. Meso- and metafemur slender. Protibia somewhat incurved, hardly stouter apically. Meso- and metatibia distinctly incurved, slender. Aedeagus with median lobe similar to that of *S. cinnamomeum*, but with lateral margins of distal portion somewhat concave. Parameres (Fig. 66) each gradually wider toward middle third, from there narrowed, in apical portion again wider; inner margin of parameres concave between middle and apical portion. Internal sac complex (Fig. 82).

Remarks. This species is similar to *S. cinnamomeum* with which it shares the interrupted sub-basal row of pronotal punctures and the reduced metasternal pubescence in male. It may be readily distinguished by the black ventral surface of the thorax and by the black femora and tibiae. Besides, it differs from *S. cinnamomeum* by the less vaulted pronotum, by the elytral and abdominal punctation (the pygidium and propygidium are notably more coarsely punctate in *S. cinnamomeum*), and by the sexual characters in male. The holotype was found in decaying plant debris, the two paratypes were taken together with *S. cinnamomeum* from under oak bark.

Scaphidium grande Gestro

Scaphidium grande GESTRO, 1879: 50; ACHARD 1920a:56; 1920b:125; 1920c:211; CHAMPION 1927:268; LÖBL 1990b:511.

Scaphidium grande var. *subannulatum* PIC, 1915c:3. - syn.nov.

Scaphidium grande var. *inimpressum* PIC, 1920:189. - syn.nov.

Scaphidiolum grande; ACHARD 1924b:91.

Diagnostic characters. Length 6 - 7 mm. Head and body black. Profemur and all tibiae black. Meso- and metafemur black, each with wide reddish fascia. Tarsus and antennomeres I to VI dark brown to blackish, club black. Frons moderately wide. Pronotum vaulted, with centre above level of elytra, discal punctation very dense. Elytron rather flat, with raised sutural area, without row of coarse punctures, discal punctation irregular, more or less fine. Male with ventral side of profemur and inner side of protibia tuberculate. All femora slender. Protibia weakly incurved, almost evenly stout, with minute apical denticle. Meso- and metatibia somewhat incurved. Metasternal pubescence dense and long. Aedeagus (Fig. 39) with median lobe wide, parameres (Fig. 55) weakly enlarged and incurved apically, internal sac complex (Fig. 71).

Type material. Holotype male, from "Sarawak" (MCSN), examined.

Material examined, 6 specimens: Nepal, Sankhua Sabha distr., bottom Arun Valley bellow Num, 1050 m, 21. and 22.IV.1984 (Löbl & Smetana) (MHNG).

Distribution. North India, Nepal, Burma, Thailand, Laos, Malaysia, Vietnam, Indonesia, Taiwan.

This is a rather variable species, especially in size and elytral punctation. The Himalayan specimens are smaller than those I have seen from southeast Asia. The infraspecific forms *inimpressum* Pic, 1920 and *subannulatum* Pic, 1915 are based on characters without taxonomic significance.

The specimens from Eastern Nepal were found under wood debris in a subtropical forest.

Scaphidium cyanelum Oberthür

Scaphidium cyanelum OBERTHÜR, 1884: 5; CHAMPION 1927: 271.

Diagnostic characters. Length 3.4 - 3.8 mm. Head dorsally, pronotum and elytra very dark violet or bluish, with metallic shine. Remaining surface of body, femora, tibiae, and antennal club black. Antennomeres I to VI and tarsi reddish-brown to black. Frons rather narrow. Pronotum vaulted above level of elytra, moderately inclined anteriorly, with distinctly sinuate lateral margins; discal punctation dense and rather coarse, sub-basal row of coarse punctures not interrupted. Elytron vaulted, with irregular discal punctation and without trace of discal rows of coarse punctures, large discal punctures usually smaller than large punctures of pronotal disc; sutural area raised. Pygidium and propygidium finely punctate, both with more or less distinct microsculpture. Male with long oblique metasternal pubescence; profemur thickened, ventral side flattened, anterior margin subangulate ventrally. Metafemur somewhat stouter than mesofemur. Male protibia straight beyond weakly incurved basal portion, gradually stouter toward shallow subapical notch, then narrowed and with oblique inner margin. Meso- and metatibia straight or hardly arcuate, gradually thickened apically. Aedeagus (Fig. 42) with apical portion of median lobe evenly wide in dorsal view, in ventral view tapering toward apex. Parameres each somewhat incurved apically. Internal sac complex (Fig. 74).

Type material. Holotype, female, from "Ind.bor." (MNHN), examined.

Material examined, 9 specimens: Nepal, Parbat distr., Kali Gandaki Khola, Kopchepani, 1600 m, 18.VI.1986 (Holzschuh) (MHNG) 1; Kopchepani-Ghasa, 1600-2000 m, 19.VI.1986 (Probst) (MHNG) 1; Patan distr., Godawari, 1500 m, 22-25.VI.1983 (Brancucci) (NMB) 1; Godawari, 1500-1600 m, 6.VII.1986 (Holzschuh) (MHNG) 1; Sankhua Sabha distr., Arun Valley, Chichila-Mure, 1900 m, 24.V.1980 (Holzschuh) (MHNG) 1; Chichila, 1950 m, 29.V.1983 (Brancucci) (NMB) 1; Arun Valley, Num, 1550 m, 5-6.VI.1983 (Brancucci) (NMB) 1; Thernathum distr., Phulvari-Waku, 1200-1600 m, 9.VI.1985 (Brancucci) (NMB, MHNG) 2.

Distribution: India "North India", Meghalaya, Nepal.

Scaphidium biseriatum Champion

Scaphidium biseriatum CHAMPION, 1927: 268.

Diagnostic characters. Length 3.8 - 4.5 mm. Body, femora and tibiae black or blackish-brown, apex of abdomen paler. Antennomeres I to VI and tarsi reddish, antennal club brown. Frons narrow. Pronotum vaulted above level of elytra, strongly inclined apically, with lateral margins sinuate; discal punctation rather fine, sub-basal row of punctures not interrupted at middle. Elytron moderately convex, with 2 or 3 rows of coarse punctures in addition to irregular, fine discal punctation; sutural area impressed. Male with long oblique metasternal pubescence. Male profemur moderately thickened, margined and with one row of tubercles ventrally. Metafemur barely thickened. Male protibia somewhat incurved, becoming stouter from base to middle, evenly thick in apical half, with small apical tooth on ventral side. Meso- and metatibia somewhat arcuate. Aedeagus (Fig. 51) with median lobe wide dorsally, ventral side tapering. Parameres (Fig. 58) each incurved, somewhat enlarged at apex. Internal sac complex (Fig. 76).

Type material. Holotype male from "Sunderdhung V., W. Almora divn., 8-1200 feet" (BMNH), examined.

Material examined, 23 specimens: Nepal, Sankhua Sabha distr., Arun Valley, Lamobagar Gola, 1000-1400 m, 27.V.-2.VI.1980 (Holzschuh) (NMB) 1; bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG) 19; Taplejung distr., confluence of Kabeli Khola and Tada Khola, 1000 m, 23-25.IV.1988 (Martens & Schawaller) (SMNS) 1; India, Uttar Pradesh, Garhwal, Gangani, 1250 m, 13-20.VI.1981 (Brancucci) (NMB) 1; West Bengal, Darjeeling distr., Tindharia near Kurseong, 7.V.1980 (Hisamatsu) (MHNG) 1.

Distribution. North India, Nepal.

Scaphidium dureli (Achard) comb. n.

Scaphidiolum dureli ACHARD, 1922c: 37.

Diagnostic characters. Length 6 mm. Head, pronotum and most of ventral surface black. Elytra and hypomera blackish, with weak reddish shine. Femora and tibiae black, tarsi dark reddish brown. Antennomeres I to VI dark reddish brown, VII to X black, XI ochreous. Eyes large. Frons moderately wide. Pronotum moderately vaulted above level of elytra, strongly inclined apically, with distinctly sinuate lateral margins, sub-basal row of punctures regular, not interrupted in middle, consisting of coarse punctures, discal punctation fine and dense. Elytron without any discal row of coarse punctures; punctation obsolete on humeral area, on most surface similar to that of pronotum. Femora slender, in male without particular sexual characters. Male protibia strongly arcuate, slender except for moderately thickened apex. Mesotibia in male weakly arcuate, metatibia almost straight. Aedeagus with wide median lobe gradually narrowed toward tip. Apical portion of parameres weakly widened. Internal sac complex.

Type material. One male syntype from "British Bootan Padong L.Durel 1913" (MHNG), examined. An additional male bearing same locality data but not Achard's identification label (MNHN) is possibly a syntype also.

Remarks. I have not been able to locate the type data. The species may be readily distinguished from *S. grande* by the uniformly flack femora and by the shape of the male profemur and protibia.

Scaphidium thakali sp.n.

Holotype, male: Nepal, Mustang distr., Lete, 2550 m, 2.X.1983 (Löbl & Smetana) (MHNG).

Paratypes, 4: Nepal, Mustang distr., Lete, 24.IX.1971 (Franz) (Coll.H.Franz, MHNG) 2 females; Myagdi distr., Gasa-Tatopani, Kali Gandaki Valley, 2000-2500 m, 20.VI.1986 (Holzschuh) (NMB) 1 female; Chitre, Ghar Khola, 2400 m, 26-31.V.1984 (Holzschuh) (MHNG) 1 male.

Diagnosis. Medium-sized species with unicolored black body. Elytral punctation irregular. Male profemur with anterior margin keeled, male protibia thickened in apical half and notched near apex.

Description. Length 4.5 mm. Body black, head and legs very dark reddish-brown. Antennomeres I to VI ochreous, VII to X black, XI dark brown. Pronotum vaulted above level of elytra, strongly inclined apically, with lateral margins oblique in basal half (dorsal view), discal punctation dense and rather coarse, sub-basal row of coarse punctures deeply impressed, not interrupted at middle. Elytron with moderately and evenly rounded lateral margin, dorsally moderately convex; area between sutural margin and deeply impressed sutural stria distinctly raised; basal punctures not elongate, becoming gradually larger laterad; discal punctation irregular, without any longitudinal row of coarse punctures, most punctures much finer than those on pronotum; apical portion of elytron somewhat flattened and with punctation coarser than that on centre. Propygidium and pygidium very finely punctate, with microsculpture distinct on propygidium and on base of pygidium, obsolete on most of pygidium. Male with metasternal pubescence long, dense, erected. Profemur thickened, with anterior margin expanded, forming small rounded keel. Metafemur somewhat stouter than mesofemur. Basal half of protibia incurved, apical half thickened and with straight outer margin, subapical notch shallow. Ventral margin of protibia weakly convex above and straight below notch. Meso- and metatibiae almost straight, barely sinuate in dorsal view. Aedeagus (Fig.52) weakly expanded apically, with ventral wall abruptly narrowed. Parameres (Fig. 61) each sinuate, narrowed subapically. Internal sac complex (Fig. 78).

Remarks. *Scaphidium thakali* exhibits secondary sexual characters very similar to those in *S. harmandi*, except for the slender protibia. However, these two species may be readily distinguished by their distinct colour patter. *S. harmandi* differs also in the higher vaulted pronotum and in the shape of the aedeagus.

Scaphidium sylhetense Achard

Scaphidium sylhetense ACHARD, 1920e: 263; Champion 1927:269.

Diagnostic characters. Length 4.0 - 4.6 mm. Head dark reddish-brown to blackish. Thorax and most of elytra black, lateral area of pronotum sometimes reddish. Elytron with reddish sub-basal fascia (Fig.15). Abdomen reddish or ochreous with dark pygidium and dark genital segments. Femora and tibiae black, tarsi dark brown. Antennomeres I to VI dark brown or reddish, club black. Frons narrow. Pronotum vaulted

above level of elytra, strongly inclined apically, with notably sinuate lateral margins; sub-basal row not interrupted, discal punctation rather coarse. Elytron moderately convex, with discal punctation similar to that of pronotum, except for very finely punctate base and sub-basal fascia; disc without any row of coarse punctures. Metasternal pubescence in male long, dense, decumbent. Male profemur thickened, flattened ventrally, margined along anterior edge, beyond narrowed and with concave margin beyond small subapical tooth. Metafemur hardly thickened. Male protibia weakly incurved, very weakly thickened apically, with row of more or less distinct tubercles on inner side. Meso- and metatibiae somewhat incurved. Aedeagus (Fig. 53) with apical portion of median lobe slender. Parameres (Fig. 59) evenly arcuate, not enlarged apically. Internal sac with small sclerites (Fig. 79).

Type material. The male lectotype from Sylhet (BMNH) was designated by Champion (1927), not examined.

Material examined (males only), 13 specimens: India, West Bengal, Darjeeling distr., Trindharia near Kurseong, 7.V.1980 (Hisamatsu) (MHNG) 1; Sukuna near Matigara, 7.V.1980 (Hisamatsu) (MHNG) 1; Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG) 1; Hedangna - Num, 800 m, 16.VI.1983 (Brancucci) (NMB, MHNG) 3; Arun Valley, Lamobagar Gola, 1000-1400 m, 25.V.-3.VI.1980 (Holzschuh) (MHNG) 5; same but 1400 m, 8-14.VI.1983 (Brancucci) (NMB) 1; Myandi distr., Tatopani, 1100-1400 m, 27-28.VI.1986 (Holzschuh) (MHNG) 1.

Distribution. Bangla Desh, North India, Nepal.

Remarks. CHAMPION (1927) noted that the "anterior femora are toothed beyond the middle beneath". This, in combination with characters given by Achard, does define the species. For further details see remarks under *S. holzschuhi*. The specimens from eastern Nepal were found on and under logs and wood debris; some were swept from vegetation.

***Scaphidium holzschuhi* sp. n.**

Holotype, male: Nepal, Sankhua Sabha distr. Arun Valley, Lamobagar, 1400 m, 8-14.VI.1983 (Holzschuh) (MHNG).

Paratypes, 4 males: Sankhua Sabha distr., Arun Valley, Hedangna - Num, 800 m, 16.VI.1983 (Brancucci) (NMB, MHNG) 2; Hedangna - Navagaon, 5.IV.1980 (Holzschuh) (MHNG) 1; bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG) 1.

Diagnosis. Medium-sized species with distinct colour pattern. Elytral punctation fine or very fine. Male profemur with minute tubercles. Inner margin of male protibia strongly sinuate.

Description. Length 4.0 - 4.5 mm. Head dark reddish-brown. Thorax black except for small reddish sub-basal area on each side of pronotum. Elytron black with ochreous sub-basal fascia. Abdomen ochreous with dark pygidium and dark genital segments. Legs dark brown. Antennomeres I to VI ochreous, club black. Frons narrow. Pronotum weakly vaulted above level of elytra, strongly inclined apically, with distinctly sinuate lateral margins; discal punctation dense, rather fine, basal punctation very fine, sub-basal row not interrupted at middle. Elytron moderately convex, very finely punctate on base and on ochreous fascia, beyond latter more or less finely punctate; punctures along sutural stria coarser than largest discal punctures; basal punctures not elongate; interval between sutural margin and sutural stria raised. Pygidium and propygidium very finely punctured and microsculptured. Male with metasternal pubescence long, dense, oblique. Profemur distinctly thickened, flattened ventrally, with anterior ventral margin irregular, bearing several minute tubercles. Metafemur only somewhat thicker than mesofemur.

Protibia incurved in basal third, with outer margin somewhat, inner margin strongly sinuate (lateral view); stouter towards apical third, from there narrowed toward apex, at apex only somewhat thicker than at base. Meso- and metatibia very weakly arcuate, gradually weakly thickened apically. Aedeagus (Fig. 54) with narrow apical portion of median lobe. Parameres and internal sac (Fig. 78) very similar to those in *S. sylhetense*.

Remarks. This species may be distinguished from *S. sylhetense* by the shape of the male profemur and protibia. The pronotal punctation seems to be somewhat finer in *S. holzschuhi* than in *S. sylhetense*, but it does not provide reliable distinguishing character. Consequently, only males may be positively identified.

Scaphidium biundulatum Champion

Scaphidium biundulatum CHAMPION, 1927:269.

Diagnostic characters. Length 5.5 - 6.0 mm. Head, body including apex of abdomen, antennae and legs black. Elytron with two large ochreous fasciae (Fig. 10). Frons wide. Pronotum not vaulted above level of elytra, moderately inclined apically, with fine discal punctation; sub-basal row not interrupted at middle. Elytron with fine discal punctation, without any row of coarse punctures, impunctate on pale fasciae. Male profemur thickened, its central portion explanate anteriorly; metafemur thickened. Male protibia incurved in basal half, straight in apical half, gradually stouter from basal fifth toward apical third, then narrowed toward apex; inner margin angulate, inner surface glabrous apically. Meso- and metatibia arcuate. Tarsi somewhat longer in male than in female. Aedeagus (Fig. 48) with wide median lobe. Parameres not enlarged apically. Internal sac complex (Fig. 68).

Type material. Holotype, male from Tonglu (Darjeeling district near Nepal frontier), BMNH, examined.

Material examined, 10 specimens: Nepal, Panchtar distr., Dhorpar Kharka, 2700 m, *Rhododendron-Lithocarpus* forest, 13-16.IV.1986 (Martens & Schawaller) (SMNS, MHNG) 3; Taplejung distr., ascent to pasture Lassetam from Omje Khola, 2400-3150 m, 6.V.1988 (Martens & Schawaller) (SMNS, MHNG) 2; Sankhua Sabha distr., above Pahakhola, 2600-2800 m, *Quercus semecarpifolia-Rhododendron*, 31.V.-3.VI.1988 (Martens & Schawaller) (SMNS, MHNG) 3; India, Sikkim, Bakkim-Choka, 2670-3050 m, nr. Yuksam, 25.IX.1983 (Sakai) (M.Sakai, MHNG) 2.

Distribution. Eastern Nepal, western Darjeeling distr. and western Sikkim.

Remarks. CHAMPION (1927) stated that *S. biundulatum* resembles closely to *S. fryi* Achard. I have examined one syntype of the latter species. It is notably smaller and has the colour pattern of the elytra significantly different (Fig. 11) from that in *S. biundulatum*.

Scaphidium arrowi Achard

Scaphidium arrowi ACHARD, 1920e: 264.

Diagnostic characters. Length 7 mm. Head, body, legs and antennae black. Each elytron with two ochreous spots. Anterior spot large, extending from sutural stria to lateral stria and from basal row of punctures upto mid-length of elytron, with deeply emargined apical margin in male, somewhat irregular, oblique apical margin in female. Apical spot smaller, wider than long, suboval, separated from sutural stria and from apical elytral margin by narrow dark area. Frons wide. Eyes relatively small. Pronotum not vaulted above level of elytra, strongly inclined apically, with strongly

sinuate lateral margins; sub-basal row of punctures not interrupted in middle; discal punctation dense and coarse, most punctures about as large as or larger than intervals. Elytron without any discal row of coarse punctures; spots impunctate, black areas inbetween densely and coarsely punctate, punctures larger than those of pronotum and about as large as intervals. Metasternal pubescence in male short, decumbent. Male femora not thickened, longer than those in female. Profemur flattened and margined ventrally, with ventral margin sinuate in frontal view. Male protibia thickened toward apical seventh, then narrowed, with inner margin oblique, not notched; basal half of protibia weakly curved, apical half straight. Mesotibia longer than in female, arcuate. Mesotarsus conspicuously long, with ventral pubescence long. Aedeagus with median lobe wide, parameres evenly slender, setose, bearing minute tubercles on apical portion of inner side, and with internal sac complex.

Type material. Lectotype, female, labelled "Bhotan Padong" (NMP), two paralectotypes, females, labelled "British Bootan Padong L.Durel 1913" (NMP, MHNG), and one male paralectotype labelled "Assam" (BMNH), by present designation.

Remarks. This species shares many characters with *S. quadrimaculatum* and its allies but exhibits setose and apically tuberculate parameres. The male paralectotype is in poor state. It has been pinned and its hind legs are missing.

***Scaphidium gurung* sp. n.**

Holotype, male: Nepal, Parbat distr., Ghoropani pass, 2700 m, S slope, 9.X.1983 (Löbl & Smetana) (MHNG).

Paratypes, 8: as holotype but 6.X., 2 males; nr. Ghoropani pass, 2700-3100 m, 5-9.X.1983 (Löbl & Smetana) (MHNG) 1 female; Bhantanti-Ghoropani, 2500-2800 m, 10.V.1984 (Holzschuh) (MHNG) 1 male, 2 females; Chitre, 2400 m, 26-31.V.1984 (Holzschuh) (MHNG) 1 male; Mustang distr., Kopchepani, 1500-1700 m, 15.V.1984 (Bhakta) (NMB) 1 female.

Diagnosis. Large species with black body and distinct colour pattern of elytra, latter finely punctate. Male profemur thickened, margined anteriorly. Male protibia with angulate inner margin.

Description. Length 5.0 - 5.5 mm. Head, body, antennae and legs black. Elytron with narrow whitish or yellowish sub-basal fascia and with two subapical spots of same colour (Fig. 14), spots sometimes joined. Frons wide. Pronotum similar to that of *S. biundulatum*, discal punctation fine, basal punctation very fine, sub-basal row not interrupted at middle. Elytron with fine discal punctures similar to those of pronotum, without any row of coarse discal punctures, with humeral area very finely punctate, basal punctures not elongate; pale spots and fasciae impunctate. Pygidium and propygidium very finely punctate, distinctly microsculptured. Male with metasternal pubescence long and dense. Profemur thickened, ventrally flattened, margined anteriorly. Metafemur moderately thickened, widest beyond middle. Protibia incurved, evenly thin in basal fourth, then gradually stouter, from widest point toward apex obliquely narrowed, with angulate inner margin. Meso- and metatibiae incurved. Aedeagus (Fig.49) with short, wide, apically narrowed distal portion. Parameres (Fig.56) each incurved, not enlarged apically. Internal sac complex (Fig.70).

Remarks. This species may be readily distinguished from *S. biundulatum* by the smaller size and by the colour pattern.

Scaphidium nepalense sp. n.

Holotype, male: Nepal, Patan distr., Phulcoki, 2550 m, 29.IV.1984 (Löbl & Smetana) (MHNG).

Paratypes, 75: as holotype, 6 males, 13 females; same but 2500m, 30.IV., 5 males, 1 female; same but 2600 m, 13.X.1983, 1 male; Phulcoki, 20. and 22.IV.1982 (A. & Z. Smetana) (CNC, MHNG) 1 male, 4 females; Kathmandu distr., Siwapuri, 24.III.1982 (Rougemont) (MHNG) 2 males, 1 female; Siwapuri, 2500 and 2540 m, 8.X.1981 (Sakai) (Coll. Sakai) 2 females; Siwapuri, 2400-2500 m, 29.IV.-1.V.1985 (Smetana) (MHNG, CNC) 25 specimens; Sindhupalcok distr., Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana) (MHNG) 3 males, 3 females; Kutumsang, 2200-2400 m, 6.IV.1981 (Löbl & Smetana) (MHNG) 1 male; Malemchi, 2800 m, 14-18.IV.1981 (Löbl & Smetana) (MHNG) 2 males, 3 females.

D i a g n o s i s . Large species with black body and distinct colour pattern of elytra. Elytra finely and irregularly punctate. Male profemur ventrally flattened, margined anteriorly. Apical half of male protibia evenly wide.

D e s c r i p t i o n . Length 4.5 - 5.0 mm. Very similar to *S. gurung*, body in average smaller, elytron (Fig.13) with yellowish colour pattern. Punctuation on pronotal disc notably coarser than that in *S. gurung*. Elytral punctuation usually finer than that of pronotum, punctures along sutural stria about as coarse as discal punctures; outer basal punctures somewhat elongate. Male with metasternal pubescence long and dense. Profemur moderately thickened, ventrally flattened and glabrous, margined anteriorly. Metafemur weakly thickened beyond middle. Protibia somewhat incurved near base, in apical half weakly and evenly thickened. Meso- and metatibia moderately incurved. Aedeagus (Fig.50) with ventral wall of median lobe gradually tapering toward apex, parameres (Fig.57) each arcuate, apically moderately enlarged, internal sac complex (Fig.69).

R e m a r k s . This species differs notably from *S. gurung* and *S. biundulatum* in the shape of the male protibia. The females of *S. nepalense* may be distinguished by the yellowish elytral pattern. These three species are possibly vicarious. Most specimens were found in decaying vegetational debris along large oak logs and under oak bark, on logs with fungi.

Scaphidium harmandi Achard

Scaphidium harmandi ACHARD, 1920f: 125.

D i a g n o s t i c c h a r a c t e r s . Length 4.5 - 5.0 mm. Head reddish. Pronotal coloration variable, generally most of surface black and lateral margin with reddish spot or fascia, sometimes median area reddish. Elytron black, with two reddish transverse fasciae (Fig.16). Abdomen black, apical segments sometimes more or less reddish. Legs blackish or dark reddish-brown, antennomeres I to VI ochreous, antennal club black. Pronotal disc not vaulted above level of elytra, with lateral margins not sinuate, oblique near base, discal punctuation coarse, sub-basal row of punctures not interrupted. Elytron moderately convex, discal punctuation fine, rather irregular, without row of coarser punctures; sutural area flat, not impressed. Male metasternum with long dense pubescence. Male profemur widened, with keeled middle of anterior margin. Meso- and metafemur slender. Male protibia with incurved basal third, then with straight outer margin, sinuate inner margin; tibia thickened beyond middle, with apical fourth slenderer than middle, but stouter than base, with small glabrous area near apical margin. Aedeagus (Fig.40) with median lobe narrowed beyond level of ventral process, moderately enlarged apically. Parameres each incurved, narrowed subapically. Internal sac complex (Fig.72).

Type material. Lectotype female, labelled "Sikkim Harmand 1886" (MNHN), by present designation.

Material examined, 13 specimens. Nepal, Myandi distr., Kopchepani, 1600 m, 18.VI.1986 (Holzschuh) (MHNG) 1; Kathmandu distr., Siwapuri, 1700-2100 m, 25.VI.1988 (Martens & Schawaller) (MHNG) 1; Sankhua Sabha distr., Chichila, 2200 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 3; forest NE Kuwapani, 2250 m, 24.IV.1984 (Smetana & Löbl) (MHNG) 1; same but 2600 m, 15.IV.1982 (A. & Z.Smetana) (MHNG) 1; Induwa Khola Valley, 2100 m, 17.IV.1984 (Löbl & Smetana) (MHNG) 1; Basantapur, 2100, 30.V.-2.VI.1985 (Brancucci) (NMB) 1; Taplejung distr., Yamputhin cultural land, 1650-1800 m, 26.IV.-1.V.1988 (Martens & Schawaller) (SMNS, MHNG) 3; between Hellok and lower Gunsu Khola, 2000-1620 m, 18.V.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. Nepal, Sikkim (or Darjeeling district).

Remarks. *Scaphidium sinense* Pic has similar colour pattern (Fig.17) as *S. harmandi*.

Scaphidium semilimbatum Pic

Scaphidium semilimbatum Pic, 1917: 3.

Diagnostic characters. Length 4.5 mm. Head reddish-brown. Pronotum reddish-brown with black base and two small black median spots; hypomeron reddish except for narrow black area near procoxal cavity. Most of elytron ochreous; basal, lateral and apical margins black, humerus black, disc with black transverse fascia (Fig.18). Most of ventral surface reddish, mesepimeron, mesepisternum and centre of metasternum black, mediobasal portion of 1st abdominal ventrite and metasternum darkened. Pygidium and propygidium reddish, base of pygidium black. Legs dark reddish. Antennomeres I to VI reddish, club black. Frons rather wide. Pronotum vaulted above level of elytra, with moderately sinuate lateral margins. Elytron convex, with rather fine punctation similar to that of pronotum, without discal row of coarser punctures. Male profemur stout, with keeled anterior margin in basal half. Male protibia moderately arcuate in basal half, with apical half of outer margin straight, inner margin sinuate between basal third and apex, and with shallow subapical notch. Meso- and metatibia each long, former weakly incurved, latter straight. Aedeagus with apical portion of median lobe enlarged near tip. Parameres each sinuate, almost equally wide in apical half. Internal sac complex.

Type material. Lectotype, male, labelled "Kurseong (R.P.Astruc)"(MNHN), by present designation.

Material examined, 1 specimen: Nepal, Sankhua Sabha distr., bottom Arun Valle below Num, 1050 m, 21.IV.1984 (Löbl & Smetana) (MHNG).

Distribution. East Nepal and India, West Bengal: Darjeeling district.

Remarks. Kurseong is a village in the Darjeeling district quoted erroneously by Pic (1917) as a Chinese locality. The single specimen of *S. semilimbatum* kept in the MNHN bears Pic's handwritten identification label. There is no doubt that this is the specimen he had described.

Scaphidium coomani (Pic), comb. n.

Scaphidiolum coomani Pic, 1925:323.

Diagnostic characters. Length 3.5 - 3.7 mm. Head with frons reddish or ochreous and vertex black. Body black, pronotum with two large lateral ochreous spots extended over upper portion of hypomera. Elytron with large sub-basal and narrower

apical ochreous fasciae (Fig.20). Apex of abdomen blackish or dark brown. Femora black, tibiae dark brown to blackish, tarsi and antennomeres I to VI reddish-brown, VII to X and basal half of XI black, apical half of segment XI paler. Frons very narrow. Pronotum notably vaulted above level of elytra, with sinuate lateral margins and very fine discal punctation. Elytra convex, with fine discal punctation, without discal row of coarser punctures. Male profemur and protibia without conspicuous features. Male meso- and metatibia longer than in female, protarsus enlarged. Aedeagus (Fig.43) with median lobe gradually narrowed apically. Parameres (Fig.64) each distinctly incurved, enlarged apically. Internal sac complex (Fig.75).

Type material. Lectotype, female, labelled "LACTHO Tonkin de Cooman" (MNHN), by present designation.

Material examined, 6 specimens: Nepal, Sankhua Sabha distr., Arun Valley, Lamobagar Gola, 1000-1400 m, 27.V.-3.VI.1980 (Holzschuh) (MHNG, NMB) 4; India, Meghalaya, Garo Hills, 2500 ft. VII.-VIII.1917 (Kemp) (MHNG,ZSI) 2.

Distribution. Vietnam, North India, Nepal.

Scaphidium baconi Pic

Scaphidium baconi Pic, 1915c: 43.

Scaphidium assamense Pic, 1915c: 43.

Scaphidium baconi; ACHARD, 1922d: 263; LÖBL, 1990b: 511.

Diagnostic characters. Length 4.5 - 5.2 mm. Head ochreous. Pronotum yellowish or ochreous, with two black discal spots and two small, more or less darkened subapical spots. Elytron yellowish or ochreous, with five black spots: larger humeral, latero-central and apical, and two smaller near sutural stria (Fig.23); sutural area, epipleuron and pseudopleuron black. Abdomen yellowish, pygidium sometimes with more or less dark spot. Upper portion of hypomeron yellowish, lower portion black. Ventral surface of thorax black except for yellowish lateral portion of metasternum. Femora yellowish with black base, profemur with black spot on ventral side. Tibiae and tarsi dark reddish-brown. Antennal segments I to VI reddish-brown, club black. Frons narrow. Pronotum somewhat vaulted above level of elytra, strongly inclined apically, with hardly sinuate lateral margins and very fine discal punctation. Elytral disc rather flat, with two long and two short rows of coarse punctures; discal punctation fine near base, gradually coarser from middle toward apex. Male profemur weakly thickened, its anterior ventral edge margined and bearing a row of minute tubercles, and with few minute subapical tubercles along posterior ventral edge. Male protibia slender, sinuate, weakly thickened apically. Meso- and metatibia arcuate, evenly slender. Aedeagus (Fig.47) with median lobe abruptly narrowed subapically. Parameres each incurved. Internal sac complex (Fig.81).

Type material. Lectotype of *S. baconi*, female, labelled "Ind.bor. Bacon" (MNHN), by present designation; lectotype of *S. assamense*, female, labelled "Margherita Assam IV & V.1889" (MNHN), by present designation.

Material examined, 3 specimens: Nepal, Sankhua Sabha distr., Arun Valley, Mure, 2000-1300 m, 9.VI.1983 (Brancucci) (NMB) 1; Taplejung distr., SE Yamputhin to Yamputhin, 2000-1650 m, and Yamputhin cultural land, 1650 - 1800 m, 26.IV. - 1.V.1988 (Martens & Schawaller) (SMNS,MHNG) 2.

Distribution. Vietnam, India, Nepal.

Scaphidium rubritarse Pic

Scaphidium rubritarse Pic, 1915b: 36.

Diagnostic characters. Length 4.5 mm. Head, most of pronotum, hypomera, and abdomen ochreous. Basal portion of pronotum and scutellum black. Elytron yellowish, with black base between suture and humerus, black lateral and apical margins, and black epipleuron and pseudopleuron (Fig.19). Ventral surface of thorax, femora, tibiae and antennal club black. Tarsi dark brown, antennomeres I to VI ochreous. Frons rather wide. Pronotum vaulted above level of elytra, strongly inclined apically, with lateral margins oblique near base, arcuate in apical half (dorsal view); discal punctation very fine, sub-basal row not interrupted at middle. Elytron weakly vaulted, with flat sutural area and very fine punctation, latter obsolete on yellowish surface of disc. Male profemur thickened, ventrally flattened, with convexly arcuate ventral margin. Meso- and metafemur slender. Protibia in basal half moderately incurved, stouter toward apex, with shallow subapical notch; inner margin concave between base and apical third, weakly oblique in apical third. Meso- and metatibia moderately incurved. Aedeagus (Fig.41) with apical portion of median lobe almost evenly wide, apical margin of ventral wall broadly rounded. Parameres incurved (Fig.62), evenly wide. Internal sac complex (Fig.73).

Type material. Not located. According to the description from Java. Possibly lost from the Pic's collection which is housed in the MNHN.

Material examined, 1 specimen: Nepal, Panchtar distr., betw. Gitang Khola Valley and Dhopar Kharka, cultural land, mixed forest, 1750-2100 m, 13.IV.1988 (Martens & Schawaller) (MHNG).

Distribution. Java, Nepal.

Remarks. The identity of the Nepalese specimen is based on its conspicuous colour pattern which corresponds with the description. The type material of *S. rubritarse* has not been traced in the MNHN.

Scaphidium septemnotatum Champion

Scaphidium septemnotatum CHAMPION, 1927: 270.

Diagnostic characters. Length 3.0 - 3.3 mm. Head and body ochreous, pronotum with two black spots, elytron with black humeral, median and apical spots, pygidium with single large black spot (Fig.21). Legs and antennomeres I to VI ochreous, club black. Frons narrow. Pronotum vaulted above level of elytra, strongly inclined apically, with distinctly sinuate lateral margins and very fine discal punctation. Elytron convex, with one long and one short row of coarse discal punctures, punctation fine on discal centre, coarser on apical third. Male profemur weakly incurved, pubescent ventrally. All tibiae weakly incurved, evenly slender. Aedeagus (Fig.44) with median lobe tapering beyond middle. Parameres (Fig.65) apically incurved and enlarged. Internal sac complex (Fig.80).

Type material. Holotype, male, from "Gopaldhara, Nepal-Sikkim Frontier H.Stevens 10.IX.18" (BMNH), examined.

Material examined, 5 specimens: Nepal, Parsa distr., nr. Birganj Lothar, 5-19.IX.1967 (Canadian Nepal Exp.) (CNC, MHNG).

Distribution. India: Darjeeling distr., Nepal.

Scaphidium species

Similar to *S. septemnotatum* but with less vaulted pronotum, the pronotal spots lying basally and the elytron without humeral spot (Fig.22). It possibly represents an undescribed species.

Material examined, 1 female: Nepal, Parsa distr., nr. Birganj Lothar, 450 ft, 5.IX.1967 (Canadian Nepal Exp.) (CNC).

Hemiscaphium Achard

Hemiscaphium Achard, 1922; type species: *Scaphidium striatipenne* Gestro, 1879, by original designation.

ACHARD (1922b) assigned to this genus 12 species, all confined to south east Asia. Their descriptions are incomplete and useless not only for a phylogenetic analysis but even for identification. Further species of this genus were described in *Scaphidium*. Only one species is known to occur in the Himalayan region.

Hemiscaphium brunneopictum Achard

Hemiscaphium brunneopictum ACHARD, 1922b: 35.

Diagnostic characters. Length 3.3 - 3.7 mm. Head, most of body and legs ochreous. Pronotum with two dark brown or black elongate median spots and with minute spot on central part of each lateral margin. Elytron with base, apex, pseudopleuron and epipleuron dark brown to black, and with dark transverse fascia on centre of disc (Fig.24). Center of pygidium usually darkened. Antennomeres I to VI ochreous, VII to X black, XI more or less pale. Pronotum with lateral margins weakly convex or oblique; discal punctation very fine, sub-basal row of punctures lying in impressed stria, not interrupted at middle. Elytron with two long discal rows of coarse punctures, accompanied by one short inner and two short outer rows of coarse punctures; discal punctation very fine on basal half, coarse on apical third. Male femur slender, not modified. Male protibia weakly incurved, almost evenly slender, protarsi not lobed, with segments 1 to 3 somewhat wider than in female. Aedeagus (Fig.46) slender, median lobe weakly narrowed apically, with rounded apex. Parameres (Fig.67) straight, hardly enlarged at apex. Internal sac moderately complex (Fig.84).

Type material. Lectotype, female, labelled "Karen Mts Birma" (NMP), by present designation.

Material examined, 10 specimens: Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG) 3; Arun R., 800 m, Hedanga-Num, 16.VI.1983 (Brancucci) (NMB) 1; India, West Bengal, Darjeeling distr., Sukna, 200 m, 7.X.1978 (Besuchet & Löbl) (MHNG) 1; same but Sevoke (MHNG) 1; Meghalaya, Garo Hills, above Tura, 3500-3900 ft., 15.VII.-30.VIII.1917 (Kemp) (ZSI, MHNG) 3; "Ober-Assam" (Hartert) (ZSM) 1.

Distribution. Burma, India, Nepal.

Cyparium Erichson

Cyparium Erichson, 1845; type species: *Cyparium palliatum* Erichson, 1845, by monotypy.

Yparicum ACHARD, 1920b; type species: *Yparicum yunnanum* Achard, 1920, by monotypy. - syn. nov.

Achard distinguished *Yparicum* from *Cyparium* by the presence of a row of denticles on the outer margin of the protibia in the former genus. Obviously, he overlooked that the outer margin of the protibiae bears a row of denticles in all species of *Cyparium*.

This genus is poorly represented in the Himalayan collections. Five species occur in North India, but none was yet found in Nepal.

KEY TO THE HIMALAYAN SPECIES OF *Cyparium*

- 1 Body black, elytron with yellowish humeral spot and yellowish apical fascia, not microsculptured *montanum* Achard
- Colour pattern different, elytron with or without microsculpture 2
- 2 Elytron yellowish or ochreous, with dark brown or black pattern along discal rows of punctures, along sutural and along lateral margins *bowringi* Achard
- Elytron more or less dark reddish, without distinct colour pattern 3
- 3 Metasternum entirely very finely punctate *plagipenne* Achard
- Metasternum with lateral portion much coarser punctate than centre 4
- 4 Body not iridescent. Length 2.8 mm *khasianum* Löbl
- Body iridescent. Larger species species indet.

Cyparium montanum Achard

Cyparium montanum ACHARD, 1922c: 41; CHAMPION, 1927: 272; LÖBL, 1984: 60.

Diagnostic characters. Length 3.1 - 3.5 mm. Body not iridescent, black, elytron with small yellowish humeral spot and larger yellowish apical fascia. Antennomeres I to VI ochreous, antennal club dark brown or black. Elytron with four rows of discal punctures, surface laterad of outer row coarsely and irregularly punctate. Elytral microsculpture absent, microsculpture on visible tergites conspicuous, consisting of punctures. Metasternum much coarser punctate laterally than on centre. Aedeagus (Fig.85) with long, slender apical portion of median lobe, internal sac simple, parameres slender, sinuate.

Type material. Lectotype from Simla, (India, Himachal Pradesh) (BMNH), designated in CHAMPION (1927), not examined.

Material examined, 11 specimens. India, Himachal Pradesh, Baroq forest 4 km SW Solan, 1500 m, 8.X.1988 (Vit) 2; Solan, N end, 1300 m, 9.X.1988 (Vit) 2; 10 km NW Sarahar, 1700 m, 7.X.1988 (Vit) 2; Kulu Valley, Naggar, 1850 m, 16.X.1988 (Vit) 4; Kulu Valley, Vashisht, 1900 m, 13.X.1988 (Vit) 1 (all MHNG).

Distribution. India (Himachal Pradesh, Uttar Pradesh, West Bengal), Bhutan.

Remarks. This species may be readily distinguished by its conspicuous colour pattern. The specimens from Himachal Pradesh and from Uttar Pradesh were found on decaying plant debris and on decaying fungi.

Cyparium bowringi Achard

Cyparium bowringi ACHARD, 1922c: 42; LÖBL, 1979: 84; 1984: 59; 1991: 126.

Diagnostic characters. Length 3.5 - 3.9 mm. Body iridescent, dark brown to black. Elytron yellowish or ochreous, with dark brown to black pattern along sutural and lateral margins, and on discal rows of punctures. Antennomeres I to VI yellowish, club dark brown. Elytral disc with four rows of coarse punctures starting basally or sub-basally and with two short lateral rows starting behind a small, irregularly punctate area. Elytral microsculpture distinct. Visible tergites with microsculpture

consisting of striae. Metasternum entirely very finely punctate. Aedeagus (Fig.86) with rather short, narrow apical portion of median lobe. Internal sac simple, bearing long, basally incurved duct, without sclerites. Parameres moderately long, straight in lateral view.

Type material. Lectotype, female, from Java, designated in Löbl (1979).

Material examined. 11 specimens. India, Himachal Pradesh, 10 km NW Sarahan, 1700 m, 7.X.1988 (Vit) (MHNG).

Distribution. India (Himachal Pradesh, Meghalaya, Tamil Nadu), Indonesia (Java).

Remarks. The species may be readily distinguished by the elytral coloration (see LÖBL 1991).

Cyparium plagipenne Achard

Cyparium plagipenne Achard, 1922c: 41; CHAMPION, 1927: 271; LÖBL, 1984: 60.

Diagnostic characters. Length 3.5 - 3.7 mm. Body not iridescent. Head and thorax dark brown to blackish. Elytra reddish, laterally and apically paler than on centre. Abdomen darker than elytra, paler than thorax. Antennae brown, club more or less darkened. Elytron microsculptured, with four discal rows of coarse punctures and with a lateral group of coarse punctures forming one or two short rows. Microsculpture on visible tergites consisting of transverse striae. Entire metasternum very finely punctate and distinctly microsculptured. Aedeagus (Fig.87) with apical portion of median lobe short, rather robust. Internal sac with setose and papillar structures and bearing sclerites. Parameres each sinuate in lateral view.

Type material. Lectotype, male, labelled "India Orient" designated by Champion 1927, examined.

Material examined. In addition to the lectotype, two specimens from "India Orient" (NMP) and from "W.Almora divn. Kumaon U.P. Oct. 1917 H.G.C.", both recorded in Champion 1927 as *C. plagipenne* (BMNH).

Distribution. North India.

Remarks. The Kumaon specimen is a female differing from the lectotype and from the second specimen labelled "India Orient" by the brighter reddish elytra and darker antennal club. As *C. plagipenne* is well defined by the aedeagal characters only, additional material is needed to confirm the specific assignment of the Kumaon specimen.

Cyparium species

A female specimen from "Sikkim: Gopaldhara, Rungbong Vall. H.Stevens" (BMNH) identified by CHAMPION (1927) as *C. plagipenne* differs by the iridescent body and by the metasternum laterally more coarsely punctate than on the centre. It possibly represents an undescribed species.

Pseudobironium Pic

Pseudobironium Pic, 1920; type species: *Pseudobironium subovatum* Pic, 1920, by monotypy.

Morphoscapha ACHARD, 1920; type species: *Morphoscapha grossum* Achard, 1920, by original designation.

Most of the 22 members of the genus are distributed in subtropical and tropical Asia. Two species, *P. lewisi* Achard and *P. ussuricum* Löbl, occur in temperate eastern Asia. *Pseudobironium globosum* Löbl from New Caledonia is of uncertain relationship and the sole species occurring southeast of the Wallace Line. The possibly sister group of *Pseudobironium*, *Pseudobironiella* Löbl, is restricted to Madagascar.

As in the three previous genera, many species of *Pseudobironium* are inadequately described and/or their male sexual characters are unknown. At the moment it is difficult to define species groups although several species share possible synapomorphies absent from other members of the genus: *P. sparsepunctatum* (Pic) and *P. linguei* (Achard) have a short and stout maxillary palpus; *P. almoratum* Champion and *P. ussuricum* Löbl are characterized by short and stout antennal segments VII to XI; *P. vitalisi* (Achard), *P. carinense* (Achard), *P. castaneum* Pic and *P. rufitarse* sp.n. share wide parameres (the parameres are slender in *P. bicolor* sp.n., *P. feai* Pic, *P. fasciatum* Löbl, *P. impressipenne* Löbl, *P. ineptum* sp.n., *P. lewisi* Achard, *P. plagifer* Löbl, *P. sinicum* Pic, and *P. subglabrum* (Löbl); *P. vitalisi* and *P. castaneum* have the lateral wall of the median lobe tuberculate. *Pseudobironium globosum* Löbl, with reduced tibial spurs, is distinguished by the aedeagus with a particularly elongate flagellum.

KEY TO THE NEPALESE SPECIES OF *Pseudobironium*

- 1 Pronotum and elytra with distinct colour pattern *bicolor* sp.n.
- Body uniformly black or very dark reddish-brown 2
- 2 First abdominal ventrite not microsculptured laterally *ineptum* sp.n.
- Entire abdomen, including first visible ventrite, microsculptured 3
- 3 Antennomeres VII to XI stout, XI usually not quite 2x as long as wide *almoratum* Champion
- Antennomeres VII to XI slender, XI 2.5 to 4x as long as wide 4
- 4 Body, femora and tibiae dark reddish-brown or reddish-black, not deep black. Antennomere VI much shorter than XI *castaneum* Pic
- Body, apex of abdomen excepted, femora and tibiae deep black. Antennomere VI as long as XI *rufitarse* sp.n.

***Pseudobironium bicolor* sp.n.**

Holotype, male, Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG).

Paratypes, 6: Nepal, as holotype, 3 females; India, Meghalaya, Khasi Hills, between Mawsynram and Balat, 16 km from Mawsynram, 1000 m, 27.X.1978 (Besuchet & Löbl) (MHNG) 1 female; Meghalaya, Garo Hills, above Tura, 3500-3900ft., 15.VII.-30-VIII.1917 (Kemp) (ZSI) 1 female; Thailand, Chiang Mai prov., Doi Pui, 1250 m, 14.III.1982 (Rougemont) (MHNG) 1 female.

D i a g n o s i s . Medium-sized species with distinct colour pattern on pronotum and on elytra (Fig.25). Median and apico-lateral portion of metasternum microsculptured. Abdomen with microsculpture consisting of striae. Parameres of aedeagus enlarged apically; internal sac bearing central and lateral sclerites.

D e s c r i p t i o n . Length 2.8 mm. Body and legs ochreous or reddish-brown. Pronotum with dark brown to black median spot enlarged anteriorly (sometimes T-shaped), and with darkened basal margin. Elytron darkened along margins, and with dark basal and central spots. Apical segment of maxillary palpus 4x as long as wide, tapering. Antennae

long, segment II about 1.7x longer than III and somewhat longer than VI, segments VII to XI slender, XI 3.5 to 4x as long as wide, apically granulate. Pronotal and elytral punctation fine, on lateral areas finer than that on centre. Elytral disc evenly inclined apically, with punctation notably dense apically, sutural area flat. Pygidium very finely punctate. Median and apico-lateral portion of metasternum microsculptured, median portion of metasternum rather finely punctate, lateral portion of metasternum extremely finely punctate. Ventrites with microsculpture consisting of transverse striae. First visible ventrite with very fine punctation, hardly visible at 100x magnification. Meso- and metatibia somewhat incurved. Segments 1 to 3 of male protarsus notably widened, narrower than apex of protibia. Aedeagus (Fig.88) 0.86 mm long. Internal sac with lateral sclerites accompanying central tubes and with membranes bearing short denticulate structures. Parameres each enlarged apically.

Remarks. *Pseudobironium bicolor* may be readily distinguished by its colour pattern. This species has been recorded from India and Thailand (LÖBL 1982; 1990b).

***Pseudobironium almorani* Champion**

Pseudobironium almorani CHAMPION, 1927: 273; LÖBL 1969: 324; 1982: 160; 1986b: 343.

Diagnostic characters. Body black, apical segment of maxillary palpus slender, tapering. Antennae short, segments VII to XI short, XI usually less than 2x as long as wide. Pronotal and elytral punctation fine. Lateral portion of metasternum very finely punctate, without microsculpture. Ventrites with distinct microsculpture consisting of punctures. Aedeagus (Fig.89) 0.76 - 0.86 mm long. Internal sac with simple flagellum extended to level of weakly sclerotized valves, bearing setose apical structures. Parameres slender, almost straight.

Type material. Lectotype, female, and 2 paralectotypes, females, labelled "Kumaon W.Almora India H.G.C." (BMNH), by present designation.

Material examined. 21 specimens: Nepal, Mustang distr., Kali Gandaki Khola, Kalopani, 2400 m, 17-19.V.1984 (Holzschuh) (MHNG) 1; Patan distr., Phulcoki, 1700 m, 10.V.1981 (Löbl) (MHNG) 3; Sindhupalcok distr., Pokhara NE Barabise, 2700 m, 7.V.1981 (Löbl & Smetana) (MHNG) 1; Sankhua Sabha distr., Chichila - Mure, 1900 m, 24.V.1980 (Wittmer) (NMB) 1; Chitre, 2200-2400 m, 28-29.V.1985 (Holzschuh) (MHNG) 1; Gorza, 2100 m, 5-6.VI.1985 (Brancucci) (NMB) 1; above Pahakhola, 2600-2800 m, 31.V. - 3.VI.1988 (Martens & Schawaller) (SMNS, MHNG) 4; Arun Valley, between Mure and Hurure, 2050-2150 m, 9-17.VI.1988 (Martens & Schawaller) (SMNG, MHNG) 4; Chichila, 1900 m, 18-20.VI.1988 (Martens & Schawaller) (SMNS, MHNG) 2; Taplejung distr., SE Yamputhin, 2000-1650 m, 20. and 30.IV.1988 (Martens & Schawaller) (SMNS) 2; Yamputhin, 1650-1800 m, 26.IV. - 1.V.1988 (Martens & Schawaller) (MHNG) 1.

Distribution. North India: Himachal Pradesh, Uttar Pradesh, Nepal.

***Pseudobironium rufitarse* sp.n.**

Holotype, male: Nepal, Taplejung distr., Yamputhin, open forest, 1650-1800 m, 26.IV.-1.V.1988 (Martens & Schawaller) (SMNS).

Paratypes: as holotype, 2 females (SMNS, MHNG).

Diagnosis. Body black. Elytron with subapical hump. Metasternum without microsculpture. Abdominal microsculpture consisting of short transverse arcs. Aedeagus

with parameres robust, sinuate; apex of median lobe incurved and pointed, internal sac bearing extremely fine setose structures and very slender median tube.

Description. Length 3.4 mm. Body black, apical abdominal segments reddish. Antennomeres I to VI ochreous, club brown. Femora and tibiae black, tarsi ochreous. Apical segment of maxillary palpus 3.5 - 4x as long as wide, tapering. Antenna long, with slender segments III to XI; III somewhat shorter than II, segment VI about 1.6x longer than III, as long as XI, latter 2.5 - 3x as long as wide. Pronotal punctation very fine. Elytron with small subapical hump. Sutural area flat anteriorly, somewhat raised apically. Elytral punctation near base very fine, similar to that of pronotum, becoming gradually coarser apically. Pygidium very finely punctate. Metasternum without microsculpture. Middle portion of metasternum densely and coarsely punctate, except on impunctate middle line. Lateral portion of metasternum very finely punctate. All tibiae somewhat incurved. Segments I to III of male protarsus conspicuously enlarged, basal segment wider than apex of tibia. Segments I to III of male mesotarsus somewhat widened. Aedeagus (Figs 92-94) 1.32 - 1.33 mm long. Median lobe gradually narrowed apically, with incurved and pointed tip. Parameres robust, sinuate in dorsal view, almost straight and gradually narrowed in lateral view. Internal sac with long thin median tube and with membranes bearing apical setose structures.

Remarks. This species may be readily distinguished by the pale tarsi contrasting with the dark tibiae and body. It is well characterized also by the shape of the median lobe and parameres.

***Pseudobironium ineptum* sp. n.**

Holotype, male: Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG).

Diagnosis. Body reddish. Elytron without subapical hump. Metasternum and lateral portion of first ventrite lacking microsculpture. Abdominal microsculpture consisting of punctures. Aedeagus with almost straight, slender parameres and short, incurved tip of median lobe. Internal sac with long flagellum and a pair of incurved central valves.

Description. Length 2.7 mm. Body, femora and tibiae reddish-brown, apex of abdomen and tarsi paler. Antennae ochreous. Apical segment of maxillary palpus about 2x as long as wide, tapering. Antennae long, segments III to XI slender, III almost as long as II, VI about 1.5x longer than III, shorter than XI, latter almost 3x as long as wide. Pronotal punctation fine. Elytral disc regularly inclined toward narrow, flattened apical area, with punctation coarser than that on pronotum; sutural area flat. Metasternum without microsculpture, middle portion densely and rather coarsely punctate, except for impunctate median line. Lateral portion of metasternum very finely punctate. First abdominal ventrite very finely punctate, laterad without, in middle with, microsculpture. Abdominal microsculpture consisting of punctures, almost obsolete on pygidium, distinct on propygidium. Meso- and metatibia weakly incurved. Segments I to III of male protarsus strongly widened, narrower than apex of tibia. Segments I to III of male mesotarsus somewhat enlarged. Aedeagus (Figs 90,91) 1.0 mm long. Median lobe irregularly narrowed towards apex, with short incurved tip. Parameres slender, each moderately incurved near base, beyond almost straight, evenly wide between expanded base and apex. Internal sac with very long, almost straight flagellum, two central valves formed by filamentous laminae, and with short stick-like sclerites.

Remarks. This species may be distinguished from other members of the genus of similar size and colour by the shape of the parameres in combination with the metasternum lacking visible microsculpture.

***Pseudobironium castaneum* Pic**

Pseudobironium castaneum Pic, 1923: 17.

Diagnostic characters. Large-sized species with dark reddish to blackish body. Apical segment of maxillary palpus slender and tapering. Antenna long, segments VII to XI slender, XI 3.5 - 4x as long as wide. Punctuation on pronotal disc fine, that on elytral disc rather coarse. Lateral portions of metasternum and of 1st abdominal ventrite very finely punctate, former without microsculpture, latter with microsculpture consisting of punctures. Aedeagus (Figs 95,96) 1.34 - 1.40 mm long. Median lobe wide, with lateral tubercles, abruptly narrowed at apex, with bilobed ventral process. Membranes of internal sac lamellar, flagellum accompanied by stick-like sclerites. Parameres robust, each enlarged sub-basally and forming a lobe extended to median line; apical portion of parameres moderately enlarged in dorsal view.

Type material. Lectotype, male, labelled "Lac Tho Tonkin" (MNHN), by present designation.

Material examined. 4 specimens: Nepal, Sankhua Sabha distr., bottom Arun Valley bellow Num, 1050 m, 22.IV.1988 (Löbl & Smetana) (MHNG).

Distribution. Vietnam, Nepal.

Remarks. This species is very similar to *P. carinense* (Achard) which differs by the absence of tubercles on the lateral wall of the median lobe. The Nepalese specimens of *P. castaneum* are somewhat darker than the specimens from Vietnam I have seen.

***Baeocera* Erichson**

Baeocera Erichson, 1845; type species: *Baeocera falsata* Achard, 1920, by subsequent designation (Opinion 1221) ICZN 1982.

Sciatrope Blackburn, 1903; type species: *Sciatrope latens* Blackburn, 1903, by monotypy.

Cyparella Achard, 1924; type species: *Scaphisoma rufoguttatum* Fairmaire, 1898, by monotypy.

Eubaeocera Cornell, 1967; type species: *Baeocera abdominalis* Casey, 1900, by original designation.

Amaloceroschema Löbl, 1967 (sg); type species: *Baeocera (Amaloceroschema) freudei* Löbl, 1967, by original designation.

This speciose genus is well represented in the Himalaya. Forty species have been distinguished and named but seven additional species known in female sex only were recognised in the collections studied. These are not included in the present study. For practical reasons the four species known only from Meghalaya (*B. senilis*, *B. pseudincisa*, *B. hygrophila*, and *B. montrosetibialis*) are included in the key provided below.

Baeocera montana (Pic, 1955) was transferred to *Baeocera* from *Scaphisoma* in LÖBL (1987b: 845). Hence, *Baeocera montana* Löbl, 1971 from India is a secondary junior homonym. I replace the name *Baeocera montana* Löbl by *Baeocera montanella* nom. nov.

Among the 30 species found in Nepal Himalaya 11 are new and appear to be endemic to certain areas of the eastern half of the Nepal territory. This is a considerably high percentage of endemism when compared to that in the Western Himalaya where only two species out of 15 are possibly endemic. In the Darjeeling district only three species out of 14 appear to be endemic.

Although all Himalayan *Baeocera* were found in moist forest litter, many show little macrohabitat preferences. *Baeocera ventralis* is common in the evergreen dipterocarp forest and in the subtropical deciduous forest, but occurs also in the temperate, mixed broad-leaved and oak forest up to about 2000 m altitude. Other species exhibit similar considerable range in vertical distribution, often exceeding 1000 m (e.g. *B. hamifera*, *B. khasiana*, *B. mussardi roberti*, *B. signata*, *B. sordidoides*, *B. vilis*, *B. wittmeri*). *Baeocera serendibensis* which occurs at 400 m altitude in the Corbett National Park in Kumaon was found up to 2750 m in Nepal, and the range of *B. microptera* extends from 1500 m in Himachal Pradesh to the alpine scrub zone at 4000 m in Khumbu Himal.

The Himalayan *Baeocera* belong to several species groups, defined mainly by the male genital characters, but only some of them are based on convincing synapomorphies (e.g. *curtula*, *excelsa*, *insolita*, *lenta*, *ventralis*, *monstrosa*, and *satana* groups):

1. The *brevicornis* group is characterized by the symmetrical, slender median lobe with apical portion tapering and moderately incurved apically; the ostium is situated apico-eudorsally and is covered by two overlapping membranous valves; the internal sac is armed with a slender, incurved elongate sclerite which is sometimes accompanied by a second slender sclerite. The parameres are symmetrical, slender and simple. Two subgroups can be recognised within this group: 1. The *brevicornis* subgroup, characterized by the body moderately convex both dorsally and ventrally. *Baeocera brevicornis* and *B. serendibensis* distributed throughout the Indian subcontinent, four additional East Asian species, *B. problematica* Löbl from Kenya and several unnamed Afrotropical species belong here. 2. The *nobilis* subgroup is characterized by the strongly convex body. *Baeocera sordidoides* from Nepal, *B. sordida* Löbl from Japan and the Mediterranean *B. nobilis* Reitter are assigned to this subgroup.

2. The monospecific *laminula* group. It shares the essential characters with the *nobilis* subgroup, but the internal sac is covered by very fine setae and spines, and is armed by three distal sclerites.

3. The monospecific *inermis* group shares the aedeagal characters with the former two groups, but the internal sac lacks any sclerotized structures. The metacoxae are approximate.

4. The *pilifera* group is characterized by the median lobe similar to that in the former groups but with the distal portion short. The internal sac is armed by a single, slender and proximally incurved sclerite. The parameres are symmetrical, enlarged and pubescent. The short basal angles of the pronotum which do not cover the mesepimeral ridge is another possible synapomorphy of the group to which *Baeocera pilifera* from the Darjeeling district, and *B. schwendingeri* Löbl and *B. pyricola* Löbl from Thailand are assigned.

5. The monospecific but polytypic *mussardi* group is characterized by the symmetrical aedeagus with the median lobe consisting of moderately large basal and long distal portions. The ostium is situated dorsally near apex of the median lobe and the valves are contiguous medially. The internal sac is vesicular and weakly sclerotized, with minute basal sclerites. The parameres are strongly enlarged in sagittal plane. The tarsi are conspicuously short.

6. The monospecific *khasiana* group is characterized by the symmetrical aedeagus similar to that of the species of the *brevicornis* group, but with the distal portion of the median lobe relatively short. The internal is complex sac, bearing overlapping flat sclerites, and membranes covered by setose and spinose structures.

7. The *lenta* group is characterized by the symmetrical median lobe and parameres, similar to those of the species of the *brevicornis* group, although they are usually wider. The internal sac is armed with two or three unevenly long, curved, flattened and partly

overlapping sclerites, which are joined proximally and form a more or less complex structure; accessory basal sclerites are often present. The ejaculatory duct is thin and not sclerotized, enters in the proximal end of the sclerites and reappears at the distal end of the longer dorsal sclerite; the distal portion of the ejaculatory duct is very long, extrudes from the ostium and usually forms several rings on the external surface of the median lobe; the proximal portion of the ejaculatory duct enters often at an enlarged or vesicular portion before reaching the complex of sclerites. In the *lenta* group the metepisternum is often obsolete with suture indicated by a row of punctures.

Most of the Asian and several Melanesian species are assigned to this group, in addition to *B. pacifica* Löbl from the Caroline Is., *B. australica* Löbl from Australia and *B. umtalica* Löbl from Zimbabwe. It includes following Himalayan species: *B. cribrata*, *B. crinita*, *B. inculta*, *B. lenta*, *B. longicornis*, *B. manasensis*, *B. martensi*, *B. microps*, *B. microptera*, *B. pigra*, *B. pseudincisa*, *B. pseudovilis*, *B. puncticollis*, *B. reducta*, *B. signata*, *B. vesiculata*, *B. vilis*, and *B. wittmeri*. *Baeocera martensi*, *B. pigra*, *B. wittmeri*, and *B. vidua* Löbl from Thailand have in common the internal sac bearing short sclerites accompanied by rows of sclerotized, apically pointed scales, situated at the left side of the ejaculatory duct. These three species may be separated in a distinct subgroup (subgroup *pigra*). Another subgroup seems to be formed by *B. vilis*, *B. pseudovilis* and *B. inculta* which have the dorsal sclerite of the internal sac enlarged and apically not delimited from membranous structures.

8. The *ceylonensis* group shares most characters with the *lenta* group, but the aedeagus differs in having the internal sac bearing a proximal tuft of sclerotized spines. In addition, the species of the group have notched parameres, characteristic elytral punctation, and a distinct metepisternum. The group includes five Oriental species: *B. ceylonensis* (Löbl), *B. dilutior* Löbl, *B. franzi* (Löbl), *B. semiglobosa* (Löbl) and *B. ventralis* (Löbl). The latter is widely distributed and occurs also in the Himalaya.

9. The monospecific *senilis* group is characterized by the symmetrical aedeagus with tapering median lobe split apically in ventral and dorsal lobe (bilobed type). The ostium is situated apically. The internal sac is armed by a simple stick-like sclerite. The parameres are straight and slender.

10. The monospecific *excelsa* group shares the bilobed median lobe with the *senilis* group, but the internal sac has a long, flat, spiral sclerite, and the parameres are enlarged.

11. The *insolita* group is defined by the trilobed distal portion of the median lobe. The basal bulbous portion of the median lobe is very large, with the feebly sclerotized apico-dorsal portion overlapping the base of the unpaired, large ventral lobe, and paired narrow dorsal lobes. The internal sac is complex, bearing numerous overlapping scales, spines and denticles. Large sclerites are absent. The parameres are slender, simple, and symmetrical. The group includes *B. insolita* Löbl from Thailand and *B. schawalleri* from Nepal.

12. The monospecific *bengalensis* group is defined by the very large and somewhat asymmetrical bulbous basal portion of the median lobe which overlaps apically the ostium and the base of the symmetrical, short and flat distal portion. The armature of the internal sac consists of large and strongly sclerotized denticles, stick-like pieces and pointed scales. The parameres are symmetrical, slender and simple. The sister group of the *bengalensis* group is possibly the *macrops* group which differs notably in having the distal portion of the median lobe asymmetrical.

13. The *curtula* group includes species having a large symmetrical median lobe with a long distal portion, the dorsal wall of which is uneven, formed by two valves. The ostium is situated latero-apically. The internal sac is provided with a long, more or less

strongly sclerotized flagellum and is armed by one or two flagellar guide-sclerites. *Baeocera kapfereri* Reitter from North Africa and six Asiatic species: *B. curtula* Achard, *B. freyi* Löbl, *B. hammondi* Löbl, *B. callida* Löbl, *B. hamifera* Löbl, and *B. mustangensis* sp.n. are assigned here. The latter three occur in the Himalayan region. Several New World species (*deflexa* and *congener* groups) are close to this group.

14. The *monstrosa* group is characterized by the asymmetrical aedeagus with the basal bulbous portion of median lobe very large and more or less overlapping the ostium, and by the small, strongly sclerotized and irregularly curved distal portion. The internal sac is extremely complex, with overlapping large sclerotized teeth and membranes covered by scales, papillae and spines. The flagellum is absent. The parameres are asymmetrical, one is lobed, the other one bears usually an apophyse. *Baeocera monstrosa* (Löbl), *B. inaequicornis* Champion and *B. gilloghyi* (Löbl) occurring in the Himalaya, *B. paradoxa* (Löbl) from Sri Lanka, several additional Oriental species, and the Japanese *B. nakanei* Löbl belong to this group.

15. The *satana* group includes species with the distal portion of the median lobe split dorsally, forming two asymmetrical, strongly sclerotized pieces. The left piece is pointed and short, the right piece is long and usually lobed. The ostium (not seen) is apparently situated between these pieces. The internal sac lacks flagellum and is very complex, armed by sclerotized teeth-like structures and by membranous spines-like structures and papillae. The parameres are asymmetrical, more or less enlarged but simple. In the male the metatibiae are modified and the colour pattern differs from that in the female. In addition to *B. satana* Nakane from Japan, five Himalayan species belong here: *B. dentipes*, *B. errabunda*, *B. monstrosetibialis*, *B. thoracica*, and *B. tuberculosa*.

KEY TO THE HIMALAYAN SPECIES OF *Baeocera*
(including Meghalayan species)

- 1 Lateral portion of metasternum very finely punctate, with punctures barely distinct at 100x magnification 2
- Lateral portion of metasternum coarsely punctate, with punctures distinct at 24x magnification 15
- 2 Sutural stria extended along elytral base to form basal stria joined with lateral stria ..3
- Basal stria, not joined with lateral stria 9
- 3 Propygidium and pygidium very finely punctate. Body very dark reddish-brown to black 4
- Propygidium and pygidium with coarse punctures 6
- 4 Distal portion of median lobe bearing ventral bidentate lobe; apex of paramere enlarged *mustangensis* sp. n.
- Distal portion of median lobe without any ventral protuberance; apical half of paramere equally wide 5
- 5 Flagellum of internal sac slender, joined with proximal end of sclerotized complex; flagellar guide-sclerite flat, curved at apex, not hook-shapes *callida* Löbl
- Flagellum of internal sac wide and moderately long, joined with central part of sclerotized complex; flagellar guide-sclerite robust, hook-shaped *hamifera* Löbl
- 6 Parameres simple 7
- One paramere with apophysis 8
- 7 Parameres almost straight, truncate at apex *gilloghyi* (Löbl)
- Parameres irregularly curved, hook-shaped at apex *pubescence* Löbl

- 8 Right paramere with basal apophysis, left paramere enlarged and lobed apically *inaequicornis* Champion
 - Right paramere simple, left paramere with large apophysis starting from centre *monstroza* (Löbl)
- 9 Mesocoxal line arcuate, finely punctate..... *khasiana* Löbl
 - Mesocoxal line parallel or subparallel to coxal foramen, coarsely punctate 10
- 10 Length 1.4 mm. Body uniformly pale reddish-brown *bengalensis* Löbl
 - Larger species. Colour pattern different 11
- 11 Male metatibia with one or more denticles on inner side near base. Elytra more or less dark, never black 12
 - Male metatibia not dentate. Body entirely black in female, black with ochreous prothorax and metepisternum in male 14
- 12 Inner side of male metatibia bearing numerous minute denticles *monstrosetibialis* Löbl
 - Inner side of male metatibia bearing one to three sub-basal teeth 13
- 13 Parameres slender and sinuate, apically not or weakly narrowed *thoracica* sp. n.
 - Parameres incurved, left paramere with middle portion wider than that of right paramere, narrowed apically *dentipes* Löbl
- 14 Male with basal and apical pronotal margins black. Median lobe strongly enlarged apically *tuberculosa* sp. n.
 - Pronotum entirely ochreous in male. Median lobe not enlarged apically *errabunda* sp. n.
- 15 Hypomeron distinctly punctate 16
 - Hypomeron impunctate 19
- 16 Sutural stria short, evanescent before reaching level of elytral base 17
 - Sutural stria long, curved along pronotal lobe and extended laterally along elytral base 18
- 17 Entire hypomeron coarsely punctate; mesepisternum distinctly punctate. Lateral portion of pronotum much more coarsely punctate than pronotal centre *cribrata* sp.n.
 - Only small area of hypomeron punctate; mesepisternum impunctate. Pronotum evenly punctate *puncticollis* Löbl
- 18 Metepisternum indistinct *microptera* Löbl
 - Metepisternum large, separated from metasternum by deep suture *excelsa* Löbl
- 19 Sutural stria reduced, not visible on anterior part of elytron 20
 - Sutural stria longer, reaching elytral base 22
- 20 Antennae short, segment VIII not or somewhat longer than wide. Small species 1.0 - 1.1 mm long *crinita* sp. n.
 - Antennae longer, segment VIII elongate. Larger species 21
- 21 Sutural stria visible only on apical part of elytron *reducta* sp. n.
 - Sutural stria longer, distinct between apex and basal 1/3 to 1/5 of sutural length *hygraphila* Löbl
- 22 Sutural stria not extended along elytral base 23
 - Sutural stria curved at base and more or less extended along elytral base 24
- 23 Length 0.9 - 1.0 mm. Antenna short, segment VIII about as long as wide *microps* Löbl
 - Length 1.75 - 2.25 mm. Antennae long, segment VIII slender, much longer than wide. Metatarsus conspicuously short, only somewhat longer than half of metatibia *mussardi* (Löbl)
- 24 Punctuation of elytron and pronotum very fine, or elytron with few somewhat larger punctures 25

- Punctuation of elytron notably coarser than that of pronotum, often irregular, or coarsely punctate area restricted to anterior half of elytron 28
- 25 Apex of median lobe exceeding somewhat level of mid-length of parameres *inermis* Löbl
- Apex of median lobe reaching almost level of apices of parameres 26
- 26 Internal sac of aedeagus with simple, straight long median sclerite *senilis* Löbl
- Internal sac of aedeagus different 27
- 27 Internal sac with two slender sclerites, one almost straight and flat, second curved, narrowed and pointed apically *sordidoides* sp. n.
- Internal sac with asymmetrical apical sclerotized lamina accompanied by two slender elongate sclerites *laminula* sp. n.
- 28 Elytron with basal stria extended to middle of basal margin or to humeral area, not joined with lateral stria 29
- Basal stria of elytron extended laterally and joined with lateral stria 34
- 29 Most of basal half of elytron coarsely punctate, remaining elytral surface impunctate or very finely punctate, with punctures about as tiny as those on pronotum 30
- Elytral punctuation different 31
- 30 Parameres curved, with emarginate middle of inner margin, not narrowed apically
..... *ventralis* (Löbl)
- Parameres straight, dentate, narrowed in apical half *manasensis* Löbl
- 31 Metepisternum wide, separated from metasternum by distinct, finely punctate suture
..... *schawalleri* sp. n.
- Metepisternum not visible or very narrow, separated from metasternum by row of coarse punctures 32
- 32 Lateral margin of elytron straight. Elytral punctuation relatively fine. Small species, 1.1 - 1.3 mm long *signata* Löbl
- Lateral margin of elytron rounded, or straight in middle portion only 33
- 33 Parameres of aedeagus not or moderately narrowed apically. Membranes of internal sac covered by pointed scales *lenta* (Löbl)
- Parameres of aedeagus much narrower in apical half than in basal half, dentate in middle. Membranes of internal sac with minute, extremely short spines
..... *pseudincisa* Löbl
- 34 Lateral portion of metasternum with apical row of coarse punctures and a few coarse punctures near anterior and lateral margins. Parameres pubescent *pilifera* Löbl
- Entire or most of lateral portion of metasternum covered by coarse punctures. Parameres smooth 35
- 35 Pronotal punctuation rather coarse, distinct at 24x magnification *martensi* sp. n.
- Pronotal punctuation very fine, not or barely visible at 24x magnification 36
- 36 Metepisternum distinct, separated from metasternum by deep, punctate suture 37
- Metepisternum often indistinct, separated from metasternum by row of coarse punctures 38
- 37 Antenna short, segment VII almost 2x longer than segment VIII. Elytron rather finely punctate, with very finely punctate base. Base of 1st ventrite rugose
..... *brevicornis* (Löbl)
- Antenna long, segment VII moderately longer than segment VIII. Elytron, base excepted, coarsely punctate. Base of 1st ventrite with elongate punctures
..... *serendibensis* (Löbl)
- 38 Apical third to half of elytron very finely punctate, basal half of elytron coarsely punctate. First ventrite without any coarse punctures except those margining base 39

- Elytron entirely coarsely punctate, or punctation becoming gradually finer toward apex and almost evanescent on latero-apical area. First ventrite usually coarsely punctate beyond basal row of punctures 40
- 39 Parameres straight, evenly wide between apex and enlarged base *pseudovilis* Löbl
- Parameres sinuate, enlarged in middle and apically *inculta* Löbl
- 40 Internal sac of aedeagus with large vesica, entered by ejaculatory duct before reaching complex of sclerites 41
- Internal sac of aedeagus without basal vesica 42
- 41 Parameres straight, parallel to each other *vesiculata* Löbl
- Parameres somewhat curved, usually diverging apically *longicornis* (Löbl)
- 42 Apex of median lobe of aedeagus situated far beyond level of mid-length of parameres. Elytron with rather large smooth latero-apical area *vilis* Löbl
- Apex of median lobe of aedeagus situated at about level of mid-length of parameres. Elytron with narrow smooth latero-apical area, or entirely coarsely punctate 43
- 43 Parameres conspicuously narrow, parallel to each other, somewhat uneven *wittmeri* Löbl
- Parameres rather wide, curved *pigra* (Löbl)

NEW RECORDS

Baecocera serendibensis (Löbl)

Material examined, 199 specimens: Nepal, Mustang distr., Kali Gandaki Valley, Mishi N Ghasa, 21.IX.1971 (Franz) (Coll. H. Franz) 2; Kali Gandaki Valley, between Lete and Ghasa, 25.IX.1971 (Franz) (Coll. H. Franz) 1; Kaski distr., Khorkore near Pokhara, ravine, 26.IX.1977 (Franz) (Coll. H. Franz) 1; Tandarakot, trail Pokhara - Ghoropani, ca 1000 m, 18.IX.1971 (Franz) (Coll. H. Franz, MHNG) 6; Parbat distr., Ghoropani Pass, 2750 m, 5.X.1983 (Löbl & Smetana) 1; Gorkha distr., Buri Gandaki, Labubesi-Gorlabesi, 900-1000 m, 29.VII.1983 (Martens & Schawaller) (SMNS) 1; Darondi Kola between Sangu and Gorkha, 1200 m, 14.VIII.1983 (Martens & Schawaller) 1; Rasuwa distr., trail from Fulang Temple via Dinguari Khola, 150 m above bottom of valley, 11.X.1971 (Franz) (Coll. H. Franz) 1; Kathmandu distr., Nagarjun forest, 1650 m, 2.IV.1981 (Löbl & Smetana) (MHNG) 1; Nagarjun, Jamacok, 1400-1600 m, 18.VIII.1983 (Martens & Schawaller) (SMNS, MHNG) 6; Gokarna forest, 1400 m, 3.VIII.1970 and 3.X.1971 (Franz) (Coll. H. Franz) 4; Gokarna forest, 1.IX.1981 and 20.X.1983 (Löbl & Smetana) (MHNG) 12; Patan distr., 2 km S Godawari, 1700 m, 20.X.1983 (Löbl & Smetana) (MHNG) 1; Sankhua Sabha distr., below Sheduwa, 2550 m, 30.III.1982 (A. & Z. Smetana) (MHNG) 1; bottom Arun Valley below Num, 1050 - 1100 m, 21.-22.IV.1984 (Löbl & Smetana) (MHNG) 30; Arun Valley near Num, 1500 m, 29.III.1982 and 1500-1600 m, 10.IV.1982 (A. & Z. Smetana) (MHNG) 7; Ilam distr., between Ilam and Mai Pokhari, 1400-1600 m, 8.IV.1988 (Martens & Schawaller) (SMNS) 1; Taplejung distr., confluence of Kabali Khola and Tada Khola, 1000 - 1050 m, 23.-25.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 52; ascent to Khebang from Tada Khola, 1500 m, 25.IV.1988 (Martens & Schawaller) (SMNS) 1; Yamputhin, 1650-1800 m, 26.IV.1988 (Martens & Schawaller) (SMNS) 1; Yamputhin, 1650-1800 m, 26.IV.1988 (Martens & Schawaller) (SMNS) 1; Yamputhin, 1650 -1800 m, 226.IV.1988 (Martens & Schawaller) (SMNS) 3; India, Himachal Pradesh, Nahan, 930 m, 3.X.1988 (Vit) 1; 10 km NW Sarahan, N. Nahan, 1700 m, 7.X.1988, (Vit), 40; Baroq forest 4 km SW Solan, 1500 m, 8.X.1988 (Vit) 19; Kulu Valley, Vashisht Baths N. Manali, 1900 m, 13.X.1988 (Vit) 1; Kulu Valley, Naggar, 1850 m, 16.X.88 (Vit) 2; 12 km E Mandi, 750 m, 25.X.1988 (Vit) 3 (all Indian specimens in MHNG).

Distribution. Pakistan, India (Himachal Pradesh, Uttar Pradesh: Garhwal and Kumaon, West Bengal: Darjeeling distr., Assam, Meghalaya, Kerala), Sri Lanka, Western, Central and Eastern Nepal, Thailand.

Baeocera brevicornis (Löbl)

Material examined, 2 specimens: Nepal, Parsa distr., Terai, Amlekganj, 8.X.1972 (Franz) (Coll. H. Franz, MHNG).

Distribution. Sri Lanka, India (Kerala), Nepal.

Baeocera mussardi roberti Löbl

Material examined, 96 specimens: India, Uttar Pradesh, Mussoorie, Rabbit Farm, 1300m, 10.VII.1989 (Riedel) (SMNS) 1; Nepal, Kathmandu distr., Rani Ban SE Sanogau, 1500-1600 m, 25.IV.1988 (Brachat) (MHNG) 1; Patan distr., Phulcoki SE Godawari, ca 1800 m, 22.IV.1988 (Brachat) (MHNG) 2; Dhading distr., Ankhu Kola Valley, Ankhu Sangu, 650 m, 24.-25.VII.1983 (Martens & Schawaller) (SMNS) 1; Sankhua Sabha distr., Arun Valley near Num, 1500-1600 m, 29.III. and 10.IV.1982 (A. & Z. Smetana) (MHNG) 27; bottom Arun Valley below Num, 1050-1100 m, 21.-22.IV.1984 (Löbl & Smetana) (MHNG) 56; bottom Arun Valley between Hedangna and Num, 950-1000 m, 6.-9.VI.1988 (Martens & Schawaller) (SMNS) 1; below Sheduwa, 2550 m, 30.III.1982 (A. & Z. Smetana) (MHNG) 1; Induwa Khola, 1750 m, 14.IV.1984 (Löbl & Smetana) (MHNG) 1; Dhankuta distr., Arun Valley, Lamobagar Gola, 1000-1400 m, 27.V.-3.VI.1980 (Holzschuh) (NMB) 1; Taplejung distr., confluence of Kabeli Khola and Tada Khola, 1000-1050 m, 23.-25.IV.1988 (Martens & Schawaller) (SMNS) 1; Yamputin cultural land, 1600-1800 m, 26.IV.-1.V.1988 (Martens & Schawaller) (SMNS) 1; Hellok in Tamur Valley, 2000 m, 17.V.1988 (Martens & Schawaller) 2.

Distribution. India (Tamil Nadu, Kerala, West Bengal: Darjeeling distr., Uttar Pradesh: Garhwal), Bhutan, Eastern and Central Nepal.

Remarks. The size of the body of *B. mussardi roberti* is rather variable. It is in several specimens similar to that in *mussardi* s.str. which occurs in Sri Lanka and in Thailand. The conspicuously coarse punctation of the pronotum and the punctate mesepimera in *roberti* provide good diagnostic characters. Most specimens of *roberti* were found in subtropical and in mixed broad-leaved forests.

Baeocera lenta (Löbl)

Material examined, 4 specimens: Nepal, Sankhua Sabha distr., Arun Valley bottom between Hedangna and Num, 950-1000 m, 6.-8.VI.1988 (Martens & Schawaller) (SMNS, MHNG), 3; Arun Valley bottom below Num, 1050 m, 20.IV.1984 (Löbl & Smetana) (MHNG) 1.

Distribution. Sri Lanka, India (Tamil Nadu, Kerala, Meghalaya), Eastern Nepal.

Remarks. This is a common species in Sri Lanka and in Southern India. The populations from Kerala and Tamil Nadu were described as *B. pseudolenta* Löbl, based on the seemingly significant characters in the shape of the basal portion of the sclerites of the internal sac. However, reexamination of the aedeagi, using better optics, showed that the previously observed differences are due partly to the different degree of the sclerotization of the aedeagus, and partly to the infraspecific variability. Hence, *Baeocera pseudolenta* LÖBL, 1979 is junior synonym of *B. lenta* (LÖBL, 1971) - syn. nov.

Baeocera longicornis (Löbl)

Material examined, 15 specimens: Nepal, Kaski distr., Pokhara Lake, hill facing temple near Pinta, 20.IX.1978 (Franz) (Coll. H. Franz) 1; Pande settle, via Pokhara, ca 2000 m,

29.IX.1971 (Franz) (Coll. H. Franz) 1; Gorkha distr., Darondi Khola betw. Doreni and Motar, 900-750 m, 13.VIII.1983 (Martens & Schawaller) 1; Kathmandu distr., Gokarna forest, 1.IV.1981 and 10.IX.1983 (Löbl & Smetana) 4; Sankhua Sabha distr., bottom Arun Valley, below Num, 1050 m, 21.IV.1984 (Löbl & Smetana) 2; Taplejung distr., confluence of Kabeli Khola and Tada Khola, 1000-1050 m, 23-25.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 4; Yamputhin, 1650 - 1800 m, 26.IV.1988 (Martens & Schawaller) 1.

Distribution. Sri Lanka, India (West Bengal: Darjeeling distr., Assam, Meghalaya, Uttar Pradesh: Kumaon and Garhwal), Western, Central and Eastern Nepal, Thailand.

Remarks. Most of the specimens previously recorded from Northern India as *B. vesiculata* belong to this species.

Baocera vesiculata Löbl

Material examined, 7 specimens: Nepal, Myagdi distr., Myagdi Khola, Muri, 2100-2300 m, III.1970 (Martens) (SMNS) 1; Kathmandu distr., Nagarjun forest, 1650 m, 2.IV.1981 (Löbl & Smetana) 1; Patan distr., Godawari, 6000', 7.-13.VIII.1967 (Canadian Nepal Exp.) (CNC) 1; 2 km S Godawari, 1700 m, 20.X.1983 (Löbl & Smetana) (MHNG) 1, Sindhupalcok distr., above Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 1; Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 2.

Distribution. India (Kerala, Meghalaya), Western and Central Nepal.

Remarks. The tentatively associated females are not listed. The species may be distinguished from *B. longicornis* only by the shape of the parameres.

Baocera pigra (Löbl)

Material examined, 1 specimen: Nepal, Kathmandu distr., Gokarna forest, 1400 m, 3.X.1971 (Franz) (Coll. H. Franz).

Distribution. Sri Lanka, India (Kerala, Tamil Nadu, Meghalaya, Assam, Uttar Pradesh: Kumaon), Central Nepal, Thailand.

Baocera wittmeri Löbl

Material examined, 30 specimens: India, Uttar Pradesh, Mussoorie, Rabit Farm, 1300 m, 10.VII.1989 (Riedel) (SMNS) 1; Nepal, Kaski distr., Tandarokot, trail Pokhara - Ghoropani, ca 1000 m, 18.IX.1971 (Franz) (Coll. H. Franz) 1; Mustang distr., Kali Ghandaki Valley, between Lete and Ghasa, 25.IX.1971 (Franz) (Coll. H. Franz) 1; Kathmandu distr., Gokarna forest, 1.IV.81 and 10.IX.1983 (Löbl & Smetana) (MHNG) 2; Nagarjun forest near Kathmandu, 1650 m, 2.IV.1981 (Löbl & Smetana) (MHNG) 1; Patan distr., Godawari, 1600 m, 31.III.1984 (Löbl) (MHNG) 1; Phulcoki, near Dalikhel, ca 1900 m, 21.IX.1977 (Franz) (MHNG) 1; Sindhupalcok distr., above Chaubas, 2500 m, 4.IV.1981 (Löbl & Smetana) (MHNG) 2; Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 1, Solukhumbu distr., ravin near Shutje S Lughla, 7.X.1975 (Franz) (MHNG) 1; Sankhua Sabha distr., forest S Mangsingma, 2200 and 2300 m, 11. and 13.IV.1984 (Löbl & Smetana) (MHNG) 6; NE Kuwapani, 2250 m, 24.IV.1984 (Löbl & Smetana) 1; Arun Valley, Chichila, 1900-2000 m, 18.-20.VI.1988 (Martens & Schawaller) (SMNS) 1; Chichila, 2300 m, 26.III.1982 (A. & Z. Smetana) 1; bottom Arun Valley below Num, 1050 and 1100 m, 20. and 21.IV.1984 (Löbl & Smetana) (MHNG) 2; Arun Valley, between Mure and Hurure, 2050-2100 m, 17.VI.1988 (Martens & Schawaller) (SMNS, MHNG) 4; below Sheduwā, 2100-2550 m, 9.IV.1982 (A. & Z. Smetana) (MHNG) 4.

Distribution. India (West Bengal: Darjeeling district, Uttar Pradesh: Kumaon, Garhwal), Western, Central and Eastern Nepal.

***Baeocera vilis* Löbl**

Material examined, 68 specimens: Nepal, Myagdi distr., Kali Gandaki Valley, Dana, 20.IX.1971 (Franz) (Coll. H. Franz) 1; Mustang distr., Kali Gandaki Valley, between Ghasa and Lete IX.1971 (Franz) (MHNG) 1; Parbat distr., above Shika near Ghoropani, 26.IX.1971 (Franz) (MHNG) 1; Kathmandu distr., Gokarna forest 1400 m, 31.III.-1.IV.1981 and 20.X.1983 (Löbl & Smetana) (MHNG) 21; Gokarna forest, 3.X.1971 (Franz) (Coll. H. Franz) 1; Bajalu Park, Kathmandu, 1400 m, 17.III.1980 (Martens & Ausobsky) (SMNS) 1; Rani Beni SE Sanogau, 1500-1600 m, 25.IV.1988 (Brachat) (MHNG) 4; Nagarjung, Jamacok, 1400-1600 m, 18.VIII.1983 (Martens & Schawaller) (SMNS) 12; Nagarjung, 1650 m, 2.IV.1981 (Löbl & Smetana) (MHNG) 5; Patan distr., Godawari, 1600 m, 31.III.1984 (Löbl) (MHNG) 1; above Godawari, 1700 m, 19.III.1980 (Martens & Ausobsky) (SMNS, MHNG) 2; Sindhupalcok distr., Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 2; Malemchi Khola bellow Malemchi, 2000 m, 15.IV.1981 (Löbl & Smetana) (MHNG) 1; Zorum River between Durmtali and Korthali, Ting San La, near Barahbise, ca 1900 m, VIII.1980 (Franz) (Coll. H. Franz) 1; Sankhua Sabha distr., below Sheduwa, 2550 m, 30.III.1982 (A. & Z. Smetana) (MHNG) 1; Induwa Khola Valley, 2000 m, 16.IV.1984 (Löbl & Smetana) (MHNG) 1; forest S Mangsingma, 2200 m, 11.IV.1984 (Löbl & Smetana) (MHNG) 2; 2 km E Mangsingma, 1900 m, 19.IV.1984 (Löbl & Smetana) 1; Ilam distr., Gitang Khola Valley, 1750 m, 11.-13.IV.1988 (Martens & Schawaller) (SMNS) 2; Panchtar distr., Paniporua, 2300 m, 16.-20.IV.1980 (Martens & Schawaller) (SMNS) 2; Taplejung distr., ascent to Khebang from Tada Khola, 1500 m, 25.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 3; above Yamputhin, left bank of Kabeli Khola, 1800-2000 m, 27.-29.IV.1988 (Martens & Schawaller) (SMNS) 2.

Distribution. India (West Bengal: Darjeeling distr.; Sikkim, Uttar Pradesh: Kumaon), Bhutan, Western, Central and Eastern Nepal.

Remarks. Females of *B. vilis* may be readily associated with the males by their elytral punctuation, notably by the latero-apical, very finely punctate area extended conspicuously anteriorly.

***Baeocera pseudovilis* Löbl**

Material examined, 10 specimens: Nepal, Kaski distr., Tandarakot between Pokhara and Ghoropani Pass, 1000 m, 18.IX.1971 (Franz) (Coll.H.Franz) 1; Parbat distr., above Shika near Ghoropani, 25.IX.1971 (Franz) (MHNG) 1; Ilam distr., Citang Khola Valley, 1750 m, 11.-13.IV.1988 (Martens & Schawaller) (SMNS) 1; Taplejung distr., Hellok in Tamur Valley, 2000 m, 17.V.1988 (Martens & Schawaller) (MHNG) 1; India, Himachal Pradesh, Khadjiari E Dalhousie, 1950 m, 21.X.1988 (Vit) (MHNG) 4; 10 km NW Sarahan, NW Hahan, 1700 m, 7.X.1988 (Vit) (MHNG) 1; Baroq forest SW Solan, 1500 m, 8.X.1988 (Vit) (MHNG) 1.

Distribution. India (Himachal Pradesh, Uttar Pradesh: Kumaon, West Bengal: Darjeeling distr.), Western and Eastern Nepal.

***Baeocera signata* Löbl**

Material examined, 22 specimens: Nepal, Manang distr., forest W Bagarchap, 2200 m, 24.IX.1983 (Löbl & Smetana) 1; Latha Manang W Bagarchap, 2350 m, 22.IX.1983 (Löbl & Smetana) 1; Parbat distr., Goropani Pass, 2700-2850 m, 5-6.X.1983 (Löbl & Smetana) 5; Kathmandu distr., Gokarna forest, 1400 m, 1.IV.1981 (Löbl & Smetana) 3; Sindhupalcok distr., Chaubas, 2600 m,

5.IV.1981 (Löbl & Smetana) 1; Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana) 1; Malemchi Khola below Malemchi, 2100 m, 15.IV.1981 (Löbl & Smetana) 1; above Shermathang, 2900 m, 26.IV.1981 (Löbl & Smetana) 1; Pokhare NE Barabhise, 2700 m, 2.V.1981 (Löbl & Smetana) 3; Sankhua Sabha distr., forest S Mangsingma, 2200 m, 19.IV.1984 (Löbl & Smetana) 4; 2 km E Mangsingma, 1900 m, 19.IV.1984 (Löbl & Smetana) 1 (all MHNG).

Distribution. India (West Bengal: Darjeeling distr.), Western, Central and Eastern Nepal.

Baeocera microptera Löbl

Material examined, 93 specimens: Nepal, Mustang distr., between Ghasa and Lete, 25.IX.1971, (Franz) (Coll.H.Franz, MHNG) 6; Mishi N Ghasa, Kali Gandaki Valley, 21.IV.1971 (Franz) (Coll. H. Franz) 1; Manang distr., Latha Manang W Bagarchap, 2400 m, 23.IX.1983 (Löbl & Smetana) (MHNG) 3; Gorka distr., Buri Gandaki, Nyak, 2270-2450 m, 1.VIII.1983 (Martens & Schawaller) (SMNS, MHNG) 5; Solukhumbu distr., Dugdima near Lughla via Blasda Pass, ca 4000 m, 4.X.1975 (Franz) (MHNG) 1; S Lughla, between Shutje and Bhum, ca 2200 m, 7.X.1975 (Franz) (Coll. H. Franz) 1; ravine near Shutje, S. Lughla, 7.X.1975 (Franz) (Coll. H. Franz, MHNG) 2; Sankhua Sabha distr., Arun Valley, betw. Mure and Hurure, 2050-2150 m, 17.VI.1988 (Martens & Schawaller) (SMNS) 1; pass NE Mangmaya, 2300 m, 6.IV.1984 (Löbl & Smetana) (MHNG) 1; Ilam distr., Mai Pokhari, 2100-2200 m, 25.-27.III.1980 (Martens & Ausobsky) (SMNS) 2; India, Uttar Pradesh, Joshimat, Pulna, 4.VIII.1989 (Riedel) (SMNS) 5; Himachal Pradesh, Baroq forest SW Solan, 1500 m, 8.X.1988 (Vit) (MHNG) 4; Kulu Valley, Chijoga S Manali, 1900 m, 12.X.1988 (Vit) (MHNG) 2; Kulu Valley, Vashisht Baths N Manali, 1900 m, 13.X.1988 (Vit) (MHNG) 5; Kulu Valley, Naggar 1850 m, 16.X.88 (Vit) (MHNG) 43; Dalhousie, 1950 m, 20.X.1988 (Vit) (MHNG) 7; Katalope Sanct. E Dalhousie, 2400 m, 22.X.1988 (Vit) (MHNG) 4; Jutogh, 10 km W Simla, 2000 m, 29.X.1988 (Vit) (MHNG) 2.

Distribution. Pakistan, India (Himachal Pradesh, Uttar Pradesh: Kumaon and Garhwal), Western and Eastern Nepal.

Remarks. This species has reduced wings and cannot fly, which is surprising in the light of its wide distribution. It occurs in coniferous and broad-leaved forests. The specimen found at Dugdima at 4000 m altitude represents the highest record for the genus.

Baeocera ventralis (Löbl)

Material examined, 152 specimens: Nepal, Kaski distr., Pokhara City, 820 m, 15-18.VI.1976 (Wittmer & Baroni Urbani) (NMB) 1; Khorkore near Pokhara, 26.IX.1977 (Franz) (Coll. H. Franz) 1; Tandarakot, trail Pokhara - Ghoropani, ca 1000 m, 18.IX.1971 (Franz) (Coll. H. Franz) 1; hill above Bennis near Pokhara, 20.IX.1978 (Franz) (Coll. H. Franz) 5; Gorkha distr., Arughat Suteo, 600-700 m, 27.VII.1983 (Martens & Schawaller) (SMNS) 2; Buri Gandaki, Suteo - Labubesi, 700 - 1000 m, 29.VII.1983 (Martens & Schawaller) (SMNS) 3; Darondi Khola between Doreni and Motar, 900-750 m, 13.VIII.1983 (Martens & Schawaller) (SMNS) 3; near Bimal Nagar, Terai, 500 m, 28.IX.1977 (Franz) (Coll. H. Franz) 4; Dhading distr., Ankhua Khola Valley, Ankhua Sangu, 650 m, 24-25.VII.1983 (Martens & Schawaller) (SMNS) 1; Buri Gandaki facing Pangshing, 1750 m, 31.VII.1983 (Martens & Schawaller) 1; Chitawan distr., Royal Chitawan National Park, 9.X.1980 (Franz) (Coll. H. Franz) 10; Parsa distr., Terai, Amlekganj 7-10.X.1972 (Franz) (Coll.H.Franz) 2; near Amlekganj, Khingar, Siwalik, 660 m, 18.X.1977 (Deharveng) (MHNG) 26; Kathmandu distr., Nagarjung, Jamaecok, 1400-1600 m, 18.VIII.1983 (Martens & Schawaller) (SMNS) 1; Patan distr., Caukel Dara, near Bajrajogini, 1600-1700 m, 23.IV.1988 (Brachat) (MHNG) 2; Phulcoki near Dalikhel, ca 1900 m, 21.IV.1977 (Franz) (H. Franz) 4; Sindhupalcok distr., 3 km N Bahunepati, 900 m, 28.IV.1981 (Löbl & Smetana) (MHNG) 1; above Barabhise, 1550 m, 6.VIII.1970 (Franz) (Coll. H. Franz) 1; Sankhua Sabha distr., Lamobagar Gac, 1400 m, 28-30.V.1980 (Wittmer) (NMB) 1;

bottom Arun Valley below Num, 1100 m, 21.IV.1984 (Löbl & Smetana) (MHNG) 1; Ilam distr., Sanishare, 5 km N, feet of Siwalik Mts, 270-300 m, 3-5.IV.1988 (Martens & Schawaller) (SMNS) 7; Taplejung distr., Kabeli Khola below Limbudin, 900 m, 1.IX.1983 (Martens & Daams) (SMNS) 2; confluence of Kabeli Khola and Taka Khola, 1000-1050 m, 23-25.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 72.

Distribution. Pakistan, India (Himachal Pradesh, Uttar Pradesh: Garhwal and Kumaon, West Bengal: Darjeeling district, Assam, Meghalaya), Western, Central and Eastern Nepal, Bhutan, Thailand.

Baeocera khasiana Löbl

Material examined, 8 specimens: Nepal, Ilam distr., Mai Pokhari, 2100-2200 m, 9-10.IV.1988 (Martens & Schawaller) (SMNS) 1; Panchthar distr., Paniporua, 2300 m, 16.-20.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 2; Taplejung distr., Omje Kharka NW Yamputhin, 2300-2500 m, 1-6.V.1988 (Martens & Schawaller) (SMNS) 1; Sankhua Sabha distr., above Tashigaon, 3100 m, 7.IV.1982 (A. & Z. Smetana) (MHNG) 2; Sindhupalcok distr., Malemchi, 2900 m, 14.IV.1981 (Löbl & Smetana) (MHNG) 1, Patan distr., Phulcoki, 2300 m, 10.V.1981 (Löbl) (MHNG) 1.

Distribution. India (Meghalaya), Eastern and Central Nepal, Thailand.

Remarks. Only females were found in Thailand. Their identity has to be confirmed.

Baeocera excelsa Löbl

Material examined, 1 specimen: Nepal, Sankhua Sabha distr., Arun Valley, between Mure and Hurure, 2050-2150 m, 9-17.VI.1988 (Martens & Schawaller) (SMNS).

Distribution. India (Uttar Pradesh: Kumaon), Eastern Nepal.

Baeocera callida Löbl

Material examined, 66 specimens: Nepal, Sankhua Sabha distr., Arun Valley bottom, below Num, 1050-1100 m, 20. and 21.IV.1984 (Löbl & Smetana) (MHNG) 24; below Sheduwā, 2550 m, 30.III.1982 (A. & Z., Smetana) (MHNG) 2; Taplejung distr., confluence of Kabeli Khola and Tada Khola, 1000-1050 m, 23-25.IV.1988 (Martens & Schawaller) (SMNS) 4; Kathmandu distr., Gokarna forest, 1400 m, 1.IV.1981 (Löbl & Smetana) (MHNG) 1; Kaski distr., Tandarakot between Pokhara and Ghoropani Pass, ca 1000 m, 18.IX.1971 (Franz) (Coll. H. Franz) 1; India, Uttar Pradesh, Mussoorie, Rabbit Farm, 1300 m, 10.VII.1989 (Riedel) (SMNS) 1; Himachal Pradesh, Jutogh 10 km W Simla, 2000 m, 29.X.1988 (Vit) (MHNG) 7; Kulu Valley, Chijoga S Manali, 1900 m, 12.X.1988 (Vit) (MHNG) 1; Kulu Valley, Naggā, 1850 m, 16.X.1988 (Vit) (MHNG) 7; Kulu Valley, Vashisht Baths N Manali, 1900 m, 13.X.1988 (Vit) (MHNG) 1, Baroq forest 4 km SW Solan, 1500 m, 8.X.1988 (Vit) (MHNG) 17.

Distribution. Eastern, Central and Western Nepal, India (Uttar Pradesh: Kumaon and Garhwal, Himachal Pradesh), Pakistan.

Remarks. The records from Pakistan and Garhwal are based on females and are therefore not very reliable (LÖBL, 1986b). However, the new findings support previous identification.

Baeocera monstrosa (Löbl)

Material examined, 3 specimens: India, Himachal Pradesh, 12 km E Mandi, 750 m, 25.X.1988 (Vit) (MHNG).

Distribution. Sri Lanka, India (Kerala, Tamil Nadu, Uttar Pradesh: Kumaon, Himachal Pradesh).

***Baeocera hamifera* Löbl**

Material examined. 34 specimens: Nepal, Mustang distr., 2 km N Kalopani, 2500 m, 1.X.1983 (Löbl & Smetana) (MHNG) 3; Lete, 2550 m, 2.X.1983 (Löbl & Smetana) (MHNG) 2; N Lete, 24.IX.1971 (Franz) (Coll. H. Franz) 1; Tangsang near Tukche, Takola, ca 3000 m, 23. IX.1971 (Franz) (Coll. H. Franz) 1; Manang distr., Marsyandi, Thanjok-Chame 2250 m, 17.IV.1980 (Martens & Ausobsky) (SMNS) 1; Kathmandu distr., Nagarjung, Jamacok, 1400-1600 m, 18.VIII.1983 (Martens & Schawaller) (SMNS) 1; Patan distr., Phulcoki, 2300, 2500 and 2700 m, 10.V.1981, 16.X.1983, and 28-29.IV.1984 (Löbl & Smetana) (MHNG) 6; Sindhupalcok distr., Malemchi Khola below Malenchi, 2100 m, 15.IV.1981 (Löbl & Smetana) (MHNG) 1; Malemchi, 2800 m, Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana) (MHNG) 1; Pokhare NE Barahbise, 2700 and 2800 m, 2. and 7.V.1981 (Löbl & Smetana) (MHNG) 4; Sankhua Sabha distr., below Sheduwa, 2100-2500 m, 9.IV.1982 (A. & Z. Smetana) (MHNG) 3; Induwa Khola Valley, 2100m, 17.IV. 1984 (Löbl & Smetana) (MHNG) 1; Panchthar distr., between Paniporua and Hinwa Khola Valley, 2300 -1850 m, 20.IV.1988 (Martens & Schawaller) (SMNS) 2; Taplejung distr., Worebung Pass, 2000 m, 21.IV.1988 (Martens & Schawaller) (SMNS) 4; Hellok in Tamur Valley, 2000 m, 17.V.1988 (Martens & Schawaller) (SMNS) 1; upper Tamur Valley, resthuth side of the valley, 2450 m, 19.V.1988 (Martens & Schawaller) (SMNS) 2.

Distribution. India (West Bengal: Darjeeling distr.), Western, Central and Eastern Nepal.

***Baeocera pubiventris* Löbl**

Material examined. 5 specimens: Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG) 2; India, Himachal Pradesh, 12 km E Mandi, 25.X.88 (Vit) (MHNG) 3.

Distribution. Thailand, Eastern Nepal, India (Himachal Pradesh).

NEW SPECIES

***Baeocera sordidoides* sp. n.**

Holotype, male: Nepal, Patan distr., Phulcoki, 2700 m, 16.X.83 (Löbl & Smetana) (MHNG).

Paratypes, 19: as holotype but 15.X.1983, 1 male; Patan distr., Phulcoki, 2500 m, 28.-29.IV.1984, 1 male, 2 females and at 2600 m, 14.X.1983 (Löbl & Smetana) 1 female (MHNG); 2 km S Godawari, 1700 m, 19.X.1983 (Löbl & Smetana) (MHNG) 1 female; Kathmandu distr. Shewapuri, 2100 - 2300 m, 25.VI.1988 (Martens & Schawaller) (SMNS) 1 male; same but 2400 m, 3.IV.1985 (Smetana) (MHNG) 1 male Sindhupalcok distr., Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 1 male, 2 females; Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana) 1 female; Manang distr., forest W. Bagarchap, 2200 m, 21:IX.1983 (Löbl & Smetana) (MHNG) 1 male, 1 female; Mustang distr., Taksang, Tukche, IX.-X.1971 (Franz) (Coll. H. Franz) 1 male; Parbat distr., Ghoropani Pass, N slope, 2750 m, 5.X.1983 (Löbl & Smetana) (MHNG) 1 male, 1 female; India, Uttar Pradesh, Joshimat, Pulna, 2300 m, 4.VIII.1989 (Riedel) (SMNS) 1 male, 1 female; Mussoorie, Rabit Farm, 1300 m, 10.VII.1989 (Riedel) (SMNS) 1 female.

D i a g n o s i s . Medium-sized species with slender aedeagus and symmetrical median lobe, similar to that of species of *brevicornis* group; internal sac with two elongate

curved sclerites; median lobe bilobed between ventral process and base of apical portion. Body, metasternum excepted, very finely punctate. Metacoxae approximate.

Description. Length 1.40 - 1.55 mm, width 0.88 - 1.0 mm. Strongly convex, especially ventrally, body, femora and tibiae more or less dark brown, antennae and tarsi paler. Eyes large. Antennae moderately long, relative length of segments as follows: III 11, IV 12, V 16, VI 14, VII 18, VIII 12, IX 19, X 17, XI 21 (holotype). Segments III to VI evenly wide, V about 4 x as long as wide; VII 3x as long as wide; VIII about 2.5x as long as wide; IX to XI each much wider than VII, XI almost 2 x as long as wide. Pronotum with rounded lateral margins except near base; lateral keels not visible in dorsal view; punctuation very fine, usually barely visible at magnification 50x. Tip of scutellum exposed. Elytra rather narrowed apically; lateral keel not visible in dorsal view and lateral margin feebly rounded; sutural area flat, very finely punctate; discal punctuation sparse and very fine, punctures very shallow, but much larger than those on pronotum, often barely visible at magnification 24x; sutural stria deep, complete, extended along basal margin, forming basal stria joined with lateral stria. Wings fully developed. Pygidium extremely finely punctate and microsculptured. Hypomeron and mesepisternum impunctate. Mesepimeral ridge about twice as long as interval between its end and mesocoxa. Mesosternum with convex centre; middle impunctate area rather large, limited laterally by finely and very densely punctate areas. Lateral portion of metasternum smooth near metacoxa, elsewhere more or less coarsely punctate, punctures often elongate. Mesocoxal area 0.04 - 0.05 mm long, with coarse marginal punctures. Metepisternum 0.04 - 0.06 mm wide, not or barely narrowed anteriorly, with deep, straight, punctate suture. Metacoxae relatively approximate. First ventrite with mediobasal hump; without microsculpture and very finely punctate; basal punctures coarse, not elongate. Protibiae straight, meso- and metatibiae somewhat curved. Segments 1 to 3 of protarsi moderately enlarged in male. Aedeagus (Figs 97,98) 0.48 - 0.52 mm long. Median lobe with long, tapering apical portion and bisinuate strongly sclerotized ventral wall beyond level of ventral process. Parameres uniformly wide, hardly curved. Internal sac with strongly curved basal sclerite.

Remarks. This new species resembles *B. sordida* Löbl from Japan. Both species share most of the significant characters, including the relatively approximate metacoxae, which distinguish them from the members of the *brevicornis* group. The aedeagi of *B. sordida* and *B. sordidoides* are similar, that of *B. sordidoides* differs in the median lobe bearing a bilobed process situated between the ventral process and the base of the narrowed apical portion. *Baeocera inermis* Löbl and *B. laminula* sp.n. described below are also difficult to separate from *B. sordida/sordidoides* by their external characters. Only the male genitalia provide positive diagnostic characters.

Most specimens of *B. sordidoides* were found in oak and mixed broad-leaved forests in Central and Western Nepal.

***Baeocera laminula* sp.n.**

Holotype, male: Nepal, Manang distr., forest W Bagarchap, 2200 m, 21.IX.83 (Löbl & Smetana) (MHNG).

Paratypes, 4: as holotype 1 male, 1 female; Parbat distr., Ghoropani Pass., N slope, 2750 m, 5.X.1983 (Löbl & Smetana) 1 male; Patan distr., Phulcoki, 2600 m, 20.IV.1982 (A. & Z. Smetana) 1 male (all MHNG).

Diagnosis. Medium-sized species with symmetrical, rather wide aedeagus. Parameres almost straight in dorsal view, sinuate in lateral view. Internal sac with large basal vesicular portion bearing very fine spines, and distal portion with asymmetrical and

flat median sclerite and two slender lateral sclerites. Body, metasternum excepted, very finely punctate. Metacoxae approximate.

Description. Length 1.50 - 1.65 mm, width 0.96 - 1.07 mm. Body dark reddish-brown to blackish. Most external characters as in *B. sordidoides*, antennae longer, with ratio of segments as follows: III 15, IV 15, V 17, VI 15, VII 18, VIII 15, IX 20, X 19, XI 22 (holotype). Elytral punctation still finer than in *B. sordidoides*, anterior portion of sutural stria accompanied by several distinct punctures. Smooth latero-apical area of metasternum larger, metepisternal suture deeper and wider, with coarser punctures. Aedeagus (Figs 99, 100) 0.55 - 0.60 mm. Median lobe with fairly short apical portion. Internal sac with apical, irregularly margined lamina joined with two slender sclerites.

Remarks. This species may be distinguished from *B. sordida/sordidoides* and from *B. inermis* by the shape of the median lobe and by the internal sac. Several females from other localities than those of the males, or slightly differing by their external characters, are not certainly conspecific with the males of *B. laminula* and therefore are not included in the type series.

***Baocera reducta* sp. n.**

Holotype, male: Nepal, Kaski distr., above Dumbus, 2100 m, 8-10.V.1980 (Martens & Ausobsky) (SMNS).

Paratypes, 4 females: as holotype (SMNS, MNHG).

Diagnosis. Micropterous member of the *lenta* group, with very short sutural striae of elytra, impunctate hypomerion, entire elytral surface coarsely punctate, parameres moderately sinuate and wide distal sclerite of internal sac of aedeagus.

Description. Length 1.15 - 1.30 mm, width 0.78 - 0.87 mm. Body strongly convex, pale reddish-brown, antennae and tarsi yellowish. Eyes moderately large. Antennae long, relative length of segments as follows: III 12, IV 13, V 15, VI 12, VII 16, VIII 14, IX 19, X 18, XI 20 (holotype). Segments III to VI slender, V somewhat wider than IV or VI; VII about 3x as long as wide, VIII 3.5 x as long as wide. Pronotum with rounded lateral margins; lateral keels not visible in dorsal view; punctation very fine, well delimited, visible at 24x magnification. Scutellum covered by pronotal lobe. Elytra rather strongly narrowed apically, with rounded lateral margins; lateral keel not visible in dorsal view; sutural area not or barely raised; sutural stria very shallow, distinct only in apical portion, evanescent on anterior half of sutural length. Entire punctation coarse and dense (including on humeral area), punctures near apex somewhat smaller and closer than those on centre. Wings strongly reduced. Pygidium very finely punctate. Hypomerion impunctate. Mesepisternum with several more or less distinct punctures. Entire metasternum coarsely punctate; punctures large, less dense laterally than on centre. Mesocoxal area very narrow. Mesepisternum not distinct. First ventrite coarsely punctate except on small smooth lateral area. Basal punctures not elongate. Pro- and mesotibiae straight, metatibiae somewhat curved. Segments 1 to 3 of protarsi somewhat enlarged in male. Aedeagus (Figs 101, 102) 0.36 mm long. Median lobe with relatively large basal bulb and very short apical portion. Parameres very weakly sinuate.

Remarks. This species shares with *B. hygrophila* Löbl most of the external and aedeagal characters. It may be distinguished from *B. hygrophila* in the much paler coloration of the body, the shorter sutural striae of the elytra, the reduced wings, the punctate mesepisternum and in the shape of the sclerites of the internal sac of the aedeagus. All specimens of *B. reducta* were found in a moist *Sarauja napaulensis* forest in western Nepal.

Baeocera crinita sp. n.

Holotype, male: Nepal, Sankhua Sabha distr., range S Mangsingma, 2800 m, 7.IV.1984, (Löbl & Smetana) (MHNG).

Paratypes, 26: Sankhua Sabha distr., as holotype 1 female; "Bakan" W of Tashigaon, 3200m, 5.IV.1982 (A. & Z. Smetana) (MHNG) 1 female; Thudam, 3550-3650 m, 25.-27.V.1988 (Martens & Schawaller) (SMNS, MHNG) 4 males, 5 females; above Pahakhola, 2600-2800 m, 3.VI.1988 (Martens & Schawaller) (SMNS, MHNG) 1 male, 14 females.

D i a g n o s i s . Small-sized micropterous member of the *lenta* group characterized by very short antennae with wide segments VII to XI, very short sutural striae of elytra and distinctly microsculptured 1st ventrite.

D e s c r i p t i o n . Length 1.0 - 1.1 mm, width 0.60 - 0.73 mm. Body moderately convex, dark reddish-brown. Antennae, tarsi and apex of abdomen paler. Eyes small. Antennae very short, relative length of segments as follows: III 8, IV 6, V 8, VI 6, VII 8, VIII 6, IX 9, X 10, XI 12 (holotype). Segments III and V somewhat wider than IV, VI notably wider than V; VII to XI each conspicuously wide, not or somewhat longer than wide. Dorsal punctation dense and fine, distinct at 24x magnification, that of pronotum somewhat finer than that of elytra. Pronotal and elytral keels not visible in dorsal view. Scutellum covered by pronotal lobe. Elytra rather strongly narrowed apically; sutural area usually somewhat raised, except anteriorly; sutural stria usually short, visible only along apical half of sutural margin. Wings almost completely atrophied. Hypomeron and metepisternum impunctate. Mesepimeral ridge about 2x longer than interval between its end and mesocoxa. Middle portion of metasternum convex, entirely densely and rather finely punctate. Punctuation of lateral portion of metasternum coarser and less dense than that of centre. Mesocoxal area very narrow. Metepisternum flat, 0.02 - 0.04 mm wide, with suture indicated by row of coarse punctures. Abdomen microsculptured. Pygidium extremely finely punctate. First ventrite with middle portion densely and rather finely punctate, laterally almost impunctate, basal punctures coarse. Tibiae straight. Segments 1 to 3 of male pro- and mesotarsi somewhat enlarged. Aedeagus (Figs 103-105) 0.29 - 0.34 mm long. Median lobe slender, its ventro-apical portion tapering. Parameres weakly sinuate.

R e m a r k s . This species seems to be related to *B. microps* Löbl which has a similar shape of the body, reduces eyes and wings, short antennae with wide segments VII to XI, and a similar aedeagus. It may be distinguished by the shorter sutural striae of the elytra, the impunctate lateral portion of the 1st ventrite, and by the darker and somewhat larger body. *Baeocera crinita* and *B. microps* are possibly vicarious and are restricted to small areas in Eastern Nepal and in Western Bengal, respectively. *Baeocera microps* has been found only in evergreen oak forest. The vertical range of *B. crinita* extends from the oak to the *Betula/Rhododendron* zone.

Baeocera cribrata sp. n.

Holotype male: Nepal, Panthar distr., Paniporua, 2300 m, 16 - 20.IV. 1888 (Martens & Schawaller) (SMNS).

Paratypes, 7: as holotype (SMNS, MHNG) 1 male, 1 female; Nepal, Sankhua Sabha distr., Chichila above Ahale, 2300 m, 26.III.1982 (A. & Z. Smetana) (MHNG) 1 male; NE Kuwapani, 2250 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 1 male; forest S Mangsingma, 2200 m, 11-13.IV.1984 (Löbl & Smetana) (MHNG) 1 female; Nuwakot distr., Dinguari Kola above Trisuli Bazar, IX.-X.1971 (Franz) (Coll. H. Franz) 2 males.

D i a g n o s i s . Brachypterous member of the *lenta* group with conspicuously coarsely punctate pronotum and coarsely punctate mesepisternum and hypomeron. Sutural stria of elytron very short. Aedeagus with relatively long median lobe and long sclerites of internal sac.

D e s c r i p t i o n . Length 1.15 - 1.30 mm, width 0.78 - 0.90 mm. Body reddish-brown, antennae and tarsi paler. Eyes small. Antennae of average length, with slender segments III to VI; relative length of segments in holotype as follows: III 13, IV 11, V 14; VI 13, VII 16, VIII 14, IX 17, X 16, XI 18. Segment VII about 3x as long as wide, VIII about 3.5x as long as wide. Pronotum with rounded lateral margins, lateral keels not visible in dorsal view; entire punctation very dense and coarse, that of centre distinct at 12x magnification, near lateral margin still coarser, with punctures larger than intervals. Scutellum barely exposed or completely covered by pronotal lobe. Elytra strongly convex, apically narrowed; lateral keel not visible in dorsal view; sutural stria very short, distinct only in apical half of sutural length; sutural area flat; whole discal surface densely and very coarsely punctate, punctures about as large as those of lateral portion of pronotum. Wings reduced, not functional. Pygidium very finely punctate. Entire hypomeron coarsely punctate. Mesepimeral ridge about 2x longer than interval between its end and mesocoxa. Mesepisternum with numerous coarse punctures. Metasternum with smooth, convex centre; punctation around smooth area and near metacoxa very dense and coarse, elsewhere less dense but still coarser. Mesocoxal area very narrow. Metepisternum indistinct. Entire first ventrite without visible microsculpture (100x), densely and coarsely punctate. Basal punctures not elongate. Pro- and mesotibia straight, metatibia somewhat curved. Segments 1 to 3 of male protarsus somewhat enlarged. Aedeagus (Figs 106-108) 0.37 - 0.39 mm long. Median lobe with long basal bulb and very short apical portion. Parameres hardly sinuate.

R e m a r k s . *Baeocera cribrata* is possibly closely related to *B. puncticollis* with which it shares a similar aedeagus, the strongly shortened sutural striae and the punctate hypomeron. It may be easily separated from the latter by the much more coarsely punctate pronotum and by the punctate mesepisterna. The species is brachypterous. It occurs in mixed broad-leaved forest in Central and Eastern Nepal.

Baeocera martensi sp. n.

Holotype, male: Nepal, Sankhua Sabha distr., Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG).

Paratypes, 20: Sankhua Sabha distr., as holotype (MHNG) 5 males, 6 females; Arun Valley bottom betw. Hedanga and Num, 950-1000 m, 6-8.VI.1988 (Martens & Schawaller) (SMNS, MHNG) 3 males, 6 females.

D i a g n o s i s . Member of the *lenta* group with distal portion of ejaculatory duct accompanied by a bunch of moderately sclerotized denticles; parameres weakly sinuate; pronotum distinctly punctate; whole elytral disc coarsely punctate.

D e s c r i p t i o n . Length 1.0 - 1.2 mm, width 0.64 - 0.78 mm. Body more or less dark reddish brown, tarsi and antennae paler. Eyes moderately large. Antennae with narrow segments III to VI, similar to those in related species. Pronotum with rounded margins, lateral keels not visible in dorsal view, punctation rather fine, barely visible at 12x magnification, distinct at magnification 24x. Scutellum covered by pronotal lobe. Elytra narrowed apically, with sutural area raised in most specimens; sutural stria complete, extended along basal margin and joined with lateral margin; lateral keel not

visible in dorsal view; punctation entirely coarse and dense, apical area finer punctate than remaining surface; most punctures distinctly larger than intervals between them. Wings apparently fully developed. Pygidium very finely punctate. Ventral surface similar as in related species. Hypomeron and mesepisternum impunctate; metasternum and 1st ventrite coarsely punctate, small smooth central area of metasternum excepted; mesocoxal area very narrow, visible portion of metepisternum narrow but distinct. Segments 1 to 3 of male protarsus moderately enlarged. Aedeagus (Figs 109 to 111) 0.29 - 0.33 mm long. Median lobe with large basal bulb and short apical portion. Parameres very weakly sinuate. Internal sac with a bunch of denticles.

R e m a r k s . This species is closely related with *B. pigra*, *B. vidua* and *B. wittmeri*; all share similar shape of the aedeagus, and the conspicuous sclerotized denticles along the ejaculatory duct, situated apically of the sclerotized pieces of the internal sac. These four species may be distinguished by the shape of the parameres, which are straight and evenly very narrow in *B. vidua*, curved and distally narrowed in *B. pigra*, and conspicuously long in *B. wittmeri*. *Baeocera martensi* may be readily distinguished from these three species by the much coarser pronotal punctation. All specimens of *B. martensi* were found in subtropical forests in Eastern Nepal.

***Baeocera schawalleri* sp. n.**

Holotype, male: Nepal, Taplejung distr., Hellok in Tamur Valley, 2000 m, 17.V.1988 (Martens & Schawaller) (SMNS).

D i a g n o s i s . Medium-sized species with aedeagus having very large bulbous portion of median lobe, distal portion of median lobe asymmetrical, with two unequal, narrow sclerotized dorsal lobes and one wider ventral piece; parameres symmetrical, slender and simple; internal sac complex, without flagellum. Basal stria of elytron interrupted. Thoracic and abdominal punctation very fine or absent, punctation on elytra and metasternum coarse. Base of 1st ventrite with row of longitudinal furrows.

D e s c r i p t i o n . Length 1.5 mm, width 1.0 mm. Body moderately convex dorsally, very dark reddish-brown to blackish, apex of abdomen and legs paler, antennae ochreous. Eyes large. Antennae with elongate segments III to VI; relative length of antennal segments as follows: III 11, IV 12, V 16, VI 15, VII 16, VIII 13, X 15, XI 25. Segment V 4x as long as wide, as wide as III or VI, somewhat wider than IV; VII about 2.5x as long as wide, distinctly wider than VI, barely wider than VIII; VIII about 2x as long as wide; IX to XI notably wider than VII, XI 2.5x as long as wide. Pronotum with regularly rounded lateral margins: lateral keels not visible in dorsal view; punctation very fine and shallow, visible at 50x magnification. Distal portion of scutellum exposed. Elytra narrowed apically, lateral keels visible near base in dorsal view; sutural area flat, with row of distinct punctures; sutural stria deep, curved near base and extended along basal margin to humeral area, separated from lateral stria by narrow space; lateral stria very densely punctate; discal punctation coarse and dense; in basal half most punctures about as large as intervals, in apical half punctation less dense, most punctures smaller than intervals. Punctation of pygidium very fine, but well visible compared to that of pronotum. Hypomeron and mesepisternum impunctate. Mesepimeral ridge almost 3x as long as interval between its end and mesocoxa. Metasternum with smooth, rather flat centre, elsewhere coarsely punctate; punctures on lateral portion of metasternum not or weakly elongate, smaller and denser near metacoxa than those on anterior portion. Mesocoxal area very narrow, with coarse, not elongate marginal punctures extended laterally along anterior metasternal margin about to level of centre of mesepimeral ridge. Metepisternum

somewhat vaulted, at widest point 0.09 mm, narrowed anteriorly, its suture deep, punctate, somewhat rounded near anterior and posterior angles. Ventrites very finely punctate, without microsculpture. First ventrite with basal row of deep, up to 0.05 mm long furrows. Tibia straight. Segments 1 to 3 of male protarsus enlarged, mesotarsus with segment 1 enlarged. Aedeagus (Figs 112, 113) 0.58 mm long. Median lobe apically asymmetrical, at tip truncate, with two slender dorso-apical lobes. Internal sac bearing numerous spines and denticles, and several teeth-like sclerites. Parameres becoming slender apically and curved near tip.

R e m a r k s . *Baeocera schawalleri* shares essential diagnostic characters with *B. insolita* Löbl. It may be recognised in having asymmetrical distal portion of the median lobe and coarsely punctate metasternum.

The new species was found in a forest remnant with bushes in Eastern Nepal. The wings of the unique specimen were not examined. They are likely fully developed, as in the other dark-coloured species.

***Baeocera mustangensis* sp. n.**

Holotype male: Nepal, Mustang distr., Lete, 2550m, 2.X.1983 (Löbl & Smetana) (MHNG).

Paratypes, 5: as holotype (MHNG) 1 male and Lete, 1971 (Franz) (Coll. H. Franz) 1 male; Mustang distr., 2 km N Kalopani, 2550 m, 1.X.1983 (Löbl & Smetana) (MHNG) 1 male, 1 female; S Lete, 2450-2600 m, 30.IV.- 1.V.1980 (Martens & Ausobsky) (SMNS) 1 male.

D i a g n o s i s . Large species of the *curtula* group with distal portion of median lobe notched ventrally and bearing a bidentate lamina; parameres sinuate in lateral view, narrowed subapically; distal sclerotized portion of ejaculatory duct slender, basal sclerite of internal sac tooth-like, almost symmetrical.

D e s c r i p t i o n . Length 2.0 - 2.2 mm, width 1.25 - 1.50 mm. Body as in *B. hamifera*, rather strongly convex, very dark reddish-brown to black. Apex of abdomen, femora and tibiae more of less dark reddish, tarsi and antennae paler. Pronotum, elytra and pygidium not microsculptured. Eyes rather large. Antennae as in related species. Pronotal centre rather coarsely and very densely punctate, with punctures not well delimited and about as large as intervalles, distinct at 12x magnification. Lateral and apical portions of pronotum decidedly finer punctate than centre. Distal portion of scutellum exposed. Elytron with deep, uninterrupted basal stria joined with lateral stria; elytral punctuation coarse and dense, much coarser than that on pronotal centre, with many punctures about as large as intervalles; punctuation on apical portion less coarse than that on middle. Wings fully developed. Pygidium very finely punctate. Mesepimeral ridge longer than interval between its end and mesocoxa. Metasternum with two rows of coarse setiferous punctures joined by medio-basal transverse row of coarse punctures. Mesocoxal area 0.05-0.07 mm long, margined by coarse punctures extended laterally to mesepimeral ridge. Metepisternum flat, 0.11 - 0.13 mm wide, with straight, punctate suture. Lateral portion of metasternum and 1st ventrite almost impunctate. Basal punctures of 1st ventrite coarse. Pro- and mesotibiae straight, metatibiae somewhat curved. Male protarsus with 1st segment very large, wider than apex of tibia, 2nd segment about as large, 3rd narrower than apex of tibia. Male mesotarsus with 1st segment almost as wide as apex of mesotibia, 2nd segment notably narrower. Aedeagus (Figs 114, 115) 0.88 - 1.0 mm long. Median lobe gradually tapering in dorsal view, with asymmetrical shaped apical portion in lateral view. Extruded portion of flagellum very long, parts of armature of internal sac strongly sclerotized.

R e m a r k s . This species has been collected in a *Taxus* and broad-leaved forest in the Kali Gandaki Valley in Western Nepal. Wider distribution might be expected as it has

fully developed wings. It differs from *B. hamifera* significantly in the shape of the aedeagus. It may be distinguished from other Old World species of the group also in the pronotal and elytral punctation, in combination with the size of the body.

***Baocera thoracica* sp. n.**

Holotype, male: Nepal, Mustang distr., Lete, 2550 m, 2.X.1983 (Smetana & Löbl) (MHNG).

Paratypes, 7: as holotype, 1 male; Parbat distr., Ghoropani Pass, 2700 m, 6.X.1983 (Löbl & Smetana) 1 male; Pun Hill at Ghoropani Pass, 3050-3100 m, 8.X.1983 (Löbl & Smetana) 1 male; Sindhupalcok distr., Malemchi, 2800 m, 14. and 17.IV.1981 (Löbl & Smetana) 1 male, 2 females (all MHNG); India, Himachal Pradesh, Simla, Kufri, 16.VII.1989 (Riedel) (SMNS) 1 male.

D i a g n o s i s . Member of the *satana* group. Distal portion of median lobe of aedeagus sinuate, with dorsally notched, not widened apex. Parameres sinuate, without abruptly notched or enlarged areas. Male metasternum simple, metatibia in male with sub-basal tooth. Elytra dark reddish brown, in male darker than pronotum, in female paler than pronotum.

D e s c r i p t i o n . Very similar to *B. monstrosetibialis* and *B. dentipes*. Length 1.65 - 1.85 mm, width 1.16 - 1.27 mm. Elytra more or less dark reddish-brown in both sexes, thorax and abdomen ochreous in male, blackish in female. Tarsi and antennae usually somewhat paler than tibiae. Relative length of antennal segments as follows: III 14, IV 18, V 20, VI 20, VII 24, VIII 21, IX 25, X 24, XI 32 (holotype); VII and VIII equally wide, VII about 3.5x as long as wide, VIII 3x as long as wide, XI almost 3x as long as wide. Sutural striae almost parallel, sutural area flat. Humeral hump small. Punctures on elytral disc usually smaller than or as large as intervalles. Mesepimeral ridge 2 - 2.5x longer than interval between its end and mesocoxa. Middle portion of metasternum convex, densely and rather coarsely punctate laterally of smooth centre and with several additional coarse punctures near medio-apical process. Lateral portion of metasternum very finely punctate. Mesocoxal area 0.03 - 0.04 mm long, marginal punctures not elongate, extended laterally to level of mesepimeral ridge. Metepisternum vaulted, at widest point almost 0.10 mm, anteriorly narrowed, its impunctate suture sinuate, very deep. Basal punctures of 1st ventrite elongate. Male with segments 1 and 2 of protarsus strongly enlarged, 1 almost as wide as apex of protibia, 2 distinctly narrower; segment 3 of protarsus moderately enlarged; male mesotarsus with 1st segment about as large as that of protarsus, 2nd much narrower, 3rd not enlarged. Male metatibia (Fig. 116) with pointed tooth behind basal fourth, beyond inner side flattened, and bearing fine longitudinal keel. Metasternum without sexual characters. Aedeagus (Figs 117 to 119) 0.92 - 0.96 mm long. Apical portion of median lobe curved to left, hardly widened near tip.

R e m a r k s . This species may be readily recognised by its sexual characters. It may be distinguished from *B. monstrosetibialis* also by the colour pattern and by the finer elytral punctation. It occurs in mixed broad-leaved forests in Western and Central Nepal, and in Himachal Pradesh.

***Baocera tuberculosa* sp. n.**

Holotype, male: Nepal, Parbat distr., Ghoropani Pass, 2850 m, 5.X.1983 (Löbl & Smetana) (MHNG).

Paratypes, 3: as holotype, 1 male, 1 female; Parbat distr., Ghoropani Pass, 2700 m, 6.X.1983 and 10 ridge E Ghoropani Pass, 3000 m, 7.X.1983 (Löbl & Smetana) 1 male (all MHNG).

D i a g n o s i s . Member of the *satana* group with black body except for ochreous prothorax and mesepisternum. Elytron with sutural area narrowed anteriorly and apically. Apex of median lobe of aedeagus strongly enlarged; apical portion of left paramere abruptly narrowed, right paramere sinuate.

D e s c r i p t i o n . Similar to *B. thoracica* from which it differs by the colour pattern, the elytra and the sexual characters. Length 1.65-1.85 mm, width 1.2-1.3 mm. Male with head, apical and basal margins of pronotum, elytra, and most of ventral side of body black. Prothorax ochreous, apical and basal pronotal margins excepted. Mesepisternum ochreous as prothorax, or pale reddish. Apical abdominal segments very dark brown. Legs dark brown to black, trochanters reddish. Antennae yellowish or pale brown. In female, body entirely black. Elytron with sutural area vaulted and widest in middle, conspicuously narrowed anteriorly and apically; sutural striae very deep, extended along base to humeral hump, separated from lateral stria by wide space. Elytral disc uneven, with very shallow lateral and apical impressions. Elytral punctation fine near sutural stria and on apical portion, with punctures smaller than intervalles, that on discal centre coarser, with many punctures about as large as intervalles. In male, middle smooth metasternal area impressed, with coarse and dense punctation on each side of impunctate centre, and with conspicuous narrow elongate protuberance. Segments 1 and 2 of pro- and mesotarsus still wider than in *B. thoracica*, 1st segment of protarsus and mesotarsus as wide as apex of tibia. Metatibia with straight basal fourth, then moderately incurved, in apical two thirds equally wide. Aedeagus (Figs 120 to 122) 1.0 - 1.05 mm long. Median lobe asymmetrical, with apical portion strongly inflexed, and in dorsal view widened. Left paramere abruptly narrowed beyond middle.

R e m a r k s . This species exhibits unusual sexual characters. The male may be readily distinguished by its colour pattern from all *Baeocera*, *B. errabunda* excepted. Most specimens were found in debris of mixed *Rhododendron*-oak forest in Western Nepal.

***Baeocera errabunda* sp. n.**

Holotype, male: Nepal, Sankhua Sabha distr., Goru Dzire Dara, eastern slope, 3350 m, 9.IV.1984 (Löbl & Smetana) (MHNG).

D i a g n o s i s . Member of the *satana* group with black body, ochreous prothorax and mesepisternum excepted. Sutural area of elytron widened in middle. Median lobe of aedeagus with right distal piece not enlarged at apex and moderately longer than left piece, apex of latter pointed. Parameres incurved, distal half of left paramere abruptly narrowed, right paramere dentate.

D e s c r i p t i o n . In external characters very similar to *B. tuberculosa*. Length. 1.65 mm, width 1.15 mm. Whole pronotum ochreous, basal margin only somewhat darkened; trochanters and femora black. Elytral disc almost evenly convex, flattened on small subapical area. Elytral punctation rather fine, with almost all punctures much smaller than intervalles. Median metasternal impression shallow, impunctate, delimited in middle by two keels. Middle portion of metasternum with few moderately coarse punctures. Metatibia straight and gradually stouter from base to mid-length, in apical half somewhat incurved, slender, and flattened on inner side. Aedeagus (Figs 123 to 125) 1.0 mm long. Apical portion of median lobe strongly asymmetrical, near tip strongly inflexed, with weakly sclerotized dorso-apical valve.

R e m a r k s . The pale prothorax is possibly a male secondary sexual character, as in *B. tuberculosa*. The species was found by sifting grass-tufts, fern and moss in Eastern Nepal.

Scaphisoma Leach

Scaphisoma Leach, 1817, type species: *Silpha agaricina* Linnaeus, 1758, by monotypy.

Scaphosoma Agazzi, 1846; unjustified emendation.

Scaphiomicrus Casey, 1900; type species: *Scaphisoma pusilla* LeConte, by original designation.

Pseudoscaphosoma Pic, 1915; type species: *Pseudoscaphosoma testaceomaculatum* Pic 1915, by monotypy.

Scutoscaphosoma Pic, 1916; type species: *Scutoscaphosoma rouyeri* Pic, 1916, by monotypy.

Scaphella Achard, 1924; type species: *Scaphosoma antennatum* Achard, 1919, by original designation.

Scaphomicrus; Achard, 1924 (misspelling).

Macrobaeocera Pic 1924; type species: *Scaphosoma phungi* Pic, 1922, by monotypy.

Mimoscaphosoma Pic 1928 (sg); type species: *Scaphosoma (Mimoscaphosoma) bruchi* Pic, 1928, by monotypy.

Scaphisoma is the largest genus of the family in terms of species diversity. It includes about 500 species and is distributed in all major biogeographical regions, Antarctica excepted. Its occurrence on many oceanic islands (i.e., Hawaii, Micronesia, Mascarene Archipelago) suggests high dispersal ability. However, the genus seems to be absent from areas with cool (or cooler) temperate climate such as south of South America or New Zealand where other scaphidiids are encountered. The distribution of the Himalayan species does also suggest their greater thermophily than that of *Baeocera*: *Scaphisoma* is notably more speciose but rarely found above the tree-line. Most of the 93 species encountered in the Himalayan region and in other North Indian and Pakistani mountain ranges occur in subtropical and mixed broad-leaved forests and seem to have a wide range of distribution. The Nepalese collections that included 53 species (57% of the Himalayan species of *Scaphisoma*, of which 21 are new and described below) are likely to be more representative for that area than collections made in other parts of the Himalaya.

Additional 12 Himalayan species represented in the MHNG by females, or by males in poor condition, remain to be identified. They are not included in the present study.

The genus may be defined by several presumably derived characters states: anten-nomere IV short, basal angles of pronotum extended apically toward metepisternum, metacoxal lines usually distinct, pubescence reduced. Members of this genus exhibit great diversity in aedeagal characters. Several species groups have been distinguished based on this character (i.e., LÖBL 1970; 1971; 1979; 1981). The phylogenetic significance of these characters will be investigated in an ulterior study, when also information on Afrotropical and Neotropical species will be available.

Only the presence, not the absence, of the hypomeral microsculpture and of the transverse row of punctures on the lateral portions of the metasternum are noted in the descriptions and redescrptions given below.

For practical reasons, the species known only from Meghalaya are also included in the key.

KEY TO THE HIMALAYAN SPECIES OF *Scaphisoma*

1	Elytron with basal stria	2
–	Elytron without basal stria	27
2	Elytron with uninterrupted basal stria	3
–	Basal stria of elytron interrupted	9
3	Body uniformly blackish or black, elytron sometimes somewhat paler than pronotum	4

- Pronotum and/or elytra with distinct colour pattern 5
- 4 Metacoxal area narrow, its margin parallel to metacoxa *kaszabianum* Löbl
- Metacoxal area wide, its margin arcuate *kashmirensis* Achard
- 5 Elytron dark reddish-brown with wide pale apical portion and with obsolete discal punctation *baloo* sp. n.
- Elytron with different colour pattern and distinct discal punctation 6
- 6 Abdominal microsculpture consisting of distinct transverse striae ... *clavigerum* sp.n.
- Abdominal microsculpture obsolete or consisting of punctures 7
- 7 Elytron yellowish or ochreous, with narrowly darkened base and one or two small dark spots on central portion of disc (Fig.27) *aurorae* sp. n.
- Elytron ochreous to reddish-brown, with large dark discal spot extended to sutural stria or sutural margin (Fig.38) 8
- 8 Internal sac of aedeagus without robust sclerite *notatum* Löbl
- Aedeagus with internal sac armed with robust sclerite *jado* sp.n.
- 9 Abdominal microsculpture consisting of transverse striae 10
- Abdominal microsculpture obsolete or consisting of punctures 13
- 10 Antennomere V about 3x as long as very short IV *pseudorufum* Löbl
- Antennomere V as long as or moderately longer than IV 11
- 11 Elytron with large sub-basal reddish spot and pale apical portion (Fig.32) *pulchellum* Löbl
- Elytron without particular colour pattern 12
- 12 Length below 2 mm. First ventrite with punctation on lateral portion much finer than that on centre *assimile curvistria* Reitter
- Length 2 - 2.2 mm. First ventrite evenly, very finely punctate *tonkineum* Pic
- 13 Elytron dark reddish-brown, with well delimited yellowish subapical fascia *flavofasciatum* Löbl
- Colour pattern of elytron different 14
- 14 Antennomere IV short, somewhat longer than III, both combined as long as or shorter than V 15
- Antennomere IV long, combined with III longer than V 20
- 15 Head and pronotum black, elytra reddish-brown. Length 2.25- 2.40 mm *inhospitale* Löbl
- Colour pattern different. Usually smaller species 16
- 16 Antennomere VI as long as or longer than segments III to V combined *antennatum* Achard
- Antennomere VI shorter than segments III to V combined 17
- 17 Pronotum reddish-brown, elytra yellowish, with black basal spot *nima* sp. n.
- Pronotum and elytra more or less uniformly dark reddish- brown 18
- 18 Antennomere VI notably longer than V *inquietum* sp. n.
- Antennomere VI as long as or distinctly shorter than V 19
- 19 Antennomere V about 2x as long as IV *adjacens* sp. n.
- Antennomere V about 4x as long as IV *praesigne* sp. n.
- 20 Length 2.4 - 2.5 mm. Body uniformly black. Antennomere XI more than 4x as long as wide *fatuum* sp. n.
- Length not exceeding 2.2 mm.. Body usually not uniformly black. Antennomere XI much less than 4x as long as wide 21
- 21 Punctation on lateral portion of metasternum much coarser than that on lateral portion of 1st ventrite *viti* Löbl
- Punctation on lateral portions of both metasternum and of 1st ventrite very fine 22
- 22 Metacoxal line parallel to metacoxa *uniforme* Löbl

- Metacoxal line arcuate 23
- 23 Mesocoxal area small, shorter than metacoxal area 24
- Mesocoxal area fairly large, about as long as metacoxal area 25
- 24 Elytral disc finely punctate, diameters of punctures on centre smaller than those of intervals *rufum* Achard
- Elytral disc coarsely punctate, diameters of punctures on centre larger than those of intervals *interjectum* sp. n.
- 25 Median portion of metasternum with wide U-shaped row of coarse punctures *minutum* Achard
- Metasternal punctation different 26
- 26 Ventral process of aedeagus robust, oblique. Punctation on medio-basal portion of metasternum and on 1st ventrite very dense *puthi* Löbl
- Ventral process of aedeagus slender and curved. Punctation of median portion on metasternum and on 1st ventrite fairly dense *besucheti* Löbl
- 27 Very small species, length less than 1 mm *minutissimum* Champion
- Larger species, at least 1 mm long 28
- 28 Antennomere IV conspicuously short, not or somewhat longer than III, both combined shorter than or about as long as V 29
- Antennomere IV elongate, notably longer than III, both combined usually longer than V 36
- 29 Abdominal microsculpture consisting of punctures 30
- Abdominal microsculpture consisting of transverse striae 32
- 30 Mesepimeral ridge distinct. Elytron with equally large discal punctures *falciferum* Löbl
- Mesepimeral ridge obsolete. Elytron with conspicuously irregular punctation 31
- 31 Elytral disc flattened, most of dense and coarse punctures situated on latero-central portion *imitator* Löbl
- Elytral disc not flattened, most of dense and coarse punctures situated on central portion of disc *mimicum* Löbl
- 32 Elytron with two well delimited reddish spots *quadrimaculatum* Pic
- Elytron immaculate 33
- 33 Antennomere VI much longer than V, usually about as long as segments III to V combined 34
- Antennomere VI about as long as V, much shorter than III to V combined *peraffine* Löbl
- 34 Length 1.2 - 1.3 mm. Elytron uniformly blackish-brown or black *discretum* Löbl
- Length 1.55 - 1.75 mm. Elytron black with pale apical margin 35
- 35 Parameres each equally wide in apical half *fraterculum* Löbl
- Parameres each gradually narrowed sub-apically, with widened apical portion *fratellum* sp. n.
- 36 Pronotum and elytra dark brown to black, each elytron with reddish sub-basal spot or fascia, and with pale apical or subapical area. Metasternum with row of punctures parallel to metacoxa 37
- Colour pattern different 39
- 37 Elytron with subapical fasciae not extended to touch apical margin (Fig.33) *quadrifasciatum* Löbl
- Entire apical 1/4 to 1/3 of elytron ochreous or yellowish (Fig.34) 38
- 38 Pronotum and elytra densely and coarsely punctate, punctures visible at magnification 12x *tetrastictum* Champion

- Pronotum and basal 1/3 of each elytron very finely punctate, punctures not or hardly visible at magnification 50x *cederholmi* Löbl
- 39 Hypomeron with microsculpture consisting of striae 40
- Hypomeron without microsculpture 43
- 40 Metasternum without row of punctures parallel to metacoxa *invalidum* sp. n.
- Metasternum with row of coarse punctures parallel to metacoxa 41
- 41 Punctuation near lateral margins of pronotum conspicuously denser and coarser than that on center *pseudodelictum* Löbl
- Punctuation near lateral margins of pronotum not or moderately coarser and denser than on center 42
- 42 Punctuation on pronotal base and center equally or almost equally fine .. *argutum* Löbl
- Punctuation on pronotal base distinctly coarser than that on pronotal center *malignum* Löbl
- 43 Elytron with more or less dark or black basal spot extended apically along suture and forming triangular or subtriangular pattern 44
- Elytral coloration different 48
- 44 Metasternum with row of relatively coarse punctures parallel to metacoxa 45
- Row of punctures parallel to metacoxa usually absent or formed by very fine punctures 47
- 45 Elytron without apical or subapical darkened patch. Middle portion of pronotum darkened *cruciatum* Champion
- Elytron with distinct dark subapical patch 46
- 46 Median lobe of aedeagus apically symmetrical, flat, tapering *bhareki* sp. n.
- Median lobe of aedeagus apically stick-like, asymmetrical *absurdum* Löbl
- 47 Middle portion of pronotum very finely punctate. Most of lateral portion of 1st ventrite not microsculptured *sikkimense* sp. n.
- Pronotum coarsely punctate. Most of lateral portion of 1st ventrite microsculptured ... *varium* Löbl
- 48 Lateral portion of metasternum without row of punctures parallel to metacoxa 49
- Lateral portion of metasternum with distinct row of punctures parallel to metacoxa 63
- 49 Abdominal microsculpture obsolete, or consisting of punctures or of extremely short striae 50
- Abdominal microsculpture consisting of distinct transverse striae 57
- 50 Mesocoxal area subtriangular 51
- Mesocoxal area oval or arcuate 52
- 51 Apical portion of median lobe wide, strongly flattened *maindroni* Achard
- Apical portion of median lobe narrow, weakly flattened *spurium* Löbl
- 52 Pronotum and elytron very dark, blackish-brown or black, except for pale elytral apices *bedeli* Achard
- Pronotum and elytra uniform more or less dark reddish-brown or elytra paler than pronotum 53
- 53 Median lobe of aedeagus conspicuously thick, with strongly inclined apical portion ... *diabolum* Löbl
- Median lobe of aedeagus narrow 55
- 55 Aedeagus weakly sclerotized, with median lobe narrowed apically, parameres thin 56
- Aedeagus strongly sclerotized, in dorsal view apically widening or subparallel, parameres robust *corbetti* Löbl

- 56 Parameres straight, symmetrical, widened at middle *suknense* Löbl
 – Parameres arcuate, asymmetrical, extremely thin, not widened at middle
 *unicolor* Achard
- 57 Lateral portions of metasternum and 1st ventrite coarsely punctate ... *fulcratum* sp. n.
 – Lateral portions of metasternum and 1st ventrite very finely punctate 58
- 58 Pronotum and elytra very dark reddish-brown to black, elytra with narrow apical
 portion distinctly paler 59
 – Pronotum and elytra uniformly ochreous or more or less dark reddish-brown, apical
 elytral margin not or somewhat paler than elytral disc 60
- 59 Medio-basal area of 1st ventrite coarsely punctate beyond basal apophyse
 *innotatum* Pic
 – Entire first abdominal ventrite very finely punctate, marginal pits of metacoxal area
 excepted *forcipatum* Champion
- 60 Aedeagus with distal portion of median lobe very short, with distinct sclerotized
 dorsal valve. Body pale *garomontium* Löbl
 – Aedeagus with distal portion of median lobe long, lacking sclerotized dorsal valve.
 Body dark 61
- 61 Parameres narrow *simplicipenis* sp. n.
 – Parameres wide *luctans* Löbl
- 63 Abdominal microsculpture consisting of punctures 64
 – Abdominal microsculpture consisting of transverse striae 68
- 64 Pronotum and elytra uniformly pale reddish-brown or ochreous *aurum* Löbl
 – Pronotum and elytra dark reddish-brown or blackish, elytra usually paler than
 pronotum 65
- 65 Mesocoxal area small, 0.03 - 0.04 mm long, with margin parallel to coxal cavity
 *nebulosum* Löbl
 – Mesocoxal area larger, with margin arcuate or sub-triangular 66
- 66 Elytron darkened subapically *echinatum* Löbl
 – Elytron uniformy dark reddish-brown or with darkened base 67
- 67 Entire first ventrite very finely punctate *nefastum* Löbl
 – First ventrite with more or less coarsely punctate medio-basal area ... *negligens* Löbl
- 68 Sutural striae of elytra strongly converging apically 69
 – Sutural striae of elytra parallel, or weakly converging apically 72
- 69 Pronotum and most of elytra uniformly colored, very dark, usually black, elytron with
 large, sharply delimited pale apical area (Fig.35)..... *leucopyga* Champion
 – Colour pattern different 70
- 70 Sutural stria of elytron curved near base (Fig. 36) *binhanum* (Pic)
 – Sutural stria of elytron angulate near base 71
- 71 Pronotum dark reddish-brown, with coarsely punctate base *impolitum* Löbl
 – Entire pronotum pale, ochreous or yellowish, very finely punctate *dohertyi* Pic
- 72 Pronotum and hypomera much paler than ventral meso- and metathorax sclerites,
 sometimes bicolored. Elytron more or less distinctly maculate 73
 – Pronotum, hypomera and entire ventral surface of thorax concolorous 77
- 73 Male pronotum ochreous, with black basal pattern (Fig.37), female pronotum dark
 reddish-brown *maculigerum* Löbl
 – Pronotum in both sexes uniformly pale, or with basal margin very narrowly darkened
 74
- 74 Aedeagus with parameres fairly wide, not lobed *nigrofasciatum* Pic
 – Parameres of aedeagus each extended ventrally by large lobe with inner margin
 strongly sclerotized 75

- 75 Basal bulb of aedeagus extended dorso-apically, partly overlapping slender apical portion of median lobe *atronotatum* Pic
 – Basal bulb of aedeagus not extended apically 76
- 76 Length 1.85 - 2.05 mm. Internal sac of aedeagus with two pairs of large teeth *khasianum* Löbl
 – Length 1.60 - 1.85 mm. Internal sac of aedeagus with single pair of large teeth *surya* Löbl
- 77 Antennomere V very long, about 3x as long as relatively short segment IV and 2x as long as segments III and IV combined *onychiorum* Löbl
 – Antennomere V not particularly long, about as long as, or moderately longer than IV 78
- 78 Aedeagus with apical portion of median lobe strongly asymmetrical, overlapped by parameres *luctuosum* Löbl
 – Aedeagus symmetrical, apical portion of median lobe not overlapped by parameres ... 79
- 79 Bulbous portion of median lobe extended dorso-apically, overlapping partly narrow apical portion of median lobe *immodicum* Löbl
 – Bulbous portion of median lobe not extended 80
- 80 Median lobe of aedeagus with single undivided dorsal valve *flexuosum* Löbl
 – Median lobe with two dorsal valves extended by arms or with single valve divided by deep suture 81
- 81 Each paramere of aedeagus with denticulate expansion 82
 – Parameres of aedeagus not denticulate 83
- 82 Basal and central portions of internal sac of aedeagus bearing strongly sclerotized armature *armatum* Löbl
 – Apical portion of internal sac of aedeagus bearing sclerotized armature ... *minax* Löbl
- 83 Paramere of aedeagus not lobed or with minute lobe 84
 – Paramere of aedeagus with large membranous lobe 93
- 84 Apical portion of paramere of aedeagus delimited by minute tooth, very narrow *coalitum* sp. n.
 – Apical portion of paramere not delimited by tooth, as wide as, or wider than subapical portion 85
- 85 Apical portion of paramere sharply delimited *alacre* sp. n.
 – Apical portion of paramere not sharply delimited 86
- 86 Inner margin of widened apical portion of paramere sinuate *scabiosum* Löbl
 – Inner margin of apical portion of paramere not sinuate 87
- 87 Internal sac of aedeagus with symmetrical, flat or arcuate central lamina 88
 – Internal sac of aedeagus without central lamina 89
- 88 Lamina of internal sac of aedeagus angulate or sinuate anteriorly, strongly sclerotized laterally; apical sclerotized denticles of internal sac arranged in two rows *nepalense* sp. n.
 – Lamina of internal sac of aedeagus tapering apically and evenly sclerotized; apical sclerotized denticles arranged in single row *championi* Löbl
- 89 Basal portion of internal sac of aedeagus with row of strongly sclerotized denticles ... *prehensor* Champion
 – Basal portion of internal sac of aedeagus covered by minute, weakly sclerotized skale-like or spine-like structures 90
- 90 Internal sac of aedeagus with central sclerotized denticles arranged in two groups pointed toward median line, and with dense apical group of sclerotized denticles *geminatum* Löbl

- Internal sac of aedeagus different 91
- 91 Paramere of aedeagus with widest point (base excepted) situated far before middle ...
..... *kanchi* sp. n.
- Paramere of aedeagus parallel-sided up to middle or to apical third 92
- 92 Arms of dorsal valves of aedeagus very short; proximal end of internal sac strongly
inflected dorsally *varians* sp. n.
- Arms of dorsal valves of aedeagus elongate; proximal end of internal sac not or
weakly inflected *necopinum* sp. n.
- 93 Internal sac of aedeagus with long inflected basal tube and with two conspicuous,
tooth-like sclerites in centre *pinnigerum* sp. n.
- Internal sac of aedeagus lacking basal tube and pair of central tooth-like sclerites ... 94
- 94 Parameres of aedeagus each widened apically, with large overlapping lobes
..... *atrox* Löbl
- Parameres of aedeagus each evenly wide, apically with small, not overlapping lobes
..... *indra* Löbl

NEW RECORDS

Scaphisoma rufum Achard

Material examined, 6 specimens (males only): Nepal, Kathmandu distr., Nagarjung forest, 1650 m, 2.IV.1981 (Löbl & Smetana) (MHNG) 1; Sindhupalcok distr., Pokhare NE Barahbise, 2700 m, 2.V.1981 (Löbl & Smetana) (MHNG) 1; Sankhua Sabha distr., forest S Mangsingma, 2200 m, 11.IV.1984 (Löbl & Smetana) (MHNG) 4.

Distribution. North India, Nepal, Singapore, Japan.

Scaphisoma pseudorufum Löbl

Material examined, 3 specimens: Nepal, Manang distr., forest W Bagarchhap, 2200 m, 21.IX.1983 (Löbl & Smetana) (MHNG).

Distribution. Nepal, India: Darjeeling distr., Thailand.

Scaphisoma corbetti Löbl

Material examined, 1-male: Nepal, Terai, Bara distr., Amlekhganj, 7-10.X.1970 (Franz) (Coll. H. Franz).

Distribution. India: Garhwal and Kumaon, Nepal.

Scaphisoma viti Löbl

Material examined, 4 specimens: Nepal, Gorkha distr., Arughat-Suteo, 600-700 m, 27.VII.1983 (Martens & Schawaller) (SMNS, MHNG).

Distribution. North Pakistan, Nepal.

Scaphisoma quadrifasciatum Löbl

Material examined, 11 specimens: India, Uttar Pradesh, Chakrata div., 7000 ft., 1.VII.1932 (Champion) (BMNH) 4; Nepal, Kathmandu distr., Gokarna forest, 1400 m, 31.III.1981 (Löbl & Smetana) (MHNG) 1; Patan distr., Phulcoki (Franz) (Coll. Franz) 1; Taplejung distr., Yamputhin, 1650-1800 m, 26.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 5.

Distribution. North Pakistan, North India, Nepal.

Scaphisoma fraterculum Löbl

Material examined, 28 specimens: Nepal, Patan distr., Phulcoki, 2500-2700 m, 10.V.1981, 13-16.X.1983, 28-30.IV.1984 (Löbl & Smetana) (MHNG) 16; Phulcoki, near Godawari, 1700 m, 10.V.1981 (Löbl & Smetana) (MHNG) 1; Kathmandu distr., Siwapuri Dara, 2500 m, 1.V.1985 (Smetana) (MHNG) 1; Sindhupalcok distr., Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana) (MHNG) 2; Malemchi, 2800 m, 18.IV.1981 (Löbl & Smetana) (MHNG) 1; Taplejung distr., above Yamputhin, left back of Kabeli Khola, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS) 4; SE Yamputhin to Yamputhin, 2000-1650 m, 26. and 30.IV.1988 (Martens & Schawaller) (MHNG) 1; Panchthar distr., Dhorpar Kharka, 2700 m, 16.IV.1988 (Martens & Schawaller) (MHNG) 1; Sankhua Sabha distr., Pahakhola, 2600-2800 m, 31.V.-3.VI.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. North India, Nepal.

Scaphisoma notatum Löbl

Material examined, 76 specimens: Nepal, Jumla distr., Dzunda Khola Valley near Talphi, W Jumla, 3000-3500 m, 19.IX.1972 (Franz) (Coll. H. Franz) 1; Parbat distr., Ghoropani Pass, 2850 m, 5.X.1983 (Löbl & Smetana) (MHNG) 1; Ridge east Ghoropani Pass, 3100 m, 7.X.1983 (Löbl & Smetana) (MHNG) 1; Manang distr., Latha Manang W Bagarchhap, 2350 m, 22.IX.1983 (Löbl & Smetana) (MHNG) 1; Gorkha distr., Chuling Khola, 3000-3400 m, 3.VIII.1983 (Martens & Schawaller) (MHNG) 1; Kathmandu distr., Siwapuri Dara, 2400 m, 30.V.1985 (Smetana) (MHNG) 1; Siwapuri Dara, 2700 m, 24.III.1982 (Rougemont) (MHNG) 5; Siwapuri Dara, 2540 m, 7.X.1981 (Sakai) (Coll. M. Sakai) 2; Patan distr., Phulcoki, 2200-2700 m, VIII.1967, IV-V. 1981, IV.1982, X.1983 (Canadian Nepal Exp., Löbl & Smetana, A. & Z. Smetana) (CNC, MHNG) 38; Godawari, 13.III.1981 (Rougemont) (MHNG) 1; Sindhupalcok distr., Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 1; Kathmandu distr., Siwapuri Dara, 2400 m, 6.IV.1981 (Löbl & Smetana) (MHNG) 2; Malemchi, 2800-2900 m, 14. and 17.IV.1981 (Löbl & Smetana) 11; Pokhara NE Barahbise, 2700, 2800, and 3000 m, 2. and 7.V.1981 (Löbl & Smetana) (MHNG) 6; Sankhua Sabha distr., forest above Ahale, 2300 m, 26.III.1982 (A. & Z. Smetana) (MHNG) 3; Taplejung distr., Gunga Khola betw. Kibla and Amjilera, 2600-2400 m, 12. IX.1983 (Martens & Dams) (SMNS) 1.

Distribution. North Pakistan, North India, Nepal.

Scaphisoma uniforme Löbl

Material examined, 52 specimens: Nepal, Manang distr. forest W Bagarchhap, 2200 m, 21.IX.1983 (Löbl & Smetana) (MHNG) 3; Parbat distr., Ghoropani Pass, N slope, 2700 m, 6.X.1983 (Löbl & Smetana) (MHNG) 5; Kathmandu distr., Siwapuri Dara, 2400 m, 29.IV.1985 (Smetana) (MHNG) 1; Siwapuri, 2700 m, 24.III.1982 (Rougemont) (MHNG) 1; Patan distr., Phulcoki, 2500-2600 m, 13-14.X.1983 and 28-30.IV.1984 (Löbl & Smetana) (MHNG) 32; Phulcoki, 2600 m, 20.IV.1982 (A. & Z. Smetana) 1; Sindhupalcok distr., Pokhara NE Barahbise, 2800 m, 3.V.1981 (Löbl & Smetana) (MHNG) 1; Sankhua Sabha distr., Arun Valley, Chichila, 1900-2000 m,

18-20.VI.1981 (Martens & Schawaller) (SMNS) 1; forest NE Kuwapani, 2500 m, 28.III.1982 (A. & Z. Smetana) (MHNG) 2; above Ahale, 2300 m, 26.III.1982 (A. & Z. Smetana) (MHNG) 1; Induwa Khola Valley, 2400 m, 15.IV.1984 (Löbl & Smetana) (MHNG) 1; forest S Mangsingma, 2200 m, 11.IV.1984 (Löbl & Smetana) (MHNG) 3.

Distribution. North India, Nepal.

***Scaphisoma kaszabianum* Löbl**

Material examined, 106 specimens: Nepal, Manang distr., Bagarchhap, 2200 m, 21.IX.1983 (Löbl & Smetana) (MHNG) 2; Parbat distr., betw. Chitre and Ghandrung, 6.V.1980 (Martens & Ausobsky) (SMNS) 1; Ghoropani, N. slope, 2700 m, 6.X. and Ghoropani Pass, 2850 m, 9.X.1983 (Löbl & Smetana) (MHNG) 6; Patan distr., Godawari, 6000 ft, 7-13.VIII.1967 (Canad. Nepal Exp.) 4; 2 km S Godawari, 1700 m, 19.X.1983 (Löbl & Smetana) (MHNG) 4; Phulçoki, 6600 ft, 13-17.VIII.1967 (Canad. Nepal Exp.) 1; Phulçoki, 2300-2600 m, X.1983 and V.1984 (Löbl & Smetana) (MHNG) 20; Kathmandu distr., Siwapuri, 2100-2300 m, 25.VI.1988 (Martens & Schawaller) (SMNS) 1; Siwapuri Dara, 2400 and 2450 m, 29. and 30.IV.1985 (Smetana) (MHNG) 2; Sindhupalçok distr., Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana) (MHNG) 4; Malemchi, 2800 and 2900 m, 14-18.IV.1981 (Löbl & Smetana) (MHNG) 3; Pokhare NE Bharabise, 2700 m, 2. and 7.V.1981 (Löbl & Smetana) (MHNG) 13; Sankhua Sabha distr., forest NE Kuwapani, 2500 m, 11-15.IV.1982 (A. & Z.Smetana) and 2250 m, 24.IV.1984 (MHNG, CNC) 14; Arun Valley, betw. Mure and Hurure, 2050-2150 m, 17.VI.1988 (Martens & Schawaller) (SMNS) 2; forest S Mangsingma, 2250 m, 12.IV.1984 (Löbl & Smetana) (MHNG) 5; Induwa Khola Valley, 2000 m, 18.IV.1984 (Löbl & Smetana) (MHNG) 12; Panchthar distr., Paniporua, 2300 m, 16-20.IV.1988 (Martens & Schawaller) (SMNS) 10, Ilam distr., Mai Pokhari, 2100-2200 m, 25-27.III.1980 (Martens & Ausobsky) 1; Taplejung distr., above Yamputhin, left bank of Kabeli Khola, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. North India (West Bengal: Darjeeling district), Nepal.

***Scaphisoma unicolor* Achard**

Material examined, 6 specimens (males only): Nepal, Patan distr., Godawari, Phulçoki, 1700 m, 10.V.1981 (Löbl) (MHNG) 1; Sankhua Sabha distr., Induwa Khola Valley, 1750 m, 14.IV.1984 (Löbl & Smetana) (MHNG) 1; Taplejung distr., SE Yamputhin to Yamputhin, 2000-1650 m, 30.IV.1988 (Martens & Schawaller) (SMNS) 1; above Yamputhin, left bank of Kabeli Khola, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS) 1; betw. Hellok and lower Gunza Khola, 2000-1650 m, 18.III.1988 (Martens & Schawaller) (SMNS, MHNG) 2.

Distribution. Japan, Taiwan, Thailand, Nepal.

***Scaphisoma besucheti* Löbl**

Material examined, 3 specimens: Nepal, Terai, Hitauri, 9.X.1972 (Franz) (Coll. H. Franz) 2; Parsa distr., Birganj Lothar 450 ft., 5-12.IX.1967 (Canad. Nepal Exp.) (CNC) 1.

Distribution. Sri Lanka, India, Nepal.

***Scaphisoma maindroni* Champion**

Material examined, 17 specimens: Nepal, Terai, Hitauri, 9.X.1972 (Franz) (Coll. H. Franz) 2; Lamjung distr., Bahun danda, 1300 m, 18.IX.1983 (Löbl & Smetana) (MHNG) 4;

Marsyandi, 1200 m, Jagat, 11.IV.1980, (Martens & Ausobsky) (SMNS) 4; Gorkha distr., Daronti Khola betw. Doreni and Motar, 900-750 m, 13.VIII.1983 (Martens & Schawaller) (SMNS) 1; Sankhua Sabha distr., Dunge Dara N Tumlingtar, 1100 m, 23.III.1985 (A. & Z. Smetana) (MHNG) 3; Lamobagar Gao, 1400 m, 28-31.V.1980 (Wittmer) (NMB) 1; Ilam distr., betw. Ilam and Mai Pokhari, 1400-1600 m, 8.IV.1988 (Martens & Schawaller) (SMNS) 1; Sanishara, 5 km N, 270-300 m, 3-5.IV.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. Pakistan, India, Nepal, Burma, Thailand, Vietnam, China.

Remarks. *Scaphisoma mutatum* Champion was placed in synonymy of *S. maindroni* (LÖBL 1986b). A male syntype of *S. mutatum* labelled "W. Almora Kumaon U.P. India H.G.C." is here desingated as lectotype (BMNH); 32 syntypes, sex not examined, from India, Kumaon, Haldwani distr. (BMNH) are designated as paralectotypes.

Scaphisoma spurium Löbl

Material examined, 26 specimens: India, Uttar Pradesh, Kumaon, Haldwani div. (Champion) (BMNH).

Distribution. Sri Lanka, North India: Kumaon and Garhwal.

Scaphisoma falciferum Löbl

Material examined, 2 specimens: Nepal, Manang distr., forest W Bagarchhap, 2200 m, 21.IX.1983 (Löbl & Smetana) (MHNG).

Distribution. Pakistan, North India: Kumaon and Himachal Pradesh, Nepal.

Scaphisoma diabolium Löbl

Material examined, 1 specimen: Nepal, Sankhua Sabha distr., Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG).

Distribution. India: Darjeeling district, Nepal.

Scaphisoma leucopyga Champion

Material examined, 2 specimens: Nepal, Chitawan distr., Chitawan Nat. Park, X.1980 (Rougemont) 1; Kaski distr., betw. Viletadi and Uleri, trek from Pokhara to Ghoropani Pass, 18.IX.1971 (Franz) (Coll. H. Franz) 1.

Distribution. Afghanistan, Pakistan, North India, Nepal.

Scaphisoma nigrofasciatum Pic

Material examined, 3 specimens: Nepal, Gorka distr., Arighat - Suteo, 600-700 m, 27.VII.1983 (Martens & Schawaller) (SMNS, MHNG) 3.

Distribution. India, Nepal, Sri Lanka, Mascarene island, Seychelles.

Scaphisoma binhanum (Pic)

Material examined, 2 specimens: Nepal, Sankhua Sabha distr., Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG) 1; Arun Valley, Lamobagar Gola, 1000-1400 m, 27.V.-3.VI.1980 (Holzschuh) (NMB) 1.

Distribution. North India, Nepal, Burma, Thailand, Vietnam.

Scaphisoma atronotatum Pic

Material examined, 67 specimens: Nepal, Kathmandu distr., Gokarna forest, 1400 m, 31.III. - 1.IV.1981, 20.X.1983 (Löbl & Smetana) (MHNG) 62; Patan distr., Phulcoki, Godawari, 1700 m, 10.V.1981 (Löbl & Smetana) (MHNG) 1; Lamjung distr., Marsyandi, 1200 m, Jagat, 11.IV.1980 (Martens & Ausobsky) (SMNS) 1; Sankhua Sabha distr., Arun Valley below Num, 1050 m, 21.IV.1984 (Löbl & Smetana) (MHNG) 1; Taplejung distr., SE Yamputhin to Yamputhin, 2000-1650 m, 26. and 30. IV.1988 (Martens & Schawaller) (SMNS) 1; Ilam distr., Citang Kholia Valley, 1750 m, 11-13.IV.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. Nepal, Burma, Thailand.

Scaphisoma malignum Löbl

Material examined, 28 specimens: India, Uttar Pradesh, Kumaon, Haldwani distr. (Champion) (BMNH) 1; Nepal, Parsa distr., Lothar near Birjang, 450 ft., 5-12.IX.1967 (Canad. Nepal Exp.) (CNC) 1; Kathmandu distr., Gokarna forest, 1400 m, 31.III. - 1.IV.1981 (Löbl & Smetana) (MHNG) 16; Sankhua Sabha distr., Arun Valley below Num, 1050 m, 21.IV.1984 (Löbl & Smetana) (MHNG) 2; Arun Valley, Lamobagar Gola, 1000-1400 m, 27.V.-3.VI.1980 (Holzschuh) (NMB, MHNG) 6; Arun Valley, Dunge Dara N Tumlingtar, 1100 m, 23.III.1982 (A. & Z.Smetana) (MHNG) 2.

Distribution. North India, Nepal.

Scaphisoma aurum Löbl

Material examined, 1 specimen: Nepal, Ilam distr., 5 km N Panishare, feet of Siwalik Mts, 270-300 m, 3-5.IV.1988 (Martens & Schawaller) (SMNS).

Distribution. Pakistan, South and North India, Nepal.

Scaphisoma indra Löbl

Material examined, 11 specimens: Nepal, Kathmandu, Nagarjung, Jamacok, 1900-2100 m, 18.VIII.1983 (Martens & Schawaller) (SMNS, MHNG) 6; Patan distr., Godawari, 13.III.1981 (Rougemont) and 1600 m, 31.III.1984 (Löbl & Smetana) (MHNG) 5.

Distribution. North India: Darjeeling district, Nepal.

Scaphisoma tetrastictum Champion

Material examined, 19 specimens: Nepal, Kathmandu distr., Gokarna forest, 1400 m, 1.VI.1981 (Löbl & Smetana) (MHNG) 3; Ilam distr., SW Ilam below Parbate, 1250-1450 m,

23.VIII.1983 (Martens & Dams) (SMNS) 1; India, Uttar Pradesh, Kumaon, Tanakpur (Champion) (BMNH) 14, Kumaon, Ranikhet (BMNH) 1.

Distribution. India, Nepal, Burma, Thailand, Vietnam, Taiwan.

Scaphisoma varium Löbl

Material examined, 3 specimens: Nepal, Sankhua Sabha distr., forest NE Kuwapani, 2250 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 1; Panchthar distr., Paniporua, 2300 m, 16-20.IV.1988 (Martens & Schawaller) (MHNG) 1; ridge betw. Sheldoti and Paniporua, 2450-2200 m, 29.VIII.83 (Martens & Dams) (SMNS) 1.

Distribution. North India: Darjeeling district, Nepal, Bhutan.

Scaphisoma prehensor Champion

Material examined, 4 (males only): Nepal, Hitaura, Terai, 9.X.1972 (Franz) (Coll. H. Franz) 1; Ilam distr., 5 km N Sanishare, Siwalik Mts, 270-300 m, 3-5.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 3.

Distribution. North India, Nepal.

Scaphisoma nefastum Löbl

Material examined, 38 specimens: Nepal, Mustang distr., Lete, 2550 m, 2.X.1983 (Löbl & Smetana) (MHNG) 1; Manang distr., forest W Bagarchhap, 2250 m, 22.IX.1983 (Löbl & Smetana) (MHNG) 10; Parbat distr., Chitre, 2400 m, 4.V.1980 (Martens & Ausobsky) (SMNS) 1; Nuwakot distr., Trisuli Khola, Dunche, 21-26.IX.1981 (Pawlowsky & Kuska) (IZK) 1; Kathmandu distr., Siwapuri, 2100-2300 m, 25.VI.1988 (Martens & Schawaller) 3; Siwapuri, 2450 m, 29.IV.1985 (Smetana) (MHNG) 1; Patan distr., 2 km S Godawari, 1700 m, 19.X.1983 (Löbl & Smetana) (MHNG) 1; Phulcoki, 2600 m, 13.X.1983 (Löbl & Smetana) (MHNG) 1; Phulcoki, 6600 ft, 4-7.VIII.1967 (Canadian Nepal Exp.) (CNC) 1; Sindhupalcok distr., Pokhare NE Barabhise, 2700 m, 2.V.1981 (Löbl & Smetana) (MHNG) 2; Sankhua Sabha distr., forest NE Kuwapani, 2500 m, 11-15.IV.1982 (A. & Z.Smetana) (MHNG) 3, and 2250 m, 24.IV.1981 (Löbl & Smetana) (MHNG) 2; Induwa Khola Valley, 2000 m, 16.IV.1984 (Löbl & Smetana) (MHNG) 2; forest S Mangsingma, 2200 m, 11.IV.1984 (Löbl & Smetana) (MHNG) 3; Panchtar distr., Paniporua, 2300 m, 16-20.IV.1988 (Martens & Schawaller) (SMNS) 1; Taplejung distr., Omje Kharka NW Yamputhin, 2300-2500 m, 1-6.V.1988 (Martens & Schawaller) (SMNS, MHNG) 5.

Distribution. North India: Kumaon, Darjeeling district, Nepal.

Scaphisoma necopinum Löbl

Material examined, 133 specimens: Nepal, Patan distr., Godawari, 7-13.VIII.1967 (Canadian Nepal Exp.) (CNC) 1; 2 km S Godawari, 1700 m, 19-20.X.1983 (Löbl & Smetana) (MHNG) 4; Phulcoki, Godawari, 1700m, 10.V.1981 (Löbl & Smetana) (MHNG) 1; Sankhua Sabha distr., below Sheduwa, 2550 m, 30.III.1982 and 2100-2550 m, 9.IV.1982 (A. & Z. Smetana) (MHNG) 13; Induwa Khola Valley, 2000 m, 16.IV.1984 (Löbl & Smetana) 15; Taplejung distr., Hellok in Tamur Valley, 2000 m, 17.V.1988 (Martens & Schawaller) (SMNS) 3; above Yamputhin, felt bank of Kabeli Khola, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS) 4; Yamputhin, open forest, 1650-1800 m, 26.IV. - 1.V.1988 (Martens & Schawaller) (SMNS, MHNG)

91; Panchtar distr., betw. Paniporua and Hinwa Khola Valley, 3200-1850 m, 27.IV.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. North India: Darjeeling district and Sikkim, Nepal.

Scaphisoma fortipatum Champion

Material examined, 72 specimens: Nepal, Myagdi distr., Myangdi Khola, Muri, S Dhaulagiri, 2100-2300 m, III.1970 (Martens) (SMNS) 1; Kaski distr., Tandarakot, trek Pokhara - Ghoropani, 1000 m, 18.IX.1971 (Franz) (Coll. H. Franz) 3; Kathmandu distr., Gokarna, 1400 m, 31.III. and 1.IV. 1981, 10.IX. and 20.X.1983 (Löbl & Smetana) (MHNG) 18; Gokarna, 1400, 3.VIII.1970 and 3.X.1971 (Franz) (Coll. H. Franz) 3; Nagarjung forest, 1650 m, 2.IV.1981 (Löbl & Smetana) (MHNG) 2; Nagarjung, Jamacok, 1900-2000 m, 18.III. 1983 (Martens & Schawaller) (SMNS) 6; Siwapuri, 2100-2300 m, 25.VI.1988 (Martens & Schawaller) (SMNS) 1; Siwapuri Dara, 2300 m, 3.V.1985 (Smetana) (MHNG) 1; Patan distr., 2 km S Godawari, 1700 m, 19-20.X.1983 and 1600 m, 31.III:1984 (Löbl & Smetana) (MHNG) 8; Godawaki, 1770 m, 19.III.1980 (Martens & Ausobsky) (SMNS) 1; Phulcoki SE Godawari, cca 2000 m, 21.IV.1988 (Brachat) (MHNG) 4; Sindhupalcok distr., Chaubas, 2500 m, 4.IV.1981 (Löbl & Smetana) (MHNG) 3; Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 1; Pokhare NE Barabhise, 2800 m, 2.V.1981 (Löbl & Smetana) (MHNG) 1; Durumtali near Barabhise, 2200-2300 m, 5.VIII.1970 (Franz) (Coll. H. Franz) 1; Sankhua Sabha distr., below Sheduwa, 2550 m, 30.III.1982 (A. & Z.Smetana) (MHNG) 1; bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG) 3; bottom Arun Valley, betw. Hedangna and Num, 950-1000 m, 6-8.VI.1988 (Martens & Schawaller) (SMNS) 8; Taplejung distr., Tada Khola, Khebang, 1600-1800 m, 2.IX.1983 (Martens & Daams) (SMNS) 1; confluence Kabeli Khola and Tada Khola, 1000-1050 m, 23-25.IV.1988 (Martens & Schawaller) (SMNS) 2; ascent to Khebang from Tada Khola, 1500 m, 25.IV.1988 (Martens & Schawaller) (SMNS) 2; Hellok in Tamur Valley, 2000 m, 17.V.1988 (Martens & Schawaller) (SMNS) 2; Ilam distr., betw. Ilam and Mai Pokhari, 1600-2000 m, 9.IV.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. Pakistan, North India, Nepal.

Scaphisoma innotatum Pic

Material examined, 34 specimens: Nepal, Sankhua Sabha distr., Arun Valley at Num, 1500-1600 m, 10.IV.1982 (A. & Z.Smetana) (MHNG) 1; bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG) 27; bottom Arun Valley, betw. Hedangna and Num, 950-1000 m, 6-8.VI.1988 (Martens & Schawaller) (SMNS) 6.

Distribution. North India, Nepal, Thailand, Vietnam.

Scaphisoma armatum Löbl

Material examined, 33 specimens: Nepal, Kathmandu distr., Gokarna, 1400 m, 31.III and 1.IV.1981, 10.X.1983 (Löbl & Smetana) (MHNG) 10; Patan distr., Godawari, 1600 m, 31.III.84 (Löbl & Smetana) (MHNG) 1; Sindhupalcok distr., Chaubas, 2600 m, 12.IV.1981 (Löbl & Smetana) (MHNG) 1; Rasuwa distr., 1.5 km NE Bhargu, 2000 m, 12.IV.1985 (Smetana) 2; Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 21.IV.1984 (Löbl & Smetana) (MHNG) 1; below Sheduwa, 2100-2550 m, 9.IV. and 2550 m, 30.III.1982 (A. & Z. Smetana) (MHNG) 5; Induwa Khola Valley, 2000 m, 6.IV.1984 (Löbl & Smetana) (MHNG) 5; Ilam distr., Mai Pokhari, 2100-2200 m, 25-27.III.1980 (Martens & Ausobsky) (SMNS) 3; Taplejung distr., Yamputhin cultural land, 1650-1800 m, 26.IV.1988 (Martens & Schawaller) (SMNS) 5.

Distribution. North India, Nepal, Thailand.

Scaphisoma minax Löbl

Material examined, 18 specimens: Patan distr., 2 km S Godawari, 1700 m, 20.X.1983 (Löbl & Smetana) (MHNG) 2; Godawari, 1770 m, 17.III.1980 (Martens & Ausobsky) (SMNS) 2; Phulcoki SE Godawari, cca 1800 m, 22.IV.1988 (Brachat) (MHNG) 1; Phulcoki, 2700 m, 16.X.1983 (Löbl & Smetana) (MHNG) 1; Sankhua Sabha distr., forest above Ahale, 2300 m, 26.III.1982 (A. & Z.Smetana) (MHNG) 1; Arun Valley, Num-Chichila, 1500-1900 m, 17.VI.1980 (Holzschuh) (MHNG) 1; Arun Valley, betw. Mure and Hurure, 2050-2150 m, 17.VI.1988 (Martens & Schawaller) (SMNS) 4; Taplejung distr., SE Yamputhin to Yamputhin, 2000-1650 m, 26. and 30.IV.1988 (Martens & Schawaller) (SMNS) 2; Yamputhin, 1650-1800 m, 26.IV.-1.V.1988 (Martens & Schawaller) (SMNS) 3; Worebung Pass, 2000 m, 21.IV.1988 (Martens & Schawaller) (MHNG) 1.

Distribution. North India: Darjeeling district, Meghalaya; Nepal.

Scaphisoma immodicum Löbl

Material examined, 3 specimens: India, Himachal Pradesh, Kulu Valley, Naggar, 1850 m, 15.X.1988 (Vit) (MHNG).

Distribution. India: Himachal Pradesh.

Scaphisoma absurdum Löbl

Material examined, 2 specimens: Nepal, Gorkha/Dhading distr., Gorlabesi-Dobhan, 1000-1100 m, 30.VII.1983 (Martens & Schawaller) (SMNS) 1; Lamjung distr., Marsyandi, 1100-1250 m, Senghe-Jagat, 11.IV.1980 (Martens & Ausobsky) (MHNG) 1.

Distribution. North India: Darjeeling district, Nepal.

REDESCRIPTIONS

Scaphisoma minutissimum Champion

Scaphosoma minutissimum CHAMPION, 1927: 278.

Diagnostic characters. Length 0.90 mm, width 0.59 mm. Body ochreous, apices of elytra and abdomen paler. Legs and antennae yellowish. Relative length of antennomeres as follows: III 3, IV 5, V 10, VI 10, VII 13, VIII 9, IX 14, X 14, XI 20 (lectotype); segment V and XI about 3x, VI and VII about 2.5x, VIII 2x as long as wide. Pronotum with weakly arcuate lateral margins, lateral keels barely visible in dorsal view, discal punctation obsolete. Tip of scutellum exposed. Elytron with lateral margin oblique except near base; lateral keel visible in dorsal view; apical margin arcuate; inner apical angle at same level as outer angle; sutural margin not raised; sutural area flat; sutural stria parallel to suture, not curved near base and not extended laterally; discal punctation obsolete. Mesepimeral ridge longer than interval between its end and mesocoxa. Metasternum without any impression, not microsculptured, punctation obsolete (100x magnification). Mesocoxal area 0.04 mm long, with arcuate, very finely punctate margin. Metepisternum strongly narrowed anteriorly, at same level as metasternum, with straight suture. First ventrite lacking visible microsculpture, punctation extremely fine (180x magnification). Metacoxal area 0.05 mm long, with margin arcuate, very finely

punctate. Tibia straight. Aedeagus (Fig.126) 0.23 mm long. Median lobe tapering, pointed. Parameres weakly sclerotized apically, curved. Internal sac with very slender flagellum.

Type material. Lectotype male, labelled "R.Sarda Gorge Kumaon, U.P. Dec. 1918 H.G.C." (BMNH), by present designation.

Distribution. India: Uttar Pradesh, Kumaon.

Remarks. The specimens of *Scaphisoma* cf. *minutissimum* recorded from Thailand (LÖBL 1990b) belong to another, undescribed species. They may be distinguished from *S. minutissimum* by the darker body, the coarser elytral punctation and by the different shape of the aedeagus.

Scaphisoma tonkineum Pic

Scaphosoma tonkineum PIC, 1922: 1; LÖBL 1976b: 224.

Diagnostic characters. Length 2.0 - 2.1 mm, width 1.43 - 1.48 mm. Body very dark reddish-brown to blackish, with apex of elytra and apical abdominal segments paler. Antennae long, relative length of segments as follows: III 5, IV 13, V 20, VI 28, VII 31, VIII 23, IX 28, X 29, XI 35 (lectotype). Pronotum densely and rather coarsely punctate, punctures barely visible at 12x magnification. Tip of scutellum distinct. Elytron with evenly arcuate lateral margin; inner apical angle exceeding level of outer angle; sutural margin not raised; sutural area flat; sutural stria parallel to sutural margin, curved along base and extended beyond middle of basal margin; discal punctation dense, coarser than that of pronotum and distinct at 12x magnification. Mesepimeral ridge somewhat shorter than interval between its end and mesocoxa. Metasternum without microsculpture, punctation dense and coarse on central portion, gradually sparser and much finer laterally. Mesocoxal area 0.08 - 0.10 mm long, with arcuate, coarsely punctate margin. Metepisternum narrowed anteriorly. Abdomen with distinct microsculpture consisting of transverse striae. First ventrite very finely punctate. Tibia straight. Male protarsus with enlarged segments 1 to 3. Aedeagus 0.50 - 0.56 mm long (see LÖBL 1976b), with median lobe gradually tapering and strongly curved at tip. Parameres slender.

Type material. Lectotype, male, labelled "Hoa Binh Tonkin" (MNHN), by present designation.

Material examined, 2 specimens. India, Uttar Pradesh, Kumaon, Haldwani distr. (Champion) (BMNH) 1; Nepal, Pokhara - Ghoropani, Sept.-Oct.1977 (Franz) (Coll. H. Franz) 1.

Distribution. Vietnam, North India, Nepal.

Scaphisoma kashmirensis Achard

Scaphosoma kashmirensis ACHARD, 1920d: 240.

Scaphosoma ebeninum CHAMPION, 1927: 278 - syn. n.

Scaphisoma kashmirensis; LÖBL 1970: 764, 1986a: 156, 1986b: 345.

Diagnostic characters. Length 2.0 - 2.2 mm, width 1.36 - 1.47 mm. Body blackish, elytra paler than pronotum, apex of abdomen, femora and tibiae reddish-brown, antennae and tarsi ochreous. Relative lengths of antennomeres as follows: III 8, IV 14, V 18, VI 20, VII 27, VIII 19, IX 25, X 24, XI 29. Pronotal punctation sparse and very fine, barely visible at 12x magnification, punctures well delimited, much smaller than intervals. Tip of scutellum exposed. Elytron with lateral keel not visible in dorsal view; apical margin truncate; inner apical angle exceeding level of outer angle; sutural margin

not raised; sutural area flat anteriorly, weakly vaulted in apical half; sutural stria from apex toward middle of sutural length somewhat diverging with sutural margin, then parallel to it, extended along base to form uninterrupted basal stria joined with lateral stria; discal punctation fine and sparse, near base similar to that on pronotum, on centre and on apical area less fine, distinct at 12x magnification. Pygidium finely punctate, with microsculpture consisting of punctures. Mesepimeral ridge about as long as interval between its end and mesocoxa. Metasternum not microsculptured, punctation dense and rather coarse on medio-apical portion, very fine and sparse laterally. Mesocoxal area 0.05-0.06 mm long, with arcuate, coarsely punctate margin. Metepisternum at same level as metasternum, strongly narrowed anteriorly, suture barely sinuate. Microsculpture of 1st ventrite consisting of distinct punctures on median portion, obsolete on lateral portion. Latter very finely and sparsely punctate. Metacoxal area 0.08 - 0.10 mm long, with arcuate, coarsely punctate margin. Tibia I and II somewhat curved, III straight. Aedeagus as figured in LÖBL (1986b).

Type material. Lectotype of *S. kashmirensis*, male, labelled "Kashmir" (MNHN), designated in LÖBL (1970), examined. Holotype of *S. ebeninum*, female, labelled "Pindar V. Almora U.P., 8-11.000 ft. July 1920, H.G.C." (BMNH), examined.

Material examined, 10 specimens: India, Kashmir, forest above Pahalgam, 15.X.1977 (Franz) (Coll. H. Franz, MHNG) 2; Himachal Pradesh, Simla distr., Kufri, 24.VI.1975 (Sengupta & party) (ZSI) 1 and Kufri, 16.VII.1989 (Riedel) (SMNS, MHNG) 6; Nepal, Patan distr., Phulcoki, 2550 m, 29.IV.1984 (Löbl & Smetana) 1.

Distribution. North Pakistan, North India, Nepal.

Scaphisoma cruciatum Champion

Scaphosoma cruciatum CHAMPION, 1927: 275.

Diagnostic characters. Length 2.0 mm, width 1.35 mm. Body ochreous, pronotal base and median portion darkened, elytral base strongly darkened, dark pattern extended apically to form triangular spot exceeding mid-length of elytron (Fig.26). Apical portion of elytron, apical abdominal segments, legs and antennae pale ochreous. Relative length of antennomeres as follows: III 8, IV 20, V 30, VI 24, VII 27, VIII 21, IX 28, X 27, XI 33. Pronotal punctation very dense and coarse, visible at 12x magnification. Tip of scutellum exposed. Elytron with lateral keel visible from base to apex in dorsal view; apical margin weakly rounded; inner apical angle at same level as outer angle; sutural margin somewhat raised apically, flat basally; sutural area finely punctate; sutural stria weakly diverging from apex toward anterior 1/5 of sutural length, then parallel to sutural margin, somewhat curved at base, not extended along basal margin; discal punctation very dense, most punctures larger than intervals, near base finer than on centre. Pygidium extremely finely punctate, with distinct microsculpture consisting of punctures. Mesepimeral ridge longer than interval between its end and mesocoxa. Metasternum microsculptured along posterior margin only, densely and rather coarsely punctate on medio-apical area, very finely and sparsely punctate between mesocoxae and on lateral portion; with 2 shallow medio-apical impressions. Mesocoxal area 0.09 mm long, with inner margin arcuate, outer margin almost oblique, marginal punctures distinct. Metepisternum strongly narrowed anteriorly, impressed along suture, latter straight except at angles. Abdomen with distinct microsculpture consisting of transverse striae, entire 1st ventrite very finely punctate. Metacoxal area 0.10 mm long, with margin arcuate, coarsely punctate.

Type material. Holotype, female, labelled "India: Kumaon Haldwani Distr. H.G.Champion B.M.1930-59" (BMNH), examined.

Remarks. None of the male specimens of different Himalayan species could be in satisfactory way associated with the female holotype of *S. cruciatum*. Other species with similar colour pattern (*S. bhareko*, *S. sikkimense*) differ by their punctation.

Scaphisoma championi Löbl

Scaphosoma cribripenne CHAMPION, 1927: 277; nec *S. cribripenne* (PIC, 1923).

Scaphisoma championi LÖBL, 1981: 158.

Diagnostic characters. Length 1.35 - 1.55 mm, width 0.95 - 1.10 mm. Most of body and femora ochreous, pronotum usually somewhat paler than elytral disc, apical portion of elytra, hypomera, apical abdominal segments, tibiae, tarsi and antennae yellowish or pale ochreous. Antennae as in other species of the group. Pronotum with lateral margins evenly arcuate; lateral keels usually not visible in dorsal view; discal punctation fine nad rather dense, visible at 24x magnification. Tip of scutellum exposed. Elytron with lateral margin arcuate; lateral keel usually visible in dorsal view from base to apex; apical margin truncate; inner apical angle exceeding level of outer angle; sutural margin raised; sutural area flat, with a row of rather large punctures; sutural stria gradually, moderately diverging from apex to base, curved near base, not extended laterad of pronotal lobe; punctation coarse and dense on most of elytral surface, finely punctate humeral area excepted, with punctures not well delimited, usually larger than intervals. Pygidium without visible punctation. Mesepimeral ridge about 2x as long as interval between its end and mesocoxa. Median portion of metasternum flattened, without any impression, with microsculpture consisting of transverse striae, distinctly punctate except on portions between mesocoxae and between metacoxae. Lateral portion of metasternum lacking microsculpture, with very dense row of rather coarse punctures parallel to metacoxa, and moderately coarse punctures beyond mesocoxal area; most of metasternal surface extremely finely punctate. Mesocoxal area 0.06-0.07 mm long, with margin parabolic, rather finely punctate. Metepisternum large, flat, narrowed anteriorly, at same level as metasternum, its suture more or less rounded. Abdomen with microsculpture consisting of transverse striae. First ventrite extremely finely and very sparsely punctate. Metacoxal area 0.07 - 0.08 mm long, with arcuate, coarsely punctate margin. Tibia straight. Segments 1 to 3 of male protarsus distinctly widened. Aedeagus (Fig. 150) 0.68 - 0.70 mm long. Median lobe with strongly inclined, slender apical portion, and short, narrow valves. Internal sac with rows of medio-apical fairly large and strongly sclerotized teeth accompanied laterally by membranous scales. Central portion of internal sac with oval disc overlapping fine scales and with two laterally denticulate, strongly sclerotized areas. Base of internal sac armed by two slender, proximally curved sclerites, membranes near basal margin scale-like or papillar. Parameres beyond strongly widened base moderately convergent, then narrowed and strongly curved.

Type material. Lectotype of *S. cribripenne* Champion, male, labelled "India: Kumaon, Haldwani Distr. H.G. Champion B.M.1930-59" (BMNH), by present designation. Paralectotypes: 46 specimens; additional 16 specimens, all with same locality data as lectotype (BMNG, MHNG).

Distribution. India, Uttar Pradesh: Kumaon.

Scaphisoma bedeli Achard

Scaphosoma bedeli ACHARD, 1920d: 240.

Diagnostic characters. Length 1.8 mm, width 1.10 mm. Pronotum very dark, almost black. Elytra blackish-brown, with paler, dark reddish-brown apical 2/7.

Apex of abdomen, legs and antennae ochreous. Relative length of antennomeres as follows: III 6, IV 10, V 16, VI 23, VII 28, VIII 20, IX 26, X 23, XI 29; segment IV about 2x as long as wide, V almost 4x as long as wide, VI more than 4x as long as wide; VII 3.5x as long as wide; VIII about 3x as long as wide. Pronotum with lateral margins evenly rounded, lateral keels not visible in dorsal view; punctation sparse and very fine, visible at 24x magnification. Tip of scutellum exposed. Elytron with almost evenly arcuate lateral margin; lateral keel not visible in dorsal view; apical margin truncate; inner apical angle about at same level as outer angle; sutural area flat, with a row of very fine punctures; sutural stria parallel to suture, curved near base, not extended laterally of pronotal lobe; punctation fine to very fine, punctures shallow, not well delimited, smaller than intervals. Pygidium with microsculpture consisting of punctures, and with very fine but well delimited punctures. Mesepimeral ridge about as long as interval between its end and mesocoxa. Metasternum with two shallow medio-apical impressions, entire surface with very fine to obsolete punctation. Mesocoxal area 0.07 mm long, with margin arcuate, finely punctate. Metepisternum flat, narrowed anteriorly, impressed below level of metasternum, suture almost straight, anterior angle rounded. Entire first ventrite very finely punctate, not microsculptured. Metacoxal area 0.05 mm long, with arcuate, coarsely punctate margin. Following ventrites with microsculpture consisting of points.

Type material. Lectotype, female, labelled "Sikkim Kurseong" (NMP), by present designation.

Distribution. India: Darjeeling district.

Remarks. The specimens recorded as *Scaphisoma* cf. *bedeli* in LÖBL (1986a) belong to *S. varians* described below. Non of the recently collected specimens have been found conspecific with the lectotype of *S. bedeli*.

NEW SPECIES

Scaphisoma praesigne sp. n.

Holotype, male: Nepal, Kathmandu distr., Gokarna forest, 1400 m, 1.IV.1984 (Löbl & Smetana) (MHNG).

Diagnosis. Body moderately large, without particular colour pattern. Antennomere IV very short. Basal stria of elytron short. Abdominal microsculpture consisting of punctures. Median lobe of aedeagus asymmetrical, internal sac simple, with extruded flagellum, parameres symmetrical, strongly expanded basally.

Description. Length 1.65 mm, width 1.10 mm. Body uniformly reddish-brown, tarsi and antennomeres I to VI paler, antennal club brownish. Relative length of antennomeres as follows: III 4.5, IV 5, V 20, VI 18, VII 22, VIII 15, IX 22, X 20, XI 23; IV very small, V about 3.5x as long as wide; VI and VII each about 2.5x as long as wide; VIII 2x as long as wide; XI somewhat more than 2x as long as wide. Pronotum with arcuate lateral margins; lateral keels not visible in dorsal view; discal punctation very fine, distinct at 24x magnification. Tip of scutellum exposed. Elytron with arcuate lateral margin; lateral keel not visible in dorsal view; apical margin somewhat rounded; inner apical angle lying at same level as outer angle; sutural margin not raised; sutural stria parallel to suture, curved at base and extended laterally to middle of basal margin; sutural area flat, with row of very fine punctures; discal punctation very fine, especially on humeral area. Pygidium extremely finely punctate, apparently without microsculpture (100x magnification). Mesepimeral ridge about as long as intervals between its end and

mesocoxa. Entire metasternum very finely and sparsely punctate, not microsculptured. Mesocoxal area 0.05 mm long, with arcuate, very finely punctate margin. Metepisternum flat, narrowed anteriorly, suture straight except at anterior angle. Entire first ventrite without microsculpture, very finely and sparsely punctate. Metacoxal area 0.07 mm long, with arcuate, finely punctate margin. Following ventrites with microsculpture consisting of punctures. Pro- and metatibia straight, mesotibia weakly curved. Segments 1 to 3 of protarsus weakly widened. Aedeagus (Figs 127, 128) 0.54 mm long. Median lobe and parameres asymmetrical. Apical portion of median lobe gradually narrowed and with curved tip and membranous lateral margin; ventral process protruding from expanded ventral wall. Internal sac simple, with long flagellum. Parameres moderately arcuate, with widened base, and very weakly sclerotized central portion of inner margin.

R e m a r k s . This species shares an asymmetrical aedeagus with the members of the *unicolor* group. It may be readily distinguished from all of them by the very short antennomere IV.

***Scaphisoma fulcratum* sp. n.**

Holotype, male: Nepal, Patan distr., 2 km S Godawari, 1700 m, 19.X.1983 (Löbl & Smetana) (MHNG).

Paratype, male: India, Himachal Pradesh, 10 km NW Sarahan, 1700 m, 7.X.1988 (Vit) (MHNG).

D i a g n o s i s . Body moderately large, without distinctive colour pattern. Antennomere IV elongate. Elytron without basal stria. Abdominal microsculpture consisting of striae. Aedeagus symmetrical, median lobe with unpaired dorsal valve and small ventral process, internal sac bearing single slender median sclerite.

D e s c r i p t i o n . Length 1.40 - 1.65 mm, width 1.08 - 1.13 mm. Body very dark reddish-brown, apices of elytra, apical abdominal segments, legs and antennae ochreous or yellowish. Relative length of antennomeres as follows: III 6, IV 12, V 16, VI 17, VII 22, VIII 15, IX 22, X 22, XI 35; segments III to VII and XI each about 3x as long as wide; VIII less than 3x as long as wide. Pronotum with evenly arcuate lateral margins; lateral keels not visible in dorsal view; punctation conspicuously dense, coarser near base than that on centre or near apex; punctures near base larger than intervals, those on centre smaller than intervals, visible at 24x magnification. Tip of scutellum exposed. Elytron with arcuate lateral and apical margins; lateral keel not visible in dorsal view; inner apical angle at same level as outer angle; sutural margin not raised; sutural area flat, with row of fine punctures; sutural stria parallel to suture, not curved near base; punctation dense and, except that on humeral area, somewhat more coarse than that on pronotal base, punctures well delimited, mostly smaller than intervals. Mesepimeral ridge somewhat shorter than interval between its end and mesocoxa. Metasternum without microsculpture, lacking depressions; metasternal punctation very dense, relatively coarse, punctures on apical portion larger than intervals. Mesocoxal area 0.05 mm long, margin arcuate, rather finely punctate. Metepisternum weakly convex, narrowed anteriorly, impressed along weakly sinuate suture, latter accompanied by coarse punctures. Abdomen with microsculpture consisting of transverse striae. First ventrite coarsely punctate near base, finely punctate near apical margin. Metacoxal area 0.06 mm long, with arcuate, rather finely punctate margin. Tibia straight. Segments 1 to 3 of male protarsus moderately widened. Aedeagus (Fig. 129) 0.38 - 0.55 mm long. Median lobe tapering apically, with single dorsal valve and ostium situated near apex. Internal sac with slender central stick-like sclerite; membranes

covered by fine scales. Parameres straight, narrow, moderately narrowed from base toward middle third, then evenly wide, not exceeding tip of median lobe.

R e m a r k s . Species of uncertain relationship. It may be recognised by the combination of both, external and aedeagal characters.

Scaphisoma interjectum sp. n.

Holotype, male: Nepal, Sankhua Sabha distr., Arun Valley, Chichile, forest above Ahale, 2300 m, 26.III.1982 (A. & Z. Smetana) (MHNG).

Paratypes, 6: Sankhua Sabha distr., Arun Valley, betw. Mure and Hurure, 2050-2150 m, 17.VI.1988 (Martens & Schawaller) (SMNS, MHNG) 1 male, 1 female; Patan distr., Phulcoki, 2550 m, 15.X.1983 (Löbl & Smetana) (MHNG) 1 male; Phulcoki, 6600 ft., 13.VIII.1967 (Canadian Nepal Exp.) (CNC) 1 female; Manang distr., forest W Bagarchhap, 2200 m, 24.IX.1983 (Löbl & Smetana) (MHNG) 1 male, 1 female.

D i a g n o s i s . Body rather small, uniformly brown. Antennomere IV elongate. Elytron with interrupted basal stria. Abdominal microsculpture consisting of punctures. Aedeagus symmetrical, median lobe with short, split dorsal valves, internal sac without flagellum or sclerotized pieces, parameres lobed.

D e s c r i p t i o n . Length 1.45 mm, width 1.03-1.08 mm. Body and femora uniformly brown. Apex of abdomen, tibiae, tarsi and antennae yellowish or ochreous. Relative length of antennomeres as follows: III 6, IV 12, V 16, VI 18, VII 24, VIII 18, IX 20, X 19, XI 26 (holotype); IV and VIII 3x as long as wide, VI, VII, and XI each somewhat more than 3x as long as wide. Pronotum with lateral keels not visible in dorsal view; discal punctation very fine, visible at 24x magnification. Tip of scutellum exposed. Elytron with lateral keel visible near base in dorsal view; apical margin weakly rounded; inner apical angle at same level as outer angle; sutural margin raised; sutural area flat or weakly oblique, with row of very fine punctures; sutural stria parallel to sutural margin, curved at base and extended along base to outer 1/3 of basal margin; discal punctation coarse and dense except near base, with many punctures larger than intervals; punctures near base fine and scattered, much smaller than intervals, coarser than those on pronotum. Pygidium extremely finely punctate, with barely visible microsculpture. Mesepimeral ridge longer than interval between its end and mesocoxa. Metasternum without microsculpture, apical depressions obsolete, punctation fine on medio-apical portion, very fine and sparse on lateral portion. Mesocoxal area 0.04 mm long, with arcuate, rather finely and sparsely punctate margin. Metepisternum flat, moderately narrowed anteriorly, at same level as metasternum, suture straight, except for rounded anterior angle. First ventrite without microsculpture, its punctation very fine laterally, much coarser on median portion. Metacoxal area 0.06 mm long, subtriangular, margin coarsely punctate. Following ventrites with microsculpture consisting of distinct punctures. Tibia slender, straight. Male protarsus with segments 1 to 3 enlarged. Aedeagus (Fig. 130) 0.62 - 0.67 mm long. Median lobe relatively large, with very short apical portion and weakly sclerotized lateral margins, dorsal valves symmetrical, distinctly split medially. Internal sac mostly membranous, bearing very small rounded or pointed scales; in addition with several slender, more or less well delimited, stronger sclerotized pieces. Parameres widened in basal half, each expanded and forming a fairly large inner lobe before middle, slender and very weakly curved in apical half.

R e m a r k s . This species shares most diagnostic characters with *S. rufum*. It may be distinguished by the shorter and wider apical portion of the median lobe, by the parameral lobes situated closer to the base, and by the elytral punctation.

Scaphisoma simplicipenis sp. n.

Holotype, male: Nepal, Patan distr., Phulcoki, 2550 m, 29.IV.1984 (Löbl & Smetana) (MHNG).

Paratypes, 114: as holotype, 16 males, 28 females; Phulcoki, 1700 m, 10.V.1981 (Löbl) (MHNG) 3 males; Phulcoki, 2500 m, 30.IV.1984 (Löbl & Smetana) (MHNG) 1 male, 6 females; Phulcoki, 2600 and 2700 m, 14. and 15.X.1983 (Löbl & Smetana) (MHNG) 1 male, 1 female; Kathmandu distr., Siwapuri Dara, 2500 m, 1.V.1985 (Smetana) (MHNG) 1 male, 2 females; Sindhupalcok distr., Pokhare NE Barabhise, 2800 m, 2. and 3.V.1981 (Löbl & Smetana) (MHNG) 1 male, 2 females; Parbat distr., Ghoropani Pass, 2850 m, 5.X.1983 and N slope of Ghoropani Pass, 2700 m, 6.X.1985 (Löbl & Smetana) (MHNG) 2 males; Manang distr., forest W Bagarchhap, 2200 m, 21.IX.1983 (Löbl & Smetana) (MHNG) 11 males, 4 females; Latha Manang W Bagarchhap, 2450 m, 23.IX.1983 (Löbl & Smetana) (MHNG) 1 male, 1 female; Sankhua Sabha distr., forest NE Kuwapani, 2250 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 1 male; Chichila, 2200 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 2 females; Pahakhola, 2550 m, 30-31.V.1988 (Martens & Schawaller) (SMNS, MHNG) 11 males, 18 females; Taplejung distr., above Yamputhin, left bank of Kabeli Khola, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS) 1 male.

D i a g n o s i s . Body moderately large, without distinctive colour pattern. Antennomere IV elongate. Elytron without basal stria. Abdominal microsculpture consisting of striae. Aedeagus symmetrical, with small basal bulb, robust ventral process, simple internal sac bearing long flagellum, and bases of parameres strongly widened.

D e s c r i p t i o n . Length 1.55 - 1.70 mm, width 1.03 - 1.16 mm. Body very dark brown to blackish, elytra sometimes paler than pronotum. Apical abdominal segments reddish-brown or brown, legs and antennae ochreous. Relative length of antennomeres as follows: III 6, IV 10, V 16, VI 23, VII 28, VIII 20, IX 26, X 25, XI 28 (holotype). Segment IV about 2.5x as long as wide, V, VIII and XI each 3x as long as wide, VI 4x as long as wide, VII about 3.5x as long as wide. Pronotum with evenly arcuate lateral margins, lateral keels not visible in dorsal view; discal punctation sparse and very fine, visible at 24x magnification. Tip of scutellum exposed. Elytron with central portion of lateral margin oblique; lateral keel not visible, or visible near base in dorsal view; apical margin weakly convex; inner apical angle at same level as outer angle; sutural margin not raised; sutural stria parallel to suture, curved near base but not extended laterally; discal punctation sparse and very fine, similar to that of pronotum or somewhat more distinct. Pygidium with microsculpture consisting of transverse striae. Mesepimeral ridge shorter than interval between its end and mesocoxa. Metasternum with shallow medio-apical impression, entirely very finely punctate, without microsculpture. Mesocoxal area 0.04 mm long, with margin arcuate, finely punctate. Metepisternum narrowed anteriorly. First ventrite without microsculpture, very finely punctate. Metacoxal area 0.05 mm long, with rounded, finely punctate margin. Following ventrites with microsculpture consisting of short transverse striae. Tibia straight. Segments 1 to 3 of male protarsus rather strongly enlarged. Aedeagus (Figs 131,132) 0.56 - 0.57 mm long. Median lobe with small basal bulb extended ventro-apically, to form strong ventral process, and with very long, slender apical portion, with margins parallel from base toward middle, then tapering. Internal sac simple, with long flagellum accompanied laterally by extremely fine, pointed scales. Parameres strongly sclerotized, reaching level of median lobe, at base strongly widened, in lateral view arcuate, in dorsal view irregularly curved.

R e m a r k s . This species shares with the species of the *unicolor* group the median lobe of the aedeagus with small basal bulb with very robust ventral process, and simple internal sac with long flagellum. It differs from members of that group by the symmetrical and strongly sclerotized aedeagus.

Scaphisoma fatuum sp. n.

Holotype, male: Nepal, Myandi distr., Kali Gandaki Khola, Kopchepani, 1500-1700 m, 15.V.1984 (Holzschuh) (MHNG).

Paratypes, 3: as holotype, 2 males, 1 female (MHNG).

D i a g n o s i s . Large-sized member of the *subalpinum* group. Antennomere IV fairly long, XI strongly elongate. Basal stria of elytron interrupted. Aedeagus with simple flagellum conspicuously narrowed and incurved apically.

D e s c r i p t i o n . Length 2.4 - 2.5 mm, width 1.71 - 1.75 mm. Body black, apex of abdomen, legs and antennae ochreous, except brown basal antennomeres. Antennae long, relative length of segments as follows: III 10, IV 15, V 19, VI 29, VII 34, VIII 25, IX 32, X 33, XI 50 (holotype); segments IV, V, VII, VIII, and IX each about 3x as long as wide, VI about 4x as long as wide, XI nearly 5x as long as wide. Pronotum with lateral keel not visible in dorsal view, punctation very fine, visible at 24x magnification. Tip of scutellum exposed. Elytron with arcuate lateral margin; lateral keel visible in dorsal view only near base; apical margin rounded; inner apical angle at same level as outer angle; sutural margin not raised, sutural area flat, with a row of fine punctures; sutural stria parallel to sutural margin, curved at base and extended along basal margin toward outer third of basal width; punctation dense and rather coarse, punctures rather well delimited, definitively smaller than intervals. Pygidium very finely punctate, with microsculpture consisting of punctures. Mesepimeral ridge somewhat longer than interval between its end and mesocoxa. Metasternum without microsculpture and without depressions; middle portion flat, rather coarsely and densely punctate apically, elsewhere very finely and sparsely punctate. Mesocoxal area 0.06 mm long, its margin arcuate, rather coarsely punctate. Metepisternum somewhat vaulted, strongly narrowed anteriorly, its margin straight or weakly sinuate, impressed below level of metasternum. Abdomen with distinct microsculpture formed by punctures. First ventrite very finely punctate laterally, somewhat less finely punctate on middle portion. Metacoxal area 0.10 mm long, with arcuate, coarsely punctate margin. Tibia straight. Male with segments 1 to 3 of protarsus strongly enlarged, narrower than apex of protibia. Segment 1 of male mesotarsus weakly enlarged. Aedeagus (Fig. 133) 1.06 - 1.10 mm. Median lobe with apical portion fairly long, gradually tapering, very slender tip. Internal sac with very long, slender flagellum incurved and narrowed apically. Parameres narrowed from base toward middle, then evenly slender and weakly curved.

R e m a r k s . This species is a member of the *subalpinum* group. It resembles *S. antennatum* by the conspicuously long antennomere XI. However, it differs in having much longer antennomere IV. *Scaphisoma fatuum* may be readily distinguished from other members of the group by the large size of the body.

Scaphisoma adjacens sp. n.

Holotype, male: Nepal, Sankhua Sabha distr., Arun Valley, Chichila, 2200 m, 24.IV.1984 (Löbl & Smetana) (MHNG).

Paratype, male: Nepal, Taplejung distr., above Yamputhin, left bank of Kabeli Khola, open forest, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS).

D i a g n o s i s . Member of the *subalpinum* group. Body fairly large. Antennomere IV very short, XI moderately long. Elytron with basal stria interrupted. Aedeagus with basal two thirds of flagellum extended laterally, and ending as very thin tube; parameres almost evenly narrow.

D e s c r i p t i o n . Length 1.85 - 1.90 mm, width 1.23 - 1.27 mm. Body very dark reddish-brown, apex of abdomen, femora and tibiae paler. Tarsi ochreous. Antennomeres I to IV yellowish, following pale brown. Relative length of antennomeres as follows: III 6, IV 7, V 16, VI 17, VII 25, VIII 18, IX 23, X 22, XI 26 (holotype); segment IV only

somewhat longer than wide, V, VI and VII each about 2.5x as long as wide, VIII somewhat more than 2x as long as wide, XI 2x as long as wide. Pronotum with lateral keels not visible in dorsal view; discal punctation rather sparse and fine, visible at 24x magnification. Tip of scutellum exposed. Elytron with evenly arcuate lateral margin; lateral keel not visible in dorsal view; apical margin truncate; inner apical angle exceeding level of outer angle, sutural margin not raised; sutural area flat, with a row of very fine punctures; sutural stria parallel to suture, curved at base and extended laterally, forming shallow basal stria interrupted in humeral area; discal punctation very fine near elytral base, elsewhere about as fine as or coarser than that of pronotum, with punctures well delimited, much smaller than intervals. Propygidium relatively coarsely punctate, pygidium much finer punctate than latter, both without distinct microsculpture (100x). Mesepimeral ridge shorter than interval between its end and mesocoxa. Metasternum without impressions, very finely and sparsely punctate, coarsely punctate on medio-apical portion. Mesocoxal area 0.06 mm long, margin arcuate, densely punctate. Metepisternum strongly narrowed anteriorly, with straight margin. First ventrite without microsculpture, very finely punctate. Metacoxal area 0.09 mm long, with arcuate, rather coarsely punctate margin. Tibia moderately curved. Segments 1 to 3 of male protarsus weakly enlarged. Aedeagus (Fig. 134) 0.59 - 0.65 mm long. Median lobe with apical portion fairly wide, moderately long, at tip rounded; ventral process relatively large. Internal sac armed with robust flagellum; flagellum rather slender in apical third and with abruptly narrowed, very thin, transversely bent end, in basal two thirds extended laterally by asymmetrical, more or less strongly sclerotized lamina. Parameres almost evenly slender from apex to moderately widened base, weakly curved apically.

Remarks. This species may be readily distinguished from other members of the *subalpinum* group by the relative length of the antennomeres, especially by the very short segment IV in combination with weakly elongate segment XI.

***Scaphisoma inquietum* sp. n.**

Holotype, male: Nepal, Parbat distr., Ghoropani Pass, N slope, 2700 m, 6.X.1983 (Löbl & Smetana) (MHNG).

Paratypes, 5: as holotype, 3 females; Mustang distr., 2 km N Kalopani, 2550 m, 1.X.1983 (Löbl & Smetana) (MHNG) 1 female; Jumla distr., Dzuga Khola Valley near Talphi, W Jumla, 3000-3500 m, 19.IX.1972 (Franz) (Coll. H. Franz) 1 male.

Diagnosis. Member of the *subalpinum* group similar to *S. adjacens*. Median lobe of aedeagus gradually narrowed, flagellum widened basally and forming hook-shaped apophysis, parameres slender beyond middle.

Description. Length 1.95 - 2.05 mm, width 1.32 - 1.37 mm. Very similar to *S. adjacens* and *S. uniforme*, differs from both in finer elytral and pronotal punctation. Latter almost indistinct at 24x magnification. Relative length of antennomeres as follows: III 6, IV 7, V 15, VI 21, VII 30, VIII 19, IX 26, X 25, XI 36 (holotype); IV conspicuously short, less than 2x as long as wide; V about 2.5x as long as wide; VI, VII, and XI each about 3x as long as wide; VIII as wide as VI, less than 3x as long as wide. Apical angle of elytron at same level as outer angle. Pygidium very finely punctate, propygidium with moderately fine punctures. Mesepimeral ridge somewhat shorter than interval between its end and mesocoxa. Metasternum with shallow medio-apical impressions, very finely and sparsely punctate, except for more coarsely punctate medio-apical area. Mesocoxal area 0.10 mm long, margin arcuate, finely punctate. Abdomen with microsculpture consisting of punctures. First ventrite very finely punctate. Metacoxal area 0.05 - 0.06 mm long,

inner margin arcuate, outer margin oblique. Tibia weakly curved. Segments 1 to 3 of male protarsus weakly widened. Aedeagus (Fig. 135) 0.57 - 0.62 mm long. Median lobe with basal bulb gradually narrowed; apical portion of median lobe almost indistinct in dorsal view, with very short, rather wide tip. Flagellum with wide base asymmetrically extended by a hook-like process, from base to about middle third gradually narrowed, in apical third very slender. Membranes of internal sac covered by distinct scales forming characteristic pattern. Parameres weakly sinuate, wide in basal third, then narrowed, in apical third notably narrower than near base.

R e m a r k s . This species may be readily distinguished from other members of the *subalpinum* group by its aedeagal characters. It also differs from most species by the conspicuously short antennomere IV.

Scaphisoma fratellum sp. n.

Holotype, male: Nepal, Taplejung distr., above Yamputhin, left bank of Kabeli Khola, bushes, open forest, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS).

Paratypes, 3: as holotype, 1 male, 2 females (SMNS, MHNG).

D i a g n o s i s . Body moderately large, without particular colour pattern. Antennomere IV very small. Elytron without basal stria. Abdominal microsculpture consisting of striae. Aedeagus symmetrical, with dorsal valve split, abruptly inclined apically and extended by short lamina. Internal sac complex, with robust medio-apical sclerite.

D e s c r i p t i o n . Length 1.55 - 1.75 mm, width 1.16 - 1.23 mm. Body black, apex of elytra yellowish or ochreous, apical abdominal segments and legs ochreous, antennae yellowish to pale brown. Relative length of antennomeres as follows: III 5, IV 6, V 11, VI 24, VII 28, VIII 15, IX 22, X 22, XI 42 (holotype); segment IV somewhat longer than wide; V about 2x as long as wide, VI and VII each about 4x as long as wide, VIII about 2.5x as long as wide, XI well 4x as long as wide. Pronotum with evenly arcuate lateral margins, lateral keels not visible in dorsal view; punctuation fine and very dense, punctures well delimited, near base somewhat larger than those on centre and near apex, barely visible at 12x magnification. Tip of scutellum exposed. Elytron with lateral margin oblique in middle; lateral keel visible near base only in dorsal view; apical margin arcuate; inner apical angle beyond level of outer angle; sutural angle not raised; sutural area flat, with a row of very fine punctures; sutural stria parallel to suture, not or barely curved near base; discal punctuation very dense and rather coarse, most punctures well delimited, about as large as intervals; humeral area finely punctate. Pygidium with obsolete punctuation. Mesepimeral ridge as long as or longer than interval between with end and mesocoxa. Metasternum without microsculpture, its median portion flattened apically, densely and finely punctate, punctuation becoming gradually finer and sparser laterad. Mesocoxal area 0.05-0.06 mm long, margin arcuate and finely punctate. Metepisternum narrowed anteriorly, at same level as metasternum, its suture rounded or oblique in middle. Abdominal microsculpture consisting of distinct transverse striae. First ventrite very finely, sparsely punctate. Metacoxal area 0.10 - 0.11 mm long, margin strongly arcuate, finely punctate. Tibia straight. Segments 1 to 3 of male protarsus strongly enlarged, 1 somewhat narrower than apex of protibia. Aedeagus (Fig. 136) 0.73 mm long. Median lobe with split valves, latter strongly inclined and sclerotized apically, and extended by horizontal, short, notched lobe covering ostium. Ventral process fairly large. Internal sac with robust, long medio-apical sclerite; small central membranous portion bearing short scales; proximal portion

long, bent basally, with more or less sclerotized long scales or denticle-like structures. Parameres straight from base to widened, incurved apical portion.

R e m a r k s . *Scaphisoma fratellum* is very similar to *S. fraterculum* Löbl in external characters but may be readily distinguished by the much longer antennae. Both species have very distinct aedeagi, that of *S. fratellum* has the ostium situated apically and covered by a dorsal lamina, the parameres simple, and the internal sac complex, in a similar way as in *S. aurorae*.

Scaphisoma aurorae sp. n.

Holotype, male: Nepal, Parbat distr., Pun Hill at Ghoropani Pass, 3050-3100 m, 8.X.83 (Löbl & Smetana) (MHNG).

Paratypes, 31: Parbat distr., as holotype, 1 female; Ridge E Ghoropani Pass, 3100 m, 7.X.1983 (Löbl & Smetana) (MHNG) 2 males, 10 females; Ghoropani Pass, N slope, 2750 m, 5.X.1983 (Löbl & Smetana) (MHNG) 3 males; Ghoropani Pass, 2850 m, 5.X.1983 (Löbl & Smetana) (MHNG) 1 male; Manang distr., Pisang, 3000 m, 3.X.1977 (Deharveng) (MHNG) 1 male; Ghorka distr., Chuling Khola, Djinski Kharka, 3400 m, 4.-5.VIII.1983 (Martens & Schawaller) (SMNS) 2 females; Myandi distr., S Dhaulagiri, Dhorpatan, 3000-3200 m, 16-24.V.1973 (Martens) (SMNS) 1 female; Sindhupalcok distr., between Ghopte and Thare Pati, 3250 m, 23.IV.1985 (Smetana) (MHNG) 1 male; above Shermathang, 2900 m, 26.IV.1981 (Löbl & Smetana) (MHNG) 1 female; Malemchi, 2900 m, 14.IV.1981 (Löbl & Smetana) (MHNG) 1 female; Patan distr., Phulcoki, 2600 m, 13.X.1983 (Löbl & Smetana) (MHNG) 1 female; Sankhua Sabha distr., between Romri La and Pahakhola, 3600-3450 m, 30.V.1988 (Martens & Schawaller) (MHNG) 1 male; Taplejung distr., Simbua Khola Valley, 3100-2900 m, 15.V.1988 (Martens & Schawaller) (SMNS) 1 female; same but near Tseram, 3250-3350 m, 10-15.V.1988 (SMNS, MHNG) 3 males, 1 female.

D i a g n o s i s . Body moderately large, with distinctive colour pattern. Antennomere IV slender. Basal stria of elytron complete. Abdominal microsculpture consisting of punctures and of very short striae. Median lobe of aedeagus abruptly inclined apically, with sclerotized valve. Internal sac bearing median sclerites. Parameres slender.

D e s c r i p t i o n . Length 1.65 - 1.85 mm, width 1.10 - 1.30 mm. Head and pronotum more or less dark reddish-brown or ochreous. Elytron (Fig. 27) yellowish, with blackish-brown or black base, and in most specimens with two small elongate dark central spots or with larger single dark central spot. Pygidium and propygidium with dark base and pale apices. Hypomeron and legs dark reddish-brown. Thorax and abdomen dark brown to black ventrally, yellowish apex of abdomen excepted. Antennae and tarsi yellowish. Relative length of antennomeres as follows: III 9, IV 15, V 20, VI 21, VII 26, VIII 23, IX 25, X 26, XI 33 (holotype); segments IV, V and VI each about 4x as long as wide; VII and XI each 3x as long as wide, VIII about 3.5x as long as wide. Pronotum with lateral margins arcuate, lateral keel not visible in dorsal view; punctuation dense, fine and shallow, barely visible at 24x magnification. Tip of scutellum exposed. Elytron with oblique central portion of lateral margin, lateral keel in dorsal view visible only near base; apical margin truncate; inner apical angle at same level as outer angle; sutural margin not raised; sutural area raised, except anteriorly, with row of very fine punctures; sutural stria deep, moderately converging beyond middle, parallel to suture before middle, curved at base and extended laterally to form uninterrupted basal stria joined with lateral stria; punctuation almost evanescent near base, beyond basal third very dense, formed by rather large but very shallow punctures, usually larger than intervals. Pygidium very finely punctate, with microsculpture consisting of punctures and of very short striae. Mesepimeral ridge as long or somewhat longer than interval between its end and mesocoxa. Metasternum not microsculptured, with two median impressions, very finely

and sparsely punctate except for more distinctly punctate medio-apical portion. Mesocoxal area 0.05 mm long, its margin subtriangular or arcuate, rather coarsely punctate. Metepisternum strongly narrowed anteriorly, with deep straight suture. First ventrite without microsculpture, with punctuation sparse, very fine laterally, rather distinct on medio-basal portion. Metacoxal area 0.06-0.07 mm long, margin arcuate, rather coarsely punctate. Following ventrites with microsculpture consisting of punctures. Tibia straight. Segments 1 to 3 of male protarsus strongly enlarged, almost as wide as protibia. Segments 1 to 3 of male mesotarsus moderately enlarged. Aedeagus (Figs 137, 138) 0.78 mm. Median lobe with short, strongly inclined and tapering apical portion, tip visible only in lateral view, apex in dorsal view seemingly truncate. Internal sac long, complex, with two parallel median sclerites. Parameres arcuate, narrowed beyond basal third in dorsal view, evenly slender and almost straight in lateral view.

R e m a r k s . This species may be readily recognized by its colour pattern in combination with the complete basal stria of elytron. It is widely distributed for a species occurring only at high altitude.

Scaphisoma nima sp. n.

Holotype, male: Nepal, Mustang distr., Kalopani, 2550 m, 1.X.1983 (Löbl & Smetana) (MHNG).

Paratype, male: as holotype (MHNG).

D i a g n o s i s . Body moderately large, with distinct colour pattern. Antennomere IV short. Basal stria of elytron interrupted. Abdominal microsculpture consisting of striae. Aedeagus symmetrical, with small ventral process; internal sac lacking flagellum or robust sclerites; parameres slender, almost straight.

D e s c r i p t i o n . Length 1.65 - 1.75 mm, width 1.16 - 1.18 mm. Head, prothorax, femora and tibiae reddish-brown. Elytra ochreous with black basal spot extended on humeral area, and darkened along apical margins. Tarsi, antennae and apical abdominal segments ochreous. Venter of thorax and basal abdominal ventrites dark brown or blackish. Relative length of antennomeres as follows: III 5, IV 7, V 19, VI 24, VII 31, VIII 26, IX 28, X 27, XI 28 (holotype); segment IV small, about 2x as long as wide; V to VII each about 3.5x as long as wide; VIII almost 4x as long as wide. Pronotum with arcuate lateral margins; lateral keels not visible in dorsal view; punctuation dense and very fine, distinct at 24x magnification. Tip of scutellum exposed. Elytron with very weakly arcuate lateral margin; lateral keel not visible in dorsal view; apical margin somewhat rounded; inner apical angle at same level as outer angle; sutural margin not raised; sutural area raised, very finely punctate; sutural stria weakly convergent from middle or from anterior third of sutural length toward apex, curved at base and extended toward humeral area, forming incomplete basal stria; discal punctuation almost obsolete on basal fourth, from there gradually becoming denser and coarser, punctures in apical half large but shallow, larger than intervals. Pygidium extremely finely punctate, with microsculpture formed by transverse striae. Mesepimeral ridge longer than interval between its end and mesocoxa. Metasternum with two shallow medio-apical impressions, on median area finely and more or less densely punctate, laterally extremely finely and sparsely punctate; without microsculpture. Mesocoxal area 0.04 mm long, with arcuate, rather finely punctate margin. Metepisternum flat, barely narrowed anteriorly, its suture straight except at angles. Abdominal microsculpture consisting of distinct transverse striae absent from latero-basal portion of 1st ventrite. Punctuation of 1st ventrite fine or very fine and sparse. Metacoxal

area 0.05 mm long, subparallel, marginal punctures rather coarse. Tibia straight. Segments 1 to 3 of pro- and mesotarsus moderately widened. Aedeagus (Fig. 139) 0.46 - 0.48 mm long. Apical portion of median lobe long, evenly wide, with rounded tip; dorsal valve situated near tip, weakly sclerotized. Basal half of internal sac covered by membranous scales, apical half with long spiny structures; sclerites absent except for thin straight median piece. Parameres almost straight, somewhat converging, exceeding weakly tip of median lobe.

Remarks. This species has the aedeagus similar to that of *S. notatum*, except for the basal portion of the internal sac which differs significantly. Both species differ drastically by their colour pattern.

Scaphisoma jado sp. n.

Holotype, male: Nepal, Sindhupalcok distr., Malemchi, 2800 m, 18.IV.1981 (Löbl & Smetana) (MHNG).

Paratypes, 15: Sindhupalcok distr., as holotype, 3 females; above Shermathang, 2900 m, 26.IV.1981 (Löbl & Smetana) (MHNG) 1 male, 3 females; below Thare Pati, 3300 m, 10.IV.1981 (Löbl & Smetana) (MHNG) 1 male, 2 females; Nuwakot distr., Trisuli Valley, Gosaikund, 3200 m, 23-26.IV.1973 (Martens) (SMNS, MHNG) 3 males, 2 females.

Diagnosis. Body rather large, with conspicuous colour pattern. Antennomere IV slender. Elytron with complete basal stria. Abdominal microsculpture consisting of punctures. Aedeagus symmetrical, dorsal valve of median lobe deeply notched. Internal sac bearing robust sclerite expanded laterally by an apophysis and extended proximally by two slender arms. Parameres with strongly expanded base.

Description. Length 1.80 - 2.10 mm, width 1.21 - 1.38 mm. Most of dorsal surface ochreous. Pronotum with large dark discal spot divided in two spots in some specimens. Elytron with large dark brown or black discal spot extended to sutural margin, and darkened along basal margin. Hypomeron ochreous. Thorax ventrally and abdominal ventrites 1 to 3 or 4 dark brown. Legs reddish-brown or ochreous, antennae ochreous to yellowish. Relative length of antennomeres as follows: III 10, IV 16, V 20, VI 20, VII 27, VIII 20, IX 25, X 25, XI 30 (holotype); segments IV to VI each about 4x as long as wide, VI and VII each about 3x as long as wide, XI not quite 3x as long as wide. Pronotum with evenly arcuate lateral margins, lateral keels not visible in dorsal view; punctuation fine, dense, more or less distinct at 24x magnification, punctures not well delimited. Tip of scutellum exposed. Elytron relatively strongly narrowed apically; lateral margin almost evenly arcuate; lateral keel not visible in dorsal view; apical margin truncate; inner apical angle exceeding level of outer angle; sutural margin not raised; sutural area raised beyond middle or beyond anterior third, very finely punctate; sutural stria deep, converging apically from mid-length of suture, parallel to suture in anterior half, curved at base and extended along base to form complete basal stria joined with lateral stria; discal punctuation dense and fine, with punctures decidedly larger than those of pronotum, many about as large as intervals but very shallow and indistinct on ochreous area. Pygidium very finely punctate, without visible (100x) microsculpture. Mesepimeral ridge shorter than interval between its end and mesocoxa. Metasternum without microsculpture, punctuation very fine and sparse laterally, more dense and notably less fine on medio-apical portion. Mesocoxal area 0.04-0.05 mm long, margin arcuate and finely punctate. Metepisternum not or weakly narrowed anteriorly, with deep straight suture. First ventrite without microsculpture, punctuation very fine and sparse, except on medio-basal area. Metacoxal area extremely narrow, parallel to coxa, its margin rather coarsely punctate. Apical

abdominal segments with microsculpture consisting of punctures. Tibia straight. Segments 1 to 3 of male pro- and mesotarsus moderately enlarged. Aedeagus (Figs 140, 141) 0.63 - 0.68 mm long. Median lobe with long apical portion; dorsal valve strongly sclerotized, deeply notched medially, almost as long as ventral piece; ventral piece strongly inclined, with curved, pointed tip; ventral process well developed. Internal sac armed with robust sclerite extended basally by two narrow arms and with a hook-shaped lateral process. Parameres with conspicuously widened base, gradually narrowed toward tip in lateral view.

R e m a r k s . This species can be readily distinguished from *S. notatum* by the aedeagal characters. Both species live at high altitudes; *S. jado* is possibly restricted to Central Nepal.

***Scaphisoma invalidum* sp. n.**

Holotype, male: Nepal, Sankhua Sabha distr., Arun Valley, Chichila, 2200 m, 24.IV.1984 (Löbl & Smetana) (MHNG).

D i a g n o s i s . Body moderately large, with distinct colour pattern. Antennomere IV elongate. Elytron without basal stria. Hypomeron, metasternum and abdomen with microsculpture consisting of striae. Aedeagus symmetrical, with single dorsal valve. Ventral process well developed. Internal sac bearing median sclerite and apical rows of denticles.

D e s c r i p t i o n . Length 1.70 mm, width 1.05 mm. Pronotum and hypomera ochreous, former with somewhat darkened centre on each side of pale median line. Elytron yellowish, with black basal spot extended apically to form a triangular spot, and with blackish apical transverse fascia. Venter of thorax and basal abdominal ventrites dark brown. Apical abdominal segments, legs and antennomeres IV to XI yellowish. Relative length of antennomeres as follows: III 6, IV 15, V 23, VI 23, VII 26, VIII 21, IX 24, X 22, XI 32; segments IV and VI about 4x as long as wide; V almost 5x as long as wide; VII 3x as long as wide; VIII and XI each somewhat more than 3x as long as wide. Pronotum with evenly arcuate lateral margins, lateral keels not visible in dorsal view; punctuation dense and very fine, visible at 12x magnification. Tip of scutellum exposed. Elytron with lateral keel visible in dorsal view only near base; apical margin truncate; inner apical angle exceeding level of outer angle; sutural margin not raised, sutural area flat, with dense row of rather coarse punctures; sutural stria parallel to suture, curved near base, not extended laterad of pronotal lobe, punctuation fine and rather sparse near base, dense and rather coarse elsewhere, most punctures larger than intervals. Pygidium extremely finely punctate, with distinct microsculpture consisting of transverse striae. Hypomeron, mesepisternum, metasternum, metepisternum, and ventrites with microsculpture consisting of striae. Metasternum, except median portion, sparsely and extremely finely punctate; punctures of median portion becoming gradually larger apically. Mesocoxal area 0.04 mm long, with margin arcuate, rather finely punctate. Metepisternum vaulted, suture weakly sinuate. First ventrite sparsely and very finely punctate. Metacoxal area 0.09 mm long, large, its margin strongly arcuate, finely punctate. Protibia straight, mesotibia weakly curved, metatibia weakly sinuate. Aedeagus (Figs 142, 143) 0.57 mm long. Median lobe with slender, arcuate, apical portion pointed in lateral view; ventral process distinctly protruding apically. Internal sac slender, with simple, sinuate median sclerite, two apical groups of small sclerotized denticles, and most of membranes covered by scales.

R e m a r k s . This species may be readily distinguished by its colour pattern in combination with the microsculptured hypomeron. The aedeagus resembles that of *S.*

aurorae by the median lobe having a single dorsal valve, the internal sac armed with a median sclerite and by the narrow parameres. The colour pattern is very similar to that of *S. bhareko* and *S. sikkimense*.

Scaphisoma baloo sp. n.

Holotype, male: Nepal, Patan distr., Phulcoki, 2650 m, 15.X.1983 (Löbl & Smetana) (MHNG).

Paratypes, 109: Nepal, as holotype, 5; same but 2700 m, 17; same but 2600 m, 14-16.X.1983, 23; same but 2550 m, 29.X.1984, 14; same but 2500 m, 30.IV.1984, 15; same but 2300 m, 10.IV.1981 (Löbl) 3; Phulcoki, 2600-2650 m, 14.V.1980 (Martens & Ausobsky) (SMNS) 1; Phulcoki, 2600 m, 20.IV.1982 (A. & Z. Smetana) (MHNG) 14; Phulcoki, 21.II.1970 (Franz) (Coll. H. Franz, MHNG) 14; Phulcoki, summit, 4.X.1971 (Franz) (Coll. H. Franz, MHNG) 3.

D i a g n o s i s . Body rather large, with distinct colour pattern. Antennomere IV long. Elytra conspicuously narrowed apically, with entire basal striae. Metacoxal area very narrow, largest near metepimeron. Aedeagus symmetrical, with single valve and large protruding ventral process. Internal sac with robust median sclerite and basal setose structures. Parameres with wide base, narrowed toward apical third.

D e s c r i p t i o n . Length 2.0 - 2.2 mm, width 1.38 - 1.60 mm. Body dark reddish, elytron darkened subapically and with wide yellowish apical portion (Fig. 28). Apex of abdomen yellowish, legs and antennae yellowish or ochreous. Relative lengths of antennomeres as follows: III 12, IV 18, V 23, VI 24, VII 30, VIII 25, IX 28, X 28, XI 30; segment III conspicuously elongate, IV, V and VI each about 5x as long as wide; VII 3x as long as wide; VIII about 3.5x as long as wide; XI less than 3x as long as wide. Pronotum with strongly arcuate lateral margins; lateral keels not visible in dorsal view, basal lobe reduced; discal punctation very fine, barely visible at 100x magnification. Scutelum completely or almost completely covered by pronotal lobe. Elytron strongly narrowed apically; lateral margin arcuate in anterior half, oblique beyond middle; apical margin truncate; inner apical angle distinctly exceeding level of outer angle; sutural margin not raised; sutural area flat, conspicuously narrow; sutural stria parallel to suture, curved at base and extended laterally, forming uninterrupted, very fine (almost obsolete) basal stria; discal punctation very fine, punctures extremely shallow, much larger than those on pronotum but usually barely visible at 50x magnification. Mesepimeral ridge indistinct. Metasternum without any impression, not microsculptured; punctation of lateral portion very fine and sparse, dense and distinct at each side of median line. Mesocoxal area 0.05 mm long, with arcuate, finely punctate margin. Metepisternum moderately narrowed anteriorly, with suture rounded only at anterior angle, notably deep, widened apically. Abdomen with microsculpture consisting of punctures. First ventrite with middle portion rather densely and fairly finely punctate, lateral portion very finely and sparsely punctate. Metacoxal area very narrow, widening toward metepimeron, with weakly oblique margin. Tibiae straight. Segments 1 to 3 of male pro- and mesotarsi distinctly enlarged. Aedeagus (Figs 144, 145) 0.69 - 0.74 mm. Distal portion of median lobe long, tapering, weakly inclined, with ventral margin sinuate in lateral view; single dorsal valve relatively strongly sclerotized; ostium situated near tip. Ventral process strongly expanded apically. Internal sac with robust, strongly sclerotized piece; membranes in basal half with very fine, dense setose structures. Parameres with wide base, in dorsal view gradually narrowed toward weakly curved apical portion, in lateral view almost straight and evenly wide from tip to level of ventral process.

R e m a r k s . This species may be easily distinguished by its colour pattern in combination with the apically strongly narrowed elytra, and with the very narrow

metacoxal area. The aedeagal characters suggest possible close relationship with *S. aurorae* and *S. invalidum*. *Scaphisoma baloo* has reduced wings and appears to be endemic to Phulcoki. Most of the specimens were found in moist plant debris along fallen oak logs.

Scaphisoma clavigerum sp. n.

Holotype, male: Nepal, Panchthar distr., Dhorpar Kharka, 2700 m, *Rhododendron-Lithocarpus* forest, 13-16.IV.1988 (Martens & Schawaller) (SMNS).

Paratypes, 4: Nepal, as holotype (MHNG) 1 male; India, West Sikkim, Choka, 3050 m, nr. Yuksam, 24.IX.1983 (Sakai) (Coll. M. Sakai, MHNG) 3 females.

D i a g n o s i s . Rather large species, with distinct colour pattern. Antennomere IV slender. Basal stria of elytron uninterrupted. Abdominal microsculpture consisting of striae. Aedeagus with strongly sclerotized dorsal valve exceeding level of ventral piece of median lobe. Internal sac bearing robust median sclerite. Parameres with subapical apophysis.

D e s c r i p t i o n . Length 1.9 - 2.1 mm, width 1.30 - 1.45 mm. Head, most of pronotal and elytral surface, apical abdominal segments, antennae, tibiae, tarsi and most of femora ochreous or yellowish. Pronotum with two dark brown or blackish discal spots (Fig. 29). Elytral base and venter of thorax dark brown or black, pale hypomeron and metepimeron excepted. Base of femora darkened. Relative length of antennomeres as follows: III 10, IV 17, V 23, VI 30, VII 37, VIII 31, IX 38, X 35, XI 37 (holotype); segments IV, V and VII each almost 4x as long as wide, VI and VIII somewhat more than 4x as long as wide, XI almost 3.5x as long as wide. Pronotal margins arcuate, lateral keels not or barely visible in dorsal view; discal punctation dense and very fine, visible at 50x magnification. Tip of scutellum exposed. Elytron with middle portion of lateral margin oblique; lateral keel in dorsal view visible near base only; apical margin truncate; inner apical angle exceeding level of outer angle; sutural margin raised; sutural area vaulted, with row of very fine punctures; sutural stria parallel to suture, curved near base and extended laterad to form uninterrupted, relatively deep basal stria joined with lateral stria; punctation dense, punctures shallow, rather large, diameters mostly as large as or larger than diameters of intervals, punctures near base much smaller than intervals and extremely shallow. Pygidium with sparse and extremely fine punctation. Mesepimeral ridge longer than interval between its end and mesocoxa. Metasternum not microsculptured; finely, very densely punctate on deeply impressed medio-apical portion, elsewhere sparsely and very finely punctate. Mesocoxal area very narrow, about 0.02 mm long, parallel, finely punctate margin. Metepisternum flat, at same level as metasternum, narrowed anteriorly, with straight suture. Abdomen with microsculpture consisting of transverse striae. First ventrite with very fine and sparse punctation, except less finely and more densely punctate medio-basal area. Metacoxal area 0.05 - 0.06 mm long, margin finely punctate, arcuate medially, oblique laterally. Tibia straight, pro- and mesotibia stouter apically. In male, segments 1 to 3 of protarsus conspicuously widened, 1 wider, 2 as wide as, 3 somewhat narrower than apex of tibia; segment 1 and 2 of mesotarsus strongly widened, 1 as wide as, 2 narrower than, apex of tibia, 3 weakly widened. Aedeagus (Figs 146-148) 1.08 mm long. Median lobe gradually narrowed apically, with single, relatively strongly sclerotized dorsal valve, extended to level of tip of parameres; ventral piece short, strongly inclined, with narrow apex. Internal sac armed by robust median sclerite with basal portion extended laterally; membranes bearing small scales. Parameres robust, each somewhat

sinuate in dorsal view, arcuate in lateral view, with wide base and distinct sub-basal apophyse in ventral view.

R e m a r k s . This species may be readily distinguished by the conspicuous colour pattern in combination with the uninterrupted basal stria of the elytron and abdominal microsculpture. It is well characterized by the shape of the parameres and by the unusually long dorsal valve of the median lobe.

Scaphisoma pinnigerum sp. n.

Holotype, male: Nepal, Patan distr., Phulcoki, near Godawari, 1700 m, 10.V.1981 (Löbl) (MHNG).

Paratype, male: Patan distr., Phulcoki, 2350 m, X.1977 (Deharveng) (MHNG).

D i a g n o s i s . Member of the *haemorrhoidale* group. Body reddish-brown, elytron paler only at apical margin. Metasternum with distinct row of dense punctures parallel to metaxoca. Abdominal microsculpture consisting of striae. Internal sac of aedeagus bearing two central teeth, medio-apical tube covered by denticles and wide basal duct. Parameres with wide inner lobe.

D e s c r i p t i o n . Length 1.85 mm, width 1.20 mm. Body reddish-brown, elytra with very narrow pale apical area; apical abdominal segments, legs and antennae ochreous or yellowish. Antennae similar to those of other species of the group. Pronotum with lateral margins weakly arcuate; lateral keels visible in dorsal view; punctation very fine, barely visible at 12x magnification. Tip of scutellum exposed. Elytron with lateral margin almost evenly arcuate; lateral keel distinct in dorsal view; apical margin arcuate, inner apical angle exceeding level of outer angle; sutural margin barely raised; sutural area flat near base, somewhat vaulted beyond basal third, very finely punctate; sutural stria gradually, weakly diverging from sutural margin anteriorly; entire discal punctation dense and coarse, most punctures larger than or as large as intervals; surface along lateral stria impunctate. Pygidium extremely finely punctate. Mesepimeral ridge longer than interval between its end and mesocoxa. Metasternum without microsculpture; medio-apical portion flattened, very densely, rather coarsely punctate, punctation on centre gradually finer and sparser anteriorly. Most of lateral portion of metasternum very finely and sparsely punctate; row of rather coarse punctures parallel to metacoxa very dense, accompanied by additional punctures. Mesocoxal area 0.06 mm long, margin arcuate, rather finely punctate. Metepisternum narrowed anteriorly, impressed below level of metasternum, suture straight except on rounded angles. Abdomen with microsculpture consisting of distinct transverse striae. First ventrite sparsely and very finely punctate, several punctures on medio-basal portion somewhat larger. Tibia straight. Segments 1 to 3 of protarsus and segment 1 of mesotarsus rather strongly widened in male. Aedeagus (Fig. 152) 0.44 mm long. Dorsal valves of median lobe rather long and wide, rounded at tip. Internal sac armed with two conspicuous, strongly sclerotized teeth converging anteriorly, their base widened and raised; membranes forming long median tube with denticles becoming larger apically; membranous portion proximal of central teeth covered by small scale-like structures, followed by striate structure overlapping anterior end of relatively wide basal duct. Parameres curved apically, with wide inner lobe.

R e m a r k s . This species is very similar to *S. indra* from which is difficult to be distinguished by its external characters. However, it may be readily recognised by the structures of the internal sac, especially by the presence of a pair of central sclerotized teeth, in combination with the wide basal duct.

Scaphisoma varians sp. n.

Scaphisoma cf. *bedeli*; LÖBL 1986a: 205.

Holotype, male, Nepal, Sankhua Sabha distr., forest S Mangsingma, 2200 m, 11.IV.1984 (Löbl & Smetana) (MHNG).

Paratypes, 135: as holotype, 14 males, 12 females; Induwa Khola Valley, 2000-2100 m, 16-17.IV.1984 (Löbl & Smetana) (MHNG) 12 males, 10 females; below Sheduwa, 2550 m, 30.III.1982 (A. & Z. Smetana) (MHNG) 1 male, 1 female, and same but 2100-2550 m, 9.IV.1982, 1 female; forest NE Kuwapani, 2600 m, 15.IV.1982 (A. & Z. Smetana) (MHNG) 5 males, 8 females; Chichila, 2200 m, 4.IV.1984 (Löbl & Smetana) (MHNG) 1 male; Chichila, 2300 m, 26.III.1982 (A. & Z. Smetana) (MHNG) 2 males; Ilam distr., Mai Pokhari, 2100-2200 m, 9-10.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 3 males, 1 female; India, Sikkim, "Rümtek", ca 2100 m, XI.1981 (Cassagnau) (MHNG) 1 male, 1 female; West Bengal, Darjeeling distr., Algarah, 1800 m, 9.X.1978 (Besuchet & Löbl) (MHNG) 1 male; 3 km N Teesta, 250 m, 10.X.1978 (Besuchet & Löbl) (MHNG) 1 male; betw. Algarah and Labha, 7 km from Algarah, 1900 m, 11.X.1978 (Besuchet & Löbl) (MHNG) 33 males, 32 females.

For additional material from the Darjeeling district see LÖBL (1986a).

D i a g n o s i s . Member of the *haemorrhoidale* group. Body more or less dark reddish-brown, wide apical portion of elytra and apical abdominal segments paler. Metasternum with sparse row of relatively fine punctures parallel to metacoxa. Abdominal microsculpture consisting of striae. Aedeagus with short pointed dorsal valves of median lobe; Internal sac with two rows of strongly sclerotized, long denticles and with long membranous portion bearing scale-like and denticulate structures.

R e m a r k s . This species was characterized and figured in LÖBL (1986a). It was held for possibly conspecific with *S. bedeli* of which type material has been subsequently examined.

Scaphisoma alacre sp. n.

Holotype, male: Nepal, Sindhupalcok distr., Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana) (MHNG).

Paratypes, 114: Mustang distr., Lete, 2550 m, 2.X.1983 (Löbl & Smetana) (MHNG) 18 males, 12 females; Kali Gandaki Khola, betw. Mishi and Gomone, 21.IX.1971 (Franz) (Coll. H. Franz, MHNG) 2 females; forest N Lete, 24.IX.1971 (Franz) ((Coll. H. Franz, MHNG) 3 males, 3 females; Lete, 2450-2600 m, 30.IV.1980 (Martens & Ausobsky) (SMNS) 2 males, 1 female; Lete, 24.IX.1971 (Franz) (Coll. H. Franz) 1 female; betw. Lete and Gasa, 25.IX.1971 (Franz) (Coll. H. Franz) 1 male, 4 females; above Shika, 26.IX.1971 (Franz) (MHNG) 2 males; Parbat distr., Chitre, 2400 m, 4.V.1980 (Martens & Ausobsky) (SMNS) 1 male, 1 female; N Ghoropani Pass, 2750 m, 5.X.1983 (Löbl & Smetana) (MHNG) 2 males; Ghoropani Pass, N slope, 2700 m, 6.X.1983 (Löbl & Smetana) (MHNG) 4 males, 2 females; Ghoropani Pass, 2850 m, 5.X.1983 (Löbl & Smetana) (MHNG) 1 female; Rasuwa distr., Dunche, 21-26.IX.1981 (Pawlowski & Kuska) (IZK) 1 male, 2 females; Langtang Khola Valley, 1950 m, 13.IV.1985 (Smetana) (MHNG) 3 males; 1 km NE Bhargu, 2000 m, 12.IV.1985 (Smetana) (MHNG) 1 female; above Bokhahundo, 1950 m, 11.IV.1985 (Smetana) (MHNG) 1 male; Sindhupalcok distr., Malemchi, as holotype, 16 males, 26 females; Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 2 males, 1 female; Patan distr., Phulcoki, 2600 m, 13.X.1983 (Löbl & Smetana) (MHNG) 1 male.

D i a g n o s i s . Rather large-sized member of the *haemorrhoidale* group, with abdominal microsculpture consisting of striae, metasternum with row of punctures parallel to metasternum, discal punctures of elytra well delimited, coarse. Median lobe of aedeagus with slender apical arms of dorsal valves; internal sac with two rows of sclerotized teeth; parameres abruptly widened and moderately curved apically.

Description. Length 1.7 - 1.9 mm, width 1.10 - 1.30 mm. Colour variable, head, pronotum, ventral surface of thorax and basal abdominal ventrites usually dark brown to black, pronotum uniformly more or less dark, or reddish-brown with darkened centre. Elytra in basal 2/3 reddish, usually darkened near sutural striae, sometimes darkened along basal margin and beyond middle; apical third yellowish or ochreous, usually well delimited. Apical abdominal segments, legs and antennae yellowish or ochreous. Antennae with segments IV to XI slender, similar to those of other species of the group. Pronotum with evenly, weakly arcuate lateral margins, lateral keels not visible in dorsal view; punctation dense and fine, well delimited, near base visible at 12x magnification, on centre visible at 20x magnification. Tip of scutellum exposed. Elytron with basal margin weakly arcuate in basal third, then oblique; lateral margin usually not visible in dorsal view, sometimes distinct in apical third; apical margin truncate; inner apical margin exceeding level of outer angle; sutural margin not raised; sutural area flat, with row of fine punctures; sutural stria very weakly converging apically, somewhat curved at base, not extended laterad; discal punctation dense and coarse, punctures well delimited, most distinctly larger than intervals. Pygidium extremely finely punctate. Mesepimeral ridge longer than interval between its end and mesocoxa. Metasternum not microsculptured. Median portion of metasternum flattened and impressed apically, bearing very dense, rather coarse punctation becoming gradually sparser and finer anteriorly. Lateral portion of metasternum with dense row of moderately coarse punctures parallel to metacoxa, with several additional distinct punctures, and with very fine, sparse punctation on most of surface; transverse row not impressed. Mesocoxal area 0.06-0.09 mm long, its margin arcuate, rather finely punctate. Metepisternum moderately narrowed anteriorly, near suture impressed below level of metasternum, suture straight except at rounded angles. Abdominal segments with microsculpture consisting of transverse striae. Entire first ventrite sparsely and very finely punctate. Metacoxal area 0.09-0.10 mm long, with arcuate, rather coarsely punctate margin. Tibia straight. Segments 1 and 2 of male pro- and mesotarsus strongly widened, segment 3 moderately widened. Aedeagus (Fig. 153) 0.82 - 0.92 mm long. Dorsal valves with short slender apical arms, ventral piece of median lobe denticulate apically. Internal sac with two apical rows of sclerotized teeth, its central membranous portion very finely denticulate, followed proximally by portion containing long, weakly sclerotized denticles; membranes of basal portion covered by scale-like structures. Parameres straight from base to abruptly widened and moderately curved apical portion, with minute subapical lobe.

Remarks. This species may be readily distinguished by the shape of the parameres of the aedeagus. Most specimens may be identified by their colour pattern, in combination with the well delimited discal punctures of the elytra and the relatively fine punctures forming the transverse metasternal row.

***Scaphisoma nepalense* sp. n.**

Holotype, male: Nepal, Sindhupalchok distr., Pokhara NE Barabise, 2700 m, 7.V.1981 (Löbl & Smetana) (MHNG).

Paratypes, 181: as holotype, and from 2800 m, 2 -3.V.1981, 98 males, 79 females; Durumtali near Barabise, via Ting Sang La, 2200-2300 m, 5.VIII.1970 (Franz) (Coll. H. Franz) 3 males, 1 female.

Diagnosis. Medium-sized member of the *haemorrhoidale* group, with pale apical portion of elytra. Lateral portion of metasternum with transverse row of punctures. Abdominal microsculpture consisting of striae. Aedeagus with slender arms of dorsal

valves. Internal sac with central, weakly sclerotized arcuate plate followed by two rows of teeth.

Description. Length 1.55 - 1.85 mm, width 1.0 - 1.20 mm. Body more or less dark reddish-brown, rarely blackish. Apical fourth to third of elytron yellowish, elytral disc darkened at anterior margin of pale apical area in some specimens. In external characters very similar to *S. varians*, but elytral punctation less dense and somewhat finer, with most discal punctures about as large as or notably smaller than intervals. Lateral portion of metasternum with distinct transverse row of fine punctures. Aedeagus (Figs 154, 155) 0.71 - 0.74 mm long. Median lobe with slender, apically narrowed arms of dorsal valves; ventral piece long. Internal sac with basal membranes covered by scale-like structures, followed by longer denticles; central portion with elongate, arcuate plate with sinuate apical margin, more strongly sclerotized at lateral margins. Apical portion of internal sac bearing two rows of teeth. Parameres weakly widened at middle, each incurved apically.

Remarks. This species may be readily recognised by the shape of the parameres in combination with the characters of the internal sac of the aedeagus.

***Scaphisoma kanchi* sp. n.**

Holotype, male: Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 20.IV.1984 (Löbl & Smetana) (MHNG).

Paratypes, 17: as holotype, and from 21.IV.1984, 6 males, 3 females; Arun river at Num, 1500 m, 29.III.1982 and 1500-1600 m, 10.IV.1982 (A. & Z. Smetana) (MHNG) 6 males, 2 females.

Diagnosis. Medium-sized species of the *haemorrhoidale* group with pale apical portion of elytron. Metasternum with row of punctures parallel to metacoxa. Abdominal microsculpture consisting of transverse striae. Aedeagus with distal arms of dorsal valves rather wide and short. Internal sac denticulate in central portion and with spine-like structures in apical portion.

Description. Length 1.55 - 1.85 mm, width 1.0 - 1.20 mm. Body dark reddish brown to black, apical fourth of elytron and apical abdominal segments ochreous. In external characters very similar to previous species. Elytron with sutural stria somewhat more converging apically and with discal punctures less delimited. Punctures forming transverse row parallel to metacoxa rather coarse, situated in impressed stria. Aedeagus (Figs 156, 157) 0.79 - 0.81 mm long. Apical portion of median lobe strongly tapering; arms of dorsal valves almost evenly wide. Internal sac with long basal portion divided into two membranous parts covered by fine denticulate structures; centre with a wide tooth accompanied by strongly sclerotized lateral teeth; apical portion of internal sac bearing strong spine-like structures. Parameres strongly narrowed beyond basal third, arcuate, with weakly sclerotized, uneven inner margin.

Remarks. This species may be readily distinguished by the aedeagal characters. It differs from *S. nepalense*, *S. prehensor*, *S. alacre*, and *S. varians* by the transverse row of metasternal punctures situated in an impressed stria.

***Scaphisoma coalitum* sp. n.**

Holotype, male: Nepal, Ilam distr., betw. Hunse and Mai Pokhari, 1600-2000 m, open land, 9.IV.1988 (Martens & Schawaller) (MHNG).

D i a g n o s i s . Member of the *haemorrhoidale* group. Body black, large apical portion of elytron pale. Elytral punctation coarse. Metasternum with distinct transverse row of punctures along metacoxa. Abdominal microsculpture consisting of striae. Aedeagus with slender sinuate parameres bearing minute lobe, internal sac armed by apical teeth.

D e s c r i p t i o n . Length 1.7 mm, width 1.18 mm. Body black, apical fourth of elytra, apical abdominal segments, antennae and legs ochreous to yellowish. Antennae similar to those of other species of the group. Pronotum with lateral margins weakly arcuate; lateral keels not visible in dorsal view; punctation very fine, distinct at 24x magnification. Tip of scutellum exposed. Elytron with lateral margin arcuate in basal third, almost straight beyond basal third; lateral keel visible in dorsal view from base to apex; apical margin truncate; inner apical angle exceeding level of outer angle; sutural margin not raised, sutural area flat, finely punctate; sutural stria weakly diverging from base to anterior third, then parallel to suture, curved along pronotal lobe; discal punctation coarse and dense, most punctures deep, well delimited, larger than or as large as intervals; punctures near sutural stria and apical margin finer. Pygidium extremely finely punctate. Mesocoxal ridge longer than interval between its end and mesocoxa. Metasternum without microsculpture; lateral portion with dense row of rather coarse punctures parallel to metacoxa and with several additional, rather coarse punctures situated close to metacoxa, elsewhere very finely punctate. Medio-apical portion of metasternum weakly impressed, rather densely and distinctly punctate. Mesocoxal area 0.07 mm long, its margin arcuate, finely punctate. Metepisternum narrowed anteriorly, impressed along suture, latter rounded only at angles. Abdomen with microsculpture consisting of transverse striae, absent from latero-basal portion of 1st ventrite. First ventrite very finely punctate laterally, with distinct punctures on median portion. Metacoxal area 0.10 mm long, with strongly arcuate, rather coarsely punctate margin. Tibia straight. Segments 1 to 3 of male pro- and mesotarsus widened. Aedeagus (Figs 158-160) 0.86 mm long. Median lobe with short, apically rounded dorsal valves; tip of ventral piece of median lobe truncate in dorsal view. Internal sac bearing several sclerotized apical teeth, subapical sclerotized laminae, scale-like and setose structures covering long membranous portion. Parameres conspicuously slender and sinuate.

R e m a r k s . This species is possibly closely related with *S. incurvum* Löbl from Thailand with which it shares sinuate parameres. It may be distinguished from this by the characters of the internal sac and by the coarser elytral punctation. *Scaphisoma coalitum* resembles particularly *S. minax*, but both species exhibit very distinct aedeagi.

Scaphisoma sikkimense sp.n.

Holotype, male: India, Sikkim (West), Choka, 3050 m, nr. Yuksam, 25.IX.1983 (Sakai) (NSMT).

Paratypes, 2: Sikkim (West), Chaozing - Bakkim nr. Yuksam, 2200 - 2670 m, 12.IX.1983 (Sakai) (MHNG) 1 female; Sikkim (West), Bakkim - Choka nr. Yuksam, 2670 - 3050 m, 13.IX.1983 (Sakai) (MHNG) 1 female.

D i a g n o s i s . Member of the *haemorrhoidale* group, with dark triangular elytral spot and metasternum lacking transverse row of punctures parallel to metacoxa. Aedeagus with internal sac bearing two converging subapical teeth, parameres with tuberculate outer margin.

D e s c r i p t i o n . Length 1.80 - 1.95 mm, width 1.20 - 1.25 mm. Head and pronotum, including hypomeron, more or less dark reddish-brown. Elytron ochreous or

yellowish, with dark brown to blackish triangular basal spot extended at suture to mid-length of elytron. Ventral surface of thorax and 1st abdominal ventrite about as dark as elytral base, following ventrites yellowish or ochreous. Legs and antennae pale reddish brown or yellowish. Antennae similar to those of other species of the *haemorrhoidale* group. Pronotum with lateral margins arcuate; lateral keel not visible in dorsal view; punctation moderately dense and very fine, barely visible at 24x magnification on most of discal surface, decidedly coarser and more dense near base, many punctures there larger than intervals. Apical portion of scutellum exposed. Elytron with central portion of lateral margin oblique; lateral keels visible in dorsal view only near base; apical margin weakly rounded; inner apical angle exceeding level of outer angle; sutural margin not raised; sutural area flat, with row of very fine punctures; sutural stria weakly converging apically, somewhat curved near base, not extended laterally; discal punctation very dense, rather fine, very shallow, most punctures larger or about as large as intervals, near lateral margin much finer than on centre. Pygidium with microsculpture consisting of transverse striae, extremely finely punctate. Mesepimeral ridge longer than interval between its end and mesocoxa. Metasternum not microsculptured, without medio-apical impression, punctation sparse and very fine on lateral portion, more dense and less fine on middle portion. Metacoxal area 0.05-0.06 mm long, with arcuate, finely punctate margin. Metepisternum flat, weakly narrowed anteriorly, somewhat impressed below level of metasternum, suture weakly sinuate to straight with rounded anterior angle. First ventrite very finely punctate, without microsculpture on latero-basal portion, elsewhere with microsculpture consisting of transverse striae. Metacoxal area strongly arcuate, 0.09 mm long, with rather fine marginal punctures. Tibia slender, straight. Segments 1 to 3 of male protarsus notably widened, narrower than apex of protibia. Aedeagus (Figs 161, 162) 0.80 mm long. Median lobe with slender apical portion, dorsal valves short, rather wide. Internal sac complex, with finely denticulate membranes, bearing a pair of subapical, converging teeth and a pair of sub-basal lamellar structures. Parameres weakly curved apically, with tuberculate outer margin, and elongate, narrow inner lobe.

R e m a r k s . This species may be distinguished from other members of the group by its colour pattern in combination with the tuberculate outer margin of the parameres and the shape of the sclerotized teeth of the internal sac of the aedeagus.

***Scaphisoma bhareko* sp. n.**

Holotype, male: Nepal, Patan distr., Phulcoki, 2500 m, 10.V.1981 (Löbl) (MHNG).

Paratypes, 307: Nepal, Jumla distr., Dzunda Khola Valley, near Talphi, 3000-3500 m, 19.IX.1972 (Franz) (Coll. H. Franz, MHNG) 4; Mustang distr., 2 km N Kalopani, 2550 m, 1.X.1983 (Löbl & Smetana) (MHNG) 3; Manang distr., Latha Manang W Bagarchhap, 2350-2450 m, 22-23.IX.1983 (Löbl & Smetana) (MHNG) 58; forest W Bagarchhap, 2200 m, 21.IX.1983 (Löbl & Smetana) (MHNG) 41; Parbat distr., Ghoropani Pass, 2700 and 2850 m, 5. and 6.X.1983 (Löbl & Smetana) (MHNG) 16; Ghoropani Pass, N slope, 2700-2750 m, 5. and 6.X.1983 (Löbl & Smetana) (MHNG) 43; ridge E Ghoropani Pass, 3100 m, 7.X.1983 (Löbl & Smetana) (MHNG) 2; Kaski distr., Dhampus - Kare near Pokhara (Franz) (Coll. H. Franz) 1; Kathmandu distr., Nagarjung, Jamacok, 1900-2000 m, 18.VIII.1983 (Martens & Schawaller) (SMNS) 1; Siwapuri, 2540 m, 7.X.1981 (Sakai) (Coll. M. Sakai) 3; Siwapuri, 2700 m, 24.III.1982 (Rougemont) (MHNG) 2; Siwapuri, 2500 m, 1.V.1985 (Smetana) (MHNG) 1; Patan distr., Godawari, 6000 ft., 7-13.VIII.1967 (Canad. Nepal Exp.) (CNC) 1; Godawari, Phulcoki, 1770 m, 19.III.1980 (Martens & Ausobsky) and 1700 m, 10.V.1981 (Löbl) (MHNG) 4; Godawari, 13.III.1981 (Rougemont) 1; SE Godawari, cca 1800 m, 22.IV.1988 (Brachat) (MHNG) 1; Phulcoki (Franz) (MHNG) 1; Phulcoki, 2500-2700 m, 10.V.1981, 14-15.X.1983, 28-29.IV.1984 (Löbl & Smetana) (MHNG) 46; Sindhupalcok distr., near

Shermathang, 1980 (Franz) (Coll. H. Franz) 2; Chaubas, 2500 m, 4.IV.1981 (Löbl & Smetana) (MHNG) 1; Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana) (MHNG) 2; Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana) (MHNG) 6; Pokhare NE Barabhise, 2600 and 2700 m, 2., 3. and 7.V.1981 (Löbl & Smetana) (MHNG) 16; Sankhua Sabha distr., forest NE Kuwapani, 2500-2550 m, 11-13. and 15.IV.1982 (A. & Z. Smetana) (MHNG) 4; same but 2350 m, 5.IV.1984 (Löbl & Smetana) (MHNG) 8; Chichila, 2300 m, 26.III.1982 (A. & Z. Smetana) (MHNG) 2; Chichila-Mure, 1900 m, 24.V.1980 (Wittmer) (NMB) 3; Chichila, 2200 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 10; betw. Mure and Hurure, 2050-2150 m, 9-17.VI.1988 (Martens & Schawaller) (SMNS) 4; above Pahakhola, 2600-2800 m, 31.V.1988 (Martens & Schawaller) (SMNS) 1; Induwa Khola Valley, 2100 m, 17.IV.1984 (Löbl & Smetana) (MHNG) 2; Ilam distr., Gitang Khola Valley, 1750 m, 13.IV.1988 m, (Martens & Schawaller) (SMNS) 1; Taplejung distr., SE Yamputhin to Yamputhin, 2000-1650 m, 26. and 30.IV.1988 (Martens & Schawaller) (SMNS) 2; Omje Kharka NW Yamputhin, 2300-2500 m, 1-6.V.1988 (Martens & Schawaller) (SMNS) 4.

D i a g n o s i s . Body moderately large, with characteristic colour pattern. Basal elytral stria absent. Metasternum with row of punctures parallel to metacoxa. Abdominal microsculpture consisting of striae. Basal bulb of aedeagus extended dorso-apically, overlapping apical portion of median lobe. Internal sac complex, with paired apical lobes and teeth.

D e s c r i p t i o n . Length 1.70 - 2.05 mm, width 1.10 - 1.40 mm. Head and pronotum reddish-brown, medio-basal portion of pronotum more or less darkened, dark area often extended laterally and apically, rarely entire pronotum black. Elytra ochreous with black or blackish brown base, dark basal area extended apically along suture toward apical third, becoming gradually narrower and less dark (Fig. 30). Hypomeron reddish-brown or ochreous. Thorax ventrally and 1st to 3rd abdominal ventrites dark, often blackish-brown or black, following ventrites pale, ochreous or yellowish. Legs and antennae yellowish. Relative length of antennomeres as follows: III 7, IV 18, V 29, VI 23, VII 28, VIII 22, IX 26, X 25, X 30 (holotype); segments IV to VI each elongate, IV and VI each about 5x as long as wide, V more than 6x as long as wide; VII and XI each about 3x as long as wide, VIII about 4x as long as wide. Pronotum with evenly arcuate lateral margins; lateral keels not visible in dorsal view or distinct only near base; punctation conspicuously coarse and dense near base, visible at 12x magnification, with punctures larger than intervals, those on centre and on apical portion distinctly finer and somewhat less dense. Tip of scutellum exposed. Elytron with lateral margin rounded basally, almost oblique between basal third and apex; entire lateral keel usually visible in dorsal view; apical margin truncate; inner apical angle exceeding level of outer angle; sutural margin not raised; sutural area flat or somewhat vaulted in apical half, with a row of rather coarse punctures; sutural stria gradually, weakly converging apically, hardly curved near base, not extended laterad of pronotal lobe; punctation dense and coarse; punctures near base not or only somewhat larger than those on pronotal base, elsewhere notably larger but not well delimited, distinctly larger than intervals. Pygidium extremely finely punctate. Mesepimeral ridge about 2x as long as interval between its end and mesocoxa. Metasternum not microsculptured, median portion vaulted, with two shallow apical impressions, rather finely and densely punctate. Lateral portion of metasternum very finely and sparsely punctate except for dense row of fairly coarse punctures parallel to metacoxa and for several punctures situated close to it. Mesocoxal area 0.04 - 0.06 mm long, its margin arcuate, coarsely punctate. Metepisternum moderately narrowed anteriorly, at same level as metasternum or somewhat impressed, suture straight except for rounded angles. Abdomen with microsculpture of transverse striae. First ventrite fairly coarsely punctate on median portion, very finely punctate laterally. Metacoxal area 0.10 - 0.11 mm long, with arcuate, coarsely punctate margin. Tibia straight. Segment 1 of male protarsus strongly widened but narrower than tibia, following 2 segments moderately widened;

segments 1 and 2 of male mesotarsus moderately widened. Lobe of 6st ventrite conspicuously wide and short, truncate. Aedeagus (Figs 163 to 165) 0.96 - 1.12 mm long. Dorsal membranous wall of basal bulb notably extended apically, and overlapping most of ventro-apical portion of median lobe. Median lobe symmetrical, long, tapering in dorsal view, obliquely inclined, with irregular dorsal margin in lateral view. Internal sac bearing paired apical lobes with strongly sclerotized apices, two slender apical teeth, finely denticulate membranes forming complex structures, and more or less strongly sclerotized central structures. Parameres rather narrow, relatively weakly sclerotized, folded.

R e m a r k s . This species is obviously closely related with *S. immodicum* with which it shares a similar aedeagus. It may be readily distinguished from the latter by the much narrower apical portion of the median lobe. Both species differ drastically in their colour pattern.

Caryoscapha Ganglbauer

Caryoscapha Ganglbauer, 1899 (sg), type species: *Scaphisoma limbatum* Erichson, 1845, by original designation.

Members of this genus resemble *Scaphisoma* but exhibit modified apical segment of the maxillary palpus (LÖBL 1987a). Four species are assigned to *Caryoscapha*: *C. limbatum* (Erichson) disjunctly distributed in Europe and in temperate East Asia, *C. seorsum* Löbl occurring in Japan, the Nearctic *C. americanum* Löbl, and the Himalayan *C. monticola* Löbl.

Caryoscapha monticola Löbl

M a t e r i a l e x a m i n e d . 1 specimen: Nepal, Manang distr., forest W Bagarchhap, 2200 m, 21.IX.1983 (Löbl & Smetana) (MHNG).

D i s t r i b u t i o n . India: Darjeeling district, Western Nepal.

Baeotoxidium Löbl

Baeotoxidium Löbl 1971; type species: *Baeotoxidium lanka* Löbl 1971, by original designation.

Baeotoxidium resembles *Scaphobaeocera* in most characters, including the narrow maxillary galea (Fig. 182) but has elytra without parasutural stria and lacks microsculpture on pronotum, elytra and metasternum. It has a conspicuously thin apical segment of labial palpus (Fig. 191).

The genus seems to be restricted to the Oriental realm. It includes 7 species, 2 of which occur in the Nepal Himalaya.

KEY TO THE SPECIES OF *Baeotoxidium*

- 1 Elytron with basal stria uninterrupted, joined to lateral stria *siamense* Löbl
- Basal stria of elytron absent 2
- 2 Hypomeron angulate, with longitudinal stria. Antennomere VIII short
..... *bengalense* Löbl

- Hypomerall stria absent. Antennomere VIII elongate 3
- 3 Mesoxocal area margined by row of elongate pits extended laterad of mesocoxa *indicum* Löbl
- Pits margining mesocoxal area not elongate and not extended laterad 4
- 4 Elytral disc distinctly bicolored *elegans* Löbl
- Elytral disc unicolored 5
- 5 Mesepimeral ridge indistinct, indicated by extremely fine stria *yeti* sp. n.
- Mesepimeral ridge distinct 6
- 6 Body blackish. Elytral punctation even, very fine *gagatum* Löbl
- Body more or less dark reddish-brown. Elytral punctation uneven, lateral portions more coarsely punctate *lanka* Löbl

NEW RECORDS

Baeotoxidium bengalense Löbl

Material examined, 74 specimens. Nepal, Parbat distr., Ghoropani Pass, N slope, 2700-2750 m, 5-6.X.1983 (Löbl & Smetana) (MHNG) 5; Kathmandu distr., Shewapuri, 2700 m, 24.III.1983 (Rougemont) (MHNG) 1; Gokarna forest, 1400 m, 10.IX.1983 (Löbl & Smetana) (MHNG) 1; Patan distr., Phulcoki near summit, 2900 m, 4.X.1971 (Franz) (Coll. H. Franz) 3; Phulcoki, 2500-2700 m, IV, V and X. 1981, 1983 and 1984 (Löbl & Smetana) (MHNG) 48; Sindhupalcok distr., Pokhare NE Barahbise, 2800 m, 2-5.V.1981 (Löbl & Smetana) (MHNG) 2; Sankhua Sabha distr., above Sheduha, 3000 m, 2.IV.1982 (A. & Z. Smetana) (MHNG) 1; Bakan W Tashigaon, 3250 m, 4.IV.1982 (A. & Z. Smetana) (MHNG) 1; Arun Valley, Chichila, 2200 m, 24.IV.1982 (Löbl & Smetana) (MHNG) 1; forest NE Kuwapani, 2350 m, 5.IV.1984 (Löbl & Smetana) (MHNG) 1; bottom Arun Valley below Num, 1050 m, 20-22.IV.1984 (Löbl & Smetana) (MHNG) 4; forest S Mangsingma, 2200 m, 11.IV.1984 (Löbl & Smetana) (MHNG) 1; Induwa Khola Valley, 2000 m, 16.IV.1984 (Löbl & Smetana) 1; Taplejung distr., Khabeli Khola, Yamputhin, 1650-1800 m, 3-4.VIII.1983 (Martens & Daams) (SMNS) 1; left bank of Khabeli Khola, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 2; Hellok in Tamur Valley, 2000 m, 17.V.1988 (Martens & Schawaller) (SMNS) 1; upper Tamur Valley, 1800-2150 m, 19.V.1988 (Martens & Schawaller) (SMNS) 1; descent from Pass Deorali to Hellok, 2600-2000 m, 17.V.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. India: Darjeeling district, Nepal.

NEW SPECIES

Baeotoxidium yeti sp. n.

Holotype, male: Nepal, Sindhupalcok distr., Malemchi 2800 m, 14.IV.1981 (Löbl & Smetana) (MHNG).

Paratypes, 2: Nepal, Manang distr., Latha Manang W Bagarchap, 2350 m, 22.IX.1983 (Löbl & Smetana) (MHNG) 1 female; Sindhupalcok distr., Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana) (MHNG) 1 female.

Diagnosis. Body ochreous, very finely punctate. Hypomeron not striate. Elytron without basal stria. Flagellum of internal sac with two basal hooks.

Description. Length 1.15 - 1.30 mm; width 0.69 - 0.78 mm. Body uniformly ochreous, or apical portion of elytra darkened. Femora, tibiae and antennae hardly paler

than body, tarsi and apical abdominal segments notably paler. Relative length of antennal segments as follows: III 9, IV 9, V 12, VI 10, VII 17, VIII 9, IX 15, X 16, XI 28; segments III to VI of almost same width; VI and VII about 2.5x as long as wide, VIII less than 2x as long as wide; XI 3x as long as wide. Pronotal punctation extremely fine, hardly visible at 100x magnification. Point of scutellum exposed. Hypomeron concave, lacking longitudinal stria. Elytron weakly narrowed apically; sutural stria deep, curved at base, not extended laterally; sutural margin not raised; discal punctation similar to that on pronotum. Mesepimeral ridge indistinct. Metasternum and 1st ventrite without microsculpture, both very finely punctate laterally. Mesocoxal area 0.04 mm long, with marginal pits not elongate and not extended laterally. Metepisternum flat, large, 0.08 - 0.11 mm wide, apically somewhat narrowed, with straight suture. Basal pits of 1st ventrite weakly elongate. Tibiae straight. Male protarsus with segments 1 to 3 moderately widened. Aedeagus (Fig. 166) 0.26 mm. Median lobe weakly curved. Parameres almost straight, with weakly sclerotized inner apical portion. Internal sac with long flagellum thickened basally and bearing two basal hooks, forming single complete circle when extruded.

R e m a r k s . This species may be readily recognised by the combination of the external characters (see the key).

Scaphobaeocera Csiki

Scaphobaeocera Csiki, 1909; type species: *Scaphobaeocera papuana* Csiki, 1909, by monotypy.
Nesotoxidium Scott, 1922; type species: *Nesotoxidium typicum* Scott, 1922, by monotypy.

Most *Scaphobaeocera* species may be distinguished from other scaphidiids in having the pronotum and elytra microsculptured and iridescent. However, the genus is defined by the presence of a parasutural stria on each elytron. So far 59 species have been recognised as valid, ranging in Asia from Pakistan and Sri Lanka to Japan, and southeastward to Australia and Micronesia. A few species are known to occur in the Mascarene and Seychelle Islands and in tropical Africa. Twelve species have been found in the Nepalese collections, one of which is described as new below.

KEY TO HIMALAYAN SPECIES OF *Scaphobaeocera* (including species from Meghalaya)

- 1 Elytron ochreous with two dark fasciae species indet. c
- Colour pattern of elytron different 2
- 2 Antennomeres VII and IX conspicuously large, each 4x as long as segments VI or VIII *zdenae* sp.n.
- Antennomeres VII and IX shorter 3
- 3 Antennomere XI as long as, or shorter than X or IX *spinigera* Löbl
- Antennomere XI longer than segments X or IX 4
- 4 Antennomere XI about as long as segments X and IX combined 5
- Antennomere XI shorter than X and IX combined 6
- 5 Length 1.3 - 1.5 mm. Aedeagus with flagellum widening basally *stephensoni* Löbl
- Length 1.2 - 1.2 mm. Aedeagus with flagellum narrowed basally *dorsalis* Löbl
- 6 Upper portion of hypomerion delimited by longitudinal stria from lower portion 7
- Hypomerion without longitudinal stria 9
- 7 Meso- and metatibiae incurved *tibialis* Löbl

- Tibiae straight.....8
- 8 Aedeagus with parameres widening apically (lateral view).....*aberrans* Löbl
- Aedeagus with parameres narrowed apically (lateral view)*querceti* Löbl
- 9 Punctuation on lateral portion of metasternum fairly coarse, notably coarser than that on elytron.....species indet. a
- Lateral portion of metasternum about as finely punctate as elytron.....10
- 10 Antennal segment VIII very small, no more than half as long as segment VII.....11
- Antennal segment VIII longer than half of segment VII.....12
- 11 Pits margining mesocoxal area large, elongate, extended laterad *discreta* Löbl
- Pits margining mesocoxal area small, not elongate, not extended laterad species indet. b
- 12 Metasternum and 1st ventrite lacking microsculpture13
- Metasternum and 1st ventrite microsculptured14
- 13 Length 0.95 - 1.20 mm. Body pale, ochreous or reddish *nuda* Löbl
- Length 1.45 - 1.55 mm. Body dark reddish brown *fratercula* Löbl
- 14 Metasternum with median stria15
- Metasternum without median stria16
- 15 Aedeagus with flagellum forming 3 or 4 complete circles *difficilis* Löbl
- Aedeagus with flagellum forming 6 complete circles *spira* Löbl
- 16 Basal bulb of aedeagus extended apically beyond level of parameral base, with oblique, abruptly delimited apical wall (lateral view) *nobilis* Löbl
- Aedeagus different17
- 17 Median lobe of aedeagus with ventral plate protruding apically above base of parameres *lamellifera* Löbl
- Median lobe of aedeagus lacking ventral plate18
- 18 Ventral process of aedeagus large, strongly protruding apically *tenella* Löbl
- Ventral process of median lobe small not protruding apically19
- 19 Internal sac of aedeagus with flagellum joined to additional basal sclerite *timida* Löbl
- Internal sac of aedeagus lacking additional sclerite20
- 20 Flagellum of aedeagus with basal hook *cognata* Löbl
- Flagellum of aedeagus lacking basal hook21
- 21 Flagellum of aedeagus spiral *mussardi* Löbl
- Flagellum of aedeagus sinuate, not forming complete circles *minuta* (Achard)

NEW RECORDS

Scaphobaeocera nuda Löbl

Material examined, 5 specimens: Nepal, Kaski distr., near Pokhara lake, 20.IX.1979 (Franz) (Coll. H. Franz) 1; Patan distr., Godawari, 1600 m, 31.III.1984 (Löbl) (MHNG) 1; Dhanding distr., Thorpu to Kordung, 1300-1400 m, 24.VI.1983 (Martens & Schawaller) (SMNS, MHNG) 3.

Distribution. India, Nepal, Thailand.

Scaphobaeocera minuta (Achard)

Material examined, 4 specimens: Nepal, Sankhua Sabha, Chichila, 2200 m, 4.IV.1984 (Löbl & Smetana) (MHNG) 2; forest S Mangsingma, 2200 m, 11-13.IV.1984 (Löbl & Smetana) (MHNG) 2.

Distribution. North India, Nepal, Thailand.

***Scaphobaeocera dorsalis* Löbl**

Material examined, 1 specimen. Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 21.IV.1984 (Löbl & Smetana) (MHNG).

Distribution. North India, Nepal, Thailand, Thaiwan.

***Scaphobaeocera stephensoni* Löbl**

Material examined, 13 specimens: Nepal, Kathmandu distr., Gokarna forest, 1400 m, 1.IV.1981 (Löbl & Smetana) (MHNG) 2; Sankhua Sabha distr., forest NE Kuwapani, 2500 m, 28.III.1982 (A. & Z. Smetana) (MHNG) 2 and 2250 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 1; Chichila, 2200 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 1; bottom Arun Valley below Num, 1050 m, 21.IV.1984 (Löbl & Smetana) (MHNG) 2; forest S Mangsingma, 2200 m, 11.IV.1984 (Löbl & Smetana) 2; Taplejung distr., above Yamputhin, left bank of Kabeli Khola, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS) 1; Omje Kharka NW Yamputhin, 2300-2500 m, 1-6.V.1988 (Martens & Schawaller) (SMNS, MHNG) 2.

Distribution. North India (Himachal Pradesh), Nepal.

***Scaphobaeocera spinigera* Löbl**

Material examined, 27 specimens: Nepal, Sindhupalcok distr., Malemchi, 2800 m, 14. and 17.IV.1981 (Löbl & Smetana) (MHNG) 9; Kathmandu distr., Gokarna forest, 1400 m, 1.IV.1981 (Löbl & Smetana) (MHNG) 1; Sankhua Sabha distr., Arun River at Num, 1500-1600 m, 10.IV.1982 (A. & Z. Smetana) (MHNG) 1; ridge S Mangsingma, 2800 m, 8.IV.1984 (Löbl & Smetana) (MHNG) 1; above Pahakhola, 2600-2800 m, 31.V.-3.VI.1988 (Martens & Schawaller) (SMNS) 1; Ilam distr., Mai Pokhari, 2100-2200 m, 9-10.IV.1988 (Martens & Schawaller) (SMNS) 1; Taplejung distr., SE Yamputhin to Yamputhin, 26. and 30.IV.1988 (Martens & Schawaller) (SMNS) 1; India, Himachal Pradesh, 4 km SW Solan, 1500 m, 8.X.1988 (Vit) (MHNG) 12.

Distribution. Pakistan, India, Nepal, Thailand.

***Scaphobaeocera tenella* Löbl**

Material examined, 3 specimens: Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 21-22.IV.1984 (Löbl & Smetana) (MHNG).

Distribution. India (Meghalaya), Nepal, Thailand.

***Scaphobaeocera cognata* Löbl**

Material examined, 8 specimens: Nepal, Kathmandu distr., Nagarjung, Jamacok, 1900-2100 m, 18.VIII.1983 (Martens & Schawaller) (MHNG) 1; Patan distr., Phulcoki, Godawari, 1700 m, 10.V.1981 (Löbl) 1; Sindhupalcok distr., Pokhare NE Barabhise, 2700 m, 7.V.1981 (Löbl & Smetana) 1; Taplejung distr., Yamputhin, 1800 m, 26.IV.-1.V.1988 (Martens & Schawaller) (SMNS) 2; above Yamputhin, left bank of Kabeli Khola, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (SMNS, MHNG) 3.

Distribution. North India (Garhwal and Meghalaya), Nepal.

***Scaphobaeocera spira* Löbl**

Material examined, 1 specimen: Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 22.IV.1988 (Löbl & Smetana) (MHNG).

Distribution. Nepal, Thailand.

***Scaphobaeocera mussardi* Löbl**

Material examined, 4 specimens: Nepal, Sankhua Sabha distr., forest S Mangsingma, 2200 m, 11.IV.1984 (Löbl & Smetana) (MHNG) 1; Chichila, 2200 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 1; forest NE Kuwapani, 2250 m, 24.IV.1984 (Löbl & Smetana) 1; Induwa Khola Valley, 2100 m, 17.IV.1984 (Löbl & Smetana) (MHNG) 1.

Distribution. Sri Lanka, India, Nepal, Bhutan.

***Scaphobaeocera difficilis* Löbl**

Material examined, 99 specimens: India, Himachal Pradesh, 10 km NW Solam, 1700 m, 7.X.1988 (Vit) (MHNG) 35; Baroq forest 4 km SW Solam, 1500 m, 8.X.1988 (Vit) (MHNG) 13; Kulu Valley, Naggar 1850 m, 16.X.1988 (Vit) (MHNG) 2; Dalhousie, Shubhash Baoli, 2080 m, 20.X.1988 (Vit) (MHNG) 1; Khajiar E Dalhousie, 1950 m, 21.X.1988 (Vit) (MHNG) 1; Mashabra forest NE Simla, 2100 m, 30.X.1988 (Vit)(MHNG) 1; Nepal, Parbat distr., Ghoropani Pass, 2850 m, 5.X.1983 (Löbl & Smetana) (MHNG) 1; Rasuwa distr., below Gosaikund, 2680 m, 21.X.78 (Cassagnau) (MHNG) 1; Kathmandu distr., Siwapuri Dara, 2400 m, 30.IV.1985 (Smetana) (MHNG) 1; Gokarna forest, 1400 m, 31.III.1981 (Löbl & Smetana) (MHNG) 1; Patan distr., Godawari, Phulcoki, 2000 m, 21.IV.1988 (Brachat) (MHNG) 2; Phulcoki, 2500-2700 m, IV. and V.1981 and 1984, X.1983 (Löbl & Smetana) (MHNG) 13; Sindhupalcok distr., Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 1; Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana) (MHNG) 1; Tarke Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana) (MHNG) 2; Malemchi, 2800 m, 14. and 17. IV. 1981 (Löbl & Smetana) (MHNG) 4; Pokhare NE Barabhise, 2700 m, 2.V.1981 (Löbl & Smetana) (MHNG) 1; Sankhua Sabha distr., Arun Valley, betw. Mure and Hurure, 2550-2150 m, 3-17.VI.1988 (Martens & Schawaller) (SHNS) 1; Chichila, 2200 m, 4.IV.1988 (Löbl & Smetana) (MHNG) 2; Chitre, 2200-2400 m, 28-29.V.1985 (Holzschuh) (NMB) 1; forest NE Kuwapani, 2450 m, 13.IV.1982 (A. & Z. Smetana) (MHNG) 4; forest S Mangsingma, 2250 m, 12.IV.1984 (Löbl & Smetana) (MHNG) 1; Induwa Khola Valley, 2000 m, 16-17.IV.1984 (Löbl & Smetana) (MHNG) 5; Panchtar distr., Paniporua, 2300 m, 18-20.IV.1988 (Martens & Schawaller) (SMNS) 1; Taplejung distr., Lassetham NW Yamputhin, 3300-3500 m, 6-9.V.1988 (Martens & Schawaller) (SMNS) 1; Ilam distr., Cilang Khola Valley, 11-13.IV.1988 (Martens & Schawaller) (SMNS) 1; Mai Pokhari, 2100-2200 m, 9-10.IV.1988 (Martens & Schawaller) (SMNS) 3.

Distribution. Pakistan, India, Nepal, Thailand.

***Scaphobaeocera timida* Löbl**

Material examined, 115 specimens: Nepal, Jumla distr., Dzunda Khola Valley near Talphi, 3000-3500 m, (Franz) (Coll. Franz) 1; Manang distr., forest W Bagarchap, 2200-2500 m, 22. and 24.IX.1983 (Löbl & Smetana) (MHNG) 22; Latha Manang W Bagarchap, 2350 m, 22.IX.1983 (Löbl & Smetana) (MHNG) 7; Mustang distr., 2 km N Kalopani, 2550 m, 1.X.1983 (Löbl &

Smetana) (MHNG) 1; Parbat distr., Ghoropani Pass, 2700-2850 m, 5-6.X.1983 (Löbl & Smetana) (MHNG) 35; Ridge E Ghoropani Pass, 3100 m, 7.X.1983 (Löbl & Smetana) (MHNG) 1; Ghoropani Pass, 3000 m, 19.IX.1971 (Franz) (Coll. H. Franz) 1; Mustang distr., Tukuiche, valley to Taksang, ca 3000 m, 23.IX.1971 (Franz) (Coll. Franz) 1; above Shika, Khali Gantaki Valley, 26.IX.1971 (Franz) (Coll. H. Franz) 1; Kaski distr., above Dhampus, 2100 m, 8-10.V.1980 (Martens & Ausonsky) (SMNS) 1; Kathmandu distr., Gokarna forest, 1400 m, 3.X.1971 (Franz) (Coll. H. Franz) 1; Patan distr., godawari, Phulcoki, 1700 m, 10.V.1981 (Löbl) (MHNG) 1; Phulcoki, 2300-2700 m, V.1981, X.1983, IV.1984 (Löbl & Smetana) (MHNG) 7; Phulcoki, 2600 m, 9.VIII.1970 (Franz) (Coll. H. Franz) 2; Sindhupalcok distr., Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana) (MHNG) 2; Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana) (MHNG) 2; Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana) (MHNG) 1; Shermathang, X.1980 (Franz) (Coll. H. Franz, MHNG) 6; Durum Valley near Barabhise, 2200-2300 m, 5.VIII.1970 (Franz) (Coll. H. Franz, MHNG) 2; above Barabhise, 2200-2300 m, 5.VIII.1970 (Franz) (Coll. H. Franz) 1; Sankhua Sabha distr., Chichila, 2200 m, 24.IV.1984 (Löbl & Smetana) (MHNG) 2; forest S Mangsingma, 2200 m, 11.IV.1984 (Löbl & Smetana) (MHNG) 1; above Pahakhola, 2600-2800 m, 31.V.-3.VI.1988 (Martens & Schawaller) (SMNS) 1; Arun Valley, betw. Mure and Hurure, 2050-2150 m, 17.VI.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. North India (Himachal Pradesh and Kumaon), Nepal, Bhutan.

Scaphobaeocera species indet. c

Material examined, 4 females: Nepal, Sankhua Sabha distr., Jaljale Himal, 2530 m, 21.XI.1978 (Casagnau) (MHNG) 1; Therhathum distr., Tinjura Dara, 2450-2850 m, 17.IX.1983 (Martens & Daams) (SMNS) 1; Dankuta distr., Dankuta, 18.IX.1978 (Bhakta) (NMB) 1; Chevri Bas, 18.IX.1978 (Bhakta) (MHNG) 1.

Remarks. This is possibly a new species. It resembles much *S. alticola*, especially in the colour pattern and in having elytron with somewhat shortened sutural striae. It may be distinguished by the relatively much shorter metasternum (with smallest interval between meso- and metacoxa not exceeding 0.10 mm). However, I am reluctant to name it in the absence of males.

NEW SPECIES

Scaphobaeocera zdenae sp.n.

Holotype, female: Nepal, Sankhua Sabha distr., forest NE Kuwapani, 2500 m, 28.III.1982 (A. & Z. Smetana) (MHNG).

Diagnosis. Medium-sized species. Antennomeres VII and IX very large, each 4x as long as segment VIII and 6x as long as wide. Hypomeron lacking longitudinal stria. Metasternum without median impression or stria.

Description. Length 1.65 mm, width 1.07 mm, dorso-ventral diameter 1.09 mm. Body, antennae and legs almost uniformly dark brown. Pronotum, elytra, and abdominal ventrites microsculptured and iridescent. Punctuation extremely fine on both, dorsal and ventral sides of body, setiferous punctures around smooth metasternal centre excepted. Relative length of antennomeres as follows: III 8, IV 14, V 16, VI 10, VII 40, VIII 10, IX 40 (segments X and XI missing in both antennae). Segments III to VI each gradually widening apically; III about 1.6x as long as wide; IV and V each 3x as long as wide; VI about 1.8x as long as wide; VII and IX each 6x as long as wide, parallel-sided; VIII about 2x as long as wide. Hypomeron with larger lower portion almost vertical, at an

angle with upper portion; longitudinal stria absent. Metasternum without median impression or stria, distinctly microsculptured laterally. Mesocoxal area 0.03 mm long, with fine marginal pits. Metepisternum flat, parallel-sided, 0.10 mm wide, with straight suture. Basal punctures of 1st ventrite small, not elongate. Tibiae I and II straight, III somewhat curved.

R e m a r k s . This species may be easily distinguished from all other members of the genus by the conspicuously large antennal segments VII and IX, each being 4x as long as segments VI or VIII.

Scaphoxium Löbl

Scaphoxium Löbl, 1979; type species: *Toxidium madurensis* Pic, 1920, by original designation.

Scaphoxium may be readily separated from other scaphidiids possessing strongly approximate meso- and metacoxae by the peculiar shape of the basally lobed or extended hypomeron. It may also be distinguished by the curved elongate antennomere III. All *Scaphoxium* have bodies strongly convex dorsally and ventrally, elytra finely punctate with shortened sutural striae and parameres of aedeagus abruptly narrowed subapically.

The genus includes 25 species ranging from India and Sri Lanka to Japan, Australia and Melanesia. Several additional Asian and Afrotropical unidentified species are represented in the collection of the MHNG.

KEY TO THE ASIAN SPECIES OF *Scaphoxium*

- 1 Elytron dark, with two pale transverse fasciae 2
- Elytron uniformly coloured 3
- 2 Length 1.6 - 1.9 mm. Metasternum not impressed at middle *zebra* (Löbl)
- Length 1.25 - 1.40 mm. Metasternum impressed at middle *oblitum* (Löbl)
- 3 Large species 2.15 mm long *grande* Löbl
- Smaller species, length not exceeding 1.9 mm 4
- 4 Lateral portion of metasternum with relatively coarse punctures
..... *gibbosum* (Champion)
- Lateral portion of metasternum very finely punctate 5
- 5 Internal sac of aedeagus membranous *singlanum* Löbl
- Internal sac of aedeagus bearing sclerites 6
- 6 Metasternum flat or convex at middle 7
- Metasternum impressed at middle 13
- 7 Each paramere of aedeagus with large subapical lobe 8
- Parameres of aedeagus different 10
- 8 Antennomere III as long as IV, segment V as long as VI. Internal sac of aedeagus bearing 5 short sclerites *avidum* Löbl
- Antennomere III longer than IV, segment V longer than VI. Internal sac of aedeagus with a pair of long sclerites 9
- 9 Parameres of aedeagus gradually tapering beyond subapical lobe. Sclerites of internal sac unicular *taiwanum* Löbl
- Parameres of aedeagus abruptly narrowed beyond subapical lobe. Sclerites of internal sac not unicular *topali* Löbl
- 10 Internal sac with apical portion of sclerites unicular *madurensis* (Pic)

- Scerites of internal sac not unclur11
- 11 Parameres of aedeagus each bearing minute subapical denticle-like apophysis
..... *japonicum* Löbl
- Parameres of aedeagus different 12
- 12 Length 1.5 mm. Antennomere V longer than III *taylori* Löbl
- Length 1.2 mm. Antennomere V as long as III *assamense* Löbl
- 13 Mesosternum with median keel partly dividing median impression *sparsum* Löbl
- Mesosternum lacking median keel 14
- 14 Parameres of aedeagus with wide, rounded subapical lobe *keralense* Löbl
- Parameres of aedeagus with narrow, pointed subapical lobe 15
- 15 Parameres of aedeagus widened or subparallel beyond level of subapical apophysis,
narrowed near apex *eximium* Löbl
- Parameres of aedeagus tapering from level of subapical apophysis 16
- 16 Subapical lobe of parameres minute *reductum* Löbl
- Subapical lobe of parameres long, longer than width of paramere at same level 17
- 17 Antennomere III as long as IV. Internal sac of aedeagus without a pair of elongate
basal sclerites *simulans* (Löbl)
- Antennomere III longer than IV. Internal sac of aedeagus with a pair of long basal
sclerites *intermedium* Löbl

NEW RECORDS

Scaphoxium eximium Löbl

Material examined, 4 specimens: India, Himachal Pradesh, 10 km NW Sarahan, 1700 m, 7.X.1988 (Vit) (MHNG).

Distribution. North India: Himachal Pradesh, Kumaon.

Remarks. The armature of the not extruded internal sac of the aedeagus is as in Fig. 167.

Scaphoxium taiwanum Löbl

Material examined, 1 specimen: Nepal, Sankhua Sabha distr., Induwa Khola Valley, 2000 m, 18.IV.1984 (Löbl & Smetana) (MHNG).

Distribution. India, Nepal, Thailand, Taiwan.

Scaphoxium sparsum Löbl

Material examined, 25 specimens: Kaski distr., Tandarokot, trail Pokhara to Ghoropani, ca 1000 m, 18.IX.1971 (Franz) (Coll. H. Franz, MHNG) 6; hill near Pinta, Kaste Lake, 20.IX.1978 (Franz) (Coll. H. Franz) 2; Kathmandu distr., Rani Ban SE Sanogau, 1500-1600 m, 25.IV.1988 (Brachat) (MHNG) 1; Patan distr., Godawari, 1600 m, 31.III.1984 (Löbl) (MHNG) 1; Phulcoki near Dalikhel, ca 1900 m, 21.IX.1977 (Franz) (Coll. H. Franz, MHNG) 2; Sankhua Sabha distr., bottom Arun Valley below Num, 1050-1100 m, 20-21.IV.1984 (Löbl & Smetana) (MHNG) 9; Arun River at Num, 1500-1600 m, 10.IV.1982 (A. & Z. Smetana) (MHNG) 2; Khandbari, 1700 m, 23.III.1982 (A. & Z. Smetana) (MHNG) 1; Induwa Khola Valley, 2000 m, 18.IV.1984 (Löbl & Smetana) (MHNG) 1.

Distribution. India, Nepal, Thailand.

Scaphicoma Motschulsky

Scaphicoma Motschulsky, 1863; type species: *Scaphicoma flavovittata* Motschulsky, 1863, by monotypy.

Lepteroscapa Achard, 1921; type species not designated.

Members of this genus differ by conspicuously long tarsi and antennae in comparison with all other scaphidiids with similarly strongly approximate meso- and metacoxae. The mouthparts in *Scaphicoma* (Figs 177, 187, 188) are very similar to those in *Toxidium*.

The genus occurs in tropical Africa and in Asia. Twelve species have been recognised, one of which is encountered in the Himalayan region.

NEW RECORD

Scaphicoma arcuatum (Champion)

Material examined, 4 specimens: Nepal, Sankhua Sabha distr., bottom Arun Valley below Num, 1050 m, 22.IV.1984 (Löbl & Smetana) (MHNG) 3; Taplejung distr., Yamputhin, 1800 m, 26.IV. - 1.V.1988 (Martens & Schawaller) (SMNS) 1.

Distribution. India: Kumaon, Darjeeling district and Assam, Nepal, Burma, Thailand.

Remarks. It is difficult to distinguish the members of this genus by their aedeagal characters. However, minor distinguishing characters may be found in the shape of the parameres and in the structure of the internal sac. The aedeagus of *S. arcuatum* is as in Fig. 173.

Toxidium LeConte

Toxidium LeConte, 1860; type species: *Toxidium gammaroides* LeConte, 1860, by monotypy.

Most of the strongly ventrally vaulted scaphidiids with approximate meso- and metacoxae and with large lateral portions of metasternum were previously assigned to *Toxidium*. When revising collections, I have transferred many of these species to *Scaphobaeocera*, *Baeotoxidium*, *Scaphoxium* and *Scaphicoma*. In the Asian and Australian faunas, only two species groups remain to date in *Toxidium*: the *aberrans*, and the *montanum* groups. The latter, for which a new genus is erected below, consists of three described and one new species.

The species of the *aberrans* group share most of the diagnostic characters with *T. gammaroides* and its New World allies: labrum with marginal row of short thick setae; mandible bidentate apically, with comb-hairs, very fine prosthecal hairs and bunch of premolar hairs (Fig.178); maxillary lacinia slender, setose apically; penultimate segment of maxillary palpus subcylindrical, apical segment tapering, at base almost as thick as preceding segment at apex (Fig. 185); labial palpus (Fig. 190) with segment II about as long as wide, and as wide as I, segment III curved, gradually narrowed apically; eye notched at or above level of its mid-length, antennal insertion fairly distant from clypeal

suture; antennomere III slender, straight, similar to the following segments; pronotum with basal angles obtuse and not extended, not reaching level of anapleural suture; pair of internal pronotal cavities (or pockets) absent; hypomeron weakly inflexed, not explanate apically; elytral parasutural stria absent, sutural stria usually shortened; prosternal keel sharply raised; mesosternal median keel obsolete or very low, pleural ridge of first ventrite distinct.

All species except *T. vagans* differ from the New World species of *Toxidium* by the relatively less approximate meso- and metacoxae. All Asian species, including several undescribed species represented in the collection of MHNG, may be also distinguished from the New World members of *Toxidium* by the ventrally less vaulted body. In addition, these species, *T. incompletum* and an unidentified species from Thailand excepted, share the unusual character combination of elytron, i. e. shortened sutural and distinct basal striae. In *Toxidium*, the mesepimeral ridge is usually absent, but it is present in *T. indicum*.

The rare monotypic *Scaphischema* from the western Mediterranean area shares almost all the diagnostic characters of *Toxidium*. It is particularly similar to the species of *T. aberrans* group.

KEY TO THE ASIAN SPECIES OF *Toxidium*
(only named species)

- 1 Most of elytron bright reddish, surface along sutural stria and apical fifth of elytron blackish *spectabile* sp. n.
- Elytron and pronotum unicolorous, or elytron with small pale transverse fascia 2
- 2 Metasternum short, mesocoxal area about as long as shortest interval between its margin and metacoxa *vagans* Löbl
- Metasternum long, mesocoxal area much shorter than shortest interval between its margin and metacoxa 3
- 3 Elytron with basal stria 4
- Basal stria of elytron absent *incompletum* Löbl
- 4 Lateral portion of metasternum with fairly coarse punctures. Mesepimeral ridge distinct *indicum* Achard
- Entire metasternum very finely punctate. Mesepimeral ridge absent 5
- 5 Pronotal punctation coarse, distinct at magnification 12x *aberrans* Achard
- Pronotal punctation very fine, hardly visible at magnification 25x 6
- 6 Elytron with fairly long sutural stria starting beyond basal 1/8 of sutural length 7
- Elytron with very short sutural stria, visible only near elytral apex 8
- 7 Elytral punctation entirely coarse *curtilineatum* Champion
- Elytron finely punctate apically *stylicherum* Löbl
- 8 Elytron with basal stria obsolete laterally; elytral punctation almost obsolete basally *pubistylis* Löbl
- Elytron with basal stria joined to lateral stria; elytral punctation distinct at base 9
- 9 Mesocoxal area about as long as half of interval between its margin and margin of metacoxa *diffidens* Löbl
- Mesocoxal area distinctly shorter than half of interval between its margin and metacoxa *robustum* Pic

NEW RECORDS

Toxidium curtilineatum Champion

Material examined, 7 specimens: Nepal, Lamjung distr., Marsyandi, 1100-1250 m, Senghe-Jagat, 11.IV.1980 (Martens & Schawaller) (SMNS) 1; Kathmandu distr., Gokarna forest,

31.III - 1.IV. 1981 and 20.X.1983 (Löbl & Smetana) (MHNG) 4; Sankhua Sabha distr., Mure-Num, 1900-1500 m, 25.V.1980 (Wittmer) (NMB) 1; Chichila-Mure, 1900 m, 24.V.1980 (Wittmer) (MHNG) 1.

Distribution. North India (Garhwal, Kumaon and Meghalaya), Nepal.

Remarks. Some of the Nepalese specimens have a narrow pale transverse fascia on apical half of elytron. The aedeagi of these specimens (Figs 168, 189) are not different from those of the uniformly coloured specimens. No additional distinguishing feature has been found to separate both forms.

NEW SPECIES

Toxidium spectabile sp. n.

Holotype, female: Nepal, Taplejung distr., above Yamputhin, left bank of Kabeli Khola, open forest, 1800-2000 m, 27-29.IV.1988 (Martens & Schawaller) (MHNG).

Diagnosis. Elytron with distinct colour pattern, basal stria present in centre of basal margin only, sutural stria obsolete except in apical tenth of sutural length. Metasternum long.

Description. Length 2.7 mm, width 1.6 mm. Head black. Pronotum reddish-brown, distinctly darkened at apical margin, somewhat darkened in middle. Elytron bright reddish, reddish-brown near base, blackish along sutural stria and on entire apical fifth. Mesepisternum, metepisternum and lateral portion of metasternum blackish, prosternum, mesosternum and centre of metasternum, ventrites I to IV and legs reddish-brown, apical abdominal segments and antennae ochreous or yellowish. Relative length of antennomeres as follows: III 25, IV 32, V 38, VI 33, VII 34, VIII 25, IX 33, X 33, XI 38; segment VII almost 3.5x as long as wide; VIII and XI each about 3x as long as wide. Pronotal punctation sparse and very fine, visible at magnification 25x. Exposed portion of scutellum fairly large. Elytron with basal stria visible along middle portion of basal margin, obsolete near pronotal lobe and near lateral margin; sutural stria strongly reduced, distinct in apical tenth of sutural length; discal punctation irregular, much coarser than that of pronotum, most punctures smaller than intervals, punctures near sutural stria arranged in 1 or 2 dense rows. Pygidium extremely finely punctate. Entire ventral side of thorax very finely and sparsely punctate. Metasternal centre flat, lacking impression. Mesocoxal area 0.12 mm long, about as long as half of shortest interval between its margin and metacoxa; marginal pits rather coarse. Metepisternum flat, with straight, deep, punctate suture. Abdominal microsculpture consisting of punctures. Tibia I and III straight, II somewhat curved.

Remarks. This species may be readily recognised by its colour pattern. The only other Asian *Toxidium* which has a well delimited reddish pattern on elytron known to me is an undescribed species from Malaysia. However, it differs conspicuously by much smaller size of the body and by the colour pattern forming a semicircular band.

Xotidium gen. n.

Type species: *Xotidium uniforme* sp.n.

Gender: neuter.

Etymology: anagram of *Toxidium*.

Diagnosis. In general shape similar to *Toxidium*. Antennal insertion distant from clypeal suture. Mandible multidentate apically. Basal pronotal angles not extended: Elytron with entire basal stria. Metacoxae approximate. Median lobe of aedeagus subcylindrical.

Description. Body narrow, similar to that of *Toxidium*. Pronotum and elytron not iridescent. Head hypognathous. Eye weakly notched. Antennal insertion about as distant from clypeal suture as from posterior margin of eye. Antenna long, segment III slender, straight, similar to following segments. Mandible multidentate apically, with two comb-hairs, simple protheca, robust premolar hairs (Fig. 179). Maxillary lacinia very slender, with few lateral hairs, apical hairs absent; galea with marginal rows of robust spine-like hairs (Fig. 186). Segment III of maxillary palpus not thickened, segment IV at base almost as thick as III. Labial palpus 2-segmented, with basal segment subcylindrical, apical segment very slender (Fig. 189). Prothorax with internal setose cavities. Basal angles of pronotum obtuse, not prolonged, not reaching level of anapleural suture. Hypomeron inflexed, not explanate basally. Elytron with entire basal stria joined with lateral and sutural striae; parasutural stria absent. Prosternal keel raised, triangular in lateral view. Mesosternal intercoxal process covering anterior margin of metasternal process. Median mesosternal keel absent. Meseplimeral ridge obsolete. Meso- and metacoxae strongly approximate, median portion of metasternum narrow. First ventrite without pleural stria or ridge. Legs long, meso- and metatibiae with single long apical spur, meso- and metatarsi almost as long as tibiae. Aedeagus with subcylindrical median lobe lacking well delimited apical portion, widened at tip. Parameres with slender basal and wider apical portion.

Remarks. The morphological features of this group of species puzzled me for many years. The discovery of an additional Himalayan species made me to reexamine their diagnostic characters. As a result, a new genus is erected. In addition to the type species, the new genus includes *Toxidium montanum* Löbl and *T. pygmaeum* Löbl from Sri Lanka, and *T. notatum* Löbl from Australia (new combinations).

To date, I have revised only some of the Afrotropical taxa assigned originally to *Toxidium*: all belong to *Scaphobaeocera*, *Scaphoxium* or to an undescribed genus. Hence, the occurrence of *Toxidium* in Africa has yet to be confirmed.

Xotidium may be readily separated from *Toxidium* and from most species assigned to genera with both, approximate coxae and reduced pubescent of body, by the entire elytral basal stria. Besides *Baeotoxidium siamense*, only *Scaphischema* and most of the members of the *Toxidium aberrans* group exhibit basal stria of elytron, which is usually not joined to the shortened sutural stria (except for that in one undescribed species housed in MHNG). It is probable that this condition is likely apomorphic, while the obtuse, unextended basal angles of the pronotum (shared with *Scaphicoma*, *Toxidium* and *Scaphoxium*) is obviously a plesiomorphic character state. However, both provide useful dichotomous characters. A synapomorphy of *Xotidium*, *Toxidium* and *Scaphicoma* is the position of the antennal insertion; the long tarsi are shared with *Scaphicoma*, but the shallow eye notch and the presence of the internal prothoracal cavities distinguish the new genus from the others. The mouthparts of *Xotidium* are unique: the mandible has several apical teeth and bears a premolar group of robust hairs, in combination with the presence of comb-hairs, the maxillary lacinia lacks apical hairs, and the labial palpus is two-segmented, with subcylindrical basal segment and conspicuously thin apical segment.

Scaphoxium may be easily separated from *Xotidium* by the curved 3rd antennal segment, the basally explanate hypomeron, and by the thickened penultimate segment of the maxillary palpus which is much wider at apex than the base of the apical segment. The latter state is found also in *Scaphobaeocera* and *Baeotoxidium* (Figs 182, 183). *Scaphobaeocera* has the elytron almost always microsculptured and iridescent, and exhibits a parasutural stria. Like *Baeotoxidium*, it also differs from *Xotidium* by the long,

distinct mesepimeral ridge and by the sutural stria of the elytron not extended along the elytral base. An autapomorphy of *Baeotoxidium* is the very slender maxillary galea (Fig. 182).

KEY TO THE SPECIES OF *Xotidium*

- 1 Body uniformly brown or reddish-brown 2
 – Body with distinct colour pattern 3
 2 Length 1.10 - 1.25mm. Aedeagus with sinuate, evenly wide flagellum
 *pygmaeum* (Löbl)
 – Length 1.55 - 1.65mm. Aedeagus with U-shaped, basally thickened flagellum.....
 *uniforme* sp. n.
 3 Elytron dark with pale transverse fascia in basal half and with pale apical portion.
 Pronotum uniformly dark *montanum* (Löbl)
 – Elytron pale, darkened along basal and apical margins, and usually also along sutural
 margin. Pronotum pale, usually with dark transverse fascia *notatum* (Löbl)

Xotidium uniforme sp. n.

Holotype, male: Nepal, Sankhua Sabha distr., Induwa Khola Valley, 2100 m, 17.IV.1984 (Löbl & Smetana) (MHNG).

Paratypes, 16: Nepal, Sankhua Sabha distr., Arun Valley, Chichila, 1900-2000 m, bushes near village, 18-20.VI.1988 (Martens & Schawaller) (SMNS, MHNG) 4 males, 5 females; Taplejung distr., SE Yamputhin to Yamputhin, 2000-1650 m, forest mainly *Alnus*, 26. and 30.IV.1988 (Martens & Schawaller) (SMNS) 1 female; ?Dolakha distr., Jiri - Thorung, 28.V.1976 (Wittmer & Baroni Urbani) (NMB) 1 male; Patan distr., Phulcoki (Franz) (Coll. H. Franz) 1 female; Godawari, 6000 ft. 7-13.VIII.1967 (Canadian Nepal Exp.) (CNC) 1 male; India, Uttar Pradesh, Kumaon, Rangarh, ca 2000 m, 9.X.1979 (Löbl) (MHNG) 1 female; Himachal Pradesh, 10 km NW Sarahan, 1700 m, 7.X.1988 (Vit) (MHNG) 2 males.

D i a g n o s i s . Body relatively large, uniformly brown or dark reddish-brown. Abdomen with microsculpture consisting of punctures. Flagellum of aedeagus U-shaped, thickened at base.

D e s c r i p t i o n . Length 1.55 - 1.65 mm, width 0.92 - 1.07 mm. Body uniformly brown or dark reddish-brown. Apical abdominal segments, legs and antennae paler. Relative length of antennomeres as follows: II 23, III 16, IV 19, V 21, VI 21, VII 25, VIII 22, IX 27, X 25, XI 28 (holotype). Punctuation very fine, that of pronotum, elytron and ventral side of thorax hardly visible at 50x magnification. Sutural area flat. Metasternum lacking median impression. Mesocoxal area 0.05-0.07 mm long, with distinct marginal pits. Metepisternum evenly wide, with straight or somewhat sinuate suture. Abdominal microsculpture consisting of extremely fine punctures. Male protarsus hardly widened. Aedeagus (Figs 170 to 172) 0.67 - 0.80 mm long. Widened apical portion of parameres long. Flagellum of internal sac U-shaped, very thin, thickened basally.

R e m a r k s . This species may be readily distinguished by the characters used in the key.

Bironium Csiki

Bironium Csiki 1909; type species: *Bironium longipes* Csiki, 1909, by monotypy (*longipes* Csiki is secondary junior homonym of *longipes* Reitter, 1880; it is replaced by the junior subjective synonym *Heteroscapha basicolle* Pic, 1956).

Heteroscapha Achard, 1914; type species: *Heteroscapha feai* Achard, 1914, by monotypy.

Scutotoxidium Pic, 1915; type species: *Scutotoxidium nigrolineatum* Pic, 1915.

Arachnoscaphula Heller, 1917; type species: *Arachnoscaphula trisulcata* Heller, 1917.

This genus is well characterized by the combination of the following characters: antennae, femora and tibiae conspicuously long; antennal insertion situated near upper eye margin; hypomeron vertical; basal pronotal angle rounded, at level of centre of mesepisternum; meso- and metacoxae distant.

Most of the 25 recognised species exhibit conspicuous elytral and metasternal punctation, and all of them have elytron with entire basal stria.

The range of the genus covers south east Asia and New Guinea. The sole record for the Himalayan region is that of a female specimen of *Heteroscapha distinctum* Achard (CHAMPION 1927: 272) from "Gopalhara, Darjeeling". *Bironium distinctum* is known from Burma and Thailand, and may occur in India. It belongs to a group of which members may be reliably identified only by the male sexual characters. Thus, Champion's record has to be confirmed. An additional, undescribed species has been found in Eastern Nepal.

Bironium nepalense sp. n.

Holotype, male: Nepal, Sankhua Sabha distr., Arun Valley, Chichila, 2200 m, 24.IV.1984 (Löbl & Smetana) (MNHG).

Paratypes, 2 females: as holotype (MHNG) 1; Chichila, 1900-2000 m, bushes near village (Martens & Schawaller) (SMNS) 1.

D i a g n o s i s . Medium-sized species, elytron maculate, vaulted between two discal rows of coarse punctures. Lateral portion of metasternum coarsely punctate. First ventrite with medio-basal protuberance; tibiae striate. Tip of aedeagus inflexed, parameres slender.

D e s c r i p t i o n . Length 2.6 - 2.7 mm, width 1.7 - 1.8 mm. Head and pronotum dark reddish-brown, most of pronotal disc darker than head. Elytron blackish-brown or black near base, along sutural stria, at middle, and near apical margin; with oblique reddish fascia on anterior half and with large ochreous spot covering most of apical half. Hypomeron, prosternum and mesosternum reddish, remaining ventral surface of thorax blackish. Basal abdominal ventrites very dark reddish brown to blackish, apical segments paler. Antennae and legs reddish or ochreous. Relative length of antennomeres as follows: II 26, III 44, IV 58, V 50, VI 62, VII 64, VIII 68, IX 58, X 50, XI 52 (holotype). Pronotum uniformly, very finely punctate, not microsculptured. Exposed portion of scutellum fairly large. Elytron with deep, coarsely punctate sutural stria; sutural area raised; humeral protuberance absent, most of discal surface impunctate or extremely finely punctate; irregular coarse punctation situated near base and on anterior half of lateral portion; two regular long discal rows of coarse punctures lying in depressions separated by vaulted interval, additional short row of coarse punctures situated between sutural stria and inner long row. Propygidium and pygidium with microsculpture consisting of punctures. Hypomeron glabrous, without microsculpture. Mesepisternum extremely finely punctate. Mesosternum convex, lacking median ridge, with a pair of large apical punctures, elsewhere extremely finely punctate, not striate. Center of metasternum impressed.

Median metasternal portion with dense transverse row of fairly coarse punctures and two irregular longitudinal rows of similarly coarse punctures. Lateral portion of metasternum very coarsely punctate. Mesepisternal suture deep, coarsely punctate. Ventrites with microsculpture consisting of punctures. Abdominal punctation extremely fine, first ventrite with conspicuous medio-basal protuberance; basal pits coarse, inner larger than outer ones. Tibiae striate, almost straight. In male ventrites without appreciable male sexual characters. Segments 1 to 3 of protarsus distinctly widened, segment 1 somewhat narrower than apex of tibia, following two gradually narrower. Aedeagus (Figs 174 to 176) 0.81 mm long. Median lobe with long, gradually narrowed apical portion; tip inflexed. Parameres almost straight, narrowed subapically, then weakly widened.

This species may be readily distinguished from other members of the genus by its colour pattern in combination with the elytral punctation. It resembles *B. distinctum* and its allies in many characters but differs drastically in having striate tibiae, a large medio-basal protuberance on 1st ventrite, long and inflexed apical portion of median lobe and slender parameres.

Mystrix Champion

Mystrix Champion, 1927; type species *Mystrix termitophilum* Champion, 1927, by monotypy.

Mystrix includes two species, *M. termitophilum* known only from the "Haldwani Division of Kumaon" and *M. kistneri* Löbl from Sumatra. *M. termitophilum* is the sole member of the termitophilous "Baeoceritae" (ACHARD 1924a), in the Indian sub-continent.

The genus may be easily distinguished from other Himalayan scaphidiid genera by the conspicuously pubescent body and flattened femora, and by the combination of the entire eye, the extremely small antennomeres III and IV, the ventrally strongly vaulted body, and the distinct metacoxal lines.

A new record of *M. termitophilum* is a specimen from Nepal, Parsa distr., Birganj Lothar, 450 ft., 13-19.IX.1967, malaise trap (Canadian Nepal Exp.) (CNC).

BIOGEOGRAPHY

The very diverse Himalayan flora has been characterized in SCHWEINFURTH (1957), and analysed in STAINTON (1972). It belongs, according to MEUSEL & al. (1965) and MEUSEL & SCHUBERT (1971), to the Sino-Japanese phytogeographic realm. DOBREMETZ (1972) found the Himalayan flora distinct from that of the latter, as well as from that of the Indian and Central Asian realms. TROLL (1967) distinguishes five main divisions, viz. the Assam-, Sikkim-, Garhwal-, Punjab-, and Indus-Himalaya. DOBREMETZ (1972) recognised three phytogeographic subregions, the East Himalayan ("Assam Himalaya" i.e., actual Arunachal Pradesh, and most of Bhutan), the West Himalaya including Kashmir and a part of Hindu Kush, and the Central Himalaya which is a transitional area including Garhwal, Kumaon, Nepal, Sikkim, and parts of Bhutan. Four areas are distinguished within Nepal (DOBREMETZ 1972, MARTENS 1979): the relatively narrow Eastern Nepal (between Sikkim and Arun Valley, with moist monsoon climate and absence of xerophilic vegetation), Central Nepal (between Arun Valley and Daulagiri, with less moist monsoon climate in which hygrophilic, mesophilic and xerophilic vegetation co-exist, possibly best characterized by the oak forests (*Quercus semecarpifolia*, *Q. lanuginosa*)), Western Nepal (with dryer seasonal climate and mesophilic and xerophilic vegetation (with *Quercus incana*, *Cedrus deodara*, *Abies pindrow*, *Olea*

cuspidata)), and North-Central Nepal (in rain shadow, north of Daulagiri, Annapurna, Manaslu, etc., with highland steppe vegetation).

The high biodiversity of the Himalaya may be explained by both historical and ecological factors. It is a transitional zone inhabited by taxa of southern (Indian), eastern (Chinese, Burmese) and western (Mediterranean, Central Asian) origin (MANI 1974, MARTENS 1979). An other conspicuous pattern of the Himalaya is the altitudinal range of the vegetation reaching over 6000 m, forming 10 (DOBREMETS 1972) or 11 (MARTENS 1979) zones. The taxa of presumably southern and eastern origin become gradually less frequent westward and are confined to lower altitudes.

The available data on Agathidiini (Leiodidae) and on Scaphidiidae are possibly significant for Himalayan fungivorous beetles. The Agathidiini are a predominantly Holarctic group with more than 400 recognised species. Only a smaller portion of them extends to the tropics or subtropics of south and southeastern Asia (Angelini, pers. commun.). The myxomycetophagous *Agathidium* species are extremely diverse in the Himalaya where about 110 species have been encountered (LAWRENCE 1989). Most of them appear to be endemic in some parts of the Himalaya, including its western portion and the Hindu Kush - Kohistan ranges.

The Scaphidiidae, with roughly 1300 known species, feed on Myxomycetes and on a variety of other fungi. They are most speciose in areas with moist, warm climate, and poorly represented in areas with temperate or dry climate. Nevertheless, like the Agathidiini they are remarkably diverse in the Himalaya. The examined collections include 206 identified scaphidiid species in 18 genera (including those from Meghalaya), and several additional species which have not been identified. However, their distributional pattern is different from that of the Agathidiini. No endemic species occurs in the Hindu Kush - Kohistan ranges, nor in Karakorum and in Kashmir, although 16 species were collected there. Two of them, *Scaphium quadraticolle* Solsky and *Scaphisoma assimile curvistria* Reitter, also occur north and northwest of Hindu Kush and Karakorum. All others species were found further eastward, most of them east of the Sutlej river, and their origin is presumably southern or eastern.

The number of the species (only the identified ones taken in account), and of the apparently endemic species per area increases from west to east: 35 species with 2 (5.7%) endemics in Himachal Pradesh, 58 species with 6 (10.3%) endemics in Garhwal and Kumaon, 129 species with 38 (29.5%) endemics in Nepal. In the Darjeeling district in West Bengal, including the unrepresentative data from Sikkim and Bhutan, 80 species with 18 (22.5%) endemics have been found.

It is hazardous to compare these numbers with those obtained from collections made in 4 days of field work in the Manas National Park in Assam (25 species, with 6, e.g., 24% endemics) or in 11 days of field work in the Khasi and Garo Hills in Meghalaya (where 61 species, with 19, e.g., 31.1% endemic were found, see LÖBL 1984; 1986a). The data from Meghalaya and from the Manas National Park are almost exclusively based on material collected by C. Besuchet and the present author on a single trip (see Löbl 1986a) while those from Nepal, Uttar Pradesh and Himachal Pradesh are from the field work of several entomologists in different seasons and during longer periods. Thus, the distributional ranges of the taxa and their endemism as quoted in this paper do rather reflect the effort in field work invested for a particular area than a biological reality.

Nevertheless, the data suggest a surprisingly high diversity of the Meghalayan fauna and indicate the following distributional pattern.

As in many other groups (i.e., Collembola: Neanuridae, CASSAGNAU 1981; Staphylinidae: Quediini, SMETANA 1988), the diversity of scaphidiids in general decreases from the east to the west.

According to MANI (1968), nearly 60% of the high altitude beetle species are endemic to the Himalaya and 96% of them are Palaearctic forms. This is certainly not true for the scaphidiids: none of the Nepalese species may be derived from the West Palaearctic stock, and only few (e.g., *Scaphidium biundulatum*, *S. nepalense*, *S. gurung*, *Scaphisoma* species assigned to the *subalpinum* group) are probable derivatives of the temperate Sino-Japanese fauna.

Scaphidiids exhibit high dispersal ability. From the 47 species recorded in South India, 20 (42.6%) occur in the Himalaya, and from the 61 species found to date in Meghalaya 41 (67.2%) occur also in the Himalaya. Actually, 206 species have been identified from the Himalaya and Meghalaya, 55 of these species (26.7%) extend their distributional range eastward beyond political border of India and/or to south India, and 16 species (7.8%) west- and/or southwestward.

Collections made in Phulcoki indicate a higher species diversity in the Mahabharat range than in the Inner Himalaya, at approximately the same meridian, and at altitudes ranging from 1600 to 2600 m. Most of the 38 species of scaphidiids inhabiting Phulcoki were found in oak forest, at 2000 to 2600 m altitude. The rate of the endemic scaphidiid species of Phulcoki (*Scaphisoma baloo* only) is very low in comparison with collections from the Inner Himalayan ranges.

It is difficult to speculate on biogeography when phylogeny of the group has not been analysed and the distribution of the taxa is known only partly. However, allopatric speciation may be supposed in groups of closely related vicarious species, such as *Scaphidium gurung* and *S. nepalense*, *Baeocera microptera* and *B. puncticollis*, or *Scaphisoma immodicum* and *S. bhareko*. The number of apparently endemic species in some areas, as in the upper Kali Gantaki Valley or at Ghoropani Pass is relatively high, but little or no information is available from nearby Daulagiri or from the southern slopes of Annapurna.

ACKNOWLEDGEMENTS

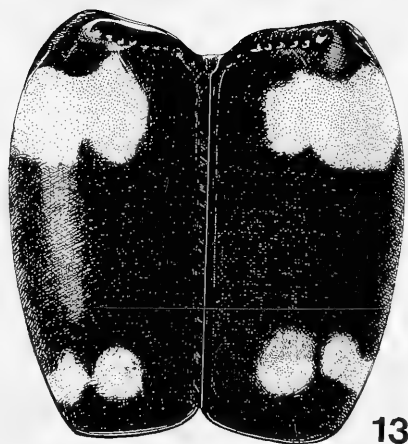
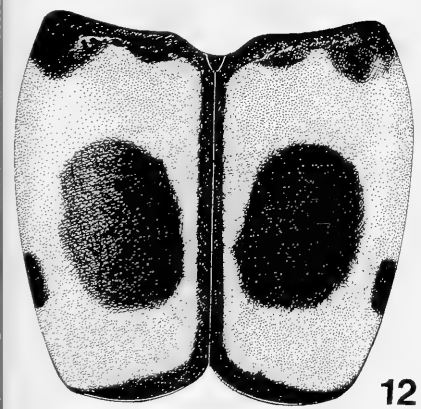
Nicolette Lavoyer made most of the line drawings during her spare time. The author is greatly indebted to her, and to Ales Smetana for reading and commenting an earlier draft of the manuscript, and to Neil D. Springate for assistance with the English text.

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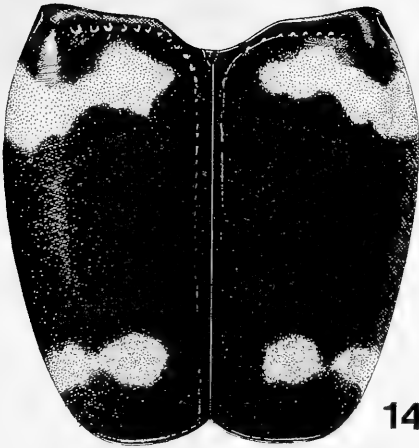
FIG. 9.

Ascaphium ochripes sp. n.

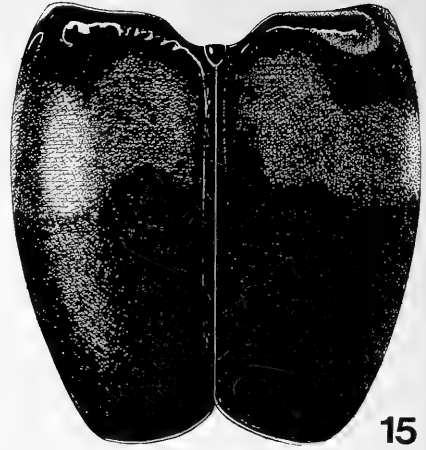


FIGS 10 TO 13.

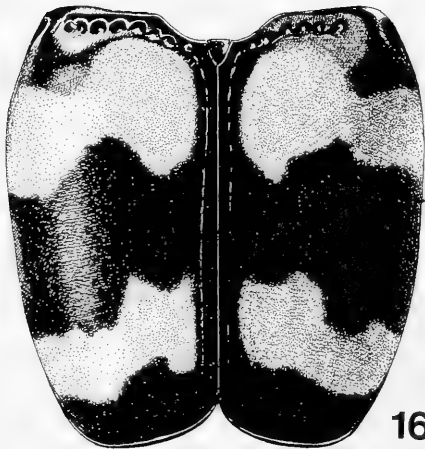
Colour pattern of elytra in *Scaphidium*; 10. *S. biundulatum* Champion; 11. *S. fryi* Achard; 12. *S. incrassatum* Achard; 13. *S. nepalense* sp. n.



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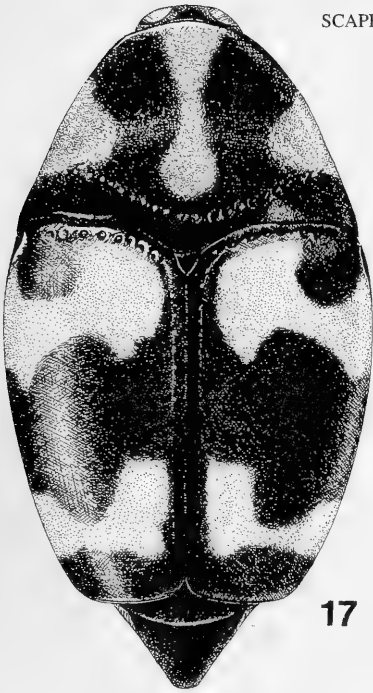
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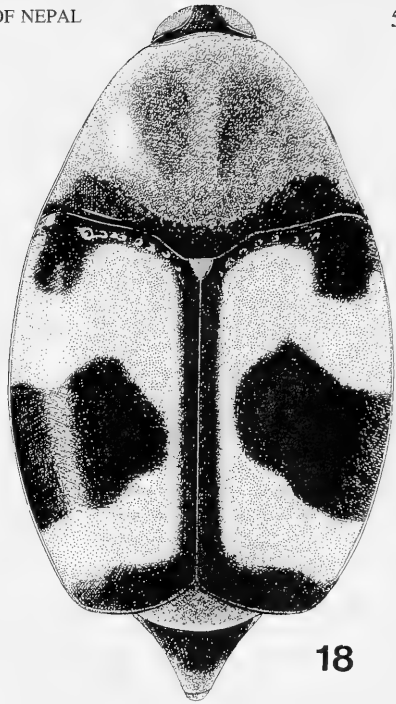
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FIGS 14 TO 16.

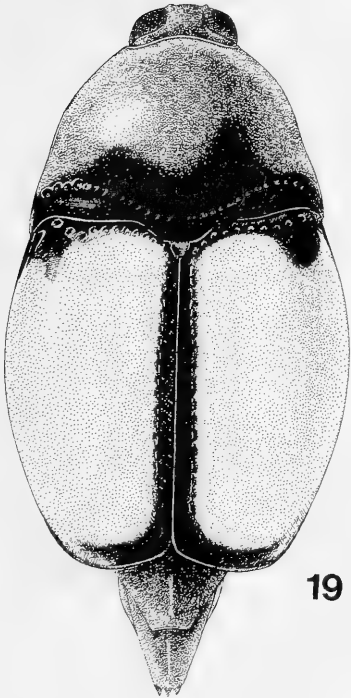
Colour pattern of elytra in *Scaphidium*; 14. *S. guring* sp.n.; 15. *S. sylhetense* Achard; 16. *S. harmandi* Achard.



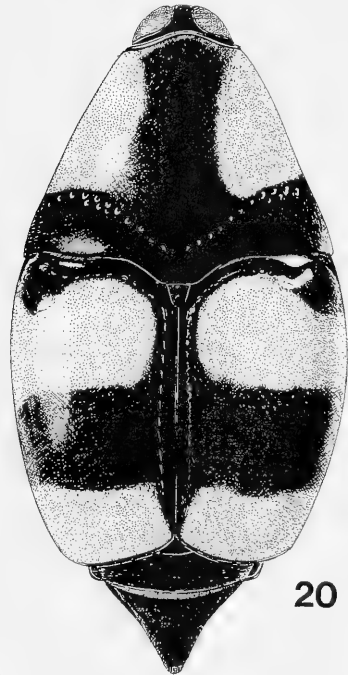
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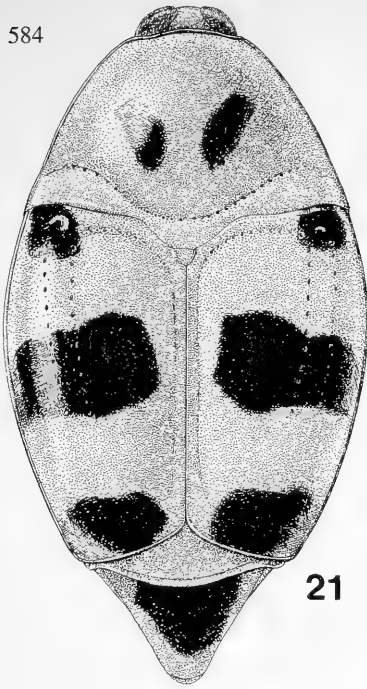
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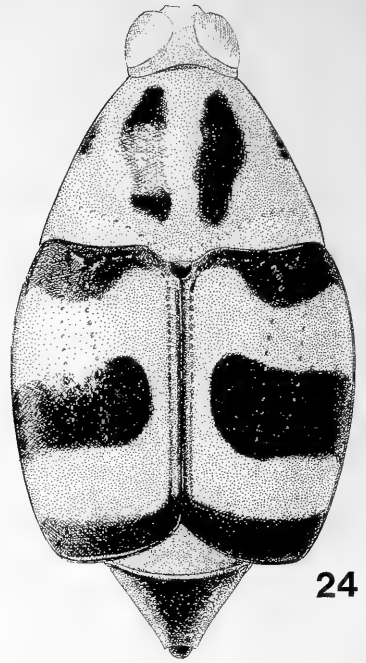
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FIGS 17 TO 20.

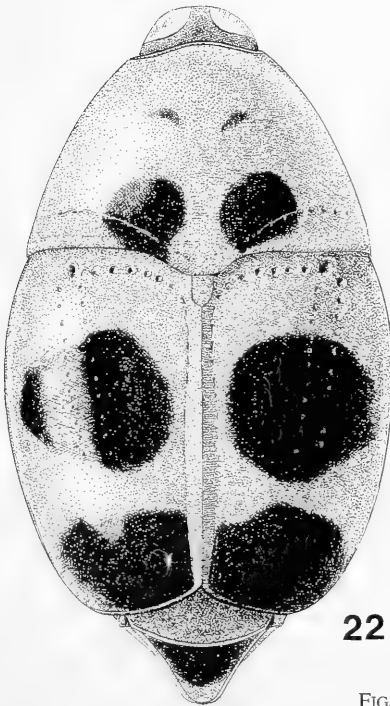
Colour pattern in *Scaphidium*; 17. *S. sinense* Pic; 18. *S. semilibatatum* Pic; 19. *S. rubritarse* Pic; 20. *S. coomani* (Pic).



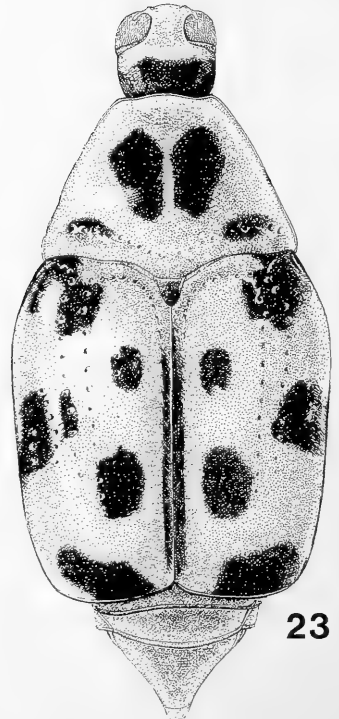
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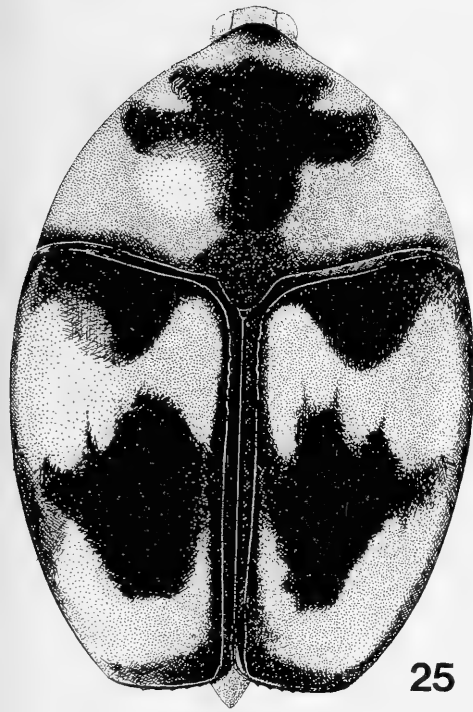
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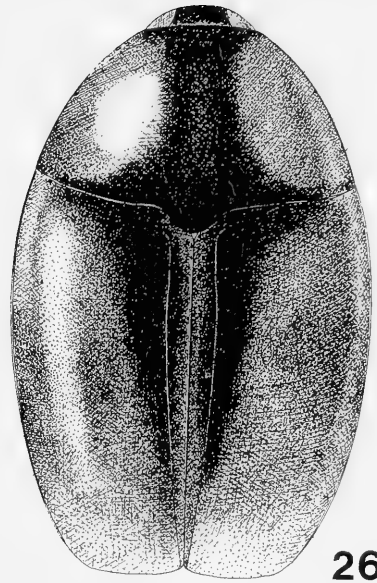
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FIGS 21 TO 24.

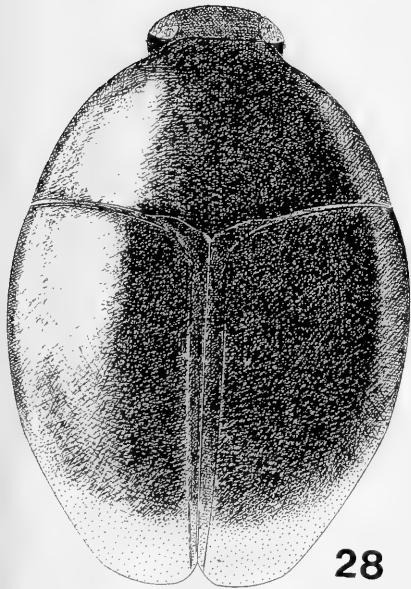
Colour pattern in *Scaphidium* und *Hemiscaphium*; 21. *S. septemnotatum* Champion, 22. *Scaphidium* sp.; 23. *S. baconi* Pic; 24. *H. brunneopictum* Achard.



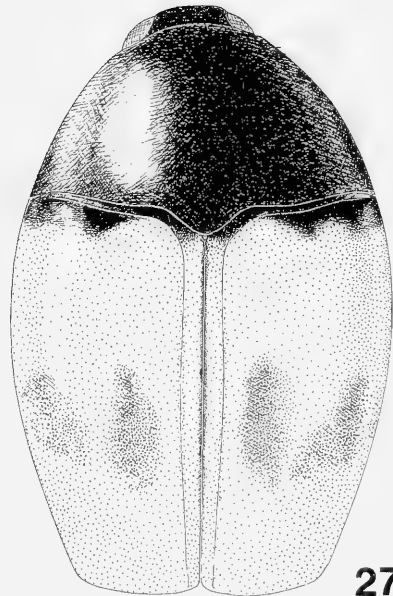
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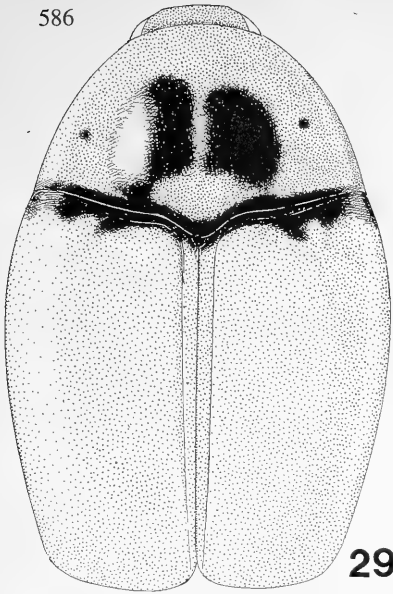
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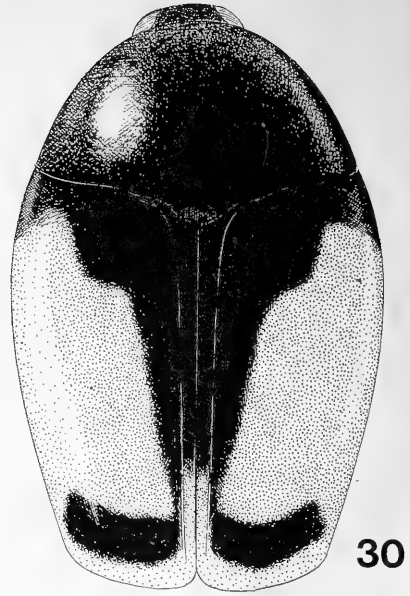
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FIGS 25 TO 28.

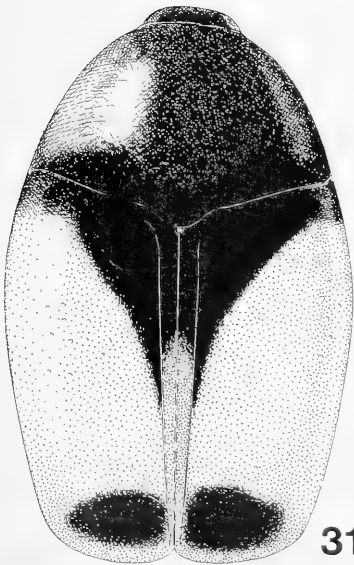
Colour pattern in *Pseudobironium* and *Scaphisoma*; 25. *P. bicolor* sp.n.; 26. *S. cruciatum* Champion; 27. *S. aurorae* sp.n.; 28. *S. baloo* sp. n.



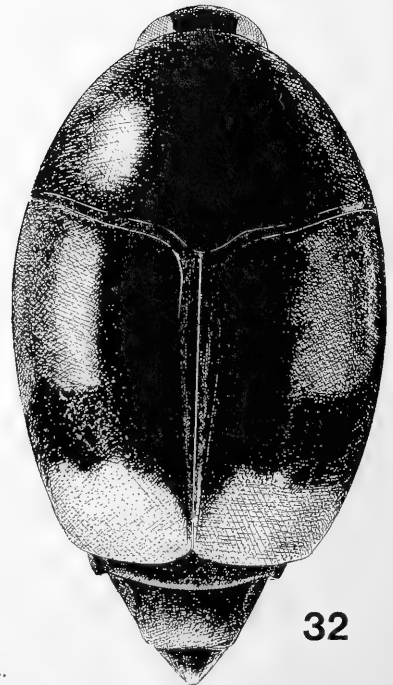
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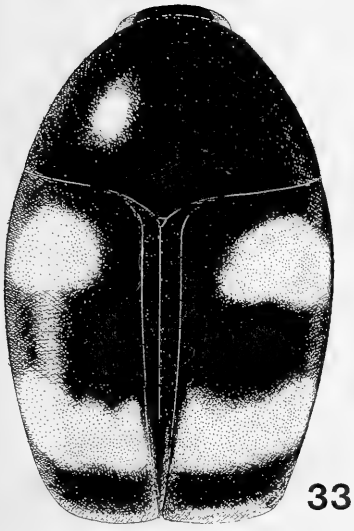
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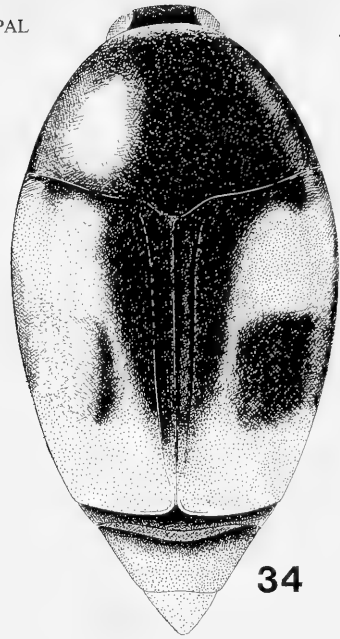
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FIGS 29 TO 32.

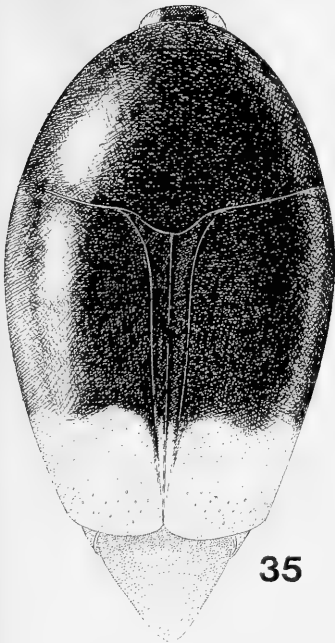
Colour pattern in *Scaphisoma*; 29. *S. clavigerum* sp. n.; 30. *S. bhareko* sp. n.; 31. *S. varium* Löbl; 32. *S. pulchellum* Löbl.



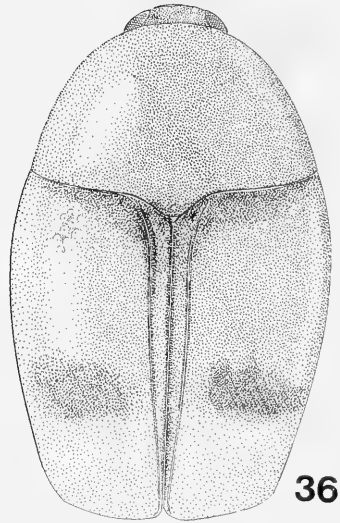
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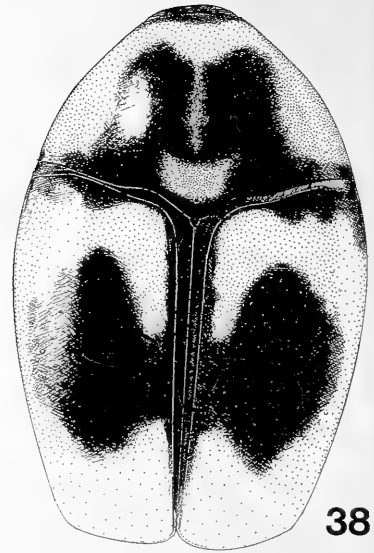
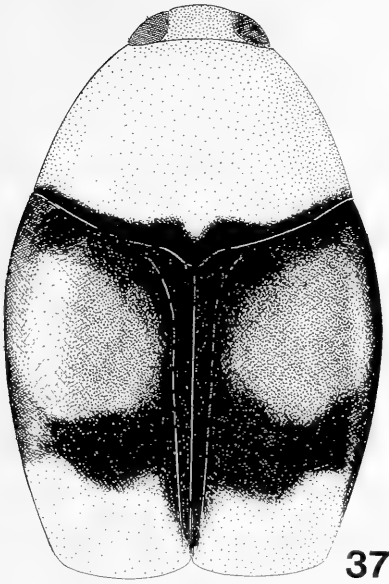
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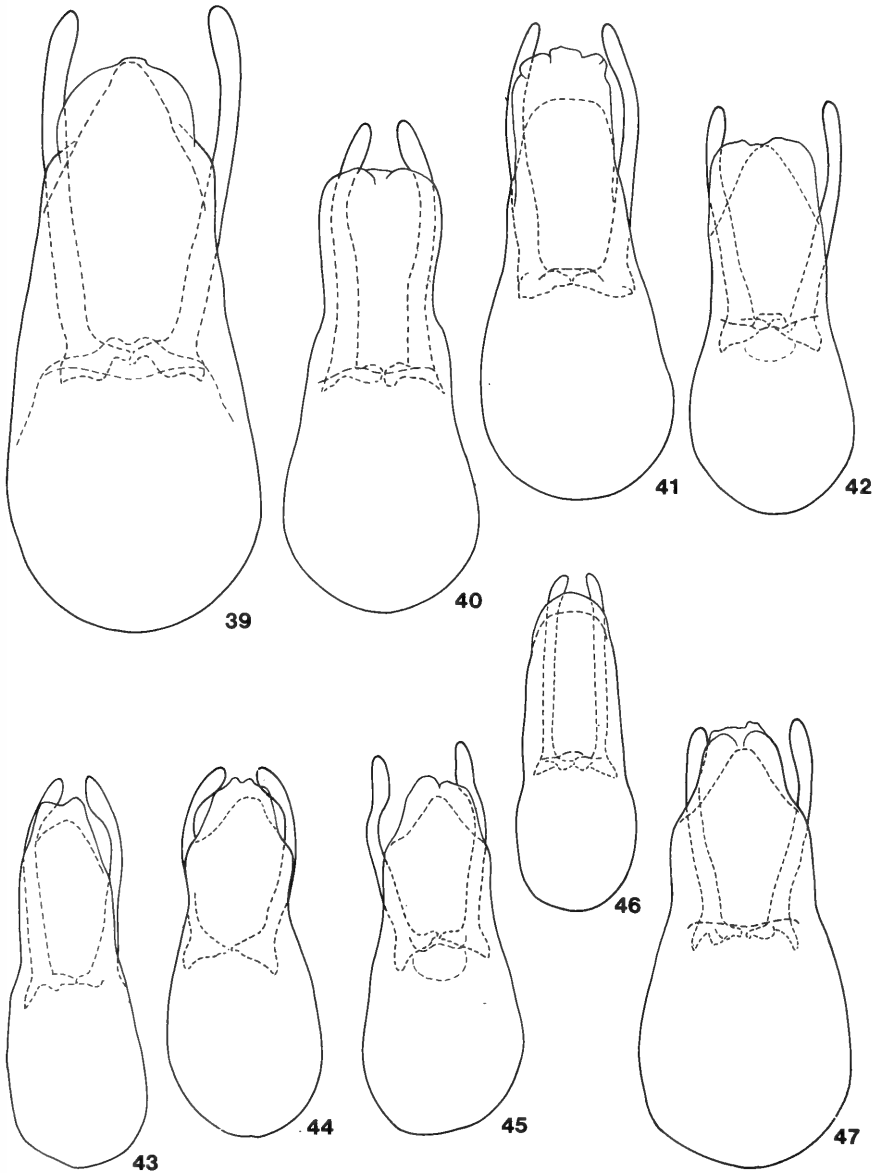
FIGS 33 TO 36.

Colour pattern in *Scaphisoma*; 33. *S. quadrifasciatum* Löbl; 34. *S. tetrastictum* Champion; 35. *S. leucopyga* Champion; 36. *S. binhanum* (Pic).



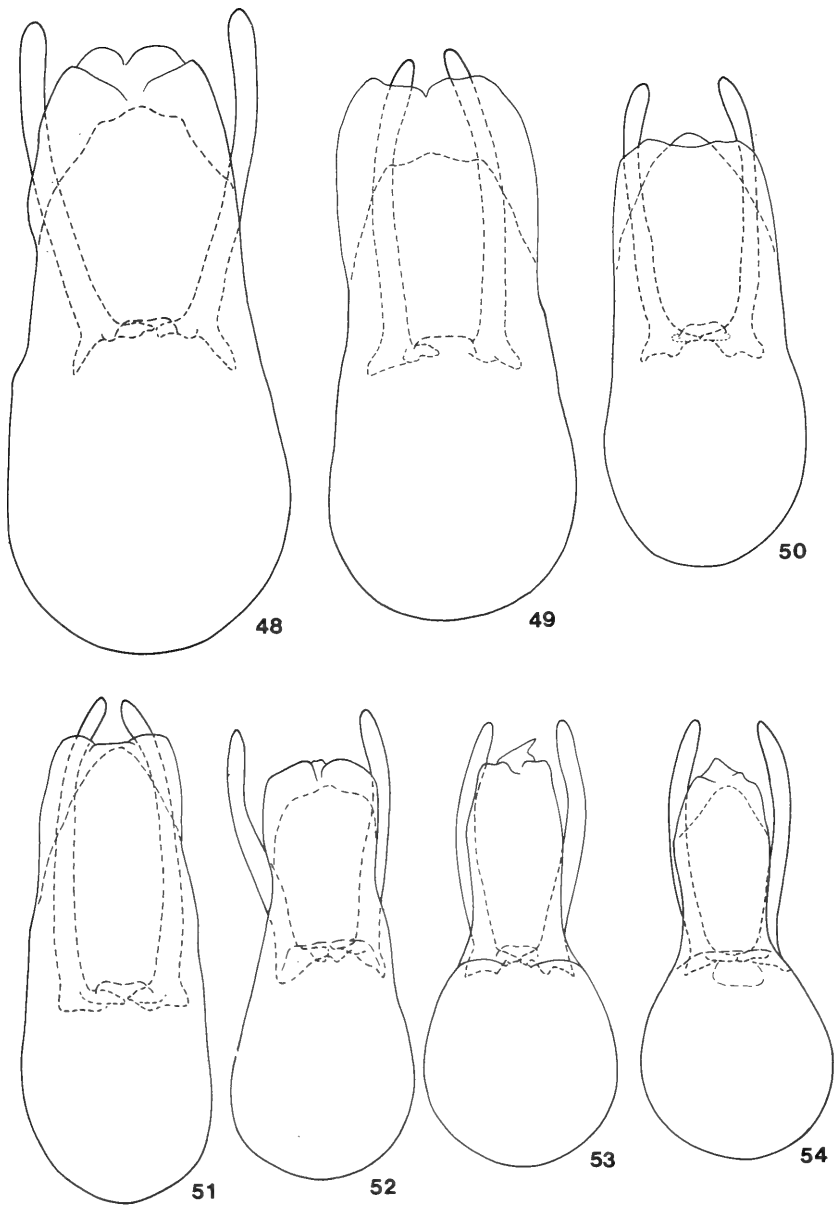
FIGS 37 AND 38.

Colour pattern in *Scaphisoma*, 37. *S. maculiger* Löbl; 38. *S. notatum* Löbl.



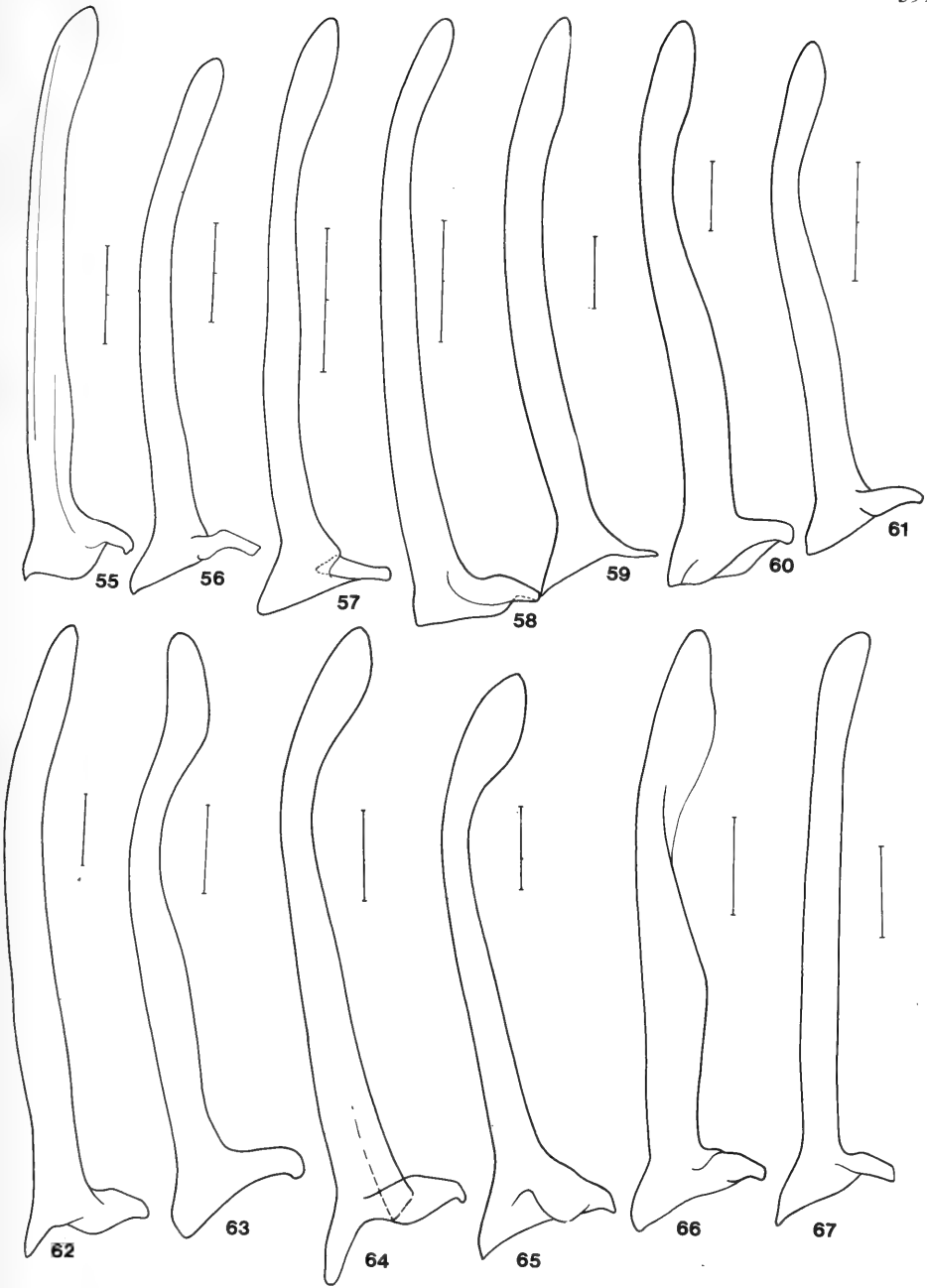
FIGS 39 TO 47.

Aedeagi in *Scaphidium* and *Hemiscaphium*; 39. *S. grande* Gestro; 40. *S. harmandi* Achard; 41. *S. rubritarse* Pic; 42. *S. cyanellum* Oberthur; 43. *S. coomani* (Pic); 44. *S. septemnotatum* Champion; 45. *S. cinnamomeum* Champion; 46. *H. brunneopictum* Achard; 47. *S. baconi* Pic.



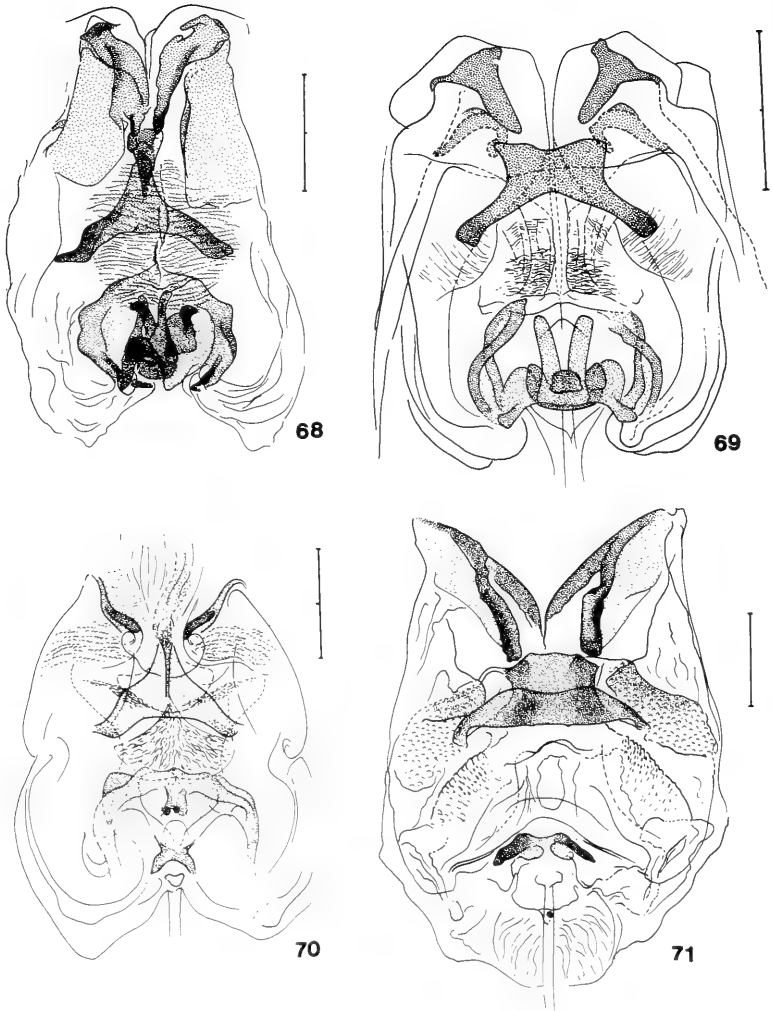
FIGS 48 TO 54.

Aedeagi in *Scaphidium*; 48. *S. biundulatum* Champion; 49. *S. gurung* sp. n.; 50. *S. nepalense* sp. n.; 51. *S. biseriatum* Champion; 52. *S. thakali* sp. n.; 53. *S. sylhetense* Achard; 54. *S. holzschuhi* sp. n.



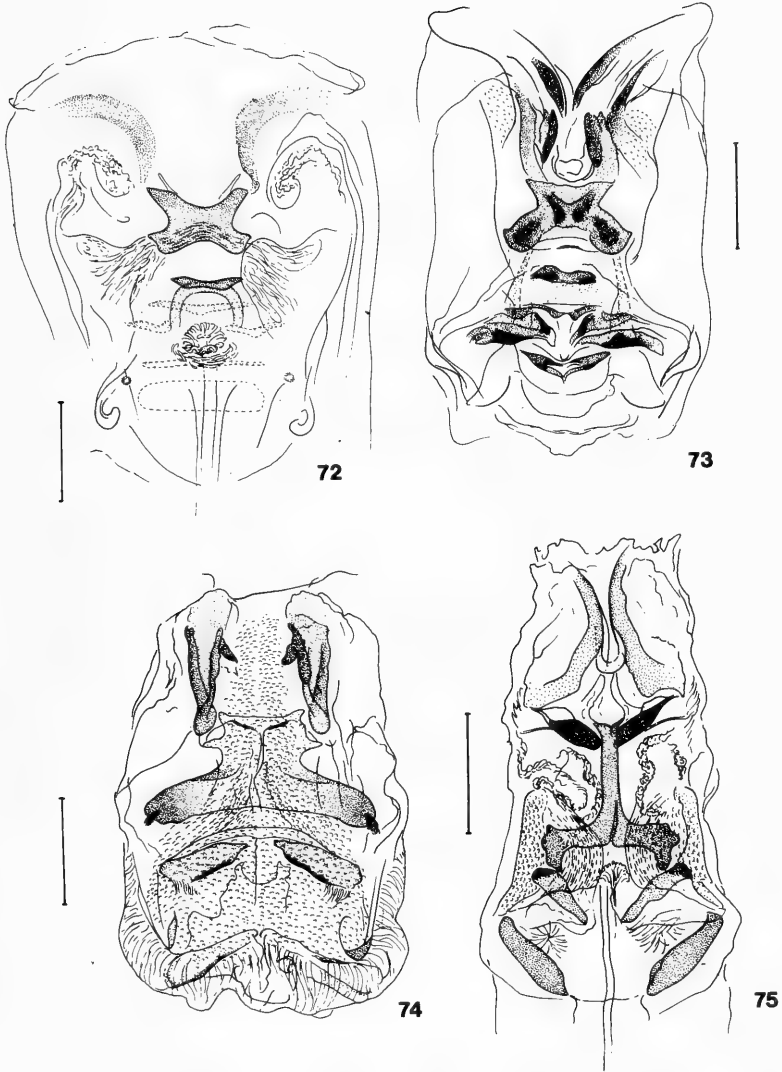
FIGS 55 TO 67.

Parameres in *Scaphidium* and *Hemiscaphium*; 55. *S. grande* Gestro; 56. *S. gurun* sp. n.; 57. *S. nepalense* sp. n.; 58. *S. biserialatum* champion, 59. *S. sylhetense* Achard; 60. *S. thakali* sp. n.; 61. *S. harmandi* Achard; 62. *S. rubritarse* Pic; 63. *S. cinnamomeum* Achard; 64. *S. coomani* (Pic); 65. *S. septemnotatum* Champion; 66. *S. melanogaster* sp. n.; 67. *H. brunneopictum* Achard. Scale bar = 0.1 mm.



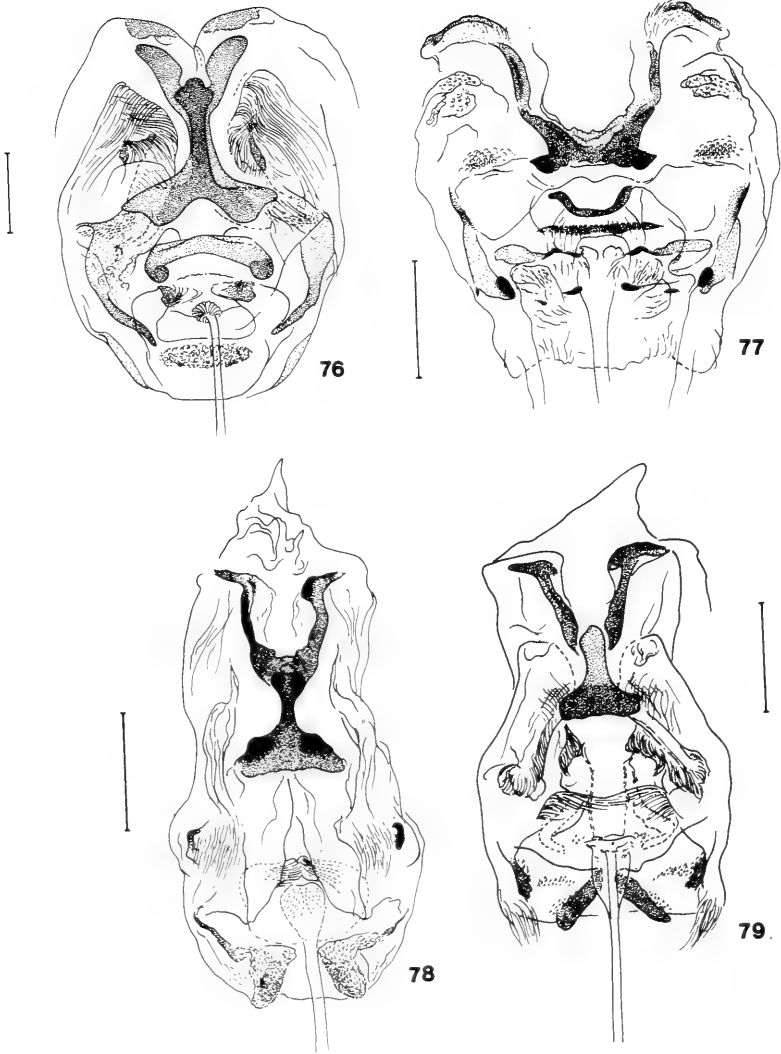
FIGS 68 TO 71.

Internal sac of aedeagi in *Scaphidium*; 68. *S. biundulatum* Champion; 69. *S. nepalense* sp. n.; 70. *S. gu-rung* sp. n.; 71. *S. grande* Gestro. Scale bar = 0.1 mm.



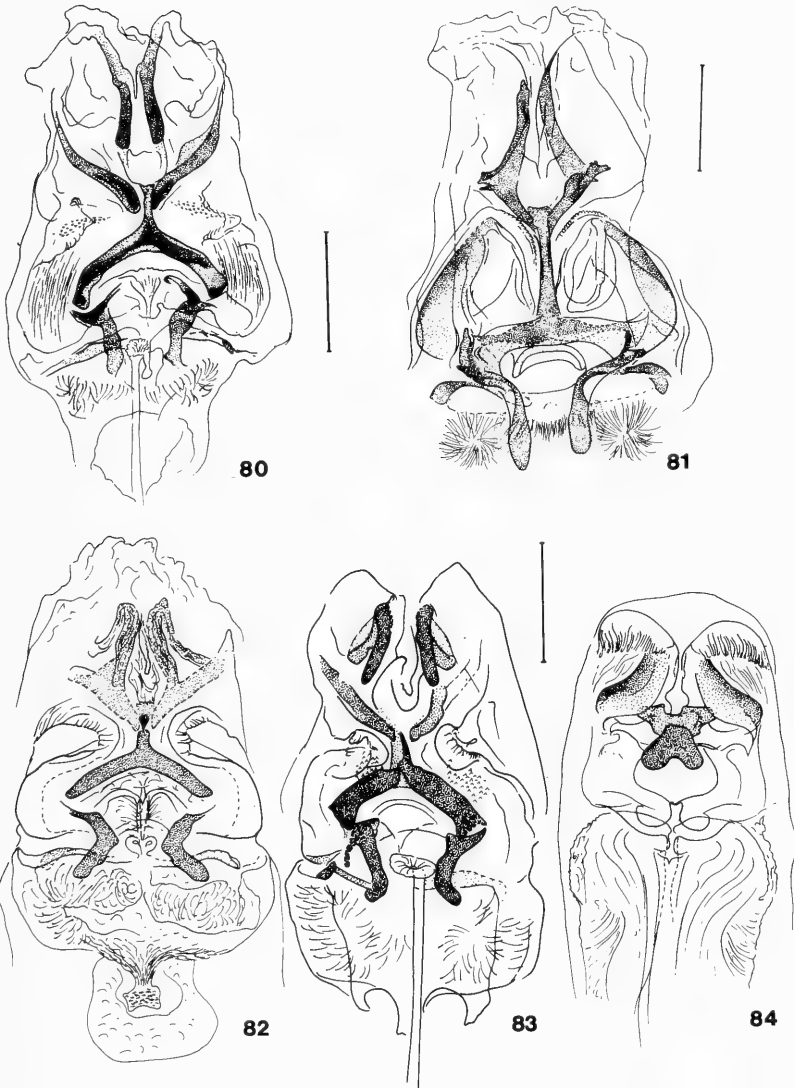
FIGS 72 TO 75.

Internal sac of aedeagi in *Scaphidium*; 72. *S. harmandi* Achard; 73. *S. rubritarse* Pic; 74. *S. cyanellum* Oberthur; 75. *S. coomani* (Pic). Scale bar = 0.1 mm.



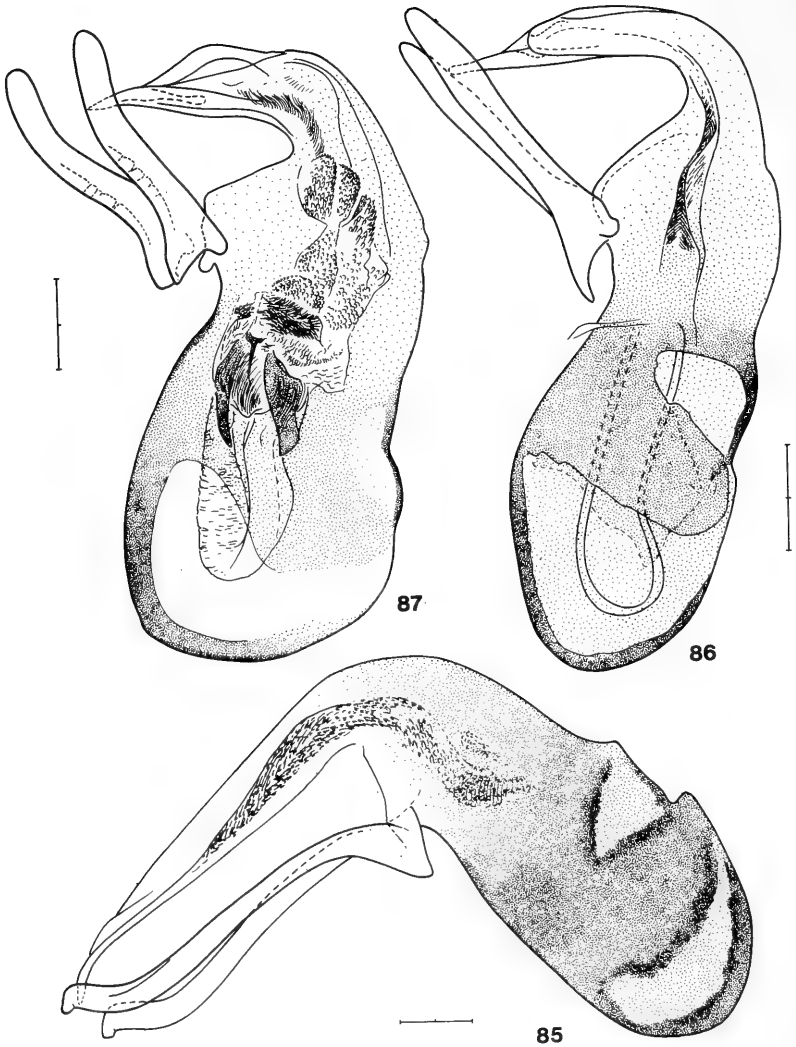
FIGS 76 TO 79.

Internal sac of aedeagi in *Scaphidium*; 76. *S. biseriatum* Champion; 77. *S. thakali* sp. n.; 78. *S. holzschuhi* sp. n.; 79. *S. sylhetense* Achard. Scale bar = 0.1 mm.



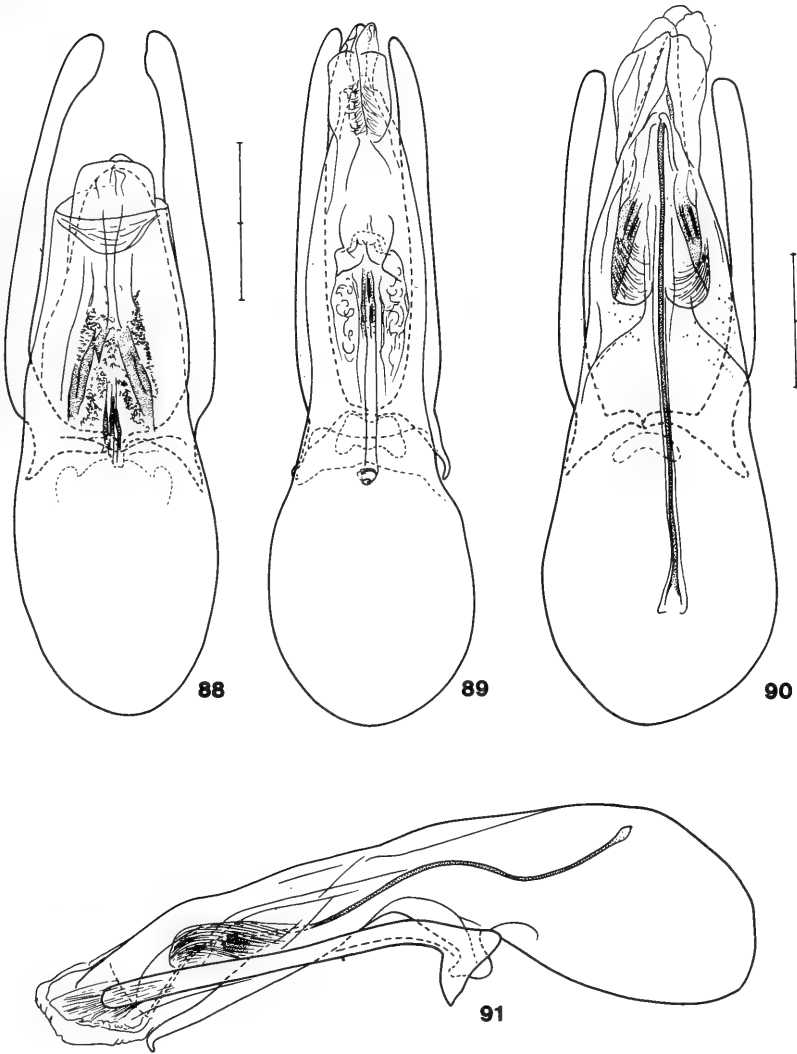
FIGS 80 TO 84.

Internal sac of aedeagi in *Scaphidium* and *Hemiscaphium*; 80. *S. septemnotatum* Champion; 81. *S. bairdii* Pic; 82. *S. melanogaster* sp. n.; 83. *S. cinnamomeum* Champion; 84. *H. brunneopictum* Achard.
Scale bar = 0.1 mm.



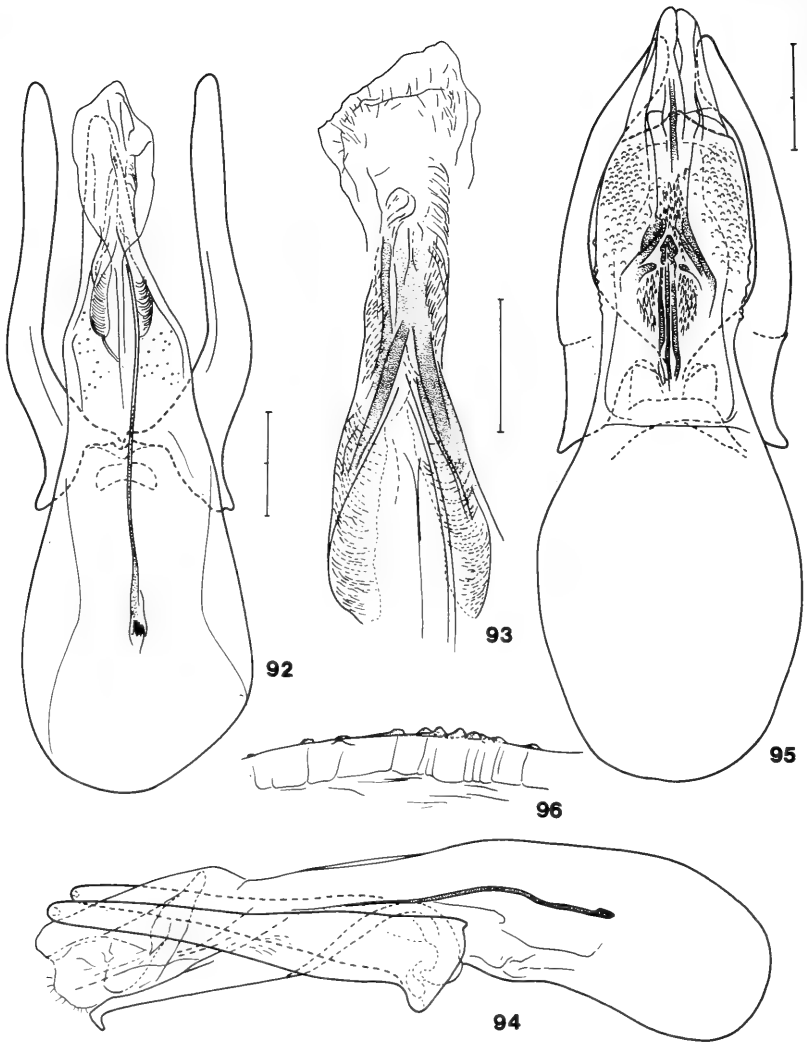
FIGS 85 TO 87.

Aedeagi in *Cyparium*; 85. *C. montanum* Achard; 86. *C. bowringi* Achard; 87. *C. plagipenne* Achard.
 Scale bar = 0.2 mm.



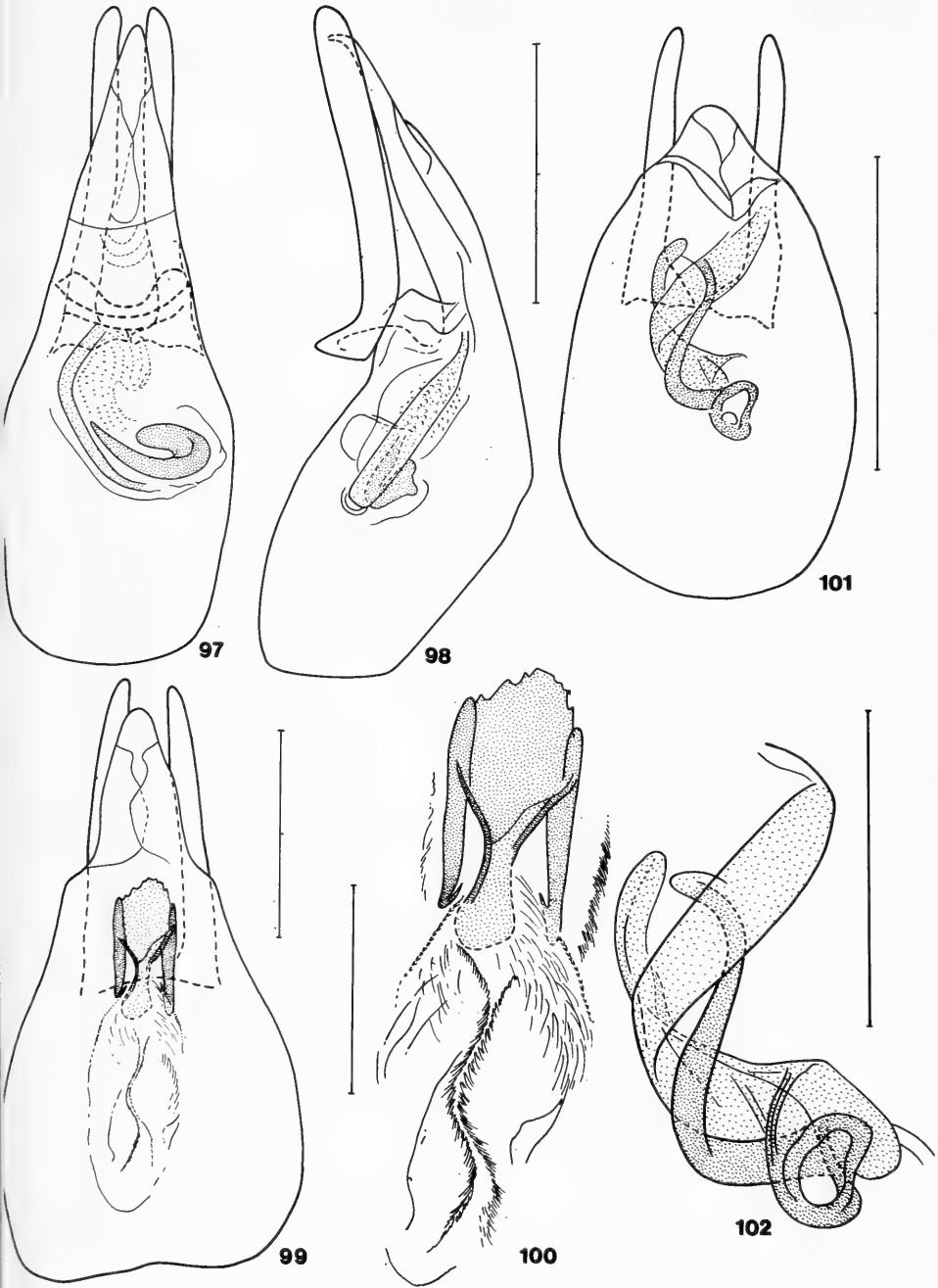
FIGS 88 TO 91.

Aedeagi in *Pseudobironium*; 88. *P. bicolor* sp. n., 89. *P. almorani* Achard; 90, 91. *P. ineptum* sp. n.
Scale bar = 0.2 mm.



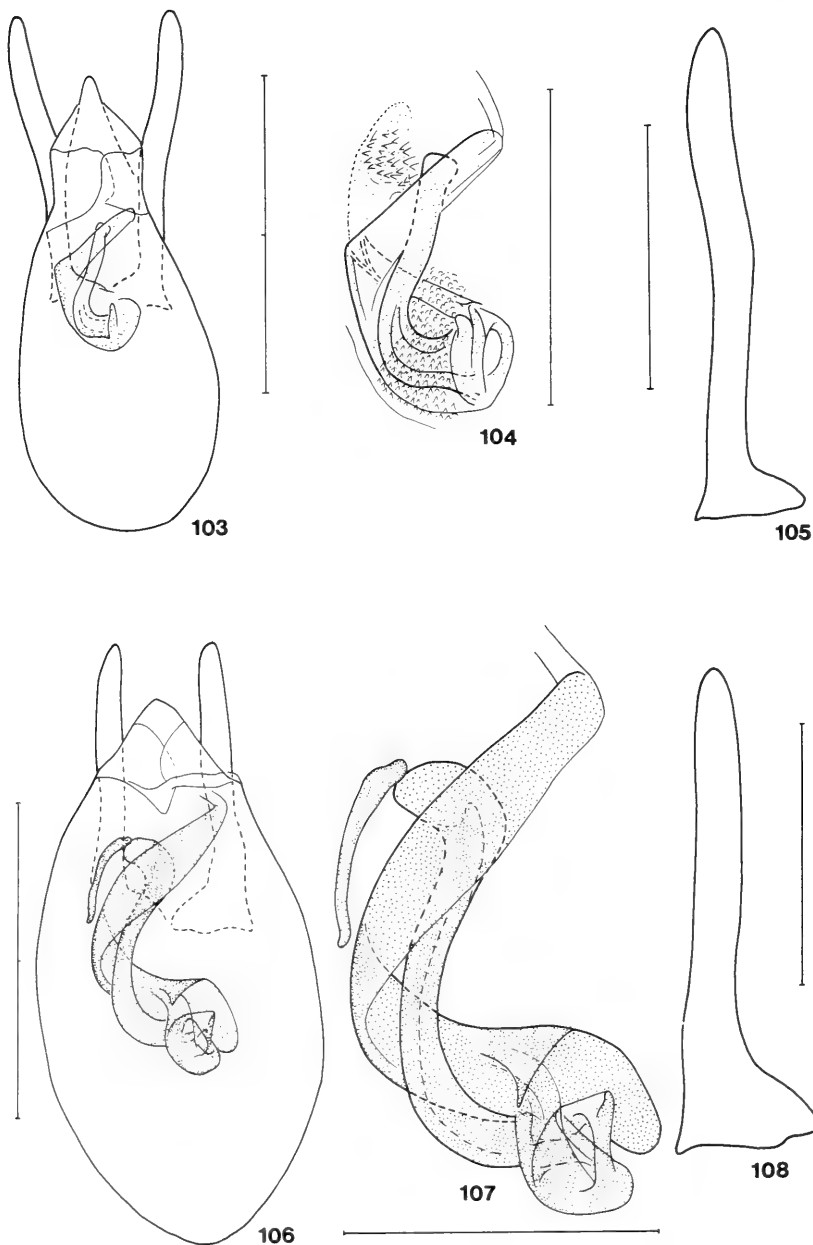
FIGS 92 TO 96.

Aedeagi in *Pseudobironium*: 92 to 94. *P. rufitarse* sp. n., apical portion of internal sac (93) in detail; 95, 96. *P. castaneum* Pic, tuberculate margin of internal sac (96) in detail. Scale bar = 0.2 mm (92, 95), and = 0.1 mm (96).



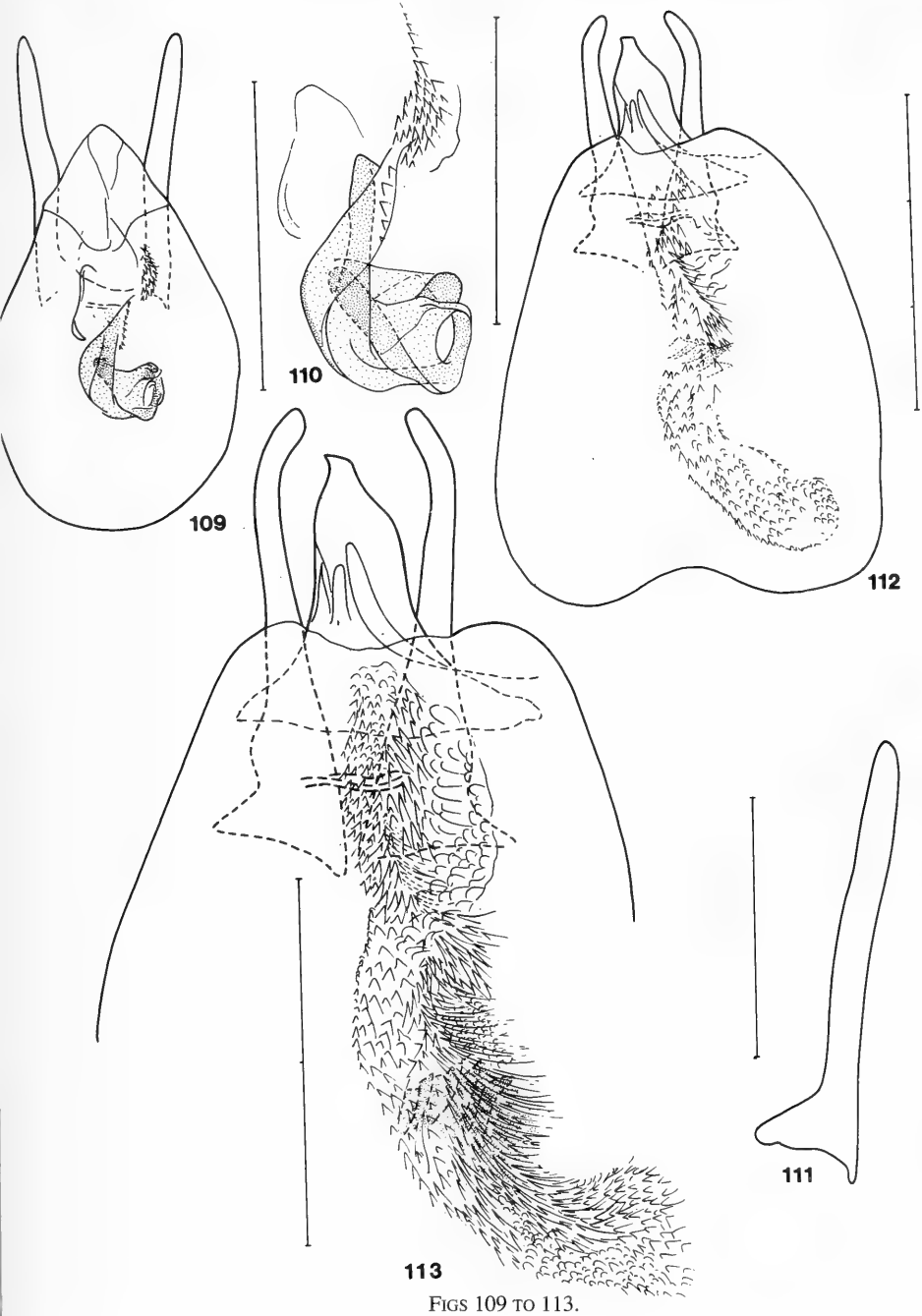
FIGS 97 TO 102.

Aedeagi in *Baeocera*. 97, 98. *B. sordidoides* sp. n.; 99, 100. *B. laminula* sp. n., internal sac (100); 101, 102. *B. reducta* sp. n., internal sac (102). Scale bar = 0.2 mm (98, 99, 101), and = 0.1 mm (100, 102).



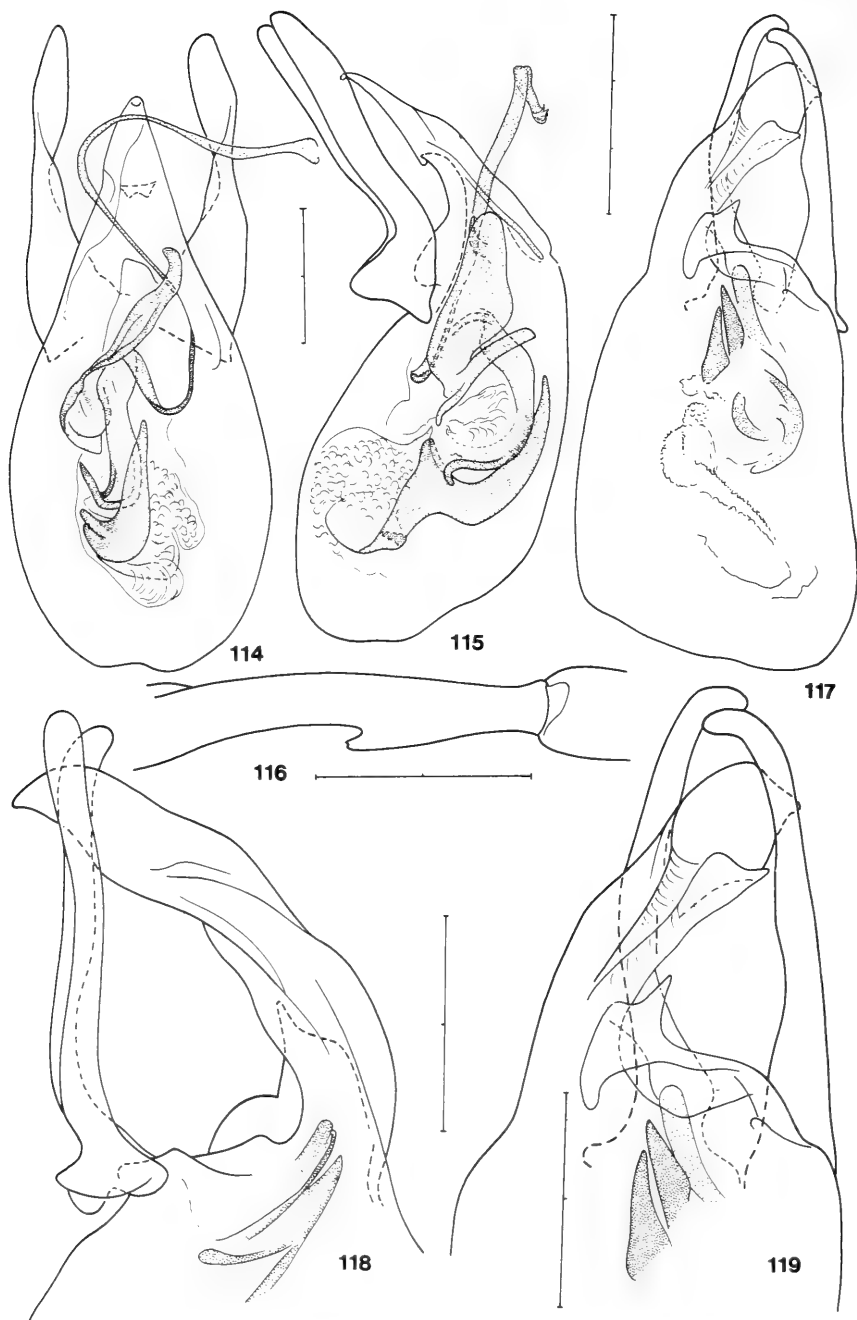
FIGS 103 TO 108.

Aedeagi in *Baocera*: 103 to 105. *B. crinita* sp. n., internal sac (104), paramere (105); 106 to 108. *B. cribrata* sp. n., internal sac (107), paramere (108). Scale bar = 0.1 mm (104, 105, 107, 108), and = 0.2 mm (103, 105).



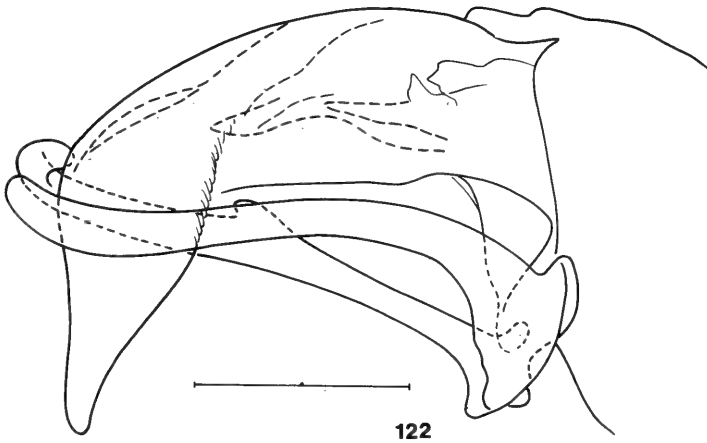
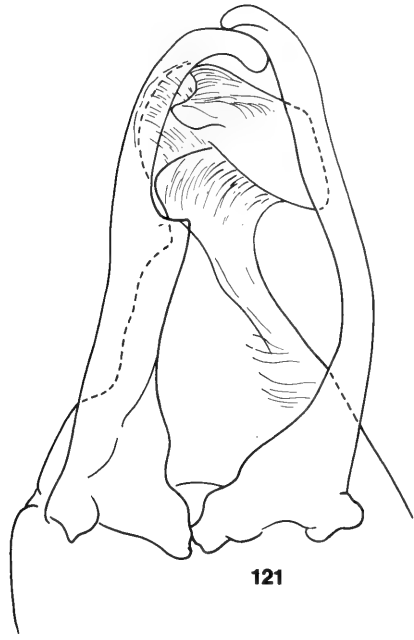
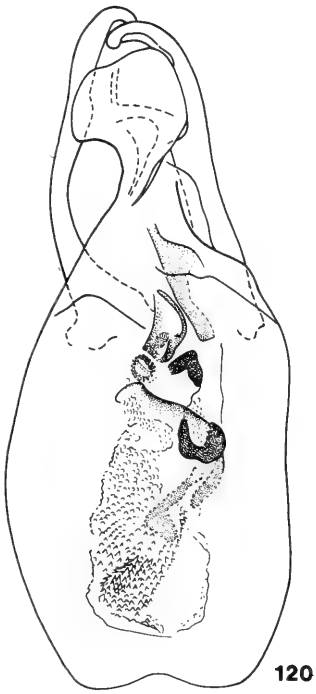
FIGS 109 TO 113.

Aedeagi in *Baeocera*; 109 to 111. *B. martensi* sp. n., internal sac (110), paramere (111); 112 and 113. *B. schawalleri* sp. n., internal sac with apical portion of median lobe and parameres (113) at higher magnification. Scale bar = 0.1 mm (110, 111), = 0.2 mm (109, 113), and 0.3 mm (112).



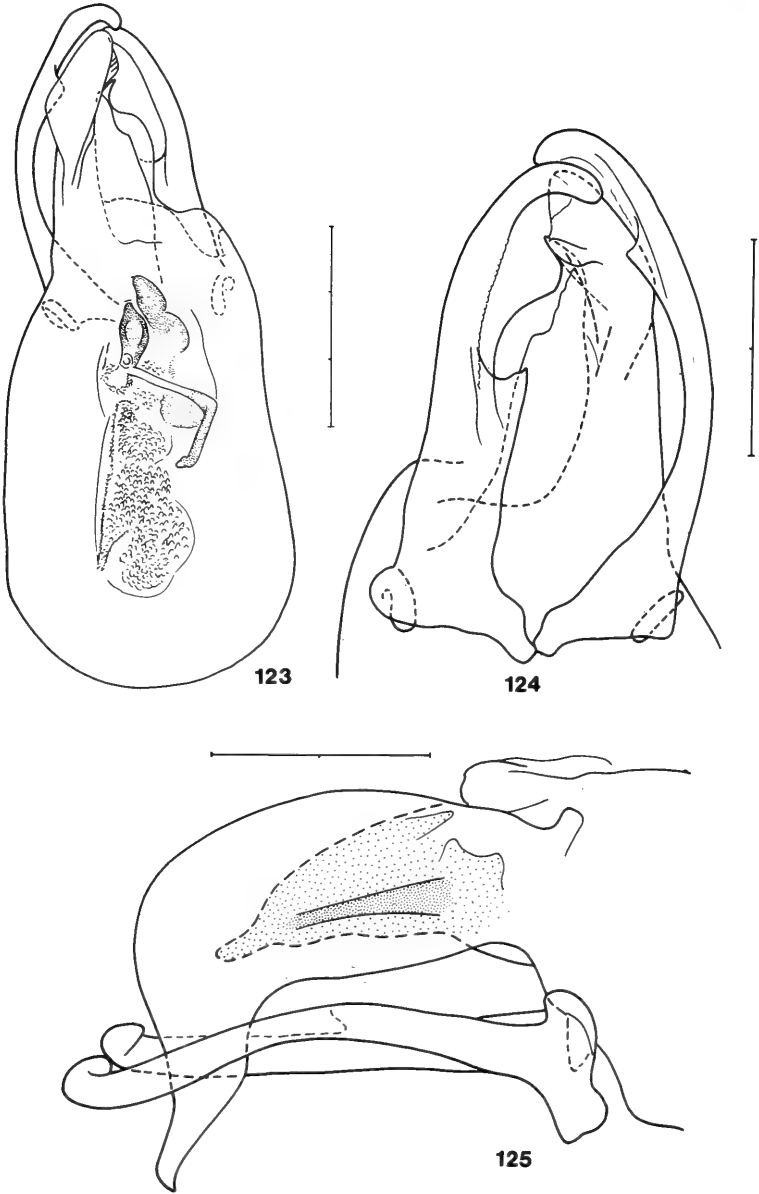
FIGS 114 TO 119.

Baeocera; 114 and 115. *B. mustangensis* sp. n., aedeagus; 116 to 119. *B. thoracica* sp. n., basal portion of male metatibia (116), aedeagus (117), apical half of median lobe and parameres (118, 119). Scale bar = 0.2 mm (114 to 116, 118, 119), and = 0.3 mm (117).



FIGS 120 TO 122.

Aedeagus in *Baocera tuberculata* sp. n., apical portion of median lobe and parameres (121, 122) at higher magnification. Scale bar = 0.2 mm.



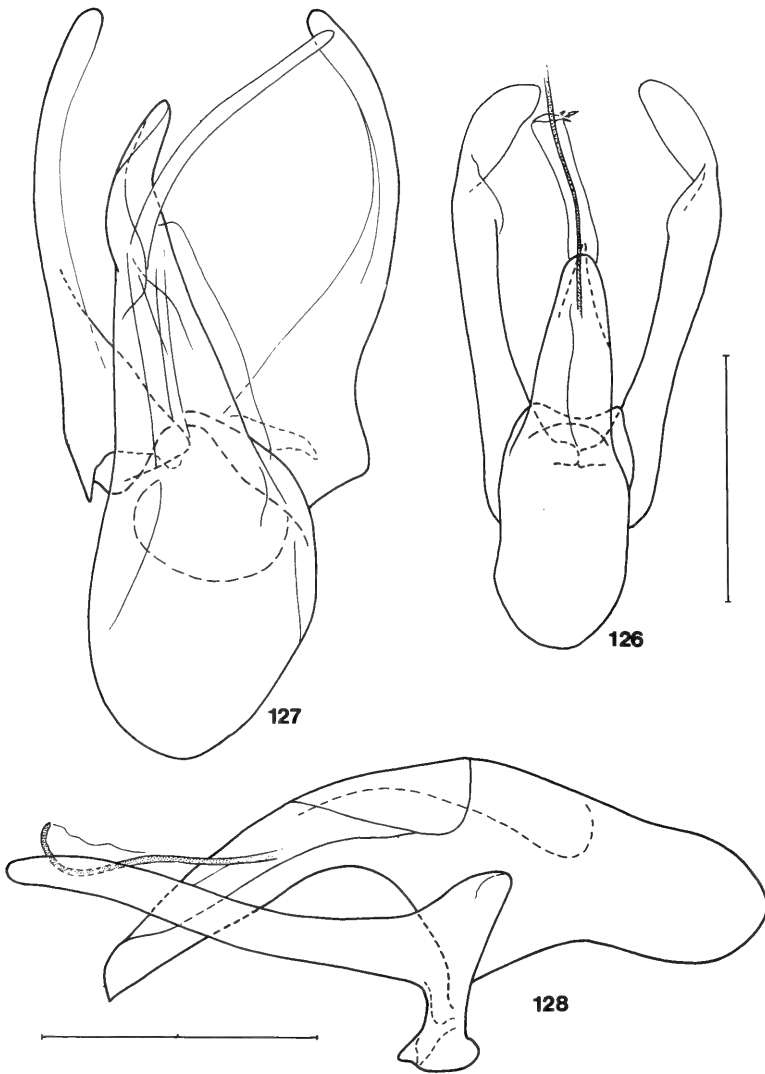
123

124

125

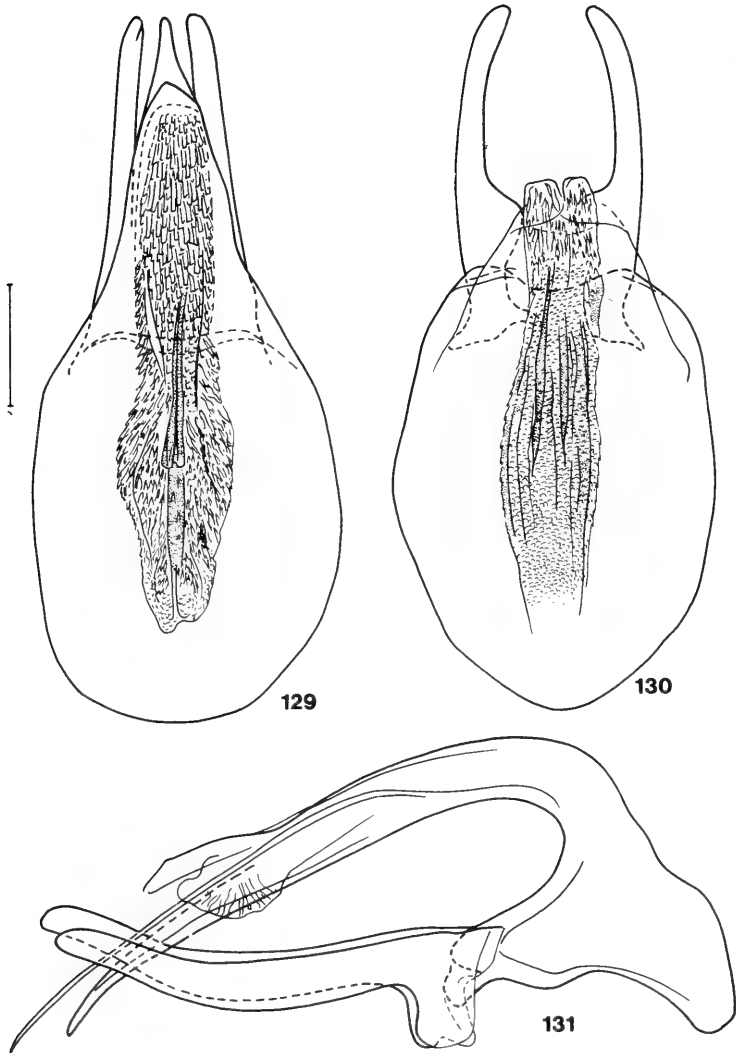
FIGS 123 TO 125.

Aedeagus in *Baeocera errabunda* sp. n., apical portion of median lobe and parameres (124, 125) at higher magnification. Scale bar = 0.2 mm (124), and = 0.3 mm (123).



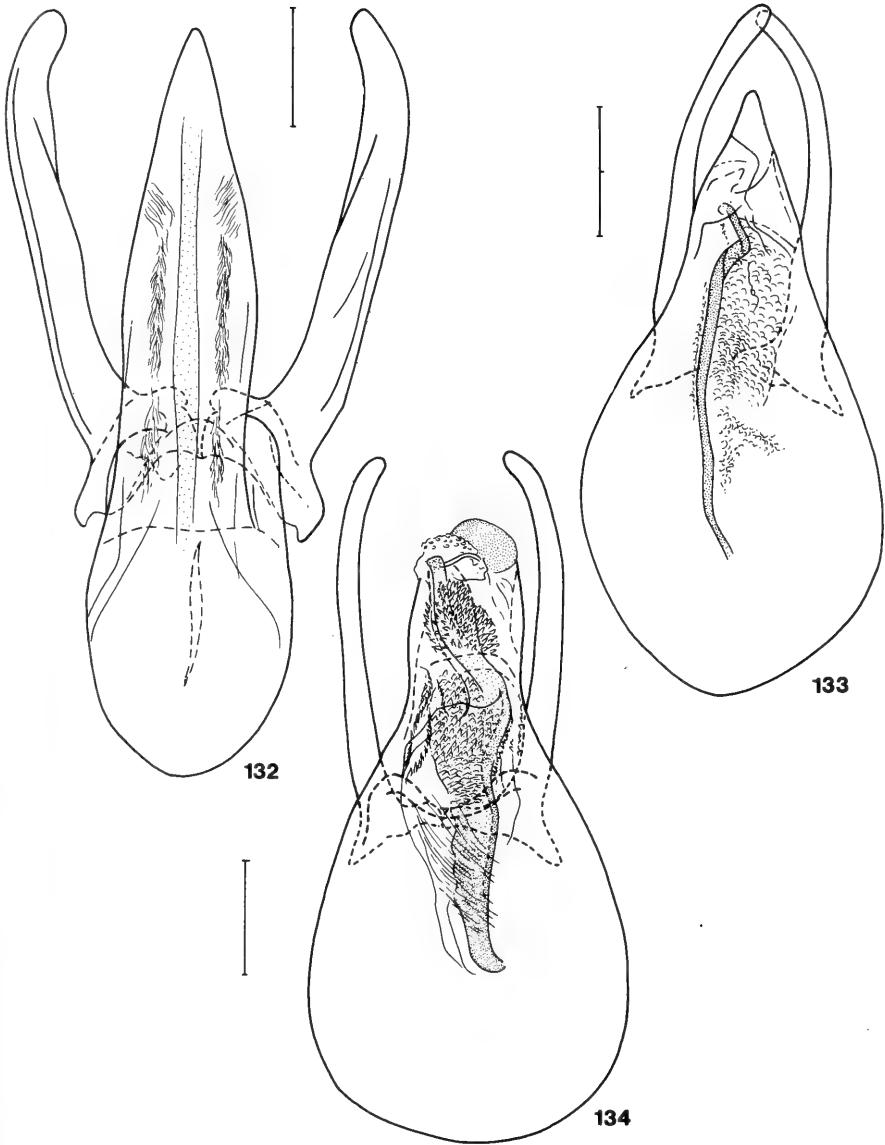
FIGS 126 TO 128.

Aedeagi in *Scaphisoma*; 126. *S. minutissimum* Champion; 127 and 128. *S. praesigne* sp. n. Scale bar = 0.1 mm (126), and 0.2 mm (127).



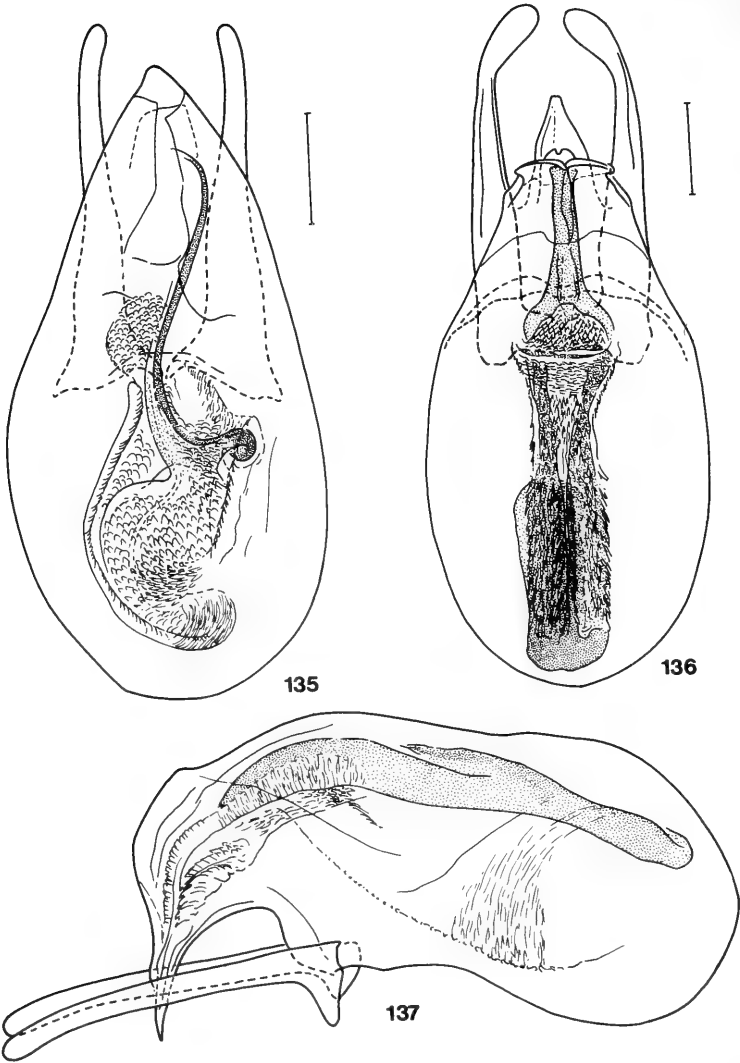
FIGS 129 TO 131.

Aedeagi in *Scaphisoma*; 129. *S. fulcratum* sp. n.; 130. *S. interjectum* sp. n.; 131. *S. simplicipenis* sp. n.
Scale bar = 0.1 mm.



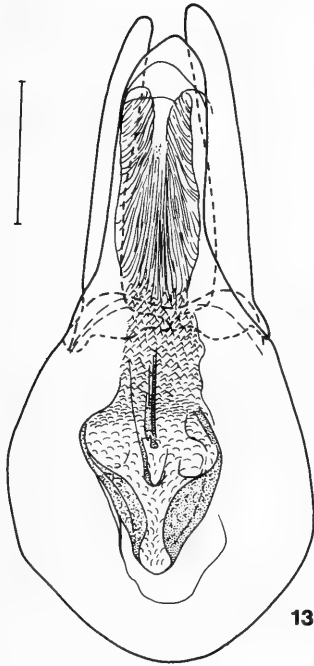
FIGS 132 TO 134.

Aedeagi in *Scaphisoma*; 132. *S. simpicipenis* sp. n.; 133. *S. fatuum* sp. n.; 134. *S. adjacens* sp.n. Scale bar = 0.1 mm.

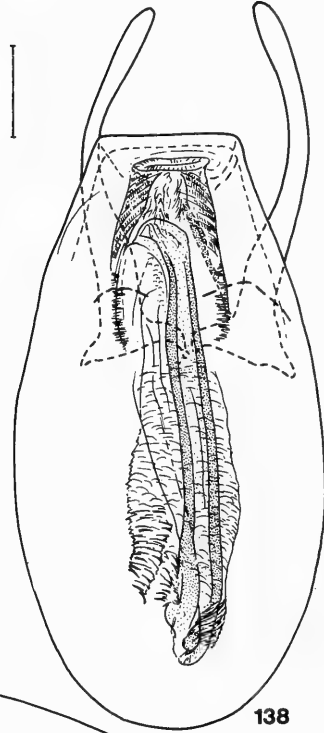


FIGS 135 TO 137.

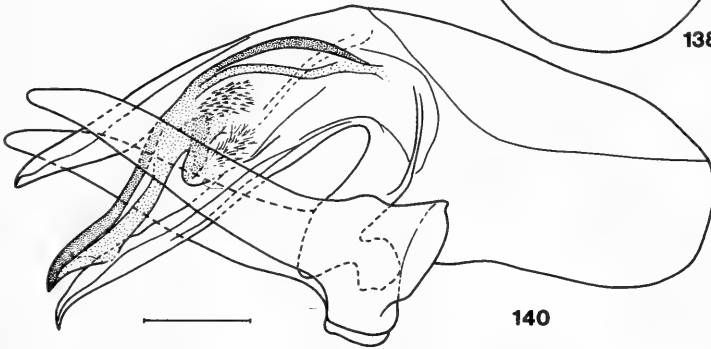
Aedeagi in *Scaphisoma*; 135. *S. inquietum* sp. n.; 136. *S. fratellum* sp. n.; 137. *S. aurorae* sp. n. Scale bar = 0.1 mm.



139



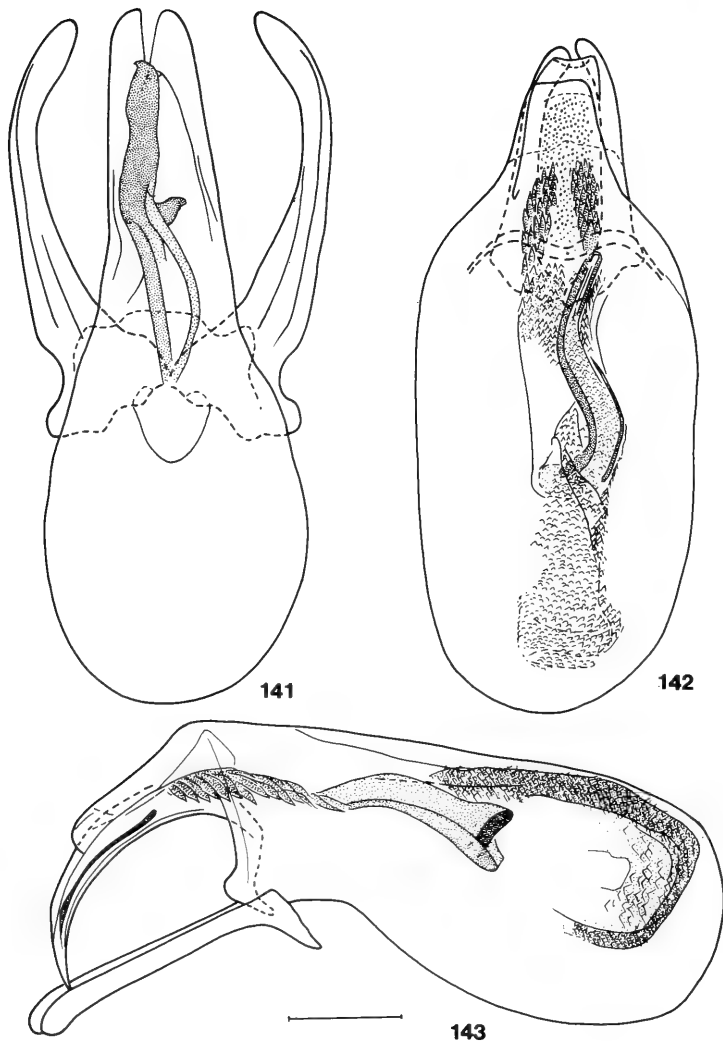
138



140

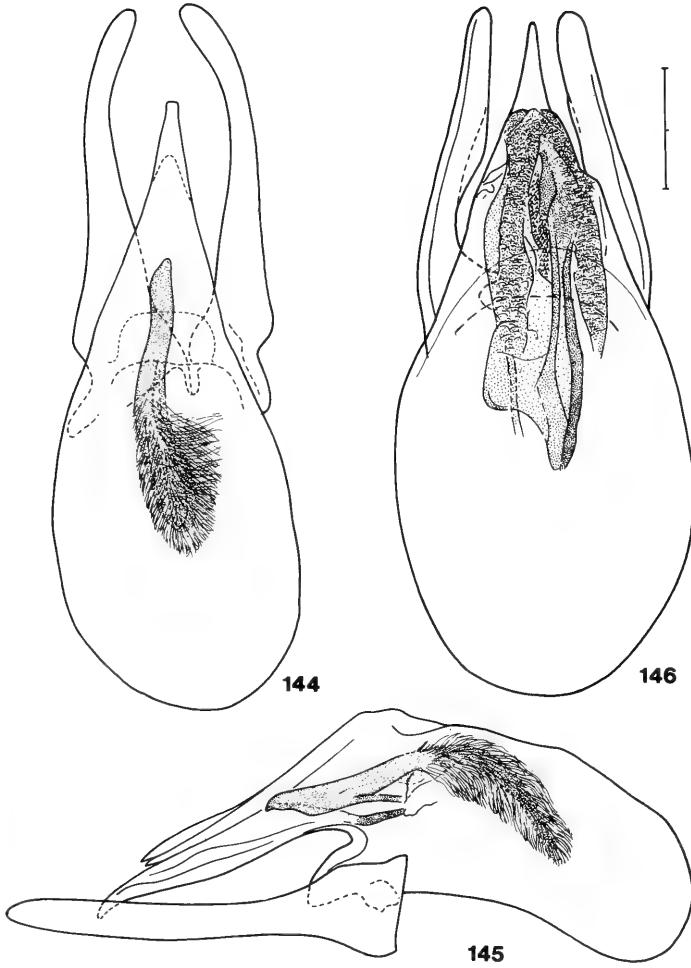
FIGS 138 TO 140.

Aedeagi in *Scaphisoma*; 138. *S. aurorae* sp. n.; 139. *S. nima* sp. n.; 140. *S. jado* sp. n. Scale bar = 0.1 mm.



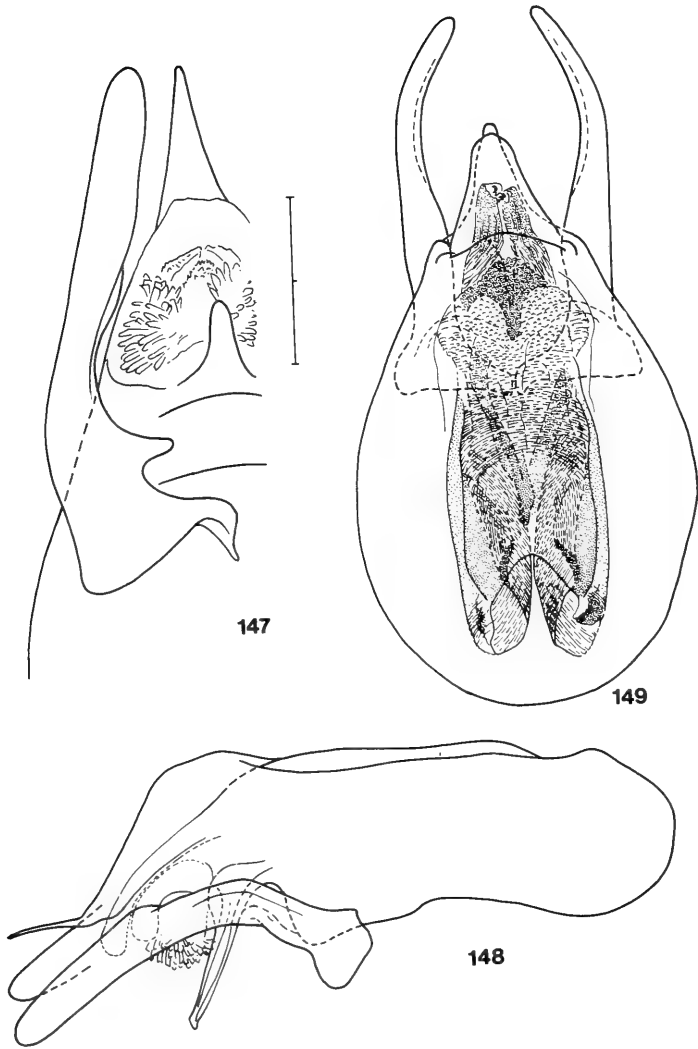
FIGS 141 TO 143.

Aedeagi in *Scaphisoma*; 141. *Scaphisoma jado* sp. n.; 142 and 143. *S. invalidum* sp. n. Scale bar = 0.1 mm.



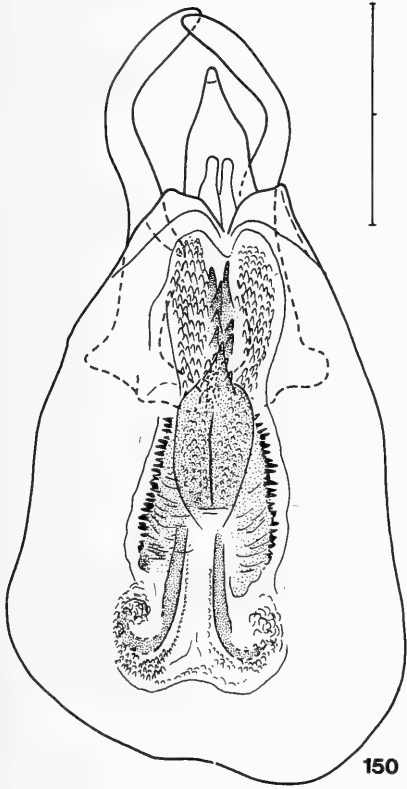
FIGS 144 TO 146.

Aedeagi in *Scaphisoma*; 144 and 145. *S. baloo* sp. n.; 146. *S. clavigerum* sp. n. Scale bar = 0.2 mm.

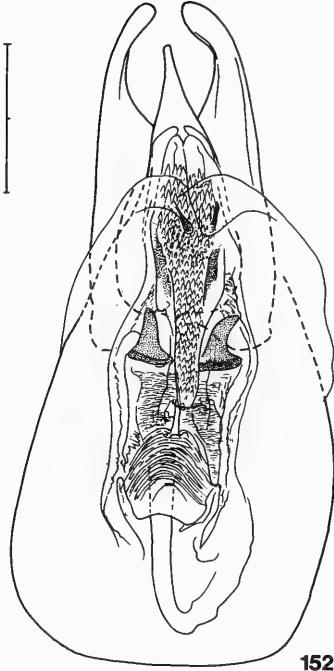


FIGS 147 TO 149.

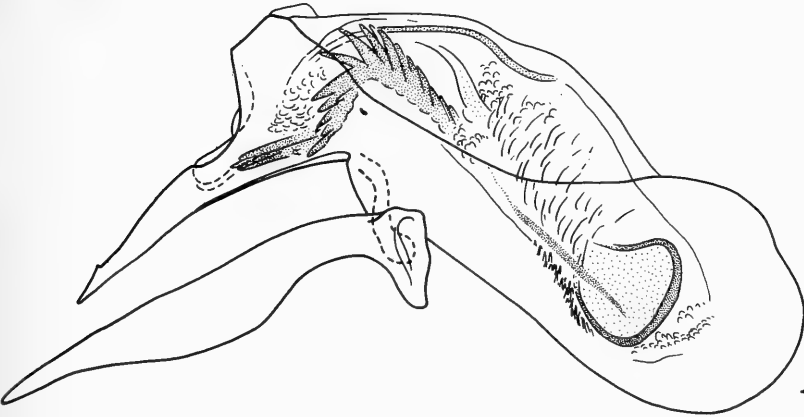
Aedeagi in *Scaphisoma*; 147 and 148. *S. clavigerum* sp. n., paramere with apical portion of median lobe (147); 149. *S. assimile curvistria* Reitter. Scale bar = 0.2 mm.



150



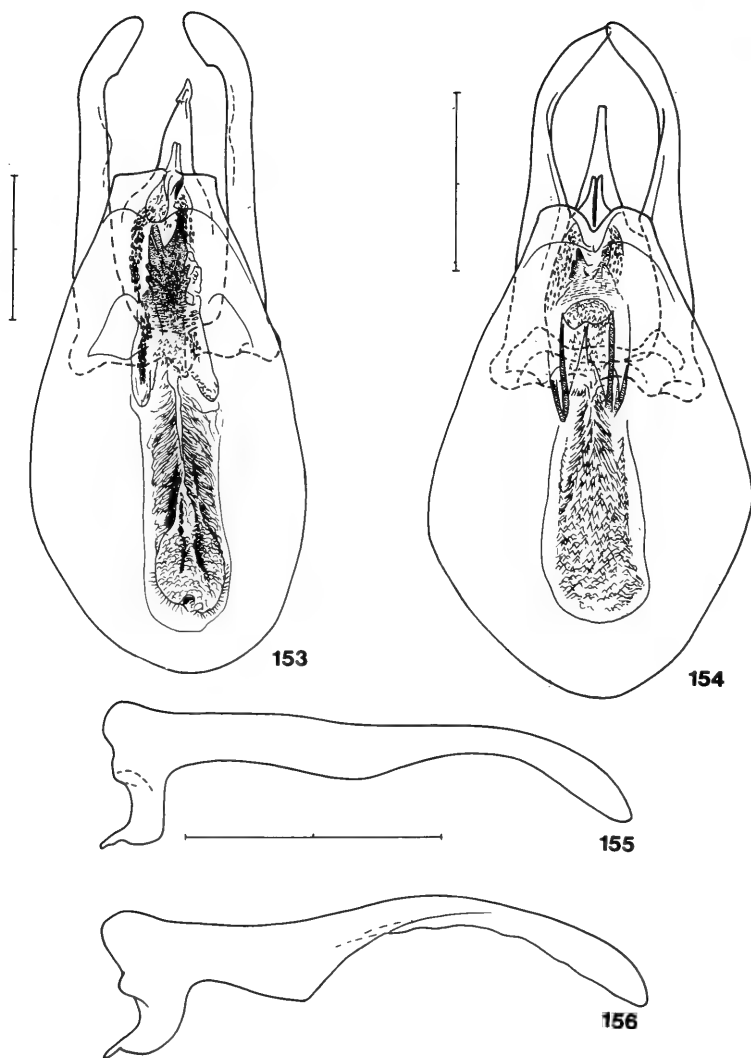
152



151

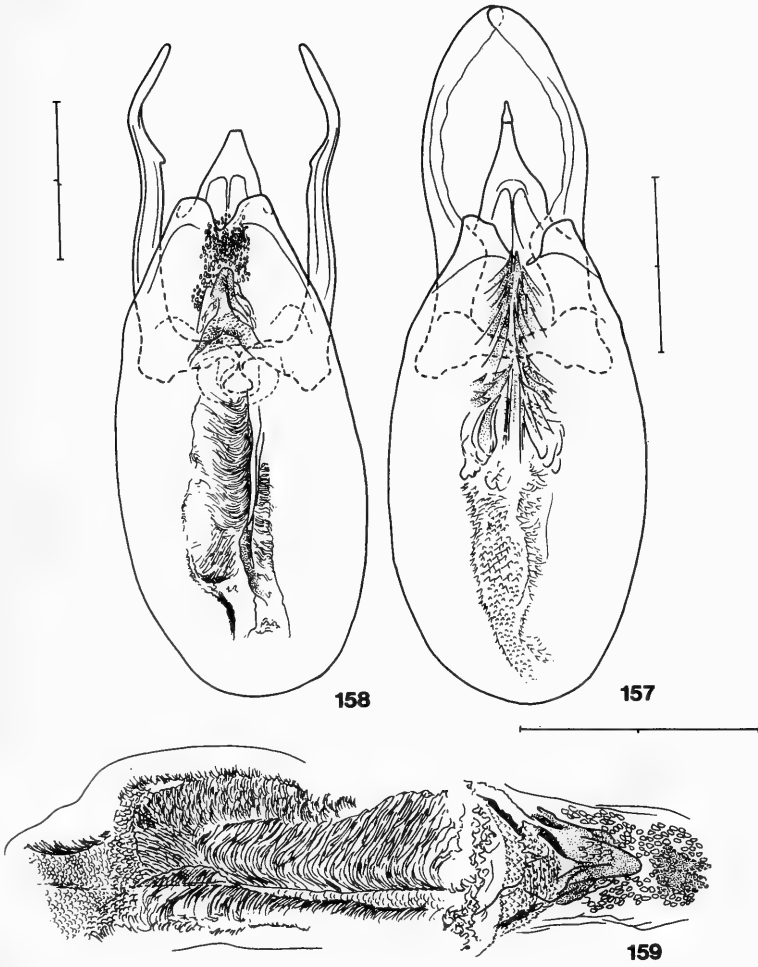
FIGS 150 TO 152.

Aedeagi in *Scaphisoma*; 150 and 151. *S. championi* Löbl; 152. *S. pinnigerum* sp. n. Scale bar = 0.2 mm.



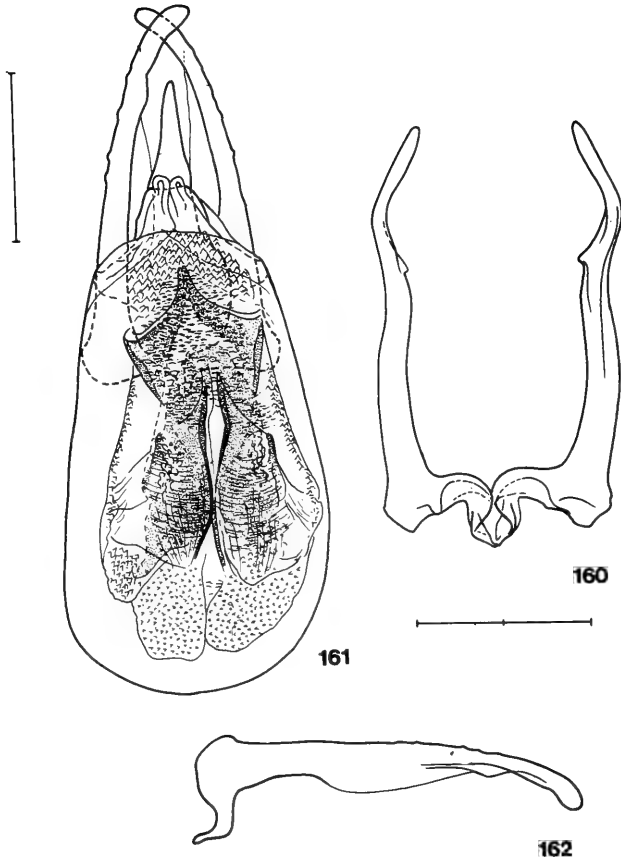
FIGS 153 TO 156.

Aedeagi in *Scaphisoma*; 153. *S. alacre* sp. n.; 154 and 155. *S. nepalense* sp. n., paramere (155) in ventral view; 156. *S. kanchi* sp. n., paramere in ventral view. Scale bar = 0.2 mm.



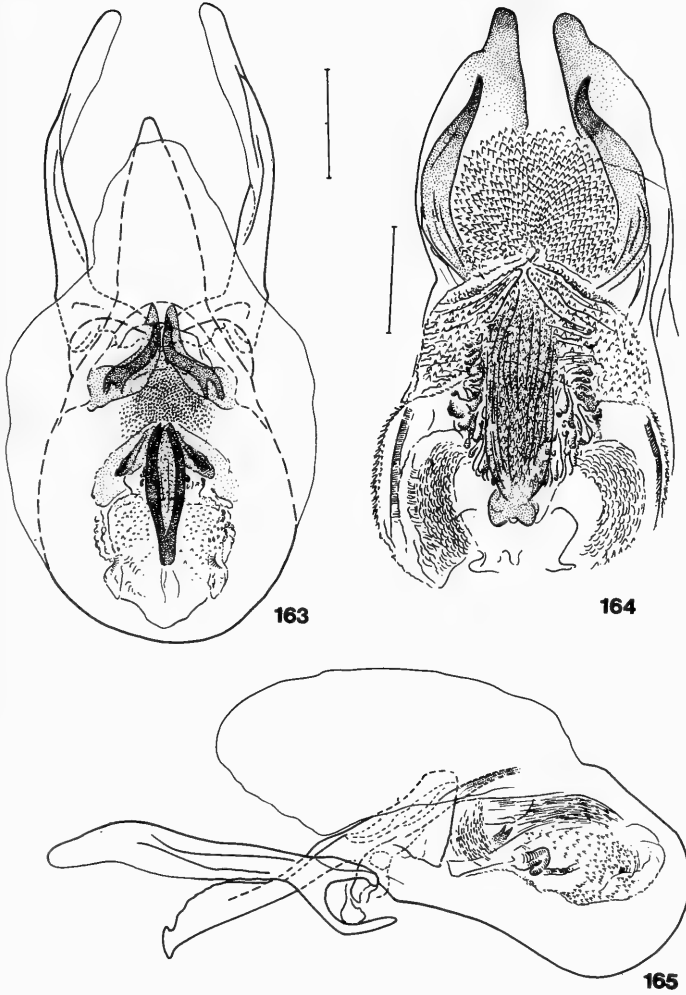
FIGS 157 TO 159.

Aedeagi in *Scaphisoma*; 157. *S. kanchi* sp. n.; 158 and 159. *S. coalitum* sp. n., internal sac (159) in detail. Scale bar = 0.2 mm.



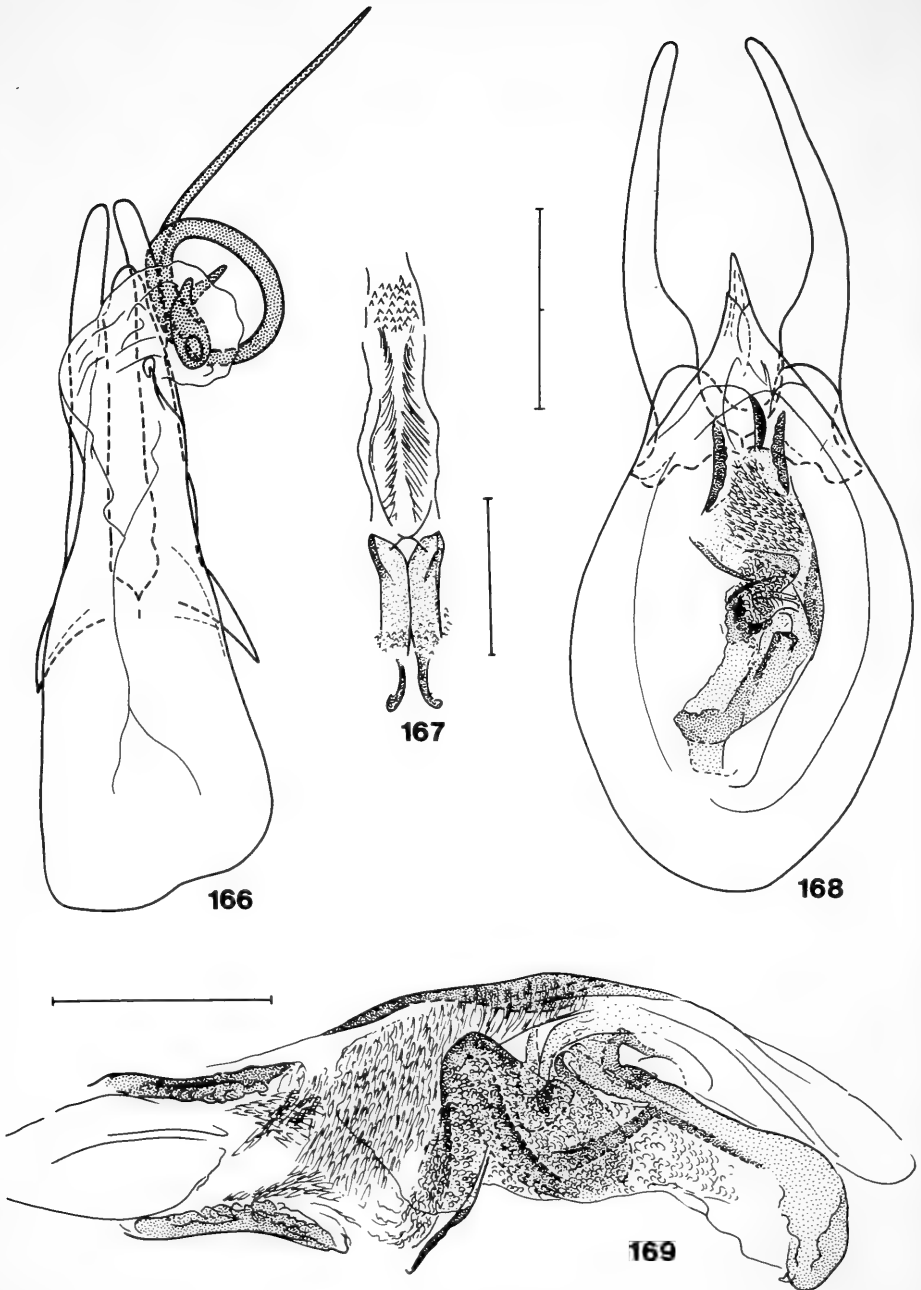
FIGS 160 TO 162.

Aedeagi in *Scaphisoma*; 160. *S. coalitum* sp. n., parameres; 161 and 162. *S. sikkimense* sp. n., paramere (162) in ventral view. Scale bar 0.2 mm.



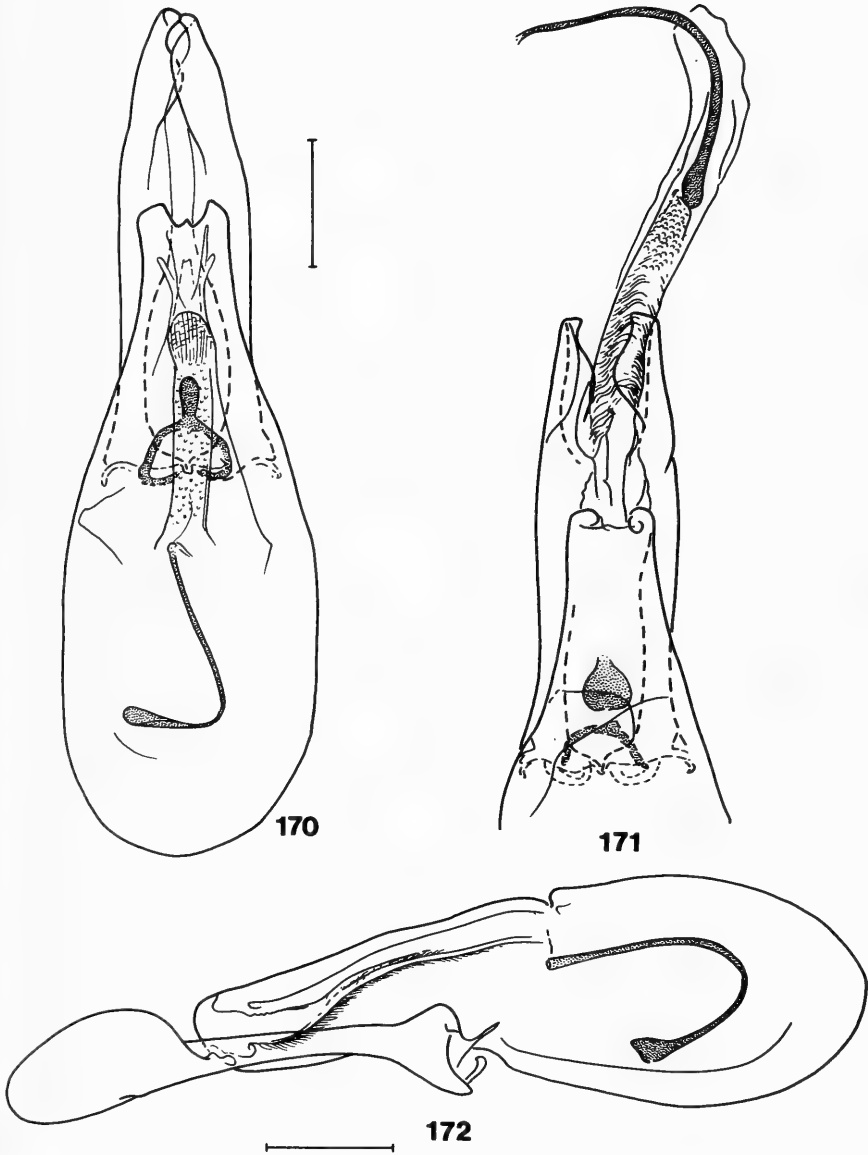
FIGS 163 TO 165.

Scaphisoma bhareko sp. n., aedeagus; internal sac (164) in detail. Scale bar 0.1 mm (164) and 0.2 mm (163).



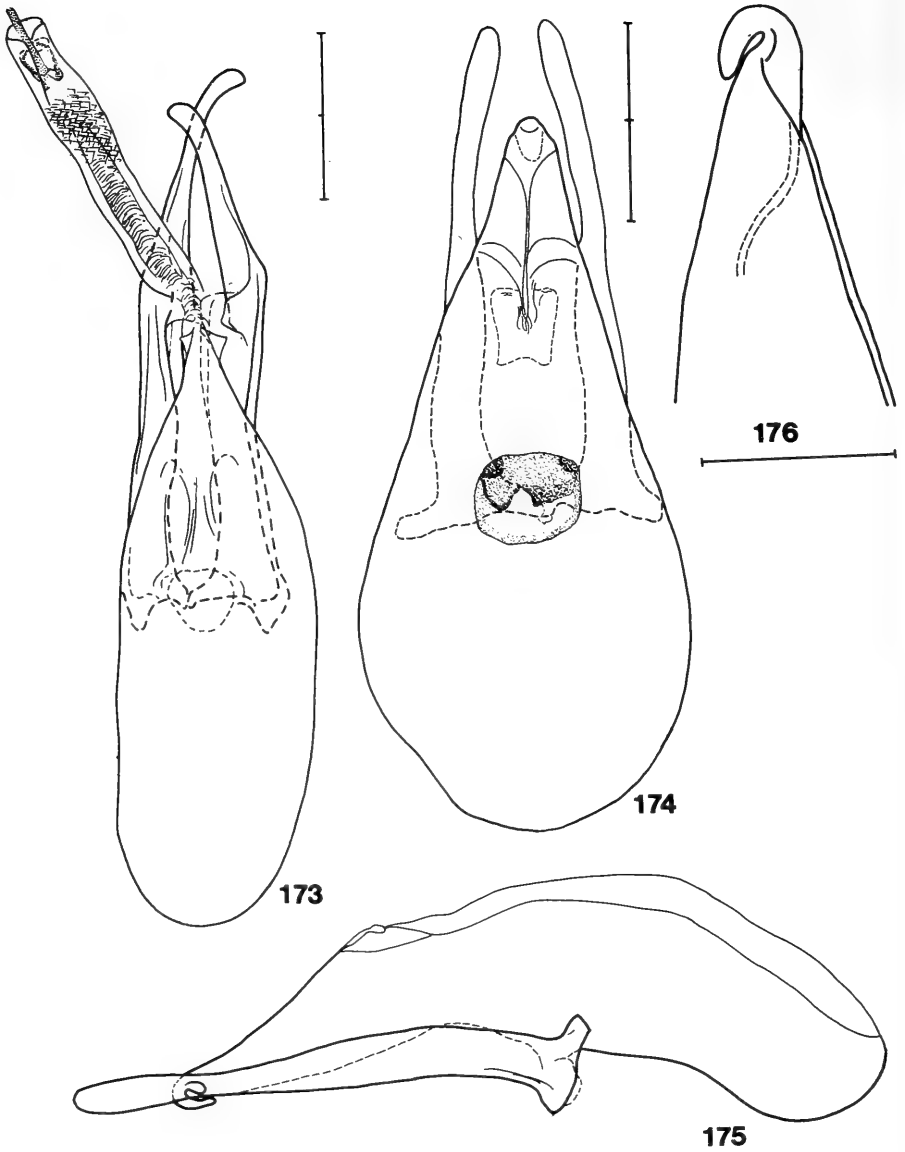
FIGS 166 TO 169.

Aedeagi; 166. *Baetoxidium yeti* sp. n., aedeagus with extruded internal sac; 167. *Scaphoxium eximium* Löbl, internal sac; 168, 169. *Toxidium curtilineatum* Champion, detail of internal sac (169).
Scale bar = 0.1 mm (166, 167, 169) and 0.2 mm (168).



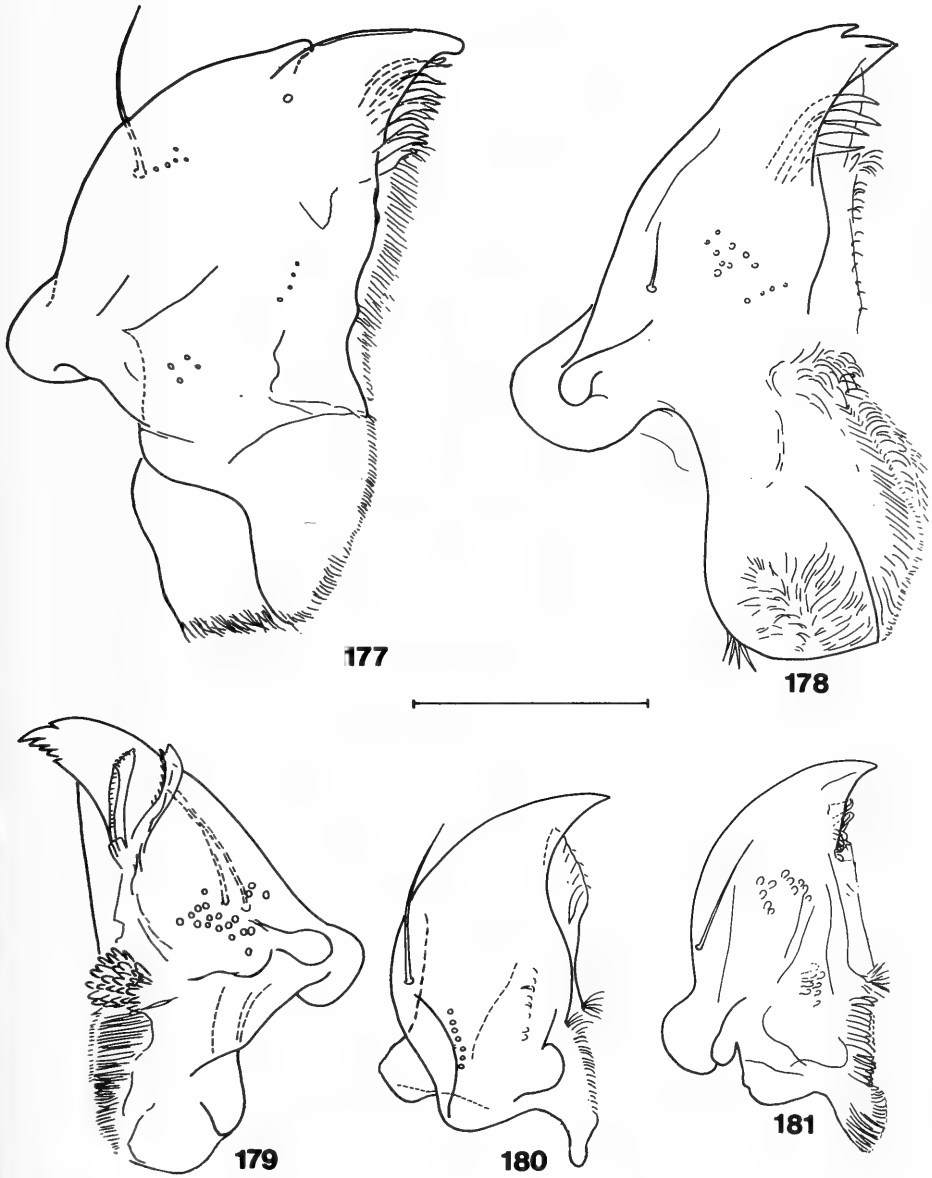
FIGS 170 TO 172.

Xotidium uniforme sp. n., aedeagus; apical portion with extruded internal sac (171). Scale bar = 0.1 mm.



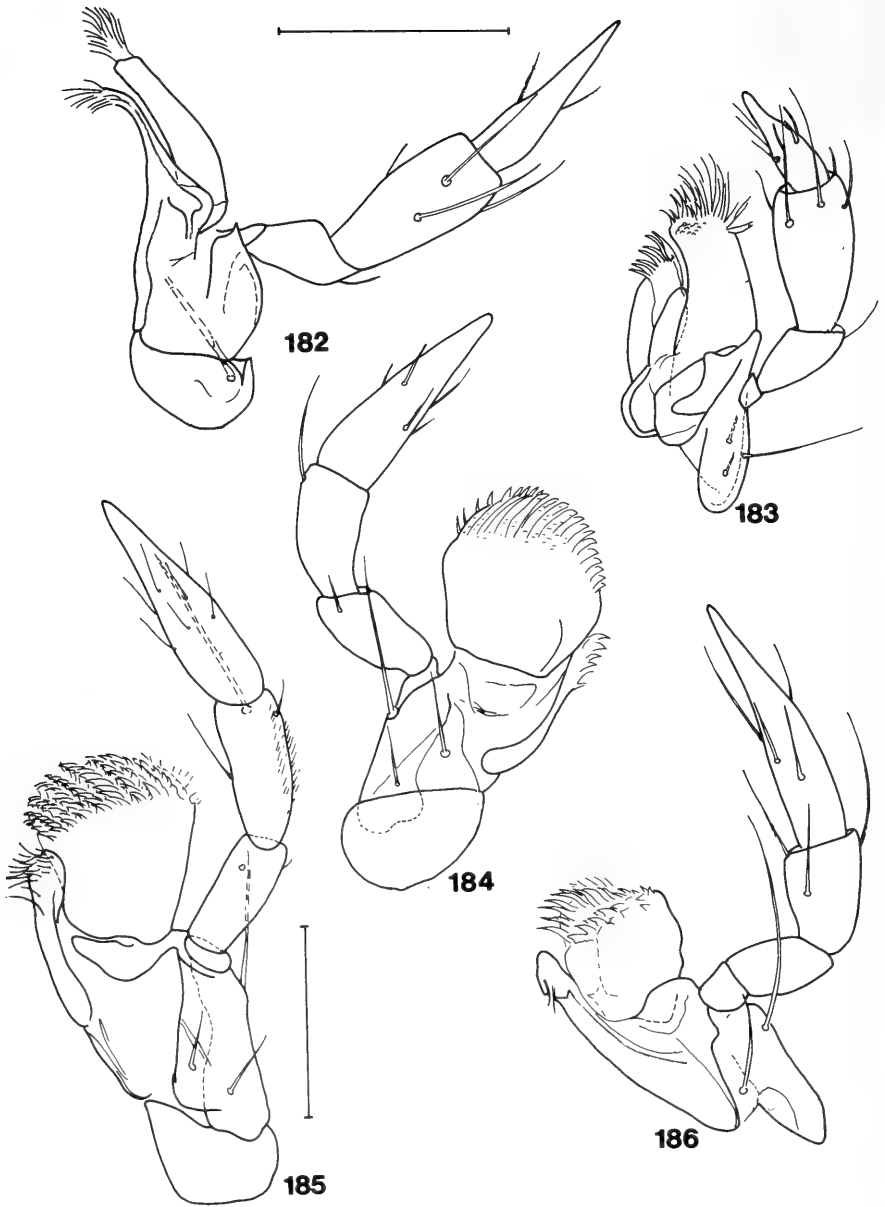
FIGS 173 TO 175.

Aedeagi; 173. *Scaphicomma arcuatum* (Champion); 174-176. *Bironium nepalense* sp. n., apical portion of median lobe (176). Scale bar = 0.2 mm (173-175) and 0.1 mm (176).



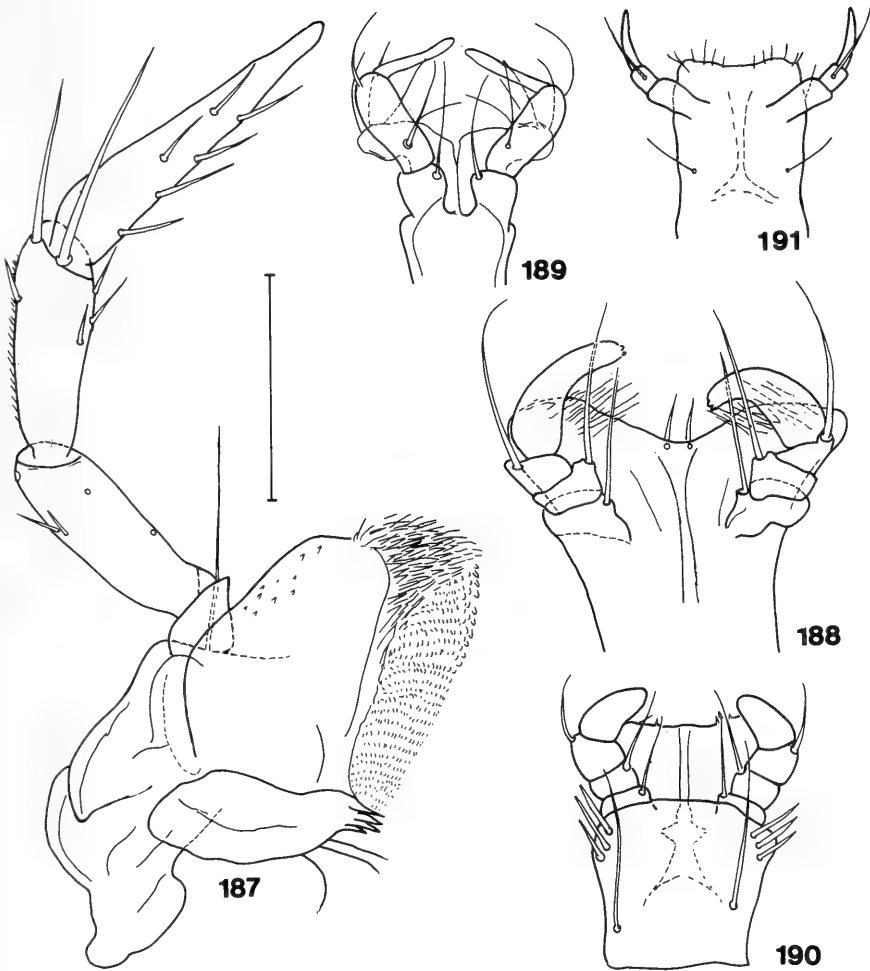
FIGS 177 TO 181.

Mandibles; 177. *Scaphicoma arcuatum* (Champion); 178. *Toxidium vagans* Löbl; 179. *Xotidium uniforme* sp. n.; 180. *Baeotoxidium lanka* Löbl; 181. *Scaphobaeocera japonica* (Reitter). Scale bar = 0.1 mm.



FIGS 182 TO 186.

Maxillae; 182. *Baeotoxidium lanka* Löbl; 183. *Scaphobaeocera japonica* (Reitter); 184. *Toxidium gammaroides* LeConte; 185. *Toxidium vagans* Löbl; 186. *Xotidium uniforme* sp. n. Scale bar = 0.1 mm.



FIGS 187 TO 191.

Mouthparts. 187, 188. *Scaphicoma arcuatum* (Champion), maxilla and labium with palpi; 189. *Xotidium uniforme* sp. n., labial palpi with hypopharynx; 190. *Toxidium gammaroides* LeConte, labium with palpi and hypopharynx; 191. *Baetoxidium lanka* Löbl, labium with palpi and hypopharynx. Scale bar = 0.1 mm.

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Morphometric data on the scapula and limb long bones of *Arvicola terrestris* (Linnaeus, 1758) (Rodentia, Arvicolidae)

by

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ABSTRACT

Data on the morphometry of the scapula and limb long bones of the northern water vole, *Arvicola terrestris*, according to sex and relative age are given. The sample was formed by 209 specimens (104 males and 105 females) captured in the Spanish Pyrenees. The whole sample was divided into six classes of relative age. The width and functional length of the scapula and limb long bones were measured in each specimen.

The results indicate a notable biometric uniformity in the scapula and limb long bones between males and females. The variables with the highest growth rate are the width and length of the scapula. The scapula and limb long bones show their maximum length increase before fourteen weeks of age. The width of the scapula shows a positive allometry against its length up to approximately the first year of age. Thereafter, this relation is isometric. The widths of the humerus and femur show a positive allometric growth against their respective lengths during adulthood. The growth rates of the length of the hind limb bones are higher than those of the forelimb.

INTRODUCTION

In the large Palaearctic distribution area of *Arvicola terrestris*, two eco-ethological types of populations are known: the digging populations from central and southwestern Europe, and the aquatic populations found in the remainder of the distribution area. These latter populations show similar habitat requirements and behaviour to the southwestern water vole, *Arvicola sapidus*, distributed in France and the Iberian Peninsula. In eastern Europe other populations with double habitat preferences (underground or aquatic according to the season) are present (KRATOCHVIL 1983). In the Iberian Peninsula there are only strictly digging populations.

Although the information published on *A. terrestris* is abundant (REICHSTEIN 1982), the bibliographic data on the morphology and morphometry of the girdles and limb skeleton are relatively scarce (BROWN & TWIGG 1969; SCHICH 1971; BOU & CASINOS 1985; BOU *et al.* 1987; LAVILLE *et al.* 1989; VENTURA *et al.* 1991). Likewise, the information on relative growth of postcranial bones is reduced to the results reported by

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BROWN & TWIGG (1969) and VENTURA *et al.* (1991) on the os coxae. The aim of this study is to give biometrical data, according to sex and relative age, on the scapula and limb long bones of an Iberian population of *A. terrestris*.

MATERIAL AND METHODS

The sample analysed was formed by 209 specimens (104 males and 105 females) captured between 1983 and 1984 in the Spanish Pyrenees (Aran Valley, Lérida). The specimens were distributed into six classes of relative age (O-V) according to the type of coat and stage of moult, morphological characteristics of the skull and sexual stage (VENTURA & GOSALBEZ 1990). The intervals of age corresponding each category are as follows (VENTURA 1988): class O: 0-3 weeks; class I: 3-6 weeks; class II: 6-10 weeks; class III: 10-14 weeks; class IV: specimens older than 14 weeks, but before the end of their first winter; class V: specimens that have wintered at least once.

The following measurements were taken (VENTURA 1990): SW: width of the scapula; SL: functional length of the scapula; HW: width of the humerus; HL: functional length of the humerus; UL: functional length of the ulna; RL: functional length of the radius; FW: width of the femur; FL: functional length of the femur; TL: functional length of the tibia. All measurements were taken with vernier calipers. The following indices were considered (VENTURA 1990): SI = (SW/SL)%; HI = (HW/HL)%; FI = (FW/FL)%; LI = [(HL+RL) / (FL+TL)] %.

The variation percentages between the means of consecutive age classes were calculated by the formula (VENTURA 1990) $VP = [(\bar{x}_{i+1} - \bar{x}_i) \cdot 100] / \bar{x}_i$, where \bar{x}_i and \bar{x}_{i+1} are the averages corresponding to the age classes considered. The significance of the differences between two sample means was calculated by the Student's t-test (SOKAL & ROHLF 1981). With the logarithmic values of the data, regressions were calculated by the least squares method (SOKAL & ROHLF 1981). The significance of the differences between two regression coefficients was determined by the comparison of their confidence intervals at 95%.

RESULTS

The intersexual comparisons of the averages of each parameter in all age classes reveal the existence of a high biometric uniformity between males and females. Only significant differences are present in UL in classes IV (males: \bar{x} =19.03, sd=0.55, n=19; females: \bar{x} =18.65, sd=0.52, n=22; t=2.2719, p<0.05) and V (males: \bar{x} =19.61, sd=0.51, n=17; females: \bar{x} =19.22, sd=0.55, n=16; t=2.1136, p<0.05) and in RL in class I (males: \bar{x} =15.17, sd=0.26, n=6; females: \bar{x} =14.61, sd=0.35, n=9; t=3.3369, p<0.01). In the indices considered, only SI in class 0 (males: \bar{x} =68.17, sd=1.16, n=4; females: \bar{x} =61.96, sd=4.66, n=4; t=2.5863, p<0.05) and LI in classes I (males: \bar{x} =83.91, sd=1.84, n=3; females: \bar{x} =86.38, sd=1.49, n=8; t=2.3171, p<0.05) and IV (males: \bar{x} =82.83, sd=1.7, n=20; females: \bar{x} =81.21, sd=1.43, n=22; t=2.1108, p<0.05) show significant differences.

From these results, the data obtained in males and females were treated together (table 1). With the aim of determining the growth rate of all the variables considered, each one was correlated against the body weight, which was used as an approximate indicator of age (PELIKAN 1972; VENTURA & GOSALBEZ 1990). The confidence intervals of the regression coefficients (b) reveal that, except between HW and FL, and UL and RL, the

TABLE I.

Values of the measurements and indices taken in the scapula and limb long bones in *Arvicola terrestris*, according to the relative age.

Variable or index	Age class	n	\bar{x}	sd	min.	max.
SW	0	8	6.52	0.53	5.6	7.0
	I	31	7.85	0.58	6.8	9.0
	II	42	9.30	0.52	7.9	10.7
	III	42	10.64	0.69	9.4	12.0
	IV	43	12.23	0.78	10.4	13.8
	V	41	13.13	0.68	11.6	14.7
SL	0	8	10.04	0.57	8.7	10.6
	I	31	11.58	0.73	10.2	12.9
	II	42	13.64	0.63	12.3	14.8
	III	42	15.55	0.74	14.0	15.9
	IV	43	17.21	0.79	15.2	18.8
	V	41	18.46	0.64	17.0	19.8
HW	0	9	1.43	0.11	1.2	1.6
	I	31	1.52	0.08	1.4	1.7
	II	42	1.68	0.09	1.5	1.9
	III	42	1.85	0.11	1.6	2.1
	IV	43	2.05	0.13	1.8	2.3
	V	41	2.25	0.15	2.0	2.6
HL	0	7	13.54	0.88	11.7	14.8
	I	31	15.19	0.73	13.5	16.7
	II	42	17.01	0.63	15.5	18.7
	III	42	18.51	0.67	16.8	20.3
	IV	43	19.73	0.66	18.2	21.3
	V	41	20.63	0.70	18.6	22.0
UL	0	6	14.38	0.70	13.1	15.2
	I	14	15.66	0.44	15.0	16.4
	II	26	16.80	0.69	15.7	19.3
	III	36	17.80	0.59	16.7	19.0
	IV	41	18.83	0.56	17.7	20.0
	V	33	19.42	0.56	18.3	20.4
RL	0	6	13.62	0.76	12.3	14.7
	I	15	14.81	0.40	14.0	15.4
	II	37	16.03	0.48	15.0	16.7
	III	38	17.12	0.50	16.0	18.4
	IV	42	18.00	0.54	16.8	19.0
	V	40	18.63	0.51	17.6	19.8
FW	0	9	1.81	0.18	1.5	2.0
	I	31	2.07	0.15	1.8	2.4
	II	42	2.35	0.13	2.1	2.6
	III	42	2.58	0.76	2.0	3.0
	IV	43	2.89	0.20	2.5	3.4
	V	41	3.07	0.21	2.7	3.4
FL	0	7	14.07	0.81	12.3	15.0
	I	29	15.74	0.82	14.3	17.2
	II	42	18.02	0.74	16.8	20.0

TABLE I. (continuation)

Variable or index	Age class	n	\bar{x}	sd	min.	max.
	III	42	20.03	0.76	18.0	21.8
	IV	43	21.69	0.75	20.0	23.0
	V	41	23.04	0.75	21.7	24.9
TL	0	6	17.70	0.32	17.4	18.3
	I	23	19.17	0.94	17.7	21.2
	II	34	21.62	0.78	20.2	23.4
	III	37	23.12	0.87	20.1	24.4
	IV	43	24.49	0.78	21.9	25.7
	V	40	25.83	0.83	24.4	27.7
SI	0	8	65.07	4.61	53.37	70.10
	I	31	67.82	2.68	61.95	73.73
	II	42	68.17	1.79	58.09	72.66
	III	41	68.40	2.39	63.51	72.73
	IV	42	70.94	2.67	64.07	76.40
	V	41	71.12	2.98	64.40	79.00
HI	0	7	10.65	0.66	9.70	11.85
	I	31	10.03	0.51	9.26	11.27
	II	42	9.89	0.55	8.52	11.61
	III	42	9.98	0.48	9.04	11.11
	IV	43	10.41	0.62	9.04	11.70
	V	41	10.92	0.68	9.52	12.63
FI	0	6	13.17	0.88	12.19	14.28
	I	29	13.16	0.64	11.73	14.46
	II	42	13.08	0.72	11.50	14.77
	III	42	12.89	0.79	9.52	14.35
	IV	43	13.31	0.89	11.36	15.53
	V	41	13.32	0.85	11.54	14.80
LI	0	4	86.97	1.31	85.26	88.59
	I	11	85.70	1.93	81.32	87.88
	II	30	83.56	1.23	80.67	85.71
	III	33	82.37	1.38	79.38	86.32
	IV	42	81.69	1.65	77.20	88.10
	V	39	80.33	1.26	77.40	82.63

slopes of the remaining regression are significantly different (table 2). SW is the variable that shows the highest slope against body weight. The length of the proximal bones of each limb shows higher regression coefficients than that of the distal ones. Moreover, the femur shows a higher growth rate than the humerus, and the tibia grows faster than the ulna and radius (table 2).

The lengths of the scapula and limb long bones generally show a progressive diminution of the variation percentages of the means between consecutive age classes (table 3), higher values appearing in 0-I (HL, UL and RL) or in I-II (SL, FL and TL) intervals. From this last interval, the variation rates diminish until class V. The variation percentages of the widths of the scapula, humerus and femur decrease from the lowers (O-

TABLE 2.

Values of the regression equations ($\log y = b \log x + \log a$) for the correlations between body weight (x) and all the measurements considered (y).

y	log a	b	Confidence intervals of b (95%)		r	n
			minor	major		
SW	-0.0513	0.5388	0.5153	0.5623	0.9528	207
SL	0.2233	0.4810	0.4646	0.4974	0.9702	207
HW	-0.4952	0.3845	0.3622	0.4068	0.9207	208
HL	0.6138	0.3241	0.3119	0.3363	0.9643	206
UL	0.7915	0.2290	0.2146	0.2434	0.9288	156
RL	0.7544	0.2378	0.2248	0.2508	0.9375	178
FW	-0.4188	0.4168	0.3949	0.4387	0.9337	208
FL	0.5176	0.3894	0.3757	0.4031	0.9689	204
TL	0.7700	0.2956	0.2816	0.3096	0.9509	183

TABLE 3.

Variation percentages between the means of consecutive age classes in the measurements and indices considered.

Variable or index	0-I	I-II	II-III	III-IV	IV-V
SW	20.40	18.47	14.41	14.94	7.36
SL	15.34	17.79	12.28	10.67	7.26
HW	6.30	10.53	10.11	10.81	9.76
HL	12.19	11.98	8.82	6.59	4.56
UL	8.90	7.28	5.95	5.79	3.13
RL	8.74	8.23	6.80	5.14	3.50
FW	14.36	13.53	9.79	12.01	6.23
FL	11.87	14.48	11.15	8.29	6.22
TL	8.30	12.78	6.94	5.93	5.47
SI	4.22	0.52	0.34	3.71	0.25
HI	-5.82	-1.40	0.91	4.31	4.90
FI	-0.08	-0.61	-1.45	3.26	0.07
LI	-1.46	-2.50	-1.42	-0.82	-1.66

I in SW and FW, and I-II in HW) to the II-III intervals, relatively high values appearing in the next (table 3).

The indices considered show particular variation patterns with relative age. SI progressively increases its averages from classes O to V (table 1), specially in the III-IV interval (table 3). The differences between the mean values obtained in the extreme categories (O, V) as well as in classes III and V are significant (O-V: $t=4.7801$, $p<0.001$; III-V: $t=4.5689$, $p<0.001$).

The HI averages diminish significantly between classes 0 and II ($t=3.2935$, $p<0.01$). In the interval between classes II and V the mean of this index increases significantly ($t=7.5767$, $p<0.001$) (table 1). This increase can be verified when the relatively high percentages of variation (4-5%) in the last two age intervals are taken into account (table 3).

The FI index follows a similar variation pattern to that of HI, although FI shows a smaller range (table 1). Thus, the average values diminish, albeit not significantly, between classes 0 and III, and from this latter one the means of FI increase significantly until class V ($t=2.3859$, $p<0.05$). Nevertheless, this increase is relatively less marked than that observed in HI in the II-V interval.

The LI averages decrease from classes 0 to V with relatively constant rate (tables 1 and 3). The differences between the means of these age classes are clearly significant ($t=10.0079$, $p<0.001$).

DISCUSSION

Although significant differences between males and females are observed in some parameters, due to the higher biometrical similarity in most of the intersexual comparisons performed, it can be stated that there is no sexual dimorphometry in the scapula and limb long bones in the population analysed.

Taking into account the values of the regression coefficients and their confidence intervals, the width of the scapula is the parameter that shows highest growth rate. The long bones of the hind limb grow faster than those of the forelimb. Likewise, in each limb, the proximal bones show the highest growth rate.

The variation percentages between the averages of consecutive age classes reveal that the scapula and the limb long bones show their maximum length increase before fourteen weeks of age, approximately. The widths of the scapula, humerus and femur show a relatively high increase starting from fourteen weeks of age. In the correlation against the body weight, these parameters show significantly higher growth rate than the corresponding lengths.

The means of SI in adult specimens (classes IV and V) are about 71%. This value is lower than that obtained in *A. sapidus* (75.1-76.1%; VENTURA 1990). These differences can be attributed to functional factors determined by the different eco-ethological characteristics of the two species. Thus, the relatively longer scapula shown by underground rodent species (SCHICH 1971; LAVILLE *et al.* 1989) may be the factor that determines the interspecific differences detected.

The variation pattern of SI with relative age in *A. terrestris* is, in general terms, similar to that obtained in *A. sapidus* (VENTURA 1990). In both species, the width of the scapula shows a positive allometry against length up to, approximately, the first year of age. Thereafter, this relation is isometric.

The averages of HI in adult specimens vary between 10.4-11%. These values are notably higher than those detected in *A. sapidus* (8.3-8.6%; VENTURA 1990). This interspecific relation coincides with the results obtained by CABRERA-MILLET (1980). Taking into account the data reported by BOU *et al.* (1987), the differences between these two species may be due to the relatively higher width that show the proximal bones of the fore limb in underground rodent species. Likewise, digging species tend to have shorter limb bones (BOU *et al.* 1987).

During the first ten weeks of life, approximately, the length of the humerus shows a positive allometry against width. Thereafter, the allometric growth is favourable to the

width. This variation pattern is similar to that reported in *A. sapidus* (VENTURA 1990), but the increase that occurs during adulthood is higher in *A. terrestris*.

The average of FI in adult specimens is about 13.3%. This percentage is clearly higher than that observed in *A. sapidus* (11.3-11.7%; VENTURA 1990). These results coincide with the data of BOU *et al.* (1987), which indicate that underground rodent species tend to have relatively shorter limb bones.

During the fourteen first weeks of life, the length and width of the femur vary isometrically, existing a relative light increase of the length. From this age on, the averages of FI increase due to the positive allometry favourable to the width during adulthood. The variation pattern of FI with relative age is similar to that reported in *A. sapidus*, but the range of variation is higher in this species (VENTURA 1990).

The mean values of LI in adult specimens vary between 80.3-81.7%. These percentages are notably higher than those observed in *A. sapidus* (74.1-74.9%; VENTURA 1990). This interspecific relation coincides with the results reported by CABRERA-MILLET (1980). According to SCHICH (1971) and CABRERA-MILLET (1980), the aquatic rodents show relative longer hind limbs. This fact determines the lower averages of LI observed in *A. sapidus* in relation to *A. terrestris*.

The regression coefficients obtained in the correlations of each limb long bone length against the body weight indicate that the hind limb shows a significant higher growth rate than the forelimb. The variation pattern of LI until fourteen weeks of age, approximately, is similar to that observed in *A. sapidus* (VENTURA 1990). During adulthood LI averages diminish lighter in both species.

The results obtained indicate some differences in the growth patterns of the scapula and limb long bones between the two Palaearctic species of *Arvicola*. The precise determination of these patterns and their adaptative and phylogenetic significance will be stated when studies on this matter on the aquatic populations of *A. terrestris* are undertaken.

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Eine neue *Bolitobius*-Art aus Pakistan
(Coleoptera, Staphylinidae)
9. Beitrag zur Kenntnis der Tachyporinen

von

Michael SCHÜLKE*

Mit 17 Textfiguren

ABSTRACT

A new *Bolitobius*-species from Pakistan (Coleoptera, Staphylinidae). – The description of *Bolitobius besucheti* spec. nov. from Pakistan is given with illustrations of distinctive characters. A Lectotype of *Bolitobius bicolor* (Cameron) is designated, and the distribution of both species is shown.

Anlässlich der Beschäftigung mit der *Bolitobius setiger* – Gruppe, die im Himalayagebiet und in Ostasien verbreitet ist, wurden auch alle anderen beschriebenen Taxa der Gattung aus dem betreffenden Faunengebiet sowie eine größere Menge unbearbeiteten Materials untersucht. So fand sich unter einer größeren Anzahl von *Bolitobius* aus dem Himalaya, die mir dankenswerter Weise von den Kollegen des Genfer Museums (Cl. Besuchet und I. Löbl; (MHNG)) zur Bearbeitung zur Verfügung gestellt wurden, eine neue Art aus der Verwandtschaft von *Bolitobius bicolor* (Cameron), die im nachfolgenden beschrieben werden soll. Neben den genannten Genfer Kollegen gilt mein besonderer Dank Miss E. DeBoise und Mr. R. Aldridge (British Museum, Natural History – BMNH) für die Ausleihe von Typenmaterial Camerons.

***Bolitobius besucheti* spec. nov.**

Material: Hototypus-♂: Pakistan: Swat, s/Utrot; 14.V.1983, 2500-2600 m, Besuchet - Löbl; Holotypus-♂, *Bolitobius besucheti* spec. nov., M. Schülke det. 1990 (rot) (MHNG); Paratypen-♂♀: 1♀, gleiche Daten, (MHNG); 1♂, 1♀, gleicher Fundort, 13.V.1983 (MHNG, cSCHÜ); 1♂, Pakistan: Swat, s/Miandam, 2300 m, 10.V.1983, Besuchet - Löbl (MHNG); 2♂, Pakistan: Chitral, s/Madaglasht, 27.V.1983, 2900-3050 m, Besuchet - Löbl (MHNG, cSCHÜ); alle mit Etikett: Paratypus-♂♀, *Bolitobius besucheti* spec. nov., M. Schülke det. 1990/91 (rot).

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Kopf und Halsschild dunkelbraun bis schwarz, die Hinterecken des Halsschildes etwas heller durchscheinend. Vorderrand des Clypeus und Mitte der Stirn etwas aufgehehlt. Flügeldecken einschließlich der Epipleuren rotbraun, Hinterleib dunkelbraun bis schwarz, die Hinterränder der Tergite III-VI aufgehehlt, das Tergit VII mit heller Hinterhälfte, die Hinterleibsspitze ganz hell. Fühlerglieder 1 und 2 gelb, die folgenden Glieder dunkler werdend, bräunlich, das Endglied heller. Beine einfarbig gelbbraun, die Mundwerkzeuge von gleicher Farbe.

Größe: 8 - 8,5 mm, Vorderkörperlänge 3,25 - 3,5 mm. Im Habitus *B. bicolor* sehr ähnlich, weshalb sich die folgende Beschreibung im wesentlichen an für die Unterscheidung beider Arten wesentlichen Merkmalen orientiert. Kopf wie bei allen anderen Arten der Gattung gebaut, Augen mäßig hervortretend. Labrum (Abb. 6) quer, wie bei anderen Arten der Gattung querreihig beborstet (Anzahl größerer Tastborsten 19). Mentum (Abb. 7) stark quer, deutlich mehr als doppelt so breit wie lang, mit zwei Paaren langer Tastborsten an den Seiten und einem Paar etwas kürzerer Borsten in der Mitte. Fühler schlank, Glied 1 dreimal so lang wie breit, Glied 3 länger und etwas breiter als Glied 2, alle folgenden Fühlerglieder länger als breit, Glied 10 so lang wie breit, das Endglied mit ausgeprägtem Sexualdimorphismus, beim Männchen gestreckt, 1,75 mal so lang wie breit, beim Weibchen kürzer, nur 1,35 mal so lang wie breit. Halsschild quer, etwa um ein Viertel breiter als lang, wie bei allen anderen Arten der Gattung mit vier langen Tastborsten an Vorder-, Hinter- und Seitenrändern. Flügeldecken etwas länger als breit (Flügeldeckenseitenrandlänge zu -breite 1,09 : 1), trotz deutlicher Schultern nach hinten etwas erweitert, die größte Breite kurz vor dem Hinterrand erreichend. Auf den Flügeldecken befinden sich zahlreiche Borstenpunkte in denen lange Tastborsten inserieren (Abb. 8). Diese Borstenpunkte sind mehr oder weniger reihig angeordnet. Neben der Flügeldeckennaht befindet sich eine Suturalreihe, die aus 14-18 Borstenpunkten besteht. Am Außenrand der Flügeldecken befindet sich eine aus etwa 12 Borstenpunkten bestehende Lateralreihe und am Hinterrand eine aus 6 - 8 Borstenpunkten bestehende Apikalreihe. Auf der Scheibe der Flügeldecken sind weitere etwa 30 Borstenpunkte in vier undeutlichen Reihen angeordnet. Eine weitere Borstenreihe befindet sich dicht unterhalb des Flügeldeckenaußenrandes auf den Epipleuren. Dort sind jederseits 20-25 kleinere Borsten angeordnet. Hinterleib gestreckt, wie bei anderen Arten der Gattung gebaut. Das III. Tergit mit einer breiten unpunktieren Mittelzone, sonst kräftig und weitläufig beborstet. Auf den folgenden Tergiten ist die Beborstung gleichmäßiger, nur vor dem Tergithinterrand bleibt in der Mitte jeweils eine punktfreie Zone erhalten. Hinterrand von Tergit VII mit deutlich entwickeltem Hautsaum. Beine schlank und gestreckt.

Mikroskulptur: Kopf nur andeutungsweise quermaschig mit etwa 2-3 Maschen/ 10 µm chaginiert, Halsschild mit sehr feinem quergerieftem Chagrin von etwa 5 Maschen/ 10 µm. Flügeldecken noch enger als der Halsschild skulpturiert (etwa 7-8 Maschen/ 10µm), Hinterleibstergite etwa so dicht wie der Halsschild, quermaschig chagriniert.

Männchen: Beim Männchen sind die Vordertarsen erweitert, Sternit VII (Abb. 3) mit einzelnen Borsten in der Mitte des Hinterrandes, Sternit VIII ähnlich wie bei *Bolitobius castaneus* (Steph.) gebildet (Abb. 4), der Hinterrand in der Mitte mit einem abgerundet dreieckigen Vorsprung. In der Mittellinie in der hinteren Hälfte mit einem langgestreckten Feld wenig dicht stehender kurzer, kräftiger Borsten, Sternit X schlank (Abb. 5). Aedoeagus (Abb. 1) ähnlich dem von *B. cingulatus* Mannh. mit mäßig gestrecktem, apikal zugespitztem Medianlobus (Innenstruktur des Medianlobus, Abb. 2).

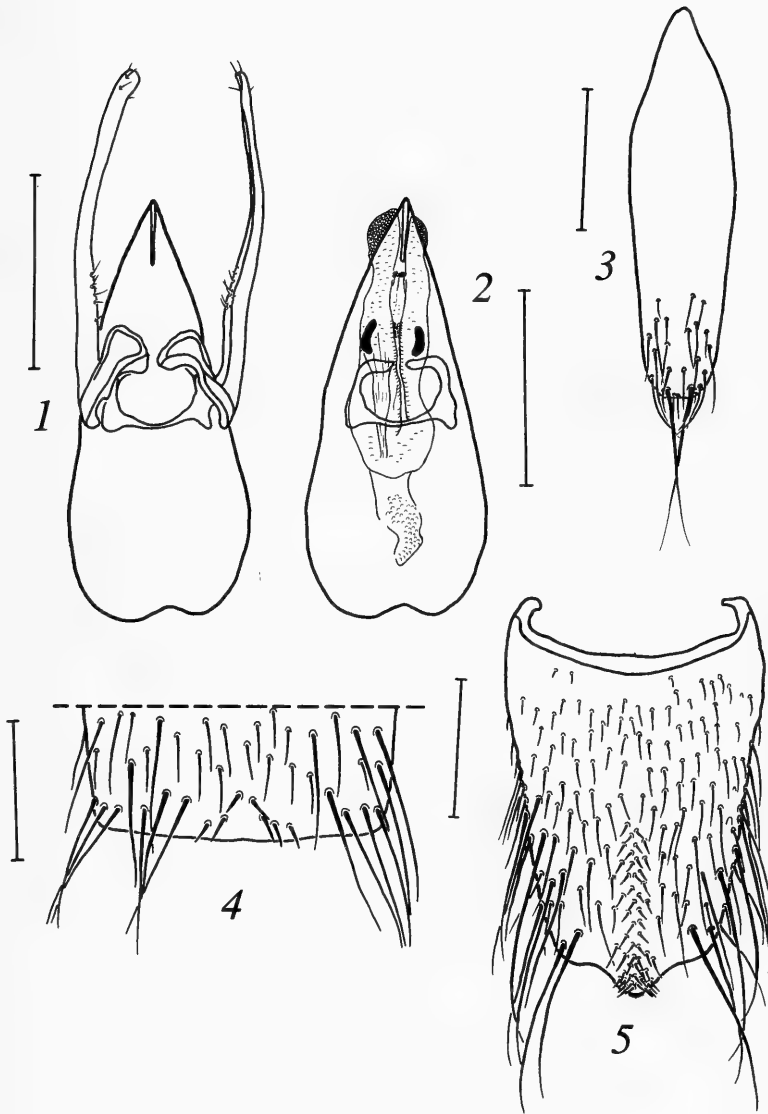


ABB. 1-5.

Bolitobius besucheti spec. nov., Pakistan, Swat 1) Aedeagus, PT (ZNr. 85), 2) Aedeagus, Medianlobus-Innenstruktur PT (ZNr. 85), 3) ♂-Sternit VII, HT (ZNr. 91), 4) ♂-Sternit VIII, PT (ZNr. 87), 5) ♂-Sternit X, PT (ZNr. 86) - Maßstab 0,5 mm.

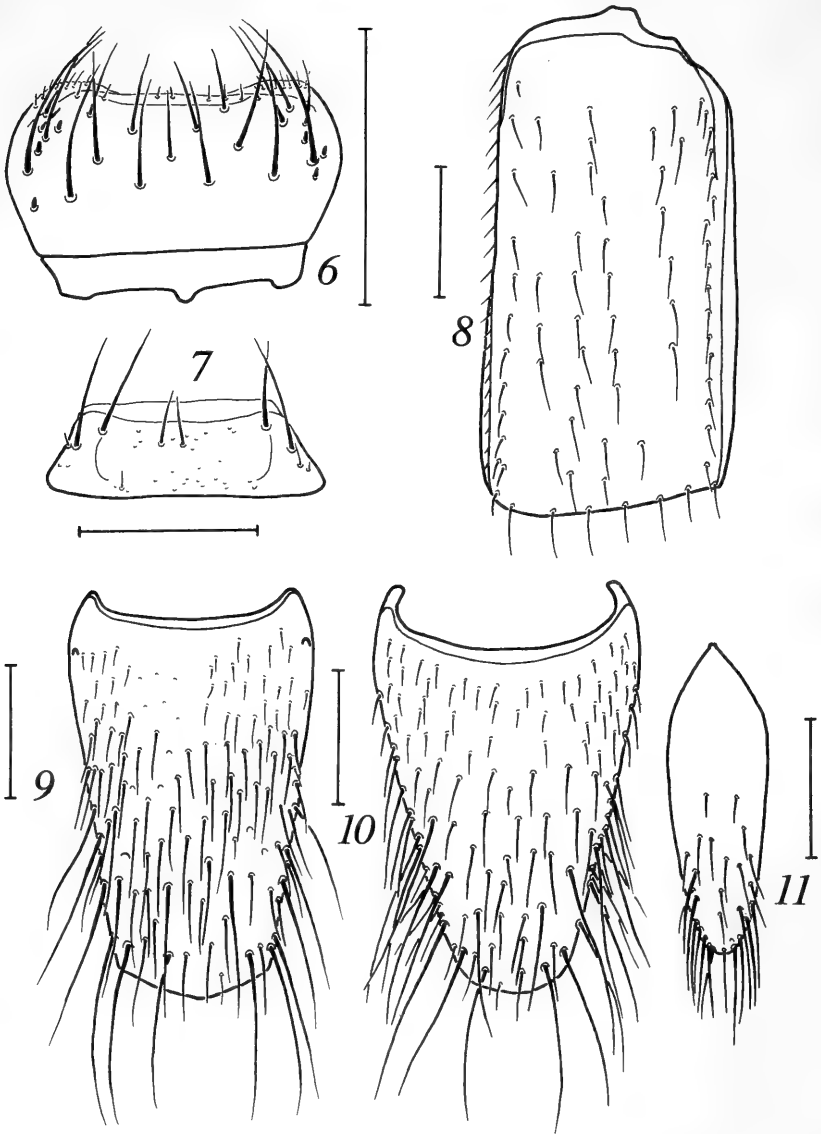


ABB. 6-11.

Bolitobius besucheti spec. nov., Pakistan, Swat 6) Labrum, PT (ZNr. 119), 7) Mentum, PT (ZNr. 120), 8) Flügeldecke, PT (ZNr. 121), 9) ♀-Tergit VIII, PT (ZNr. 122), 10) ♀-Sternit VIII, PT (ZNr. 123), 11) ♀-Tergit X, PT (ZNr. 116) - Maßstab 0,25 mm (6,7), 0,5 mm (8-11).

Weibchen: beim Weibchen ist das Sternit VIII am Hinterrand einfach breit abgerundet (Abb. 10), das Tergit VIII ebenfalls ohne besondere Auszeichnungen (Abb. 9). Tergit X relativ schlank (Abb. 11).

Verbreitung: Bisher nur aus den pakistanischen Provinzen Swat und Chitral aus Höhenlagen zwischen 2300 und 3050 m bekannt. Wahrscheinlich ist die Art in ähnlichen Höhen im Westhimalaya weiter verbreitet (Abb. 17).

Derivatio nominis: Herrn Dr. Cl. Besuchet (Museum d'Histoire naturelle Genève) als Entdecker der Art gewidmet.

Differentialdiagnose: Leider sind mir bisher von *Bolitobius bicolor* (Cameron) nur weibliche Tiere bekannt, so daß ein Vergleich der männlichen Sexualcharaktere vorerst ausbleiben muß. Beide Arten lassen sich aber auch im weiblichen Geschlecht deutlich unterscheiden:

B. besucheti spec. nov.

Flügeldecken (Abb. 8) schlanker, etwa so breit wie der Halsschild, auf der Scheibe mit etwa 30 in vier undeutlichen Reihen angeordneten Borstenpunkten, Apikalreihe aus 7-8 Borstenpunkten bestehend. Flügeldeckenepipleuren wie die Flügeldecken gefärbt. Fühler gestreckt, die vorletzten Glieder länger als breit oder so lang wie breit (Glieder 10), Fühlerglieder 3-10 bräunlich. Sternit und Tergit VIII des Weibchens am Hinterrand +/- einfach abgerundet (Abb. 10, 9), Tergit X schlanker (Abb. 11). Mentum mit schärferen Hinterecken und einem Paar kleinerer Tastborsten in der Mitte (Abb. 7). Mikroskulptur auf dem Kopf erloschen und wie auf dem Halsschild etwas weitläufiger als bei *B. bicolor* (Cameron). Bisher in Höhenlagen zwischen 2300 und 3050 m gefunden.

B. bicolor (Cameron)

Flügeldecken (Abb. 13) etwas breiter als der Halsschild, auf der Scheibe mit etwa 25 in drei Reihen angeordneten Borstenpunkten. Auf der Innenseite der Flügeldecken befinden sich neben der Suturalreihe nur wenige Einzelborsten. Die Apikalreihe besteht nur aus 5 Borsten. Die Flügeldeckenepipleuren schwarz. Fühler kurz, die vorletzten Glieder deutlich quer, Fühlerglieder 3-10 schwarz. Sternit VIII des Weibchens am Hinterrand etwas zugespitzt (Abb. 15), Tergit VIII (Abb. 14) am Hinterrand in der Mitte mit einem abgerundeten Mittelvorsprung. Tergit und Sternit VIII breiter als bei *B. besucheti* spec. nov., Tergit X ebenfalls wesentlich breiter (Abb. 16). Mentum mit breit abgerundeten Hinterecken (Abb. 12) und ohne zusätzliches drittes Borstenpaar in der Mitte. Mikroskulptur auf dem Kopf deutlicher und dichter (5 Maschen / 10 µm), auf dem Halsschild ebenfalls dichter (7-8 Maschen/ 10 µm), sonst wie bei *B. besucheti*. Die bisherigen Funde stammen soweit bekannt aus Höhenlagen unter 2000 m.

Bolitobious bicolor (CAMERON, 1926)

Typen: *Bolitobius bicolor* (Cameron) wurde von Dehra Dun und Sijla Gad (Chakrata District) beschrieben. Mir lag aus dem British Museum (Natural History) ein Syntypus (♀) mit folgender Etikettierung vor: Syntype (rund mit blauem Rand); Dehra Dun, Dr.

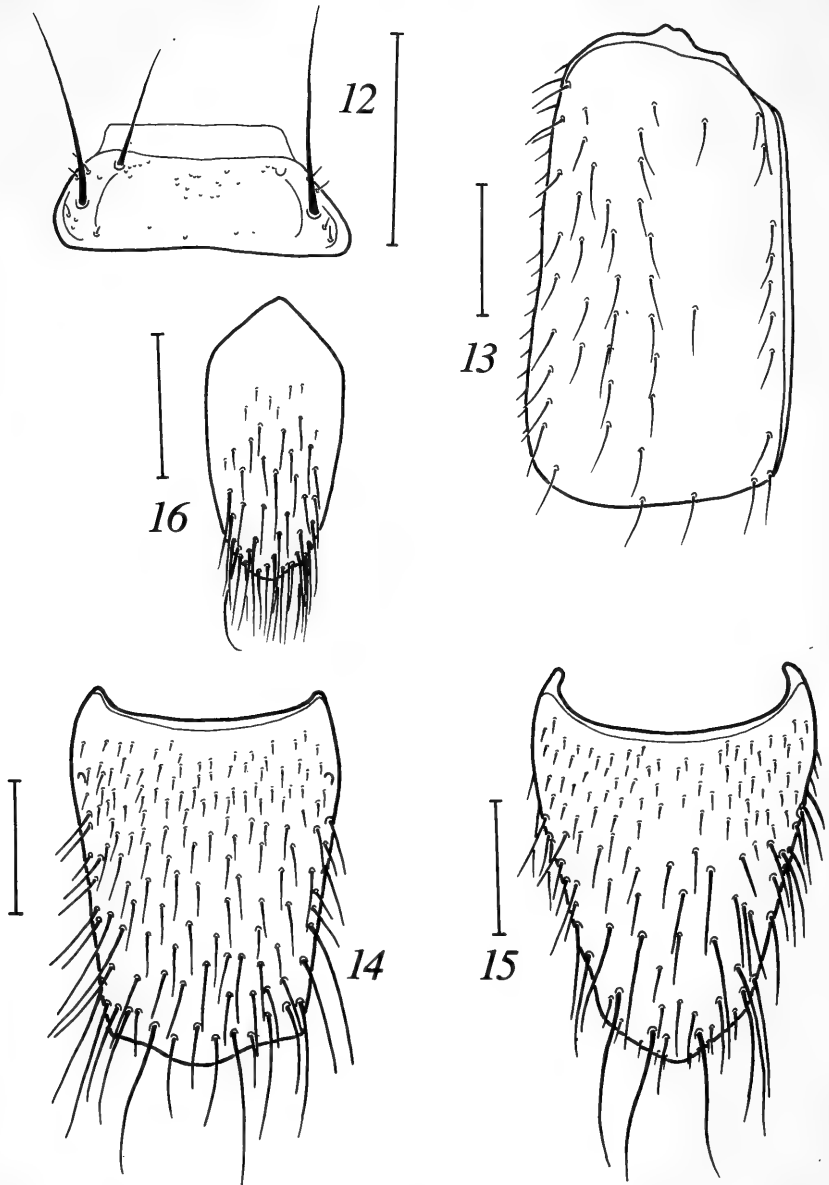


ABB. 12-16.

Bolitobius bicolor (Cameron), Indien, Chaubattia 12) Mentum, (ZNr. 118), 13) Flügeldecke (ZNr. 124), 14) ♀-Tergit VIII (ZNr. 125), 15) ♀-Sternit VIII (ZNr. 126), 16) ♀-Tergit X (ZNr. 117) - Maßstab 0,25 mm (12), 0,5 mm (13-16).

Cameron, 11-7-1921; M. Cameron, Bequest., B.M. 1955-147.; Wood (rotten); *Bryocharis bicolor* (Cam., P.M. Hammond det. 1989, Syntype. Dieser Syntypus wird hiermit als Lectotypus designiert, er wurde von mir mit einer Etikette: Lectotypus-♀, *Bryocharis bicolor* Cameron, 1926, des. M. Schülke 1991, versehen.

Weiteres Material lag mir von folgenden Fundorten vor: Indien, Kumaon (UP), Chaubattia Pres. Rassikhet. env. 1800 m, 14-13-X-79, I. Löbl (1♀, cSCHÜ); Pakistan: Hazara, Malkandi, 1500 m, 3.VI.1983, Besuchet - Löbl (1♀, MHNG).

Damit scheint *B. bicolor* über den Westhimalaya weit verbreitet zu sein und hier vor allem in den Vorgebirgen der Siwalik Range vorzukommen (Abb. 17).

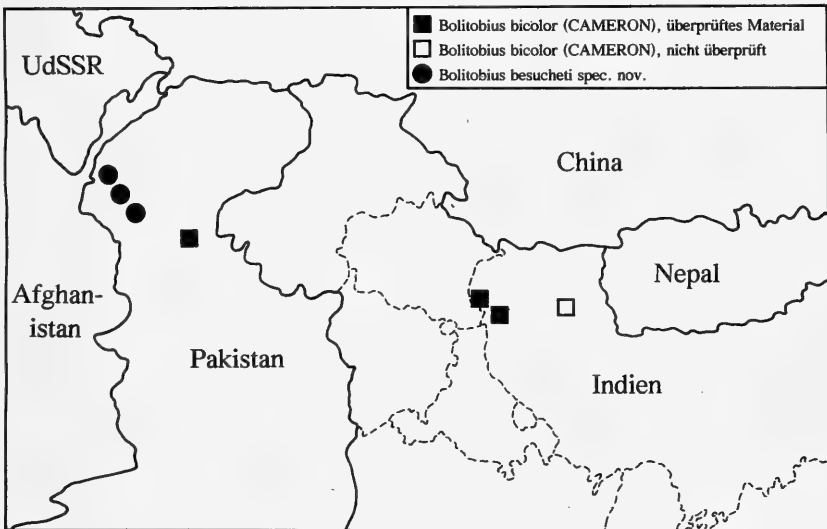


ABB. 17.

Verbreitung von *Bolitobius besuchteti* spec. nov. und *B. bicolor* (Cameron).

Bolitobius bicolor (Cameron) und *B. besuchteti* spec. nov. sind wahrscheinlich Schwesterarten. Auf Grund des Fehlens von männlichen Exemplaren von *B. bicolor* Cameron kann ich z.Z. aber nicht ausschließen, daß *bicolor* doch zur *B. setiger* (Sharp) - Gruppe gehört. Beide Artengruppen sind nach ekto skelettalen Merkmalen im weiblichen Geschlecht nicht zu unterscheiden. Ein Indiz für die Zugehörigkeit zur *B. setiger*-Gruppe könnte eventuell das Fehlen eines dritten Borstenpaares auf dem Mentum sein (bei den anderen Arten der *B. castaneus* (Stephens) - Gruppe sind drei Borstenpaare vorhanden, die allerdings anders als bei *B. besuchteti* angeordnet sind). Wer in seiner Sammlung eventuell männliche Exemplare von *Bolitobius bicolor* (Cameron) besitzt, sei hiermit gebeten diese Tiere zur Klärung zur Verfügung zu stellen.

LITERATUR

CAMERON, M. 1926. New species of Staphylinidae from India. – *Trans. Ent. Soc. London*, 74: 171-191.



Two new species of *Laureola* Barnard, 1960 from India and Vietnam (Crustacea, Oniscidea, Armadillidae)

par

D.H. KWON*, **F. FERRARA**** and **S. TAITI****

With 5 figures

ABSTRACT

Two species of *Laureola* Barnard, 1960 (Armadillidae), *L. indica* from India, and *L. vietnamensis* from Vietnam, are described as new. These records fill the distributional gap of the genus, previously known from Africa and Australia.

The genus *Laureola* was established by BARNARD (1960: 53) to accommodate three species previously ascribed to the genus *Akermania* Collinge, 1919 and three new species, all from southern Africa. The definition of the genus is very short and incomplete, and also contains a mistake ("No flange or tooth ventrally on epimera of 1st and 2nd peraeon segments", actually present). Some years later VANDEL (1973a), discussing species from Australia, gave a new definition of *Laureola* and instituted the new genus *Praelaureola*. Curiously all Barnard's species fit Vandel's definition of *Praelaureola* while none can be placed in *Laureola* sensu Vandel, 1973 so that SCHMALFUSS & FERRARA (1983) synonymized *Praelaureola* Vandel, 1973 with *Laureola* Barnard, 1960 and instituted the new genus *Pseudolaureola* for *Laureola* sensu Vandel. *Pseudolaureola* includes three species: *P. wilsmorei* (Nicholls and Barnes, 1926) from western Australia, *P. atlantica* (Vandel, 1977) from St. Helena, and *P. hystrix* (Barnard, 1958) from Madagascar. Since no type species was selected for *Pseudolaureola*, *Laureola atlantica* Vandel is here designated as such. SCHMALFUSS & FERRARA (1983) also suggested that *Laureola* might correspond to *Echinodillo* Jackson, 1933 which at present includes two species: *E. montanus* Jackson, 1933 from Marquesas Islands, and *E. cavaticus* Green, 1963 from Tasmania. The problem of this synonymy can only be clarified with a general comparative study, which has not yet been possible to undertake.

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Nine species are currently ascribed to the genus *Laureola*: *L. paucispinosa* (Barnard, 1949), *L. longispina* (Barnard, 1956), *L. miacantha* (Barnard, 1960), *L. bivomer* Barnard, 1960, *L. hiatus* Barnard, 1960, *L. rubicunda* Barnard, 1960, *L. silvatica* (Vandel, 1973), *L. canberrensis* (Vandel, 1973), and *L. dubia* Schmalfuss and Ferrara, 1983. The first six species populate southern Africa, *L. dubia* Principe and Sao Tomé islands in the Gulf of Guinea, and *L. silvatica* and *L. canberrensis* New South Wales, Australia.

The discovery of two new species of *Laureola* from southern India and Vietnam is of particular interest since these two areas fill a good part of the distributional gaps between the species of *Laureola*.

The material is deposited in the collections of the Hungarian Natural History Museum, Budapest (HNHM), the Muséum d'Histoire Naturelle, Genève (MHNG), and the Museo Zoologico "La Specola" (Sezione del Museo di Storia Naturale) dell'Università, Firenze (MZUF).

Genus *Laureola* BARNARD, 1960

Synonyms: *Praelaureola* VANDEL, 1973a: 150.

Paralaureola VANDEL, 1973b: 142 (nomen nudum).

Type-species: *Akermania paucispinosa* Barnard 1949, by original designation.

Laureola indica sp. nov. (Figs 1-3)

Specimens examined. — India, Travancore: 1 ♀ holotype, Palnis supérieurs, petite Shola au-dessus de Pumarai, 2000 m, sous bois, 29.III.1927, leg. J. Carl (MHNG); 2 ♀ ♀ paratypes, Palnis supérieurs, Kukkal-Shola, ca. 2000 m, sous bois pourri, 1.IV.1927, leg. J. Carl (MHNG); 1 ♀ paratype, same data (MZUF); 5 ♀ ♀ paratypes, Vallée de Vattavadaï (entre Palnis et Ananimalais), grande forêt primaire dans la partie supérieure de la vallée, env. 1800-1850 m, 10.IV.1927, leg. J. Carl (MHNG); 1 ♂, 1 ♀, paratypes, same data (MZUF).

Description. — Maximum size, 6.5 x 4.5 mm. Colour yellow, brown or reddish brown. Dorsum with short spiniform tubercles arranged as follows: 5 on cephalon; 1+5 on pereonite 1; 5 on each of pereonites 2-7; 1 in the middle of each of pleonites 3-5. One line of noduli laterales per side, arranged on lateral tubercles of each pereonite. Eyes with 16-17 ommatidia. Cephalon with frontal lamina distinctly protruding above vertex, with upper margin raised in the middle, forming a triangular process frontally excavated. Pereonite 1 with posterior margin concave at the sides, postero-lateral corner rounded; a small rounded transversal tooth on ventral surface of epimera. Epimera of pereonites 2-4 triangular; 5-7 and pleonites 3-5 with short points at posterior corners. Pereonite 2 ventrally with a large quadrangular lobe more or less parallel to the anterior margin, clearly separated in the distal part from outward directed epimeron. Telson with triangular distal part, sinuous sides. Antennule with many superimposed aesthetascs near apex. Antenna with second article of flagellum four times as long as first. Mandible with molar penicil composed of several plumose setae of increasing length, each arising from a common stem. Outer branch of maxillule with 10 teeth apically simple; inner branch with two unequal penicils. Maxilliped with no particular modifications. Uropods with protopod triangular, exopod inserted near medial margin, not surpassing tip of protopod.

Male. All pereopods without apparent sexual specializations. Pleopod 1 exopod small, much wider than long, with largely rounded distal part; endopod with apical part bent outwards, without particular modifications. Pleopod 2 exopod slightly shorter than endopod; endopod with styliiform distal part.

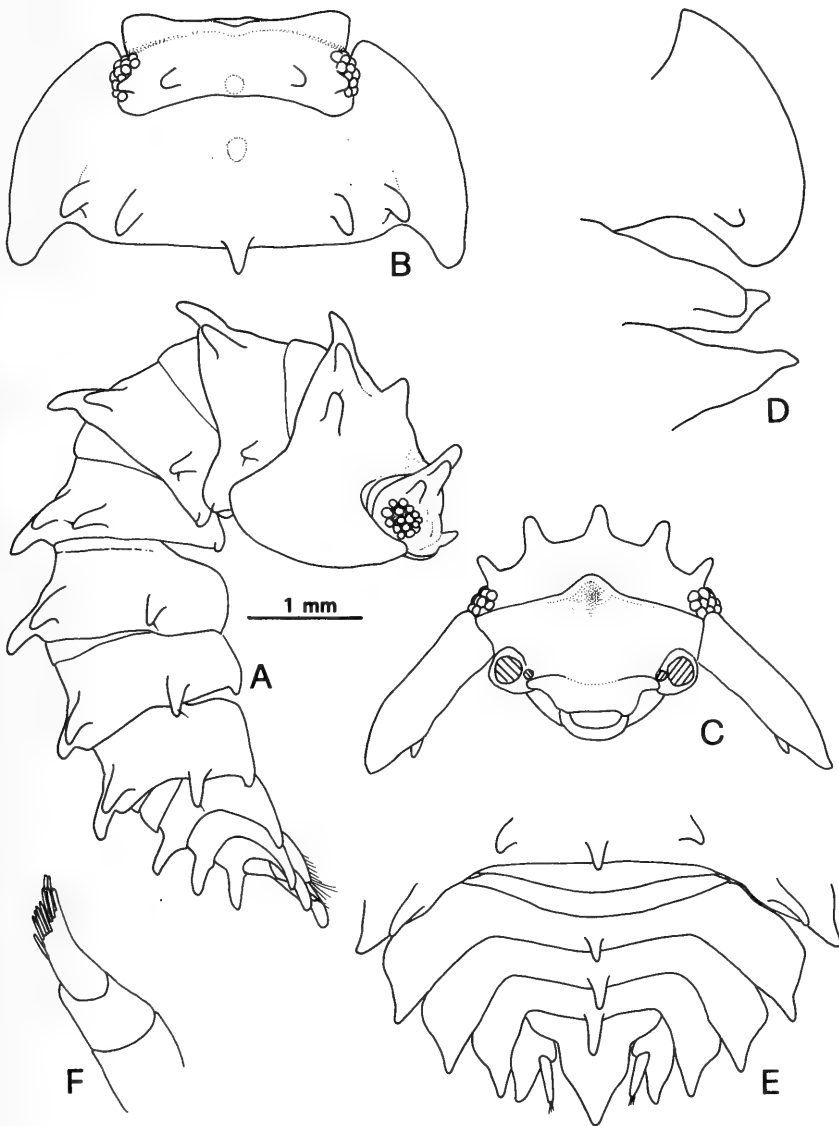


FIG. 1.

Laureola indica sp. nov., ♀ paratype: A) lateral view; B) cephalon and pereonite 1 in dorsal view; C) the same in frontal view; D) left epimera of pereonites 1-3 in ventral view; E) pereonite 7, pleon, telson and uropods; F) antennule.

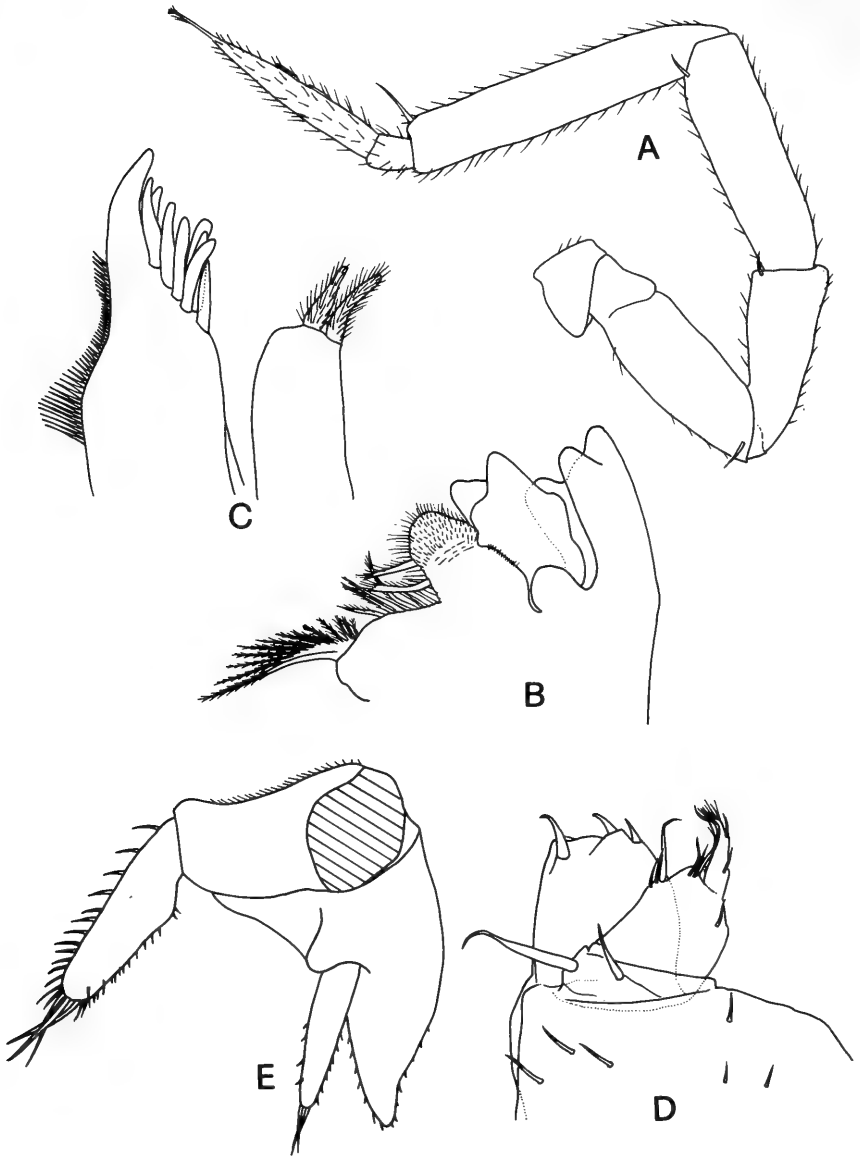


FIG. 2.

Laureola indica sp. nov., ♀ paratype: A) antenna; B) mandible; C) maxillule; D) maxilliped; E) uropod.

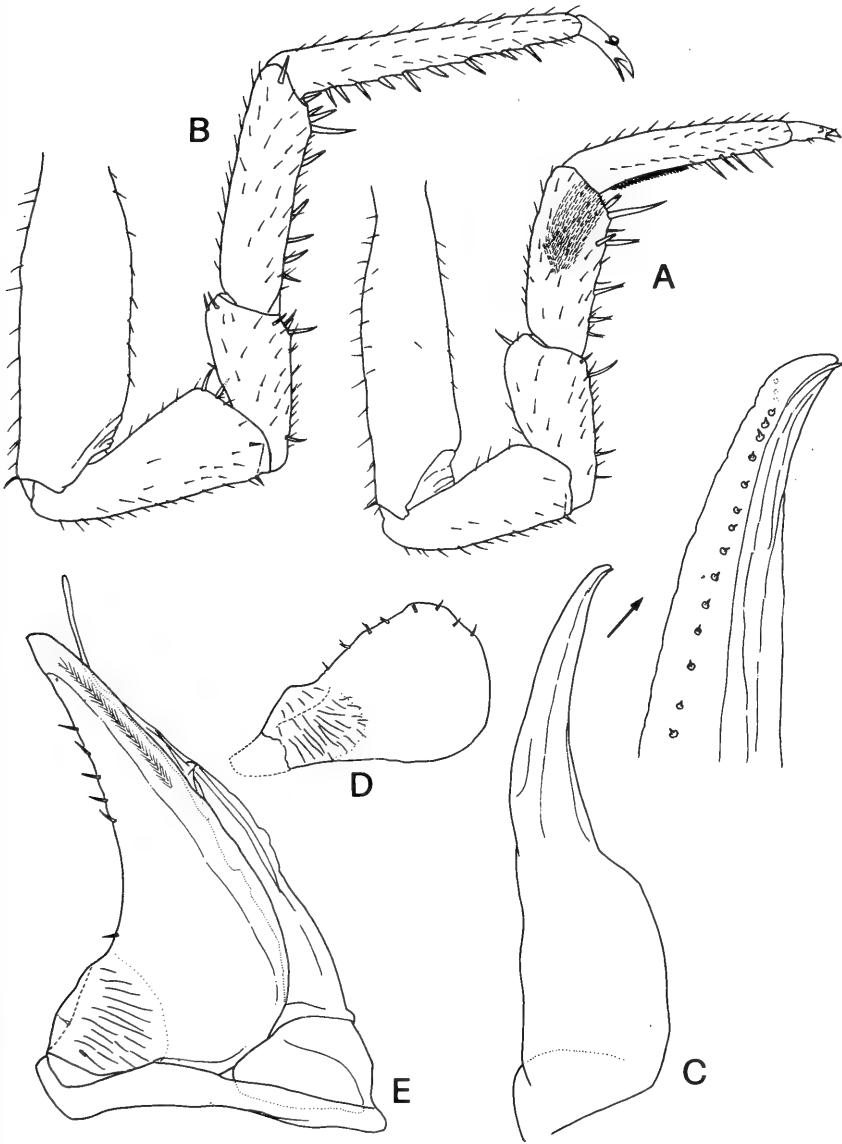


FIG. 3.

Laureola indica sp. nov., ♂ paratype: A) pereopod 1; B) pereopod 7; C) pleopod 1 endopod; D) pleopod 1 exopod; E) pleopod 2.

E t y m o l o g y . – The name of the species refers to India, where the specimens were collected.

R e m a r k s . – The easiest characters to distinguish species of *Laureola* are number, shape and disposition of dorsal spiniform tubercles. *L. indica* is readily distinguished from southern African species by the fewer tubercles (total 44 vs 81 or more); from *L. dubia* and *L. canberrensis* by the different number of tubercles and also by the shape of the telson with triangular instead of rectangular distal part (from *L. dubia* also by the shape of uropodal protopod, distally acute vs rounded); from *L. sylvatica* by the number (46 vs 73) and disposition (presence of median spine) of tubercles.

***Laureola vietnamensis* sp. nov. (Figs 4, 5)**

S p e c i m e n s e x a m i n e d . – Vietnam: 1 ♀ holotype, Cuc Phuong, Prov. Ninh binh, 14.V.1966, beaten from bushes in forest, leg. Topál (HNHM).

D e s c r i p t i o n . – Dimensions: 8 x 5 mm. Colour yellowish (faded by conservation?). Dorsum with long spiniform tubercles arranged as follows: 2+5 on cephalon; 7 on pereonite 1; 9 on pereonites 2-6; 7 on pereonite 7; a short median one on pleonites 3 and 4; a long one on basal part of telson. Pereonites 2-7 with a pair of sublateral triangular projections, directed forwards, which overlap the preceding pereonite. One nodulus lateralis per side on each lateral tubercle of pereonites, in subapical position. Globose eyes with 16 ommatidia. Cephalon with frontal lamina distinctly protruding above vertex and with a long triangular process in the middle. Pereonite 1 with posterior margin straight and largely rounded posterolateral corner; a small rounded tooth on ventral surface of epimera near posterior margin; epimera directed outwards. Pereonites 2-7 and pleonites 3-5 with lateral margins of epimera elongated, tapering, directed horizontally outwards. Epimera of pereonite 2 ventrally with a large quadrangular lamellar lobe. Telson with narrow triangular distal part, apex subacute. Antenna with long fifth article of peduncle, slightly exceeding middle of pereonite 1 when pushed back; flagellum with second article over three times as long as first. Buccal pieces as in *L. indica*. Uropods with protopod triangular, long exopod inserted on medial margin, distinctly surpassing tip of protopod but not reaching tip of telson.

E t y m o l o g y . – The species is named after Vietnam where the specimen was collected.

R e m a r k s . – *L. vietnamensis* differs from all the other species by the number and disposition of tergal tubercles. It is similar to *L. longispina*, *L. miacantha*, *L. bivomer*, and *L. hiatus*, all with a triangular telson and long dorsal spiniform tubercles. Among other characters, *L. vietnamensis* is readily distinguished from these and *L. indica* by the lack of tubercles on pleonite 5 and the long triangular process in the middle of the frontal lamina. It differs from *L. sylvatica*, *L. dubia* and *L. canberrensis* by having a median tubercle on the pereonites, pleonites 3-4 and telson, by the frontal process and the length of tubercles. From *L. dubia* and *L. canberrensis*, it also differs in the shape of telson (triangular vs rectangular) and uropods.

ACKNOWLEDGEMENTS

We wish to thank Dr B. Hauser (MHNG) and Dr L. Forró (HNHM) for the loan of material.

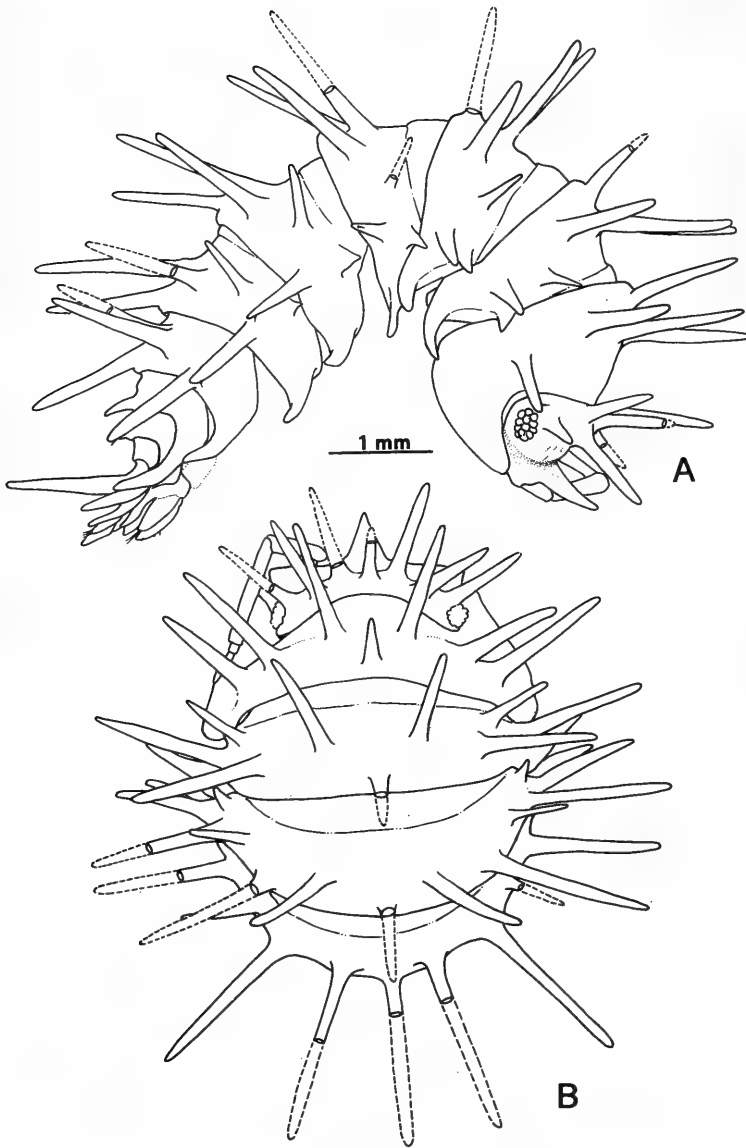


FIG. 4.

Laureola vietnamensis sp. nov., ♀ holotype: A) lateral view; B) cephalon and pereonites 1-4 in dorsal view.

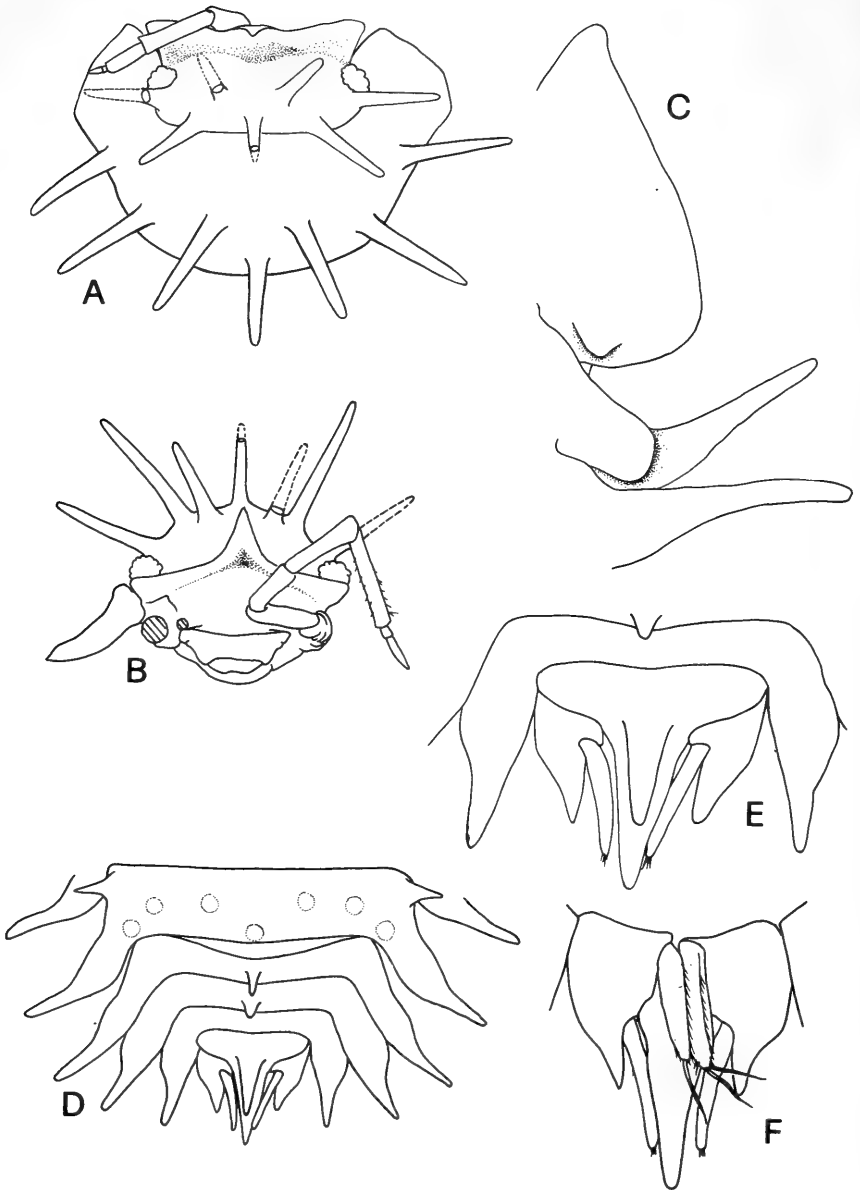


FIG. 5.

Laureola vietnamensis sp. nov., ♀ holotype: A) cephalon and pereonite 1 in dorsal view; B) cephalon in frontal view; C) left epimera of pereonites 1-3 in ventral view; D) pereonite 7, pleon, telson and uropods (position of spiniform tubercles on pereonite 7 is represented by circles); E) pereonite 5, telson and uropods in dorsal view; F) telson and uropods in ventral view.

RÉSUMÉ

Deux nouvelles espèces de *Laureola* Barnard, 1960 (Armadillidae), *L. indica* d'Inde et *L. vietnamensis* du Viêt-Nam sont décrites. Ces données permettent d'étendre la distribution du genre, connu jusqu'à présent seulement d'Afrique et d'Australie.

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Palpigrades cavernicoles et endogés de Thaïlande et des Célèbes (1ère note)

par

Bruno CONDÉ*

Avec 11 figures

ABSTRACT

Endogean and cave dwelling Palpigrades from Thailand and Sulawesi (First contribution). – The first Palpigrades known from Thailand were described by H. J. HANSEN (1901) as *Koenenia angusta* and *K. siamensis*. Two other species, the endogean *Koeneniodes spiniger* and the troglomorphic *Eukoenenia thais*, were recently established (CONDÉ 1984, 1988b). The present paper deals with six species, four of them being previously undescribed. Palpigrades are recorded for the first time from Sulawesi.

Les premiers Palpigrades connus de Thaïlande ont été récoltés par Th. Mortensen sur l'île de Koh Chang, dans le Golfe de Siam, sous des pierres, les 7 et 17 janvier 1900. Les deux espèces reconnues par H.J. Hansen et attribuées au genre *Koenenia* étaient inédites: *Eukoenenia angusta* (Hansen, 1901) et *E. siamensis* (Hansen, 1901). *Eukoenenia angusta* a été retrouvée par P. Leclerc en 1976, sur la plage de Wanakhon, au sud de Praachuap Khiri Khan, dans le milieu interstitiel (CONDÉ 1988a). Cette espèce a été rencontrée à Pondichéry (ssp. *tamula* Remy) et sur Sri Lanka par P. REMY (1960, 1961) et je l'ai fait connaître de Varanasi (Bénarès) (ssp. *hindua* Condé, 1989).

Dans l'humus forestier de la région de Chiang Dao, entre 700 et 1000 m d'altitude, L. Deharveng a récolté, en décembre 1980, les premiers spécimens de *Koeneniodes spiniger* Condé, 1984. Au cours d'une visite du réseau supérieur de la grotte dite Tham Chiang Dao, le 25 décembre 1980, L. Deharveng et A. Gouze ont capturé une femelle adulte de la première espèce troglomorphe connue du Sud-Est asiatique, *Eukoenenia thais* Condé, 1988b, dont les relations avec l'espèce endogée *E. siamensis*, non perçues lors de sa description, sont établies dans le présent travail.

Nous poursuivons ici l'étude des très nombreux matériaux rassemblés depuis 1985 par L. Deharveng et P. Leclerc, en Thaïlande et à Sulawesi, les Palpigrades étant signalés pour la première fois de cette grande île.

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Six espèces des genres *Eukoenia* (4) et *Koeneniodes* (2) ont été reconnues, parmi lesquelles deux seulement (*E. thais*, *K. spiniger*) étaient déjà décrites.

Tous les spécimens sont déposés au Muséum d'Histoire naturelle de Genève, Département des Arthropodes et d'Entomologie II.

Je rends hommage à la mémoire du regretté M. J. Chevelu pour le talent et la patience qu'il a déployés dans la mise au net de l'abondante et difficile illustration de cette note.

1°. *Eukoenia deleta* n. sp.

THAÏLANDE¹. Province de Phangnga, chef-lieu de Tha Put, village de Ban Tham Thong Lang. Grotte de Tham Nam, rivière souterraine d'environ 600 m de long, milieu très humide 20.VII.87, P. Leclerc leg: 1 femelle adulte, perdue au cours des manipulations de montage et d'orientation. – Grotte de Tham Phet, réseau très voisin du précédent, 18.VII.87, P. Leclerc leg: 1 immature A.

Longueurs. – Corps: 0,92 mm (extension); bouclier prosomien: 0,27 mm; basitarse IV: 100 µm; patte IV, à partir du tibia: 0,34 mm; B/bta: 2,78; bta/ti: 0,88.

Prosoma. – Organe frontal médian presque 1 fois 3/4 (1,70) aussi long que large, à branches latérales ovalaires, terminées par une pointe très nette. Organes latéraux comprenant 4 éléments fusiformes acuminés à gauche et 3 seulement à droite.

Bouclier avec au moins 8 + 8 soies assez développées. Segment libre avec 3 + 3 phanères, les intermédiaires les plus longs. Une seule soie deuto-tritosternale.

Chélicères avec 7 dents à chaque mors et 2 phanères rigides sur l'article basal.

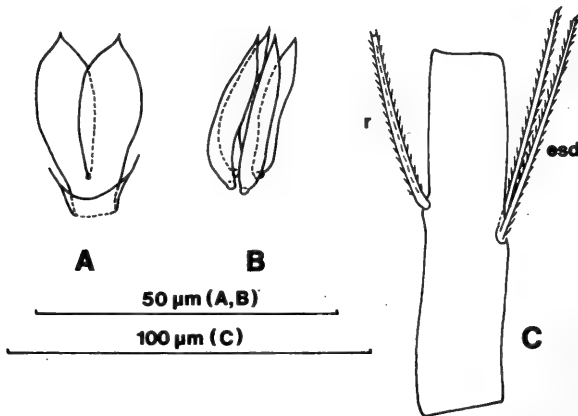


FIG. 1.

Eukoenia deleta n. sp. immature A holotype de Tham Phet: A. Organe frontal médian. B. Organe latéral gauche. C. Basitarse de la patte locomotrice IV. Explication des lettres dans le texte.

¹ Province et chef-lieu traduisent respectivement *changwat* et *amphoe*; *ban* signifie village et *tham* grotte.

Pédipalpes et pattes locomotrices I et IV. Longueurs relatives des articles: pédi-palpes: ti (non mesurable), bta 1= 40, bta 2= 57, ta 1= 33, ta 2= 47, ta 3= 61; pattes I: ti= 110, bta 1 + 2= 88, bta 3= 53, bta 4= 46, ta 1= 42, ta 2= 43, ta 3= 153; pattes IV: ti= 131, bta= 116, ta 1= 63, ta 2= 91.

Aux pattes I, la soie raide du basitarse 3, environ 1 fois 1/4 aussi longue que le bord tergal de l'article, est insérée un peu au-delà du milieu du bord sternal.

Aux pattes IV, le basitarse est plus court que le tibia (116/131, bta/ti= 0,83) et, mesuré au niveau de *r*, environ 4 fois 1/2 (4,67) aussi long que large; la soie raide (*r*) est épaisse, exactement 2 fois plus courte que le bord tergal de l'article (58/116), et insérée aux 4/6 distaux de ce bord (65/116, t/er= 1,78), son apex dépassant le bord distal de l'article. Les 2 autres phanères sont les soies sternales distales (*esd*), insérées presque au même niveau, et de longueurs subégales (72, 75).

Opisthosoma. – Au sternite III, *st*₁ est deux fois plus court que *st*₂ et *st*₃. De IV à VI, les *a*₁ et les *a*₂ (53-55) sont longs et relativement grêles, égaux à un peu plus des 2/3 de l'écartement des *a*₁. Une seule paire de phanères au sternite VII. Segments VIII à XI avec chacun 8 soies (4 + 4). Le XIe, un peu moins long que large (75/80), est sensiblement égal à la somme de IX et X (77).

Seul le premier article du flagelle est présent; en y incluant l'anneau intermédiaire il est environ 2 fois 1/3 aussi long que XI (179/80), avec un verticille apical de 8 longues soies, suivi d'une couronne de 16 phanères épineux.

Discussion. Nous admettons que l'immaturation de Tham Phet est cospécifique de l'adulte, malencontreusement perdu, de Tham Nam, les deux cavités appartenant au même réseau. Ses caractères, parmi lesquels la forme de l'organe frontal médian, la présence de 3 et 4 éléments aux organes latéraux et la position distale de la soie raide du basitarse IV permettront d'identifier l'adulte correspondant et justifient de nommer ce stade juvénile. L'existence de 3 ou 4 éléments aux organes latéraux dès le stade A, n'est connue que dans les populations occidentales (Basses-Alpes, Savoie) de *E. spelaea* (Peyerimhoff) (CONDÉ 1977: 666); l'augmentation du nombre de ces récepteurs sensoriels étant une caractéristique des lignées troglobies, nous pouvons attribuer *E. deleta* à l'une d'elles. On notera aussi la taille relativement grande de cet immature qui égale déjà celle de la femelle adulte de *E. lyrifer*, par exemple. Le nom spécifique (du latin *deletus*, *a*, *um*, détruit) rappelle la perte, particulièrement malheureuse, du seul spécimen adulte.

2°. *Eukoenia thais* Condé, 1988b

THAÏLANDE. Province de Chiang Mai, chef-lieu de Chiang Dao, village de Ban Tham Chiang Dao. Grotte de Tham Chiang Dao, réseau supérieur, à 150 m du point de capture de l'holotype, 10.VII.85, L. Deharveng leg.: 1 mâle immature (C).

Longueurs. – Les nombres entre parenthèses se rapportent à la femelle holotype. Corps 0,80 mm (1,07 en extension médiocre); bouclier prosomien 0,27 mm (0,36); basitarse IV: 158 µm (223); patte IV, à partir du tibia 0,47 mm (0,62); B/bta: 1,69 (1,61); bta/ti: 0,95 (1).

Prosoma. Le bord antérieur du bouclier est endommagé, ne permettant pas de lire l'organe frontal médian. L'organe latéral gauche comprend 9 éléments (13 chez l'holotype). Bouclier dorsal avec 10 paires de soies courtes. Cinq soies deuto-tritosternales (2 + 1 + 2) en W.

Chélicères avec 8 dents à chaque mors.

Pédipalpes et pattes locomotrices I et IV. Longueurs relatives des articles (holotype entre parenthèses):

pédipalpes: ti= 72 (95), bta 1= 31,5 (40), bta 2= 34 (46), ta 1= 24 (26), ta 2= 23 (29), ta 3= 36 (42); pattes I: ti= 83 (114), bta 1 + 2= 64 (82), bta 3= 35 (45), bta 4= 28 (36), ta 1= 21 (24), ta 2= 23 (28), ta 3= 74 (95); pattes IV: ti= 86 (116), bta= 82 (117), ta 1= 35 (43), ta 2= 41 (49).

A la patte IV gauche, la seule bien orientée, la soie raide du basitarse est brisée dès la base. Son insertion est un peu plus distale que chez l'holotype, t/er= 4,37 (5,58).

Opisthosoma. – Papille génitale correspondant à la variante 3 (CONDÉ 1984: 387).

Remarque. – Ce spécimen est le deuxième représentant connu de l'espèce.

3°. *Eukoenia lyrifer* n. sp.

THAÏLANDE. Province de Chiang Rai, chef-lieu de Mae Sai, village de Ban Tham. Grotte de Tham Kukan, 24.VI.86, P. Leclerc leg.: 1 femelle adulte.

Longueurs. – Corps: 1,07 mm (extension); bouclier prosomien: 0,27 mm; basitarse IV: 100 μ m; patte IV, à partir du tibia: 0,32 mm; B/bta: 2,70; bta/ti: 0,88.

Prosoma. – Organe frontal médian environ 2 fois aussi long que large; ses branches, à bord externe convexe et à bord interne subrectiligne ou légèrement concave, arrondies à l'apex. Organes latéraux non dénombrables à gauche, mais formés à droite de 8 éléments fusiformes acuminés¹.

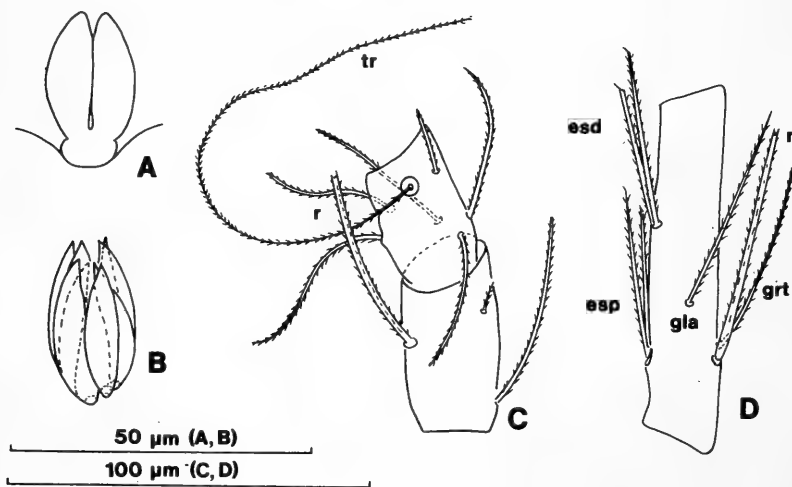


FIG. 2.

Eukoenia lyrifer n. sp. femelle adulte holotype de Tham Kukan: A. Organe frontal médian. B. Organe latéral droit. C. Basitarses 3 et 4 de la patte locomotrice I. D. Basitarse de la patte locomotrice IV. Explication des lettres dans le texte.

¹ Le comptage du groupe de droite n'a été possible qu'à l'aide du dispositif de contraste interférentiel (Nomarsky-Nachet).

Bouclier avec 10 + 10 soies relativement courtes. Segment libre avec 3 + 3 phanères, les intermédiaires les plus longs. 7 soies deuto-tritosternales (3 + 1 + 3), insérées suivant un W dont les branches médiales sont très courtes.

Chélicères avec 9 dents à chaque mors. Deux longs phanères rigides, terminés en une petite palette denticulée, sur l'article basal.

Pédipalpes et pattes locomotrices I et IV. Longueurs relatives des articles:

pédipalpes: $ti=119$, $bta\ 1=44$, $bta\ 2=56$, $ta\ 1=35$, $ta\ 2=44$, $ta\ 3=56$; pattes I: $ti=116$, $bta\ 1+2=95$, $bta\ 3=56$, $bta\ 4=47$, $ta\ 1=28$, $ta\ 2=38$, $ta\ 3=121$; pattes IV: $tibia=133$, $bta=117$, $ta\ 1=48$, $ta\ 2=66$.

Aux pattes I, la soie raide du basitarse 3, un peu plus longue que le bord tergal de l'article (61/56), est insérée à peine en deçà du milieu du bord sternal.

Aux pattes IV, le basitarse est plus court que le tibia (117/133, $bta/ti=0,88$) et, mesuré au niveau de r , environ 5 fois aussi long que large; la soie raide r est environ 1 fois 3/5 plus courte que le bord tergal de l'article (75/117, $t/r=1,56$) et est insérée un peu au-delà du 1/4 proximal de ce bord (32/117, $t/er=3,65$). Les 6 autres phanères sont la soie grêle tergale (grt , 61) qui s'insère très près de r , un peu plus distalement à droite et un peu plus proximale à gauche; la soie grêle latérale (gla , 65); les 2 paires de soies sternales, les éléments de chaque paire légèrement inégaux (48, 52, 56), étant presque superposés en vue latérale.

Opisthosoma. – Tergites II à VI sans t_2 ; les t_1 (19,5) et les t_3 (21) plus courts que l'écartement des t_1 (28) et que la distance t_1-t_3 (23,5). Tergite VII sans s . Segments VIII avec 9 (4 + s + 4), IX à XI avec 8 (4 + 4) phanères.

Premier volet génital avec 11 + 11 soies (a_4 présents); à la rangée distale, les phanères ne peuvent être mesurés avec précision, en raison de leurs orientations; a_1 et a_2 semblent un peu plus courts que a_3 et a_4 , ces derniers étant du reste mieux orientés. Au deuxième volet, les x sont plus grêles que y et z , mais sensiblement de même longueur. Au bord interne de chaque moitié du volet; une sclérisation sinueuse dessine, avec sa symétrique, un motif rappelant une lyre. Examiné en contraste interférentiel, l'ensemble prend un aspect assez différent dans lequel on reconnaît néanmoins les branches de la lyre. Le réceptacle séminal n'a pu être observé.

Sternites IV à VI avec 2 + 2 phanères épais (a_1, a_2) compris entre une seule paire de soies beaucoup plus courtes et un peu plus grêles (s). Les a_1 sont plus courts que leur écartement (environ 1 fois 1/3 en V). Une paire de plages réfringentes en IV et V. Sternite VII avec une seule paire de phanères a , 1 fois 2/5 plus courts que leur écartement, et une paire de s .

Affinités. *E. lyrifer* est, par les dimensions et par un certain nombre d'autres caractères, intermédiaire entre l'espèce endogée *E. siamensis* (Hansen) et l'espèce troglobie évoluée *E. thais* Condé (tableau I). Elle permet ainsi de préciser la position systématique de cette dernière que nous n'avons pu établir à l'époque de sa description (CONDÉ 1988b: 741).

TABLEAU I

	B (mm)	P IV (mm)	Bta IV (μm)	B/bta	t/r	t/er	bta/ti	L/l bta	o. lat.
<i>E. siamensis</i>	–	0,21	57,7	–	1,07	–	0,69	3,75	3
<i>E. lyrifer</i>	0,27	0,32	100	2,70	1,56	3,65	0,88	5	8
<i>E. cf. lyrifer</i>	0,27	0,35	121	2,23	1,90	5,52	0,98	6,90	6
<i>E. thais</i>	0,36	0,62	223	1,61	2,27	5,58	1	9	13

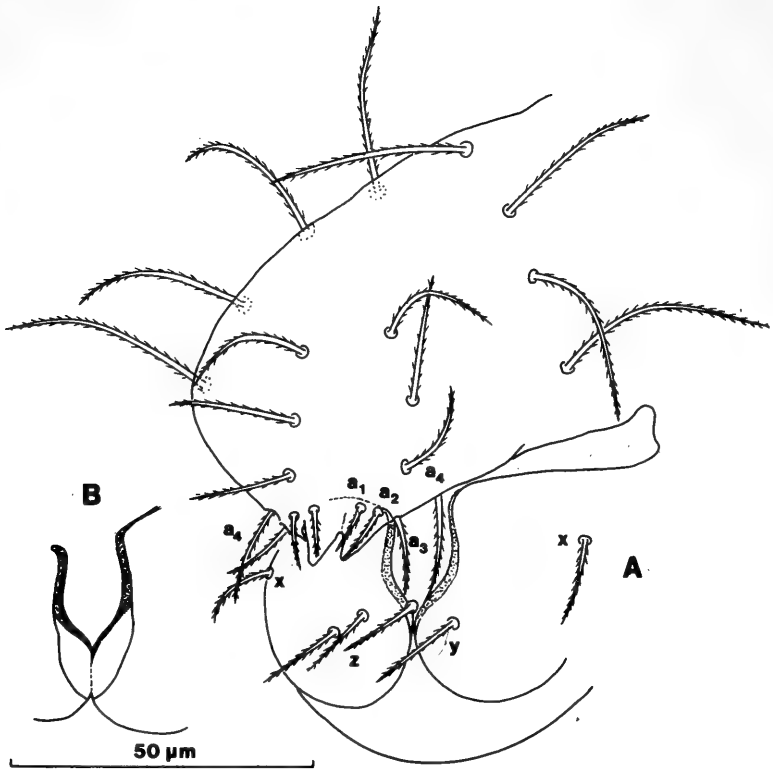


FIG. 3.

Eukoenenia lyrifer n. sp., femelle adulte holotype de Tham Kukan: A. Premier et deuxième volets génitaux. B. Sclérisation du deuxième volet observée en contraste interférentiel. Explication des lettres dans le texte.

Parmi les ressemblances avec *E. thais*, on peut retenir la forme de l'organe frontal médian; le nombre et la disposition des phanères du deuto-tritosternum; l'insertion de la soie raide (*r*) du basitarse IV qui à une exception près est un peu plus proximale que celle de la soie grêle tergale (*grt*); la chétotaxie des sternites opisthosomiens IV à VI, comprenant une seule soie grêle latérale (*s*) et celle des quatre derniers segments. Les différences concernent essentiellement le nombre d'éléments aux organes latéraux (8 au lieu de 13), le moindre allongement des appendices ($L/l=5$ au lieu 9 pour bta IV), la sclérisation (lyriforme) du 2^e volet génital et la taille beaucoup plus faible (bta IV 100 µm au lieu de 223).

Le nom spécifique (du grec latinisé *lyra*, *ae*, lyre et du latin *fero*, porter) rappelle la sclérification du deuxième volet génital.

4°. *Eukoenia* cf. *lyrifer*

THAÏLANDE. Province de Chiang Mai, chef-lieu de Chiang Dao, village de Ban Tham Chiang Dao. Grotte de Tham Chiang Dao, réseau guano, sur la paroi, 16.VII.85, P. Leclerc leg: 1 femelle adulte.

Longueurs. – Les nombres entre parenthèses se rapportent à la femelle holotype de *E. lyrifer*. Corps: 0,84 mm, opisthosome contracté (1,07 en extension); bouclier prosomien: 0,27 mm (0,27); basitarse IV: 121 μ m (100); patte IV, à partir du tibia: 0,35 mm (0,32); B/bta: 2,23 (2,70); bta/ti= 0,98 (0,88).

Prosoma. – Bouclier comme l'holotype, sauf 6 éléments au lieu de 8 à chaque organe latéral et la forme un peu différente de l'organe médian.

Pédipalpes et pattes locomotrices I et IV. Longueurs relatives des articles (holotype de *E. lyrifer* entre parenthèses).

pédipalpes: ti= 130 (119), bta 1= 52 (44), bta 2= 63 (56), ta 1= 38 (35), ta 2= 42 (41), ta 3= 60 (56); pattes I: ti= 127 (116), bta 1 + 2= 102 (95), bta 3= 55 (56), bta 4= 48 (47), ta 1= 25 (28), ta 2= 33 (38), ta 3= 119 (121); pattes IV: ti= 141 (133), bta= 139 (117), ta 1= 57 (48), ta 2= 70 (66).

Longueurs comparées des trois appendices mesurés à partir du tibia: 385 (351), 509 (501), 407 (364).

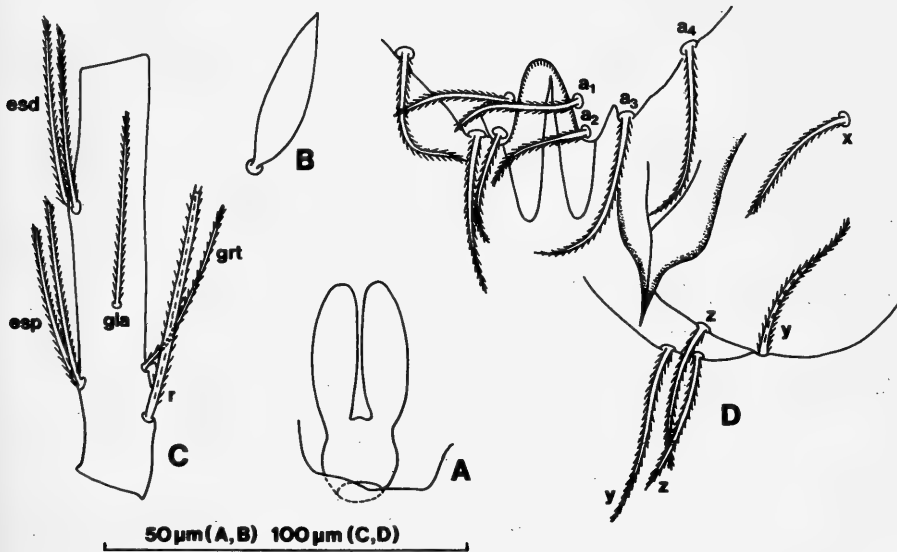


FIG. 4.

Eukoenia cf. *lyrifer* n. sp., femelle adulte de Tham Chiang Dao. A. Organe frontal médian. B. Un élément de l'organe latéral droit. C. Basitarse de la patte locomotrice IV. D. Région marginale du premier volet génital et portion postérieure du deuxième volet. Explication des lettres dans le texte.

Le basitarse IV est à peine plus court que le tibia ($bta/ti = 0,98$) et sa soie raide est relativement plus courte et insérée plus proximale: $t/r = 1,90$ (1,56), $t/er = 5,52$ (3,65), ces valeurs rapprochant ce spécimen de la femelle holotype de *E. thais* (2,27; 5,58).

Opisthosoma. — La marge postérieure du premier volet génital présente une profonde échancrure subtriangulaire médiane, séparant les paires de phanères a_1 et a_2 , comme chez *E. thais* (CONDÉ, *loc. cit.*, fig. 12, B). Le deuxième volet, observé de trois quarts, présente une sclérification lyriforme.

Remarque. En dépit de certaines ressemblances, et de la proximité du lieu de récolte, il n'est pas possible de rapporter ce spécimen à *E. thais*, d'autant que l'on connaît à présent l'immatrice *C* de cette espèce qui le dépasse déjà en taille (bta IV: 158 contre 121 μm) et en différenciation (9 éléments contre 6 aux organes latéraux). Comme *E. lyrifer*, cette forme paraît intermédiaire entre l'endogée *E. siamensis* et l'espèce troglomorpe *E. thais*. Une comparaison entre les représentants des autres groupes zoologiques récoltés respectivement dans le réseau supérieur et dans le réseau inférieur (guano) de cette vaste cavité pourrait éclairer les relations entre les peuplements de ces deux biotopes.

5°. *Eukoenia maros* n. sp.

SULAWESI. Province de Sulawesi-sud, chef-lieu de Maros, village de Kappang. Grotte de Gua Tanette (réseau Kiri), à environ 800 m de l'entrée, 6.VII.88, P. Leclerc leg.: 1 femelle adulte.

Longueurs. Corps: 0,98 mm (extension moyenne); bouclier prosomien: 0,25 mm; basitarse IV: 133 μm ; patte IV à partir du tibia: 0,40 mm; B/bta : 1,87; bta/ti : 0,88.

Prosoma. Organe frontal médian environ 2 fois aussi long que large; ses branches, à bords subrectilignes, terminées par une très courte pointe mousse. Organes latéraux comprenant 5 éléments dont un plus petit à gauche, 4 à droite; tous sont foliacés, larges et terminés par une très courte pointe mousse.

Bouclier portant 10 + 9 soies minuscules, difficiles à dénombrer; le phanère latéral droit de la rangée postérieure n'a pas été vu. Segment libre avec 2 + 2 phanères; le médial (t_1) manque, l'intermédiaire (t_2) étant presque 2 fois plus long que le latéral (t_3) (65/34). 10 soies deuto-tritosternales en 2 rangées, une antérieure de 2 phanères, et une postérieure sinuée de 3 + 1 + 4.

Chélicères avec 9 dents à chaque mors. Trois longs phanères rigides, terminés en une petite palette denticulée, sur l'article basal.

Pédipalpes et pattes locomotrices I et IV. Longueurs relatives des articles:

pédipalpes: $ti = 112$, $bta\ I = 43$, $bta\ 2 = 55$, $ta\ 1 = 33$, $ta\ 2 = 38$, $ta\ 3 = 55$; pattes I: $ti = 130$, $bta\ 1 + 2 = 84$, $bta\ 3 = 59$, $bta\ 4 = 42$, $ta\ 1 = 43$, $ta\ 2 = 40$, $ta\ 3 = 128$; patte IV: $tibia = 158$, $bta = 130$, $ta\ 1 = 49$, $ta\ 2 = 53$.

Aux pattes I, la soie raide du basitarse 3, un peu plus longue que le bord tergal de l'article (125/118), est insérée un peu au-delà du 1/3 distal du bord sternal (60/102, $s/er = 1,70$).

Aux pattes IV, le basitarse est plus court que le tibia (130/158, $bta/ti = 0,88$) et, mesuré au niveau de r , presque 9 fois aussi long que large ($L/l = 8,8$); la soie raide r est presque 2 fois 1/2 plus courte que le bord tergal de l'article (106/255, $t/r = 2,40$) et est insérée un peu en deçà du milieu de ce bord (117/255, $t/er = 2,18$). Les 6 autres phanères sont la soie grêle tergale (grt , 98), la soie grêle latérale (gla , 103) insérée près de la

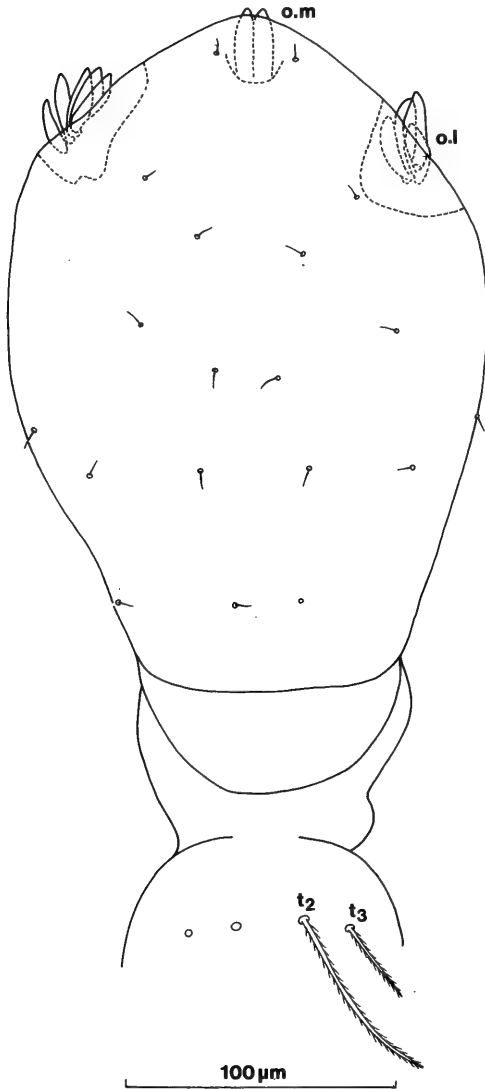


FIG. 5.

Eukoenia maros n. sp., femelle adulte holotype de Gua Tanette. Bouclier prosomien et tergite du segment libre. *o.m* = organe frontal médian, *o.l* = organe latéral.

précédente et, un peu plus distalement, les 2 paires de soies sternales (*esp*, *esd*) de longueurs comparables entre elles (100 - 110).

Opisthosoma. Tergites III à VII avec une rangée réduite à une paire de phanères latéraux (*t₃*) particulièrement longs (55 μ m et égaux aux 3/4 environ de leur écartement en IV) et

épais, mais progressivement atténués vers l'apex, comprise entre une paire de phanères courts et grâles (*s*). Segment VIII avec 7 (3 + *s* + 3), IX et X avec 6 (3 + 3) et XI avec 8 (4 + 4) phanères.

Premier volet génital avec 10 + 10 soies (les a_3 manquent); à la rangée distale, les a_1 sont un peu plus courts que les a_2 (28 – 35), leurs embases sensiblement équidistantes; les

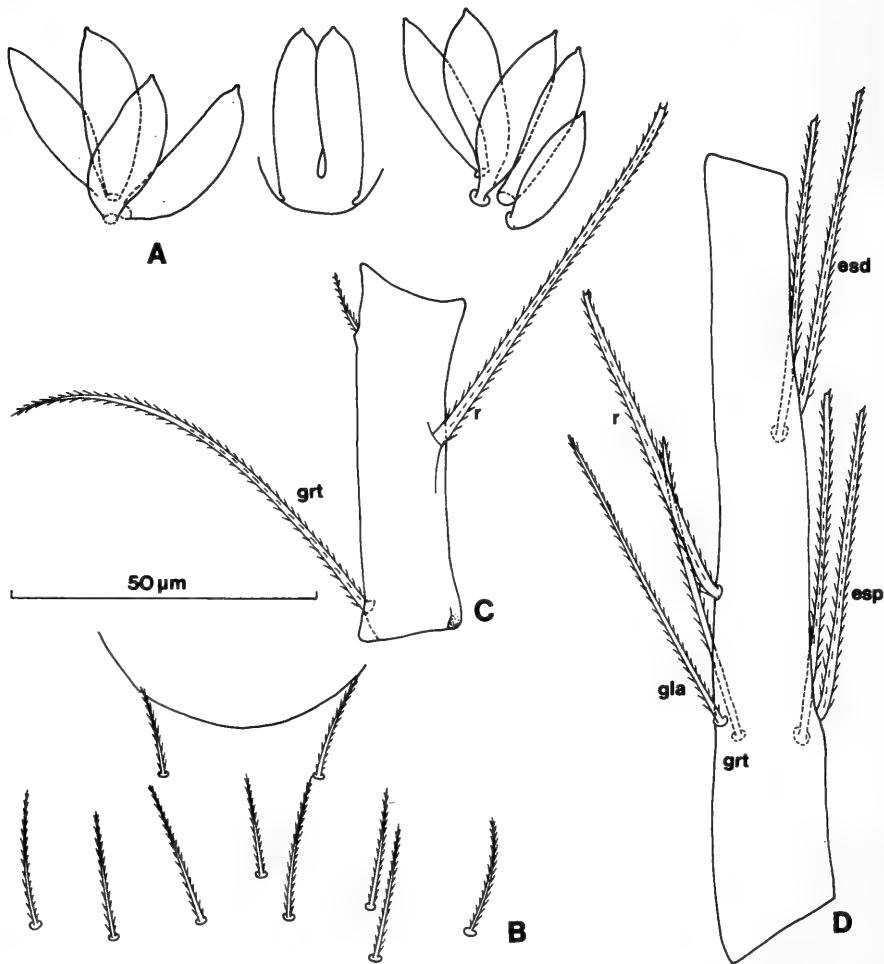


FIG. 6.

Eukoenia maros n. sp., femelle adulte holotype de Gua Tanette: A. Organes frontal médian et latéraux droit (à gauche) et gauche, vus par la face ventrale. – B. Soies du deutotritosternum. – C. Basitarse 3 de la patte locomotrice I. – D. Basitarse de la patte locomotrice IV. Explication des lettres dans le texte.

a_4 sont plus longs (ca 45) et relativement plus grêles, la distance $a_2 - a_4$ étant au moins double de la distance $a_1 - a_2$. En arrière de a_1 et a_2 , deux lobes subtriangulaires prolongent la portion centrale de la marge; ils sont hyalins, avec des épines cuticulaires éparses. Deux orifices parasagittaux (g_1) s'ouvrent sur la face interne. Le deuxième volet

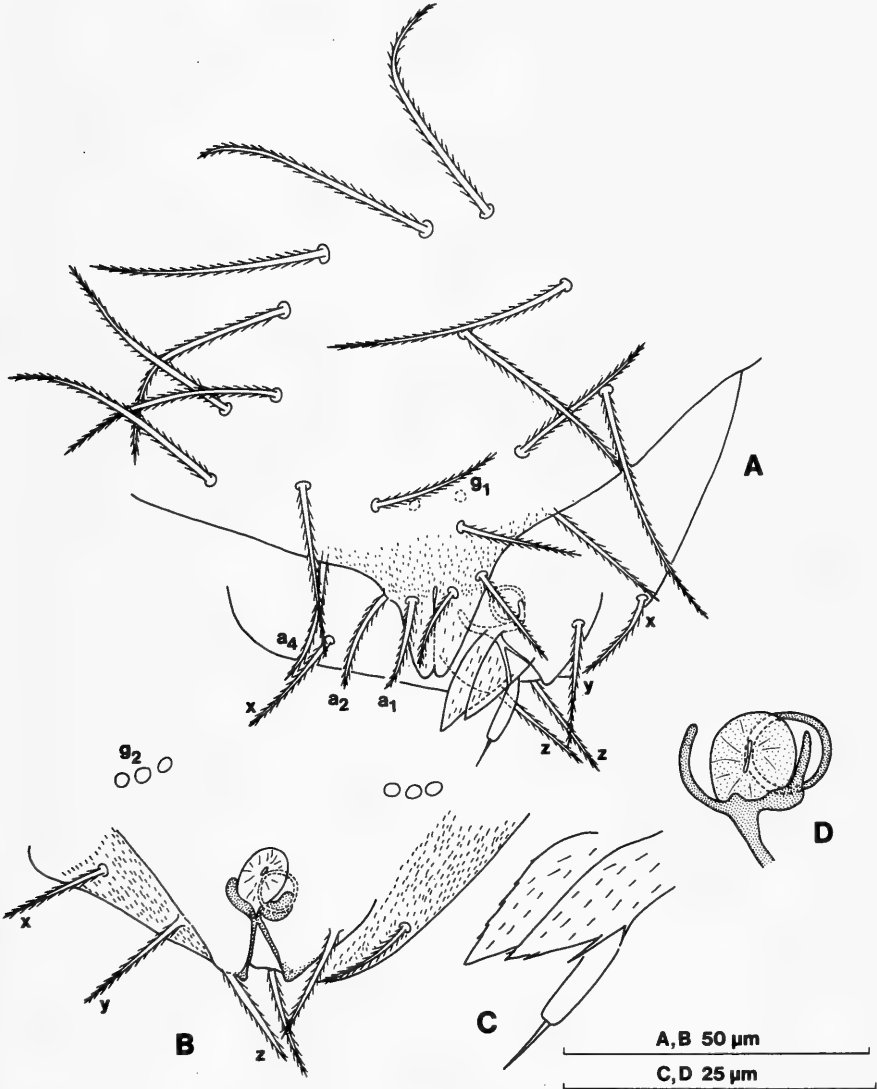


FIG. 7.

Eukoenenia maros n. sp., femelle adulte de Gua Tanette: A. Premier et deuxième volets génitaux. – B. Deuxième volet génital, les lobes apicaux non représentés. – C. Lobes apicaux et processus sétiforme du deuxième volet génital. – D. Coupe optique au niveau des sclérifications et du réceptacle du deuxième volet. Explication des lettres dans le texte.

porte sur chaque moitié les 3 soies habituelles (x, y, z) qui sont de longueur et de calibre comparables. Un lobe subtriangulaire hyalin, à pubescence éparse et à bord latéral externe épineux, prolonge chaque moitié du volet. De la face dorsale du lobe gauche se détache un diverticule à région basale subcylindrique, se terminant par un court segment sétiforme. Cette formation a été observée debout sur le lobe droit, avant la mise à plat de la préparation. Le bord interne de chaque moitié du volet est un peu épaissi et rejoint une sclérification qui, avec sa symétrie, évoque une sorte de coupe au voisinage de l'orifice génital. En profondeur, on distingue un réceptacle circulaire, à paroi épaissie, de $5 \mu\text{m}$ de diamètre seulement. Deux groupes latéraux antérieurs de 3 gros orifices glandulaires (g_2).

Les sternites IV à VI sont en majeure partie épilés; les phanères qui subsistent sur la moitié droite sont longs et grêles, une discrimination entre ceux des séries a et s étant impossible à présent; on ne discerne aucun massif glandulaire sous-jacent et aucune plage réfringente n'a été vue au voisinage du plan sagittal. J'ai compté $4 + 4$ poils en IV, V et VI, ceux de la paire médiane étant plus espacés l'un de l'autre que les suivants. Sternite VII avec $2 + 2$ poils, les latéraux plus courts que les autres.

Affinités. *Eukoenia maros* est une espèce troglomorpe, comparable, de ce point de vue, à *E. thais* Condé, 1988b, du réseau supérieur de la grotte dite Tham Chiang Dao, en Thaïlande septentrionale. L'allongement des appendices est cependant un peu moins accentué, le basitarse IV étant encore plus court que le tibia correspondant ($0,82$ au lieu de 1), quoique ses proportions soient approchantes chez les deux espèces (environ 9 fois aussi long que large); en revanche, sa longueur, en valeur absolue, est discriminante (133 et $223 \mu\text{m}$), d'autant que le basitarse d'un mâle juvénile de *E. thais* atteint déjà $158 \mu\text{m}$. Les organes latéraux ($5 + 4$ éléments) sont modestes, face aux groupes de 8 à 13 éléments observés chez quelques espèces. *E. thais* notamment, mais on connaît aussi des formes troglomorphes, telle *E. gasparoi* Condé, ne possédant que 3 éléments de chaque côté. La présence, sur les tergites de l'opisthosome, d'une seule paire de phanères t , considérés comme t_3 d'après leur position latérale, est partagée par un très petit nombre d'espèces de *Eukoenia*, toutes troglomorphes (*draco zariquieyi* Condé, *patrizii* Condé, *gasparoi* Condé, *naxos* Condé). On peut encore mentionner les soies minuscules du bouclier prosomien qui sont communes à *gasparoi*, *thais*, *naxos* et semblent accompagner souvent les modifications précédentes.

Parmi les caractères séparant *E. maros* de *E. thais*, on peut encore retenir la forme de l'organe frontal médian, l'absence de t_1 au segment libre du prosoma, la présence de 3 phanères rigides sur l'article basal des chélicères, la position de r et gla au basitarse IV, l'absence de a_3 au premier volet génital, l'aspect des sclérifications du deuxième volet et la chétotaxie des sternites IV à VI.

6°. *Koeneniodes leclerci* n. sp.

THAÏLANDE. Province de Hua Hin, chef-lieu de Pran Buri, village de Ban Khung Tanot (massif de Kao Sam Roi Yot). Grotte de Tham Sai, réseau fossile de 250 m environ, avec avens d'effondrement, milieu humide, 26.VII.87, P. Leclerc leg.: 1 femelle adulte.

Longueurs. – Corps: $1,07$ mm (en extension); bouclier prosomien: $0,25$ mm; basitarse IV: $88,6 \mu\text{m}$; patte IV, à partir du tibia: $0,28$ mm; B/bta: $2,82$; bta/ti: $0,89$.

Prosoma. – Organe frontal médian à branches assez trapues, terminées par une courte pointe. Organes latéraux formés chacun de 4 éléments fusiformes acuminés, formant une rangée subrectiligne. Bouclier dont les soies minuscules ne sont pas dénombrables par

transparence. Segment libre avec 3 + 3 phanères, les intermédiaires (t_2) 1 fois 3/4 (1,74) aussi longs que les latéraux (t_3). 5 soies deuto-tritosternales sur un V.

Chélicères avec 9 dents à chaque mors. Deux phanères rigides, terminés en une petite palette denticulée, sur l'article basal.

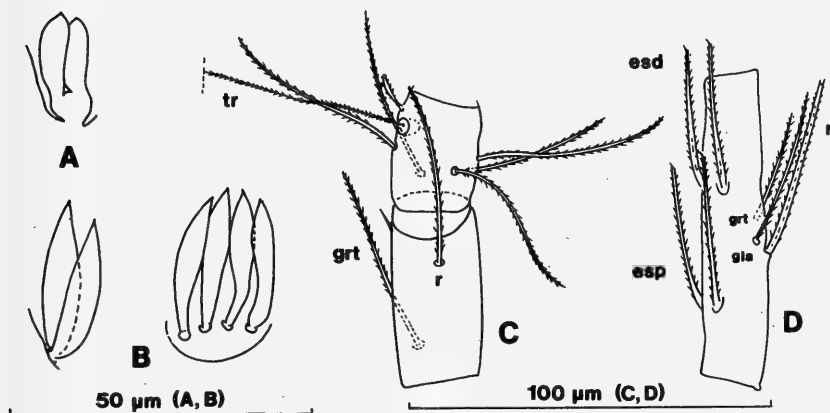


FIG. 8.

Koeneniodes leclerci n. sp., femelle adulte holotype de Tham Sai: A. Organe frontal médian. B. Organes latéraux, 2 éléments du gauche et les 4 éléments du droit, ces derniers à région basilaire contractée. C. Basitarses 3 et 4 de la patte locomotrice I. D. Basitarse de la patte locomotrice IV. Explication des lettres dans le texte.

Pédipalpes et pattes locomotrices I et IV. Longueurs relatives des articles:

pédipalpes: $t_i = 95$ (+); bta 1 = 40; bta 2 = 55; ta 1 = 29; ta 2 = 42; ta 3 = 56; pattes I: $t_i = 113$; bta 1 + 2 = 92; bta 3 = 56; bta 4 = 41; ta 1 = 31; ta 2 = 37, ta 3 = 114; pattes IV: $t_i = 114$; bta = 102; ta 1 = 41; ta 2 = 66.

Aux pattes I, la soie raide du basitarse 3, de même calibre que la soie grêle tergale, est sensiblement égale à la longueur du bord tergal de l'article (58/56) et est insérée vers le quart distal du bord sternal (39/53, $s/er = 1,35$), son apex atteignant la région basilaire du tarse 1.

Aux pattes IV, le basitarse est plus court que le tibia (102/114, $bta/t_i = 0,89$) et, mesuré au niveau de r , environ 5 fois aussi long que large; la soie raide r est robuste, environ 1 fois 3/4 plus courte que le bord tergal de l'article (58/102, $t/r = 1,75$) et est insérée un peu au-delà des 3/5 proximaux de ce bord (44/102, $t/er = 2,31$). Les 6 autres phanères sont la soie grêle tergale (grt , 35), insérée un peu plus distalement que r ; la soie grêle latérale (gla , 48), insérée entre r et grt ; les deux paires de soies sternales (51,46/48, 43), les phanères de chaque paire étant insérés presque au même niveau.

Opisthosoma. – Tergites II à VI sans t_2 (t_1 , t_3 , s); les t_1 un peu plus courts que les t_3 et que la distance $t_1 - t_3$ (43/51/50 en III).

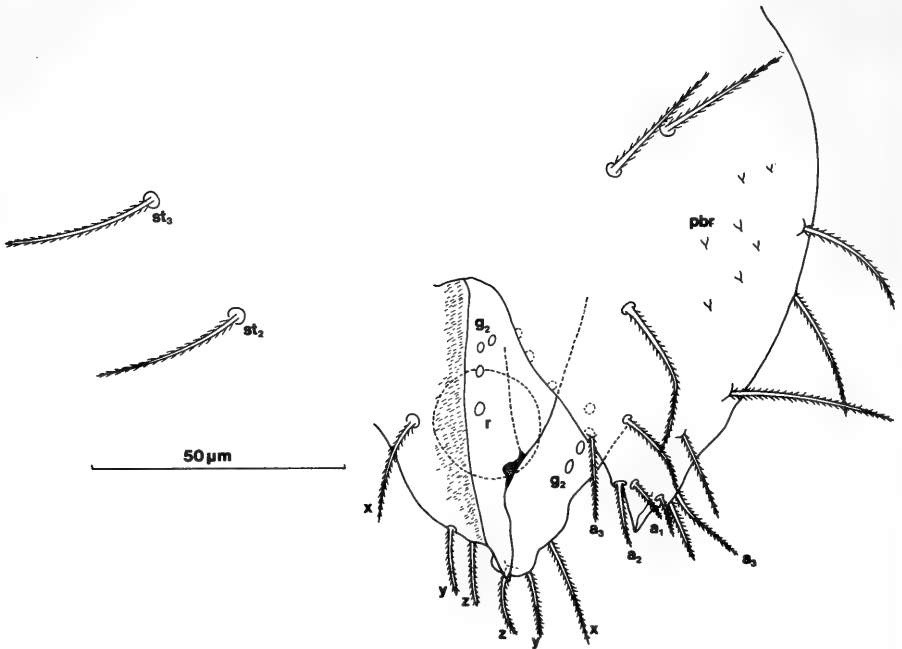


FIG. 9.

Koeneniodes leclerci n. sp., femelle adulte holotype de Tham Sai: Volets génitaux de profil. g_2 = orifices glandulaires du deuxième volet; r = réceptacle séminal. Explication des autres lettres dans le texte.

Tergite VII avec 4 + 4 phanères, la paire médiane la plus courte. Segments VIII avec 11 (5 + ls + 5), IX avec 9 (? 1 sternal), X et XI avec 8 (4 + 4) phanères.

Premier volet génital avec 7 + 7 soies, 4 + 4 ventrales, disposées en paires et 3 + 3 constituant la rangée distale. A cette rangée, les phanères a_1 , a_2 et a_3 sont de longueurs croissantes (15, 25, 33), les a_3 étant comparativement plus grêles. Entre les 3 paires les plus antérieures, on distingue un groupe de 7 (3 + 1 + 3) minuscules phanères à base renflée (pbr) et tige égale au plus à la base. Le deuxième volet porte sur chaque moitié les 3 soies habituelles les x plus longues que y ou z (40/25).

Au sternite III, les st_2 et st_3 sont semblables entre eux. Au bord antérieur du sternite IV, un groupe médian de 6 gros phanères coniques (gm) disposés sur 2 rangs superposés (4 + 2) et, en arrière, une rangée de 4 courts phanères bacilliformes (a_1 , a_2), comprise entre une paire de soies plus longues et plus grêles (s_1 , s_2); sternite V identique, moins le groupe médian; sternite VI avec une rangée antérieure de 9 phanères bacilliformes et une rangée postérieure de 4 phanères semblables, cette dernière homologue de la rangée unique des sternites IV et V.

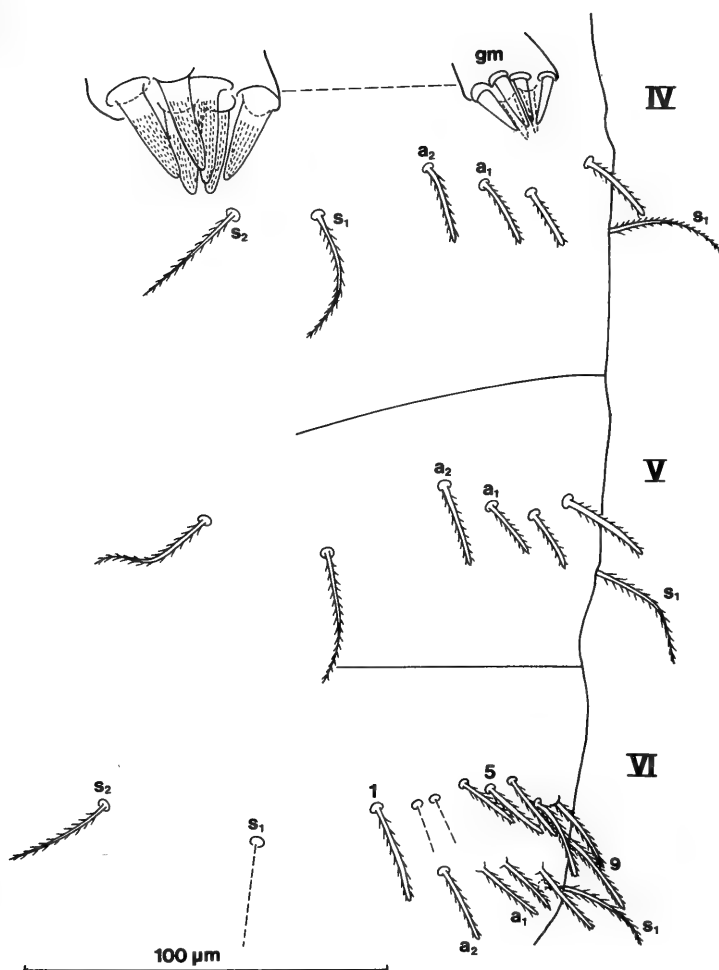


FIG. 10.

Koeneniodes leclerci n. sp., femelle adulte holotype de Tham Sai: Sternites IV à VI de l'opisthosome et détail du groupe médian de phanères du sternite IV. Explication des lettres dans le texte.

Affinités. L'espèce la plus voisine est *K. deharvengi* Condé, 1981, de Mindoro (Philippines), connue par la seule femelle holotype. Chez cette dernière, le groupe médian du sternite IV est beaucoup plus important (19 phanères), mais on retrouve les 4 phanères bacilliformes de la rangée postérieure; ces derniers sont également plus nombreux en VI (8), sans atteindre la densité constatée chez *leclerci* (13). Il existe aussi des ressemblances

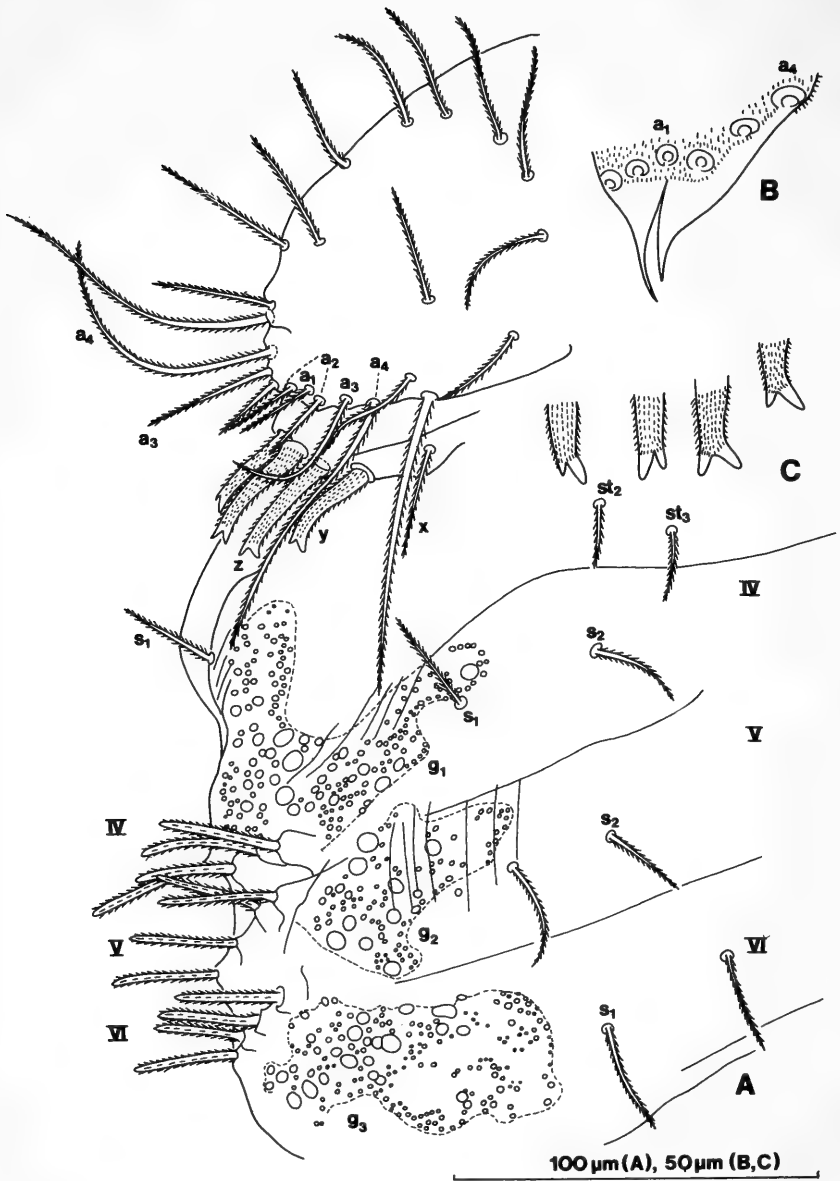


FIG. 11.

Koeneniodes spiniger Condé, 1984, femelle adulte de Tham Soi Yok Noi: A. Volets génitaux et sternites IV à VI. B. Lobes apicaux du premier volet. C. Apex des phanères y et z du deuxième volet. g_1 , g_2 , g_3 = massifs glandulaires; s_1 , s_2 = soies grêles; st_2 , st_3 = phanères latéraux du sternite III. Explication des autres lettres dans le texte.

au niveau des organes latéraux du prosome (4 éléments); des chélicères (9 dents); du basitarse IV, sur lequel la soie grêle tergale (*grt*) est distale par rapport à la soie raide (*r*); du premier volet génital avec 7 + 7 phanères principaux. Aucune confusion n'est cependant possible entre les deux espèces, l'absence des groupes latéraux de phanères plumeux aux sternites V et VI de *leclerci* étant le critère saillant; s'y ajoutent la brièveté des soies du bouclier prosomien, la position et la longueur de la soie grêle tergale du basitarse IV, la rudimentation des phanères médiaux du premier volet génital et le détail de la chétotaxie des sternites IV à VI.

7°. *Koeneniodes spiniger* Condé, 1984

THAÏLANDE. Province de Kanchanaburi, chef-lieu de Nam Tok. Près de l'entrée de la grotte de Tham Soi Yok Noi, sous une pierre enfoncée dans une terre plus ou moins noire, sous une litière assez humide, en forêt primaire, 17.VI.86, P. Leclerc leg.: 1 femelle adulte.

Longueurs. – Les nombres entre parenthèses se rapportent à la femelle holotype. Corps: 0,82 mm (0,96), l'une et l'autre en extension médiocre; bouclier prosomien: 0,27 mm (0,23); basitarse IV: 82,5 μ m (80,2); B/bta: 3,27 (2,85); bta/ti= 0,83 (0,85).

Prosoma. – Au basitarse IV: $t/r= 1,35$ (1,23); $t/er= 2,57$ (2,48). La soie grêle antérieure *gla* (55) est insérée à égale distance de *r* (70) et de la soie grêle tergale *grt* (64), tandis qu'elle est plus près de *r* que de *grt* chez l'holotype (1984, fig. 4B).

Opisthosoma. – Au premier volet génital, le phanère grêle nommé a_4 dans la diagnose originale (1984, fig. 6A) ressemble en fait aux autres soies ventrales qui seraient ainsi au nombre de 6 paires (au lieu de 5); le très long phanère marginal, inséré à proximité de a_3 , est considéré ici comme un a_4 . Deux lobes subtriangulaires, aigus et hyalins, non vus chez le type, prolongent le volet au-delà des phanères $a_1 - a_4$ (fig. 11 B). Les gros phanères *y* et *z* du deuxième volet sont tous nettement bifides à l'apex; les deux pointes sont glabres, l'une, plus courte et plus grêle que l'autre, n'ayant pas été observée chez le type (fig. 11 C).

Les sternites IV, V et VI portent chacun une rangée de 4 gros phanères surmontant de volumineux massifs glandulaires. Les limites des sternites sont effacées, comme on l'a déjà noté pour l'holotype, et les rangs de phanères sont proches les uns des autres, l'ensemble formant une protubérance médio-ventrale caractéristique. Il ne s'agit donc pas d'un artefact, résultant d'une déformation de l'opisthosome, comme on pouvait le craindre lors de la description du type, mais bien d'un complexe glandulaire associant trois segments, comme chez d'autres espèces de *Koeneniodes*.

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New and interesting mites from the
Geneva Museum LXIII.
A survey of the Oribatid fauna of Senegal
(Acari: Oribatida)

by

S. MAHUNKA*

With 102 figures

ABSTRACT

Thirty Oribatid species are enumerated from Senegal, fourteen of them are new to science, two also representing new genera: *Senilochthonius* gen. n. (*Haplochthoniidae*) and *Chaunoproctellus* gen. n. (*Chaunoproctidae*). Taxonomic investigations are presented concerning their family *Haplochthoniidae* (partial redescription of *Haplochthonius simplex* Willmann, 1930 and *H. sanctaeluciae* Bernini, 1973, and description of a new species from Greece) and the "areolata"-group in the genus *Galumnella* (with the redescription of *G. subareolata* Mahunka, 1969), furthermore, the description of a new genus and species: *Trichogalumnella hauseri* gen. et sp. n. (*Galumnidae*) from Rhodesia is presented.

INTRODUCTION

My research aiming at the exploration of the Oribatid fauna of the Ethiopian Region were mostly concentrated to East, Central and South Africa, since no adequate material originating from West Africa was available. This is why I am especially grateful to Dr. B. Hauser, curator of the Arthropoda Collection, Muséum d'Histoire naturelle, Geneva, for his kindness in allowing me to study a large material from Senegal, during my stay in Geneva in 1985.

This material, collected by several collectors (R. Mussard, S. and P. Hainard, P. Strinati) at various times and collecting sites in Senegal, proved to be highly interesting and very rich, well beyond expectation. I have identified a total of 30 species, 14 of which are new to science, two also representing two new genera (*Senilochthonius*: *Haplochthoniidae*)

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and *Chaunoproctellus*: *Chaunoproctidae*). While studying this material several taxonomic problems have been encountered. Thus it was inevitable to revise all the taxa of *Haplochthoniidae*. The comparative studies revealed a new species, also representing a new genus, while two species are related to species known mostly from the Palearctic Region. The species that I mentioned from Greece under the name *Haplochthonius simplex*, is in fact an independent, new species, whose description follows hereunder.

The description of a new species in the genus *Galumnella* also focused my attention to some problems; consequently, I had to revise the whole "*areolata*"-group. I give a redescription of *G. subareolata* Mahunka, 1969. The species mentioned by me as *G. areolata* Balogh, 1961 from Rhodesia, is in fact a new taxon, for which the establishment of a new genus is necessary.

Though the material is large, it is still insufficient for zoogeographical conclusions. Nevertheless, it is interesting to note that besides the Central African elements (*Allonothrus monodactylus*, *Africacarus calcaratus*) there are also some species showing links with Palearctic elements (*Haplochthonius sanctaeluciae*, *Medioppia subpectinata*, *Xylobates lophotrichus*).

In the descriptions I generally apply the terminology used in NORTON & BEHAN-PELLETIER (1986) based on Grandjean's work. Measurements given correspond to extremes observed in the present material; length is measured from the rostral apex to the furthestmost opposite point of the body. The pilosity of the parts of the body and of the legs are expressed in formulae. The sequence of the anogenital formula is: number of genital, anogenital, anal and adanal setae.

LIST OF LOCALITIES

- Se-72/1 = Sénégal, Rufisque (port 30 km de Dakar), au pied d'un Baobab (*Adansonia digitata*, Bombacacées), 21.II.1972. leg. R. Mussard.
- Se-72/2 = Sénégal, Ziguinchor (Casamance), 12°30N. – 16°15W au Sud de la Gambie, 20.III.1972. leg. R. Mussard.
- Se-72/3 = Sénégal, Rufisque (port 30 km de Dakar), vieux baobab pourri, tamisage et appareil Winkler, VII. 1972. leg. R. Mussard.
- Sen-73/1 = Sénégal, Rufisque, 2.VII.1973. leg. P. Strinati.
- Sen-76/1 = Sénégal, Casamance, Ziguinchor, sol sableux ferrugineux, forêt secondaire, env. 20 m, prélèvement de terre, 9.XI.1976. leg. S. et P. Hainard.
- Sen-76/2 = Sénégal, Casamance, Ziguinchor, sol sableux ferrugineux, forêt à *Cola cordifolia*, env. 20 m, prélèvement de terre, 9.XI.1976. leg. S. et P. Hainard.
- Sen-76/3 = Sénégal, Casamance, Ziguinchor, sol sableux-vaseux, salé, mangrove à *Avicennia nitida*, 9.XI.1976. leg. S. et P. Hainard.
- Sen-77/1 = Sénégal, Nianing, baobab pourri, 1.V.1977. leg. R. Mussard.
- Sen-77/2 = Sénégal, Rufisque, prélèvement de bois décomposé de baobab, 7.IX.1977. leg. R. Mussard.
- Sen-77/3 = Sénégal, Nianing, bois pourri de baobab, 7.IX.1977. leg. R. Mussard.
- Sen-77/4 = Sénégal, Nianing, (baobab pourri), 28.IX.1977. leg. R. Mussard.
- Hel-75/1 = Péloponnèse: au bord de la route de Krestena à Andritsena, 230 m, prélèvement de terre sous *Acer monspessulanum*, 19.IV.1975. leg. B. Hauser.
- The-76/25 = Grèce (Acarnanie): prélèvement de terre au pied de *Quercus* sp., près Astakos, 120 m, 15.V.1976, leg. B. Hauser.
- Rho-69/1 = Rhodesia: Inyanga, Umtali, 27.II.1969, leg. R. Mussard.

LIST OF IDENTIFIED SPECIES

Haplochthoniidae van der Hammen, 1959*Senilochthonius baobab* gen. n., sp. n.

Locality: Sen-77/3.

Haplochthonius graecus sp. n.

Localities: The-76/25, Hel-75/1.

Haplochthonius sanctaeluciae Bernini, 1973Localities: Sen-76/2: 1 specimen, Sen-77/2: 2 specimens,
Sen-77/3: 2 specimens, Sen-77/4: 2 specimens.*Haplochthonius simplex* (Willmann, 1930)

Locality: Sen-77/3: 3 specimens.

Mesoplophoridae Ewing, 1917*Mesoplophora africana* Balogh, 1958

Locality: Sen-76/1: 2 specimens.

Lohmanniidae Berlese, 1916*Torpacarus omittens* Grandjean, 1950

Locality: Sen-76/1: 2 specimens.

Epilohmanniidae Oudemans, 1923*Epilohmannia pallida* Wallwork, 1962

Locality: Sen-76/1: 2 specimens.

Nothridae Berlese, 1885*Nothrus senegalensis* sp. n.

Locality: Sen-76/2.

Trhypochthoniidae Willmann, 1931*Allonothrus monodactylus* Wallwork, 1960

Locality: Sen-76/2: 8 specimens.

Malaconothridae Berlese, 1916*Malaconothrus heterotrichus* sp. n.

Locality: Sen-76/1.

Damaeolidae Grandjean, 1965*Fosseremus quadripertitus* Grandjean, 1965

Locality: Sen-76/1: 1 specimen.

Oppiidae Grandjean, 1954*Graptoppia mussardi* sp. n.

Localities: Sen-77/1, Sen-77/4.

Insculptoppia crenata sp. n.

Locality: Sen-76/2.

Karenella foveolata sp. n.

Locality: Sen-76/2.

Multioppia calcarata sp. n.

Locality: Sen-77/2.

Paroppia senegalensis (Mahunka, 1975)Localities: Se-72/1: 15 specimens, Se-72/2: 1 specimen,
Se-72/3: 8 specimens, Sen-77/1: 2 specimens,
Sen-77/2: 1 specimen, Sen-77/3: 5 specimens.

Medioppia subpectinata (Oudemans, 1901)

Localities: Sen-77/3: 1 specimen, Sen-77/4: 2 specimens.

Oppiella nova (Oudemans, 1902)

Localities: Sen-73/1: 1 specimen, Sen-77/3: 3 specimens.

Uroppia hainardorum sp. n.

Locality: Sen-76/2.

Chaunoproctidae Balogh, 1961

Chaunoproctellus rugosus gen. n., sp. n.

Localities: Sen-77/1, Sen-77/2.

Oribatulidae Thor, 1929

Baobabula mussardi Mahunka, 1975

Localities: Se-72/1: 4 specimens, Se-72/3: 11 specimens.

Perscheloribates minimus sp. n.

Locality: Se-72/2.

Scheloribates exiguus sp. n.

Locality: Sen-76/3.

Scheloribates fimbriatus Thor, 1930

Locality: Sen-77/2: 10 specimens.

Scheloribates laevigatus (C.L. Koch, 1836)

Locality: Sen-77/3: 9 specimens.

Haplozetidae Grandjean, 1936

Xylobates lophotrichus (Berlese, 1904)

Locality: Sen-76/1: 2 specimens.

Ceratozetidae Jacot, 1925

Africacarus calcaratus Wallwork, 1965

Locality: Sen-77/3: 2 specimens.

Oribatellidae Jacot, 1925

Oribatella ceylanica (Oudemans, 1915)

Locality: Se-72/2: 1 specimen.

Galumnidae Jacot, 1925

Allogalumna sinornata sp. n.

Locality: Se-72/2.

Galumna coronata sp. n.

Locality: Se-72/2.

Galumnella apiculata sp. n.

Locality: Sen-76/1.

Trichogalumnella hauseri gen. n., sp. n.

Locality: Rho-69/1.

DESCRIPTIONS

The genus *Haplochthonius* Willmann, 1930

GRANDJEAN (1947) published a very good redescription of the genus in connection with his research on the system of the group *Enarthronota*. He examined two species which belong to this genus (*H. simplex* Willmann, 1930 and *H. sanctaeluciae* Bernini,

1973*) but he did not see the type specimens. BERNINI (1973), who described the second species, did not give any new data regarding the knowledge of the genus and he did not discuss the epimeral chaetotaxy. Since then some authors mentioned one of the two species, but no relevant data were disclosed.

Both species belong to a uncommon group, therefore, it was very unexpected, to find three *Haplochthonius* species in these small samples, and even, in one sample, all three together.

Because of the significant geographical distribution and the very special biotopes I compared these specimens with both species collected in the Mediterranean Region. I have found, that one species is unambiguously identical with *H. sanctaeluciae* and one species with *H. simplex* (sensu GRANDJEAN). The third specie stands very far from both preceding ones and the establishment of a new genus is inevitable for it.

I re-examined also a series of specimens which was published by me (MAHUNKA 1977, 1982b) under the name of *H. simplex* from Greece, however, they did not prove to be conspecific with GRANDJEAN's species, therefore, I describe it as a new species.

I examined in every case some of the important characters: the position of notogastral cupules, the epimeral and the anogenital chaetotaxy. I found, that among these species great differences exist:

	<i>simplex</i> (sensu Grandj.)	<i>graecus</i>	gen. n.	<i>sanctaeluciae</i>
form of not. setae	simple	simple	simple	widened
position of cupule	near	near	partly far	near
epimeral setal formula	3-2-3-4	3-2-3-3	3-2-3-3	3-2-2-3
number of genital setae	7	7	9	7

The variability of the epimeral setal formula is most remarkable and it queries the value of this character in other relatively primitive groups, as the family *Brachychthoniidae*.

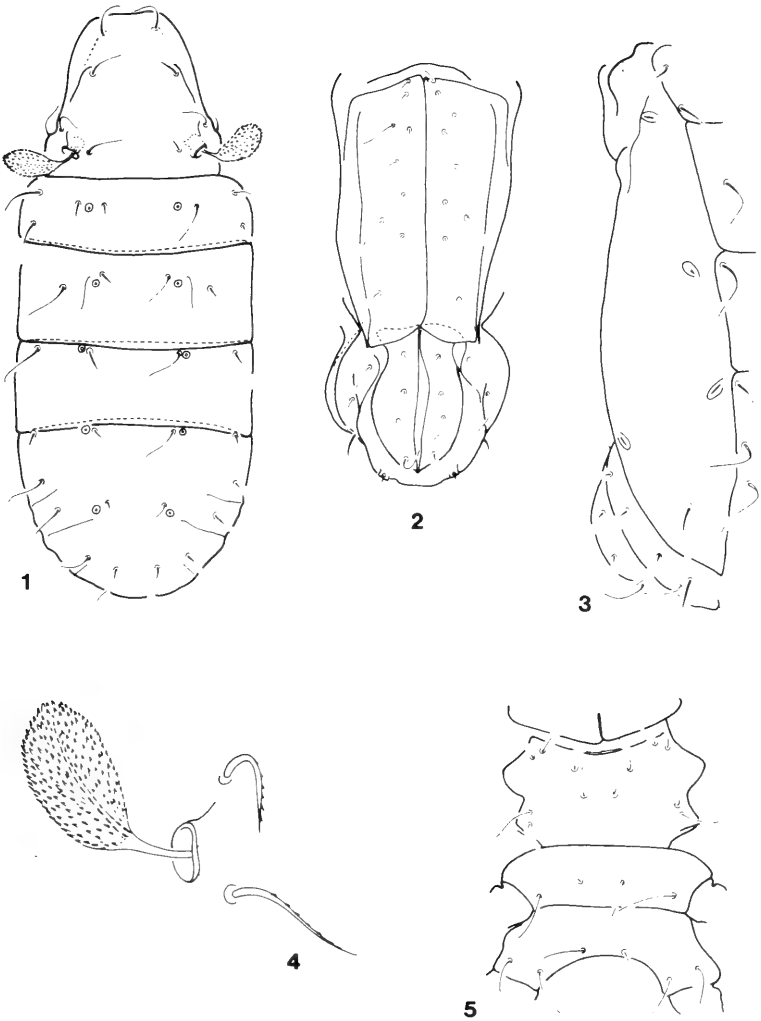
The most important character is the number of the genital setae. On this ground it would be inconsequent to order the new species in the same genus, thus I establish a new genus.

Senilochthonius gen. n.

D i a g n o s i s : Family *Haplochthoniidae*. Habitus and notogastral chaetotaxy similar to that of the genus *Haplochthonius*. Notogastral cupules originating in some cases far from the median setae (in the case of setae d_1 and h_1). Epimeral setal formula: 3-2-3-3. Nine pairs of genital setae present. All legs with one claw.

T y p e s p e c i e s : *Senilochthonius baobab* sp. n.

* At that time as "espèce de Sainte-Lucie": GRANDJEAN 1947.



FIGS 1-5.

Senilochthonius baobab gen. n., sp. n. – 1: dorsal side; 2: anogenital region; 3: notogaster from lateral view; 4: trichobothrium; 5: coxisternal region.

***Senilochthonius baobab* sp. n.**

Measurements: – Length: 316 μ m, width: 119 μ m.

Prodorsum: Weakly chitinized, no transversal ridge between the rostral and in front of the lamellar setae. All prodorsal setae thin, but ciliate. Sensillus (Fig. 4)

comparatively short, flabellate, its laminate head wide, the surface spiculate. Both pairs of exobothridial setae long, they are not shorter than the interlamellar ones, lamellar setae three times longer than the length of the exobothridial setae.

Notogaster: Cerotegument ornamented by very fine reticulation. All setae thin, comparatively short, their surface finely roughened; setae d_1 and e_1 not longer than half diameter of segments NM_1 or NM_2 . The cupules originating far from setae c_1 , d_1 and h_1 , only at setae e_1 and f_1 they stand close to them (Fig. 1). Surface of tergites with some fine rugae, being stronger on the pygidium. Lateral margin of pygidium also waved.

Pleural region (Fig. 3): Apophysis *Te* well separated, but not high. Lyrifissures *im* an *ip* originating near to notogastral tergites.

Coxisternal region (Fig. 5): Epimeral setal formula: 3-2-3-3 (!). All setae long.

Anogenital region (Fig. 2): Anogenital setal formula: 9-0-4-4.

Material examined: Holotype: Sen-77/3. Holotype. MHNG¹.

Remarks: As I discussed previously this new species stands very far from any known *Haplochthonius* Willmann, 1930 species.

I give hereunder the description of the other examined species, being also new for science.

Haplochthonius graecus sp. n.

Measurements. – Length: 311-326 μm , width: 157-165 μm .

Prodorsum: Weakly chitinized, but a fine transversal line observable in the lamellar region. All setae simple, nearly equal in length. Sensillus flabellate, comparatively wide.

Notogaster (Fig. 6): Notogastral setae very short (d_1 , e_1 39-45 μm) but stick-shaped, their surface finely roughened. Notogastral cupule originating – with the exception of one pair on *Na*-tergite – very near to the median setae.

Coxisternal region: Epimeral setal formula: 3-2-3-3. All setae simple (Fig. 9).

Anogenital region: As shown in Fig. 7.

Material examined: Holotype: The-76/25; 26 paratypes: from the same sample; 1 paratype: Hel-75/1. Holotype and 17 paratypes: MHNG, 9 paratypes (1156-PO-85): HNHM².

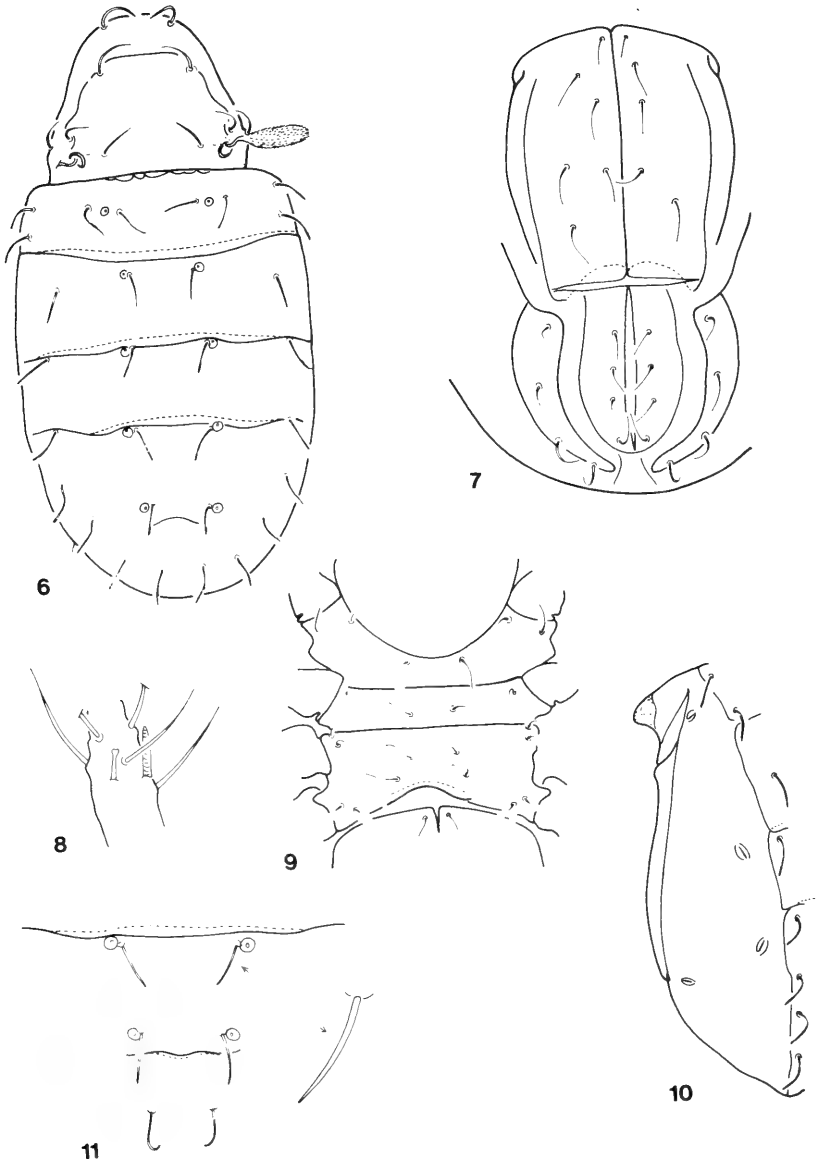
Remarks: The heretofore known *Haplochthonius* Willmann, 1930³ species may be distinguished by the following key:

- 1 (2) Notogastral setae wide, setae an_1 also wider than other anal setae (Figs 12-14).
sanctaeluciae Bernini, 1973
- 2 (1) Notogastral setae thin, filiform or stick-shaped. All anal setae similar to each other.
- 3 (4) Epimeral setal formula: 3-2-3-4, all setae long (Figs 15-20)
simplex (Willmann, 1930) sensu GRANDJEAN, 1946
- 4 (3) Epimeral setal formula: 3-2-3-3, all setae short
graecus sp. n.

¹ MHNG = deposited in the Muséum d'Histoire naturelle, Genève.

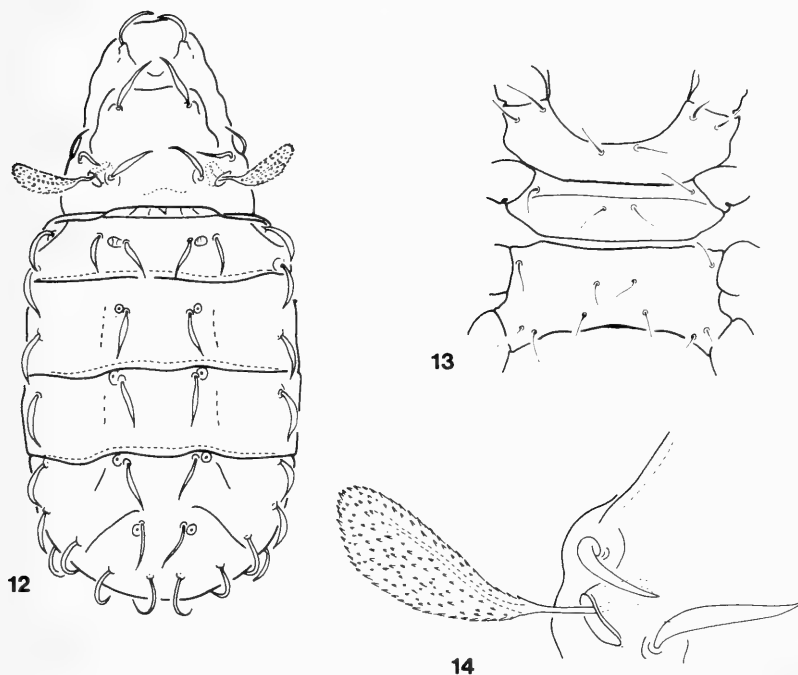
² HNHM = deposited in the Hungarian Natural History Museum, Budapest with identification number of the specimens in the Collection of Arachnida.

³ I have not investigated the *Haplochthonius clavatus* (Hammer, 1958) from South America.



FIGS 6-11.

Haplochthonius graecus sp. n. — 6: dorsal side; 7: anogenital region; 8: tarsus of leg I; 9: coxisternal region; 10: notogaster from lateral view; 11: pygidium.



FIGS 12-14.

Haplochthonius sanctaeluciae Bernini, 1973 – 12: dorsal side; 13: coxisternal region; 14: trichobothrium.

Torpacarus omittens Grandjean, 1950

Measurements. – Length: 631-648 μm , width: 271-285 μm .

The specimens from Senegal are completely identical with the description and figures given by GRANDJEAN (1950), except some round areolae porosae¹ arranged in transversal bands on the notogaster, which are absent on the South American specimens. But they are highly variable (Figs 21-22) and do not justify the separation of a new taxon. The sutures *mt*, *nt* or *pt* also vary.

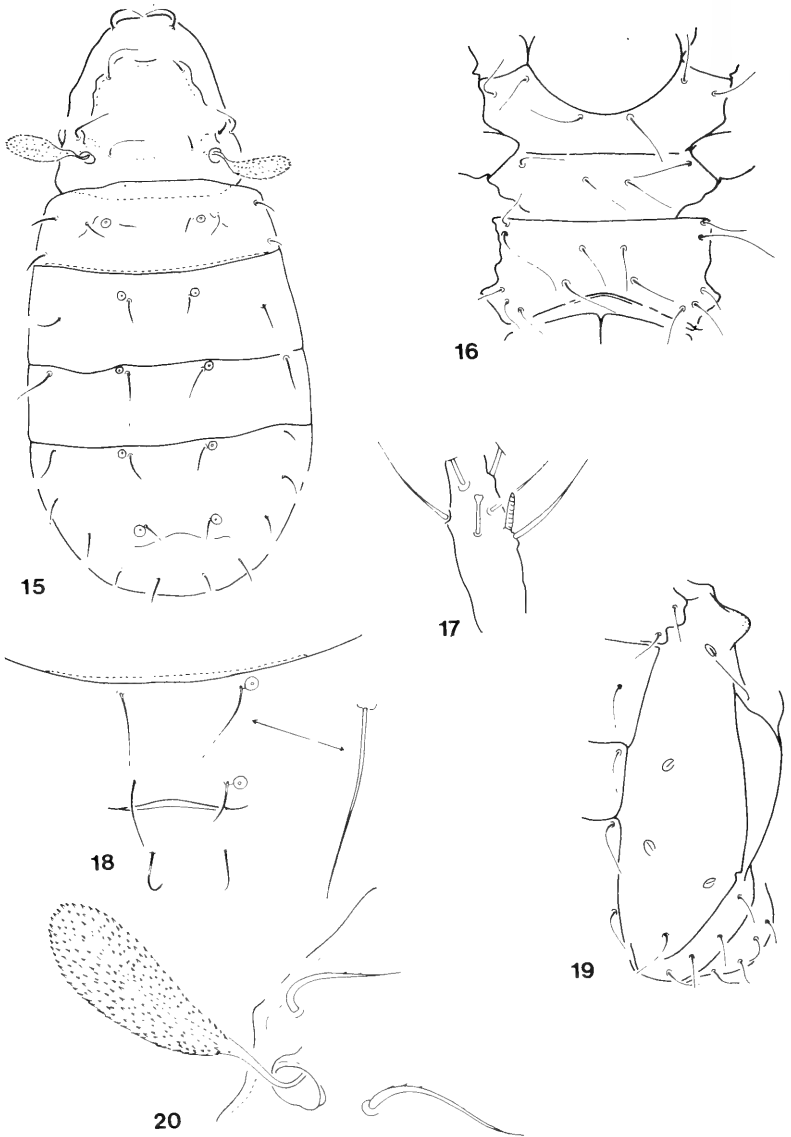
Examined material: Sen-76/1: 2 specimens.

Nothrus senegalensis sp. n.

Measurements. – Length: 688-720 μm , width: 322-348 μm .

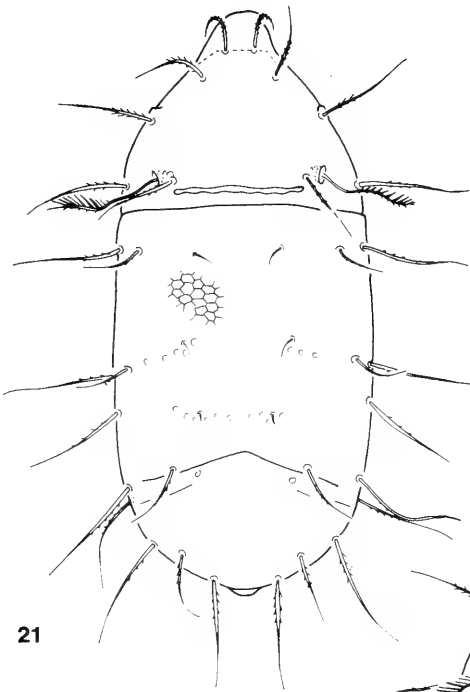
Prodorsum: Rostral and lamellar setae arising on tubercles connected by transversal laths. Both pairs of setae and the interlamellar ones also ciliate, spathulate.

¹ WALLWORK (1962) also observed them on his specimen collected in Ghana.

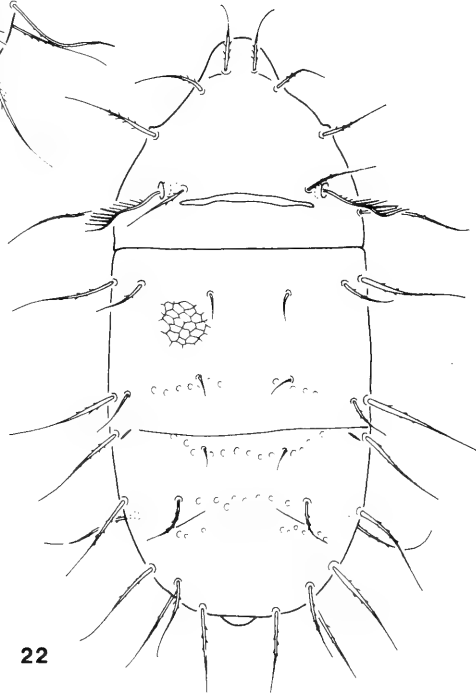


FIGS 15-20.

Haplochthonius simplex Willmann, 1930 – 15: dorsal side; 16: coxisternal region; 17: tarsus of leg I; 18: pygidium; 19: notogaster from lateral view; 20: trichobothrium.



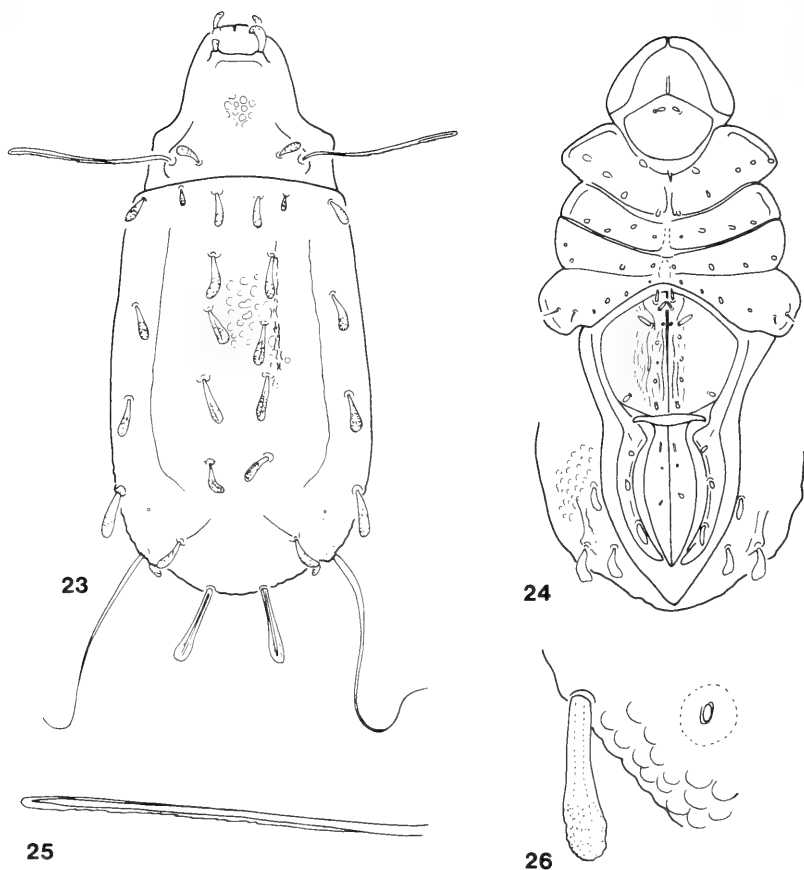
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FIGS 21-22.

Torpacarus omittens Grandjean, 1950 – 21-22: dorsal views of different specimens.



FIGS 23-26.

Nothrus senegalensis sp. n. – 23: dorsal side; 24: ventral side; 25: distal end of sensillus; 26: notogastral seta.

Prodorsal surface areolate. Sensillus (Fig. 25) very long (240 μm), much longer than distance between bothridia.

Notogaster: Surface also areolate, but laterally pustulate. Notogastral setae – with the exception of k_1 – also dilated (Fig. 26). Significant differences in their lengths (Fig. 23) exist: c_1 more than twice as long as c_2 , p_1 (91 μm) nearly two and a half times longer than h_1 . Setae h_2 (275 μm) thin, gradually narrowing distally, with a slightly flagellate end.

Coxisternal region: Epimeral setal formula: 5-4-4-6 (it was observable only in one specimen!). All setae more or less dilated.

A n o g e n i t a l r e g i o n : Inner margin of genital plates rugose, some larger longitudinal rugae also observable (Fig. 24). Genital setae also dilated. Two pairs of anal, three pairs of adanal setae present, all dilated, however, *an*₁ much larger than the others.

L e g s : All legs monodactylous.

M a t e r i a l e x a m i n e d : Holotype: Sen-76/2; 1 paratype: from the same sample. Holotype: MHNG, paratype (1157-PO-85): HNHM.

R e m a r k s : The new species belongs to the "*palustris*"-group, however, on the ground of the number of claws it stands nearest to *Nothrus mystax* Mahunka, 1985, but, the ratio of the notogastral setae in the latter one is different.

***Malaconothrus heterotrichus* sp. n.**

M e a s u r e m e n t s . – Length: 414-429 µm, width: 182-200 µm.

P r o d o r s u m : Rostral and lamellar setae thick, but rostral ones smooth and thinner than the latter. Interlamellar setae thinner but longer than sensillus, both pairs ciliate basally. Two pairs of ridges observable, one stronger around the bothridium, bending inwards, the other weaker, laterally, directed to lamellar setae. Some large foveolae visible basally and medially (Fig. 29). Pori *m* well visible, large, insertion of exobothridial setae scarcely observable.

N o t o g a s t e r : All notogastral setae ciliate basally; with the exception of setae *e*₂, *h*₂ and *ps*₂ all short, dilated on their basal part (Fig. 27). Setae *e*₂, *h*₂ and *ps*₂ much longer than the others (Fig. 32). Lyrifissure *ip* opening always transversally.

C o x i s t e r n a l r e g i o n : Setae *h* slightly dilated, blunt. Epimeral setae different in lengths: setae *1c* minute, *1b* much longer than *1a*. Setae *3b* and *3c* and *4c* slightly dilated, well ciliate. Cerotegument between the anterior and posterior sternal plates well granulate.

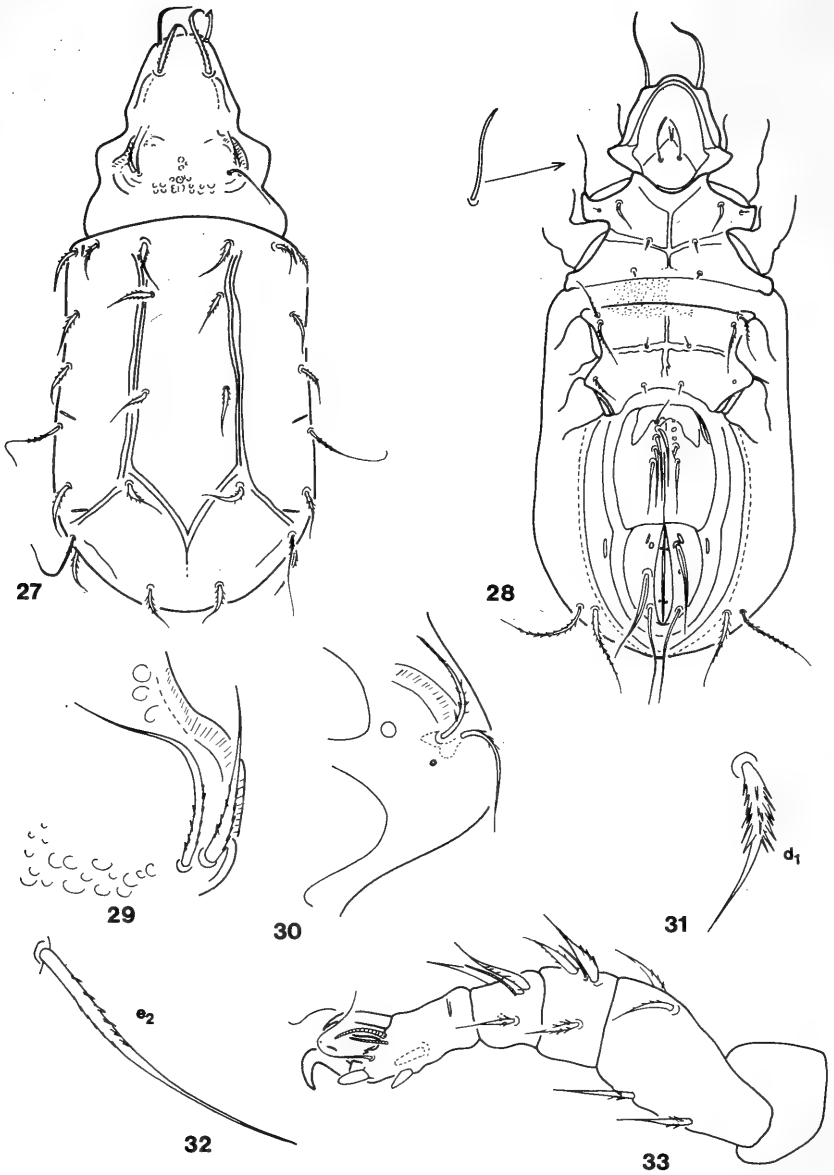
A n o g e n i t a l r e g i o n : Five (sometimes six) pairs of dilated and slightly pilose genital setae present. One or two minute anal setae hardly recognizable. All three pairs of adanal setae strong, *ad*₁ much longer but thinner than *ad*₂ and *ad*₃.

L e g s : Solenidium *v*₁ comparatively short, simply bent anteriorly. Setae *d* and *l'* of tibia I and the setae of genu and femur well dilated and ciliate basally (Fig. 33). These setae also dilated on the other legs.

M a t e r i a l e x a m i n e d : Holotype: Sen-76/1; 8 paratypes: from the same sample. Holotype and 5 paratypes: MHNG, 3 paratypes (1158-PO-85): MNHM.

R e m a r k s : The new species belongs to a species group ("*plumosus*"-group) that can be characterized by the dilated and ciliate prodorsal or notogastral setae. These species are:

- plumosus* Willmann, 1929 – Java
- robustus* Hammer, 1958 – South America
- keriensis* Hammer, 1966 – New Zealand
- neoplumosus* Balogh & Mahunka, 1969 – South America
- variosetosus* Hammer, 1971 – Fiji
- pachypilus* Hammer, 1972 – Tahiti
- ensifer* Mahunka, 1982 – Ethiopia



FIGS 27-33.

Malacothrus heterotrichus sp. n. — 27: dorsal side; 28: ventral side; 29: lateral part of prodorsum from dorsal view; 30: lateral part of prodorsum from lateral view; 31: seta d_1 ; 32: seta e_2 ; 33: leg I.

On the ground of the notogastral heterotrichy the new species stands nearest to *M. variosetosus*, however, it is distinguished from the latter by the very thick lamellar and interlamellar setae, by the sensillus, and by the shape of adanal and genital setae.

Graptoppia mussardi sp. n.

Measurements. – Length: 196-200 μm , width: 90-96 μm .

Prodorsum: Rostrum widely rounded, rostral setae arising on the dorsal surface, thicker and longer than the lamellar on interlamellar ones. Well developed costula present, narrowing basally. A convex transcostula present, but becoming thin medially. Three pairs of light spots present in the interlamellar region. Exobothridial setae thinner, but not shorter than interlamellar ones. Sensillus short, its head strongly, but asymmetrically clavate, with 10-11 lateral branches.

Notogaster: Elongate. Ten pairs of notogastral setae present. Setae *ta* minute, all others short, nearly equal in length, stick-shaped, some of them, in posteromarginal position, arising from small tubercles (Fig. 34).

Lateral part of podosoma: Pedotecta I small, II-III absent, discidium small, but sharply pointed and steeply projecting from the surface. Exobothridial region (Fig. 38) granulate.

Coxisternal region: Borders between the 1. and 2. epimeres hardly observable, sejugal borders wide (Figs 36-37). Epimeral surface with some polygonal fields. Epimeral setae short, setae *1c* originating far from pedotecta 1, setae *3c* and *4c* (!) arising from tubercles. Between epimeres 3 and also 4 a wide median field present.

Anogenital region: Anogenital setal formula 5-1-2-3, aggenital, adanal and anal setae nearly equal in length. Setae *ad*₁ in postanal, setae *ad*₃ in preanal position, the latter nearly in a transversal line along with the aggenital setae. Lyrifissure *iad* in adanal position.

Legs: All solenidia of tarsus I (Fig. 35) short, *w*₁ arising on a tubercle. Solenidium *w*₁ of tibia II also short and blunt, directed laterally (Fig. 39).

Material examined: Holotype: Sen-77/4; 1 paratype: Sen-77/1. Holotype: MHNG, paratype (1159-PO-85): MNHM.

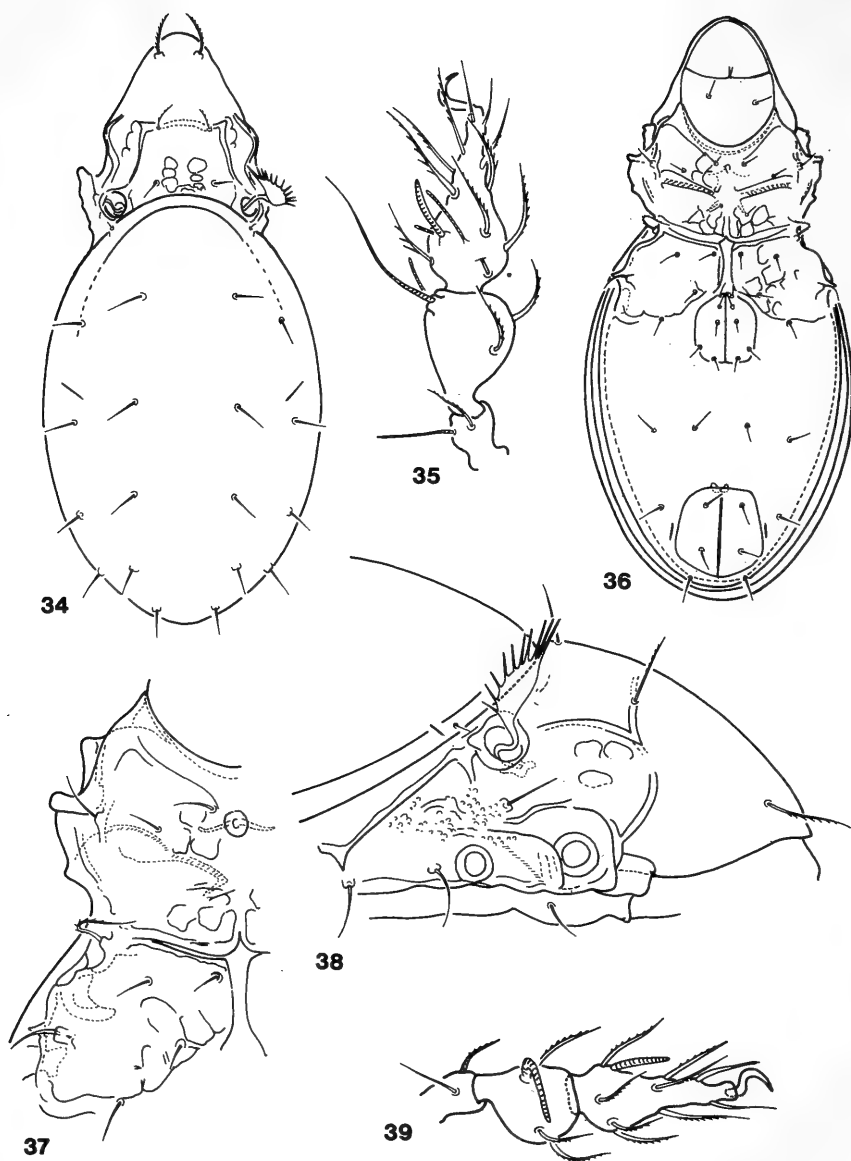
Remarks: The new species stands very near to *G. foveolata* (Paoli, 1908) and *G. africana* Mahunka, 1987. It is distinguished from both species by the presence of setae *ta* on the notogaster and by the number of lateral branches of the sensillus.

Insculptoppia crenata sp. n.

Measurements. – Length: 295-312 μm , width: 164-171 μm .

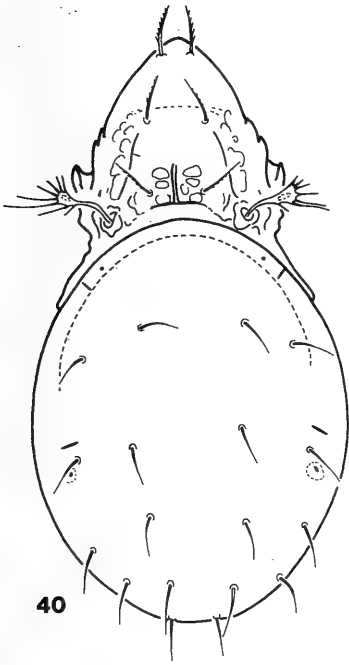
Prodorsum: Ratio of prodorsal setae: *ro* > *in* > *le* > *ex* (Fig. 43). All setae ciliate, but setae *ro* also slightly thicker than the others. Dorsal surface with a pair of sharp lines running from bothridium towards lamellar setae. Between interlamellar setae 3 (4) pairs of irregular spots and among them a well-visible, short, longitudinal lath (Fig. 40) present. Sensillus fusiform, unilaterally ciliate. Ciliae (or branches) different in length.

Notogaster: Nine pairs of short notogastral setae present, setae *ta* represented only by their alveoli.

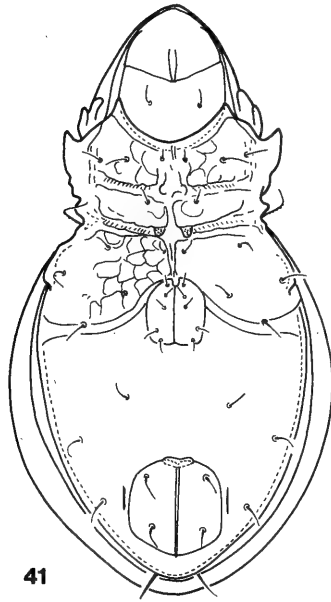


FIGS 34-39.

Graptoppia mussardi sp. n. — 34: dorsal side; 35: leg I; 36: ventral side; 37: coxisternal region; 38: prodorsum from lateral view; 39: leg II.



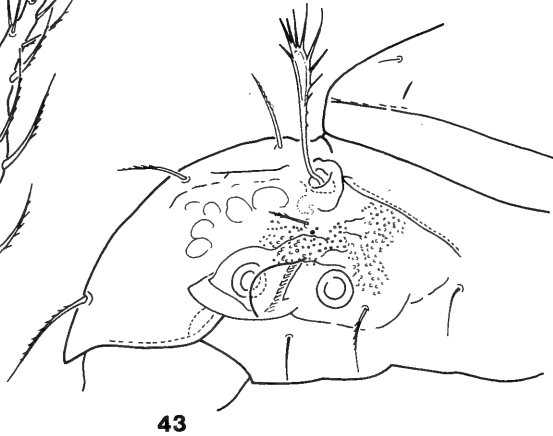
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43

FIGS 40-43.

Insculptoppia crenata sp. n. — 40 dorsal side; 41: ventral side; 42: leg I; 43: prodorsum from lateral view.

Lateral part of prodorsum: Surface well granulate. Pedotecta 1 small, pedotecta 2 absent, discidium without sharp spur. Setae *1c* originating far from pedotecta 1.

Coxisternal region: Epimeral borders well observable. Sejugal borders with a pair of characteristic tubercles, directed backwards. Epimeral surface ornamented by polygonal network. Epimeral setae short and simple (Fig. 41).

Anogenital region: Anogenital setal formula: 5-1-2-3. All setae simple and short. Setae *ad*₃ originating in postanal position and directed slightly outwards.

Legs: Tibia of leg I (Fig. 42) without spur. Solenidium *w*₁ long, *w*₂ blunt, *v*₁ also blunt but *v*₂ filiform, much longer than *v*₁.

Material examined: Holotype: Sen-76/2; 2 paratypes: from the same sample. Holotype and 1 paratype: MHNG, 1 paratype (1160-PO-85): MNHM.

Remarks: The new species stands nearest to *I. fusiformis* (Wallwork, 1961) from Ghana, however, the latter has no median laths between the light spots of the interbothridial region and the head of sensillus is narrower than in the new species.

***Karenella foveolata* sp. n.**

Measurements. – Length: 271-300 μm, width: 157-174 μm.

Prodorsum: Rostrum widely rounded, rostral setae arising laterally far from each other. All prodorsal setae simple, setiform, setae *in* minute, setae *ex* represented only by their alveoli. Between the interlamellar setae a characteristic formation present, which consists of one pair of short, longitudinal laths and between them two pairs of round spots. Sensillus long, its head asymmetrically clavate, barbed distally.

Notogaster: Its surface ornamented by large but shallow foveolae, their margin hardly observable, indistinct. Ten pairs of setae present, nine pairs of them characteristically widened basally (Fig. 44), and barbed distally, one pair (*ta*) minute, originating very near to lyrifissura *ia*.

Lateral part of podosoma: Exobothridial region granulate, some stronger rugae also observable (Fig. 47). Pedotecta 1 normal, discidium weakly developed, without sharp spur. Setae *4c* originating very far from the acetabulum of leg IV. Setae *1c* arising also on the epimeral surface (Fig. 45).

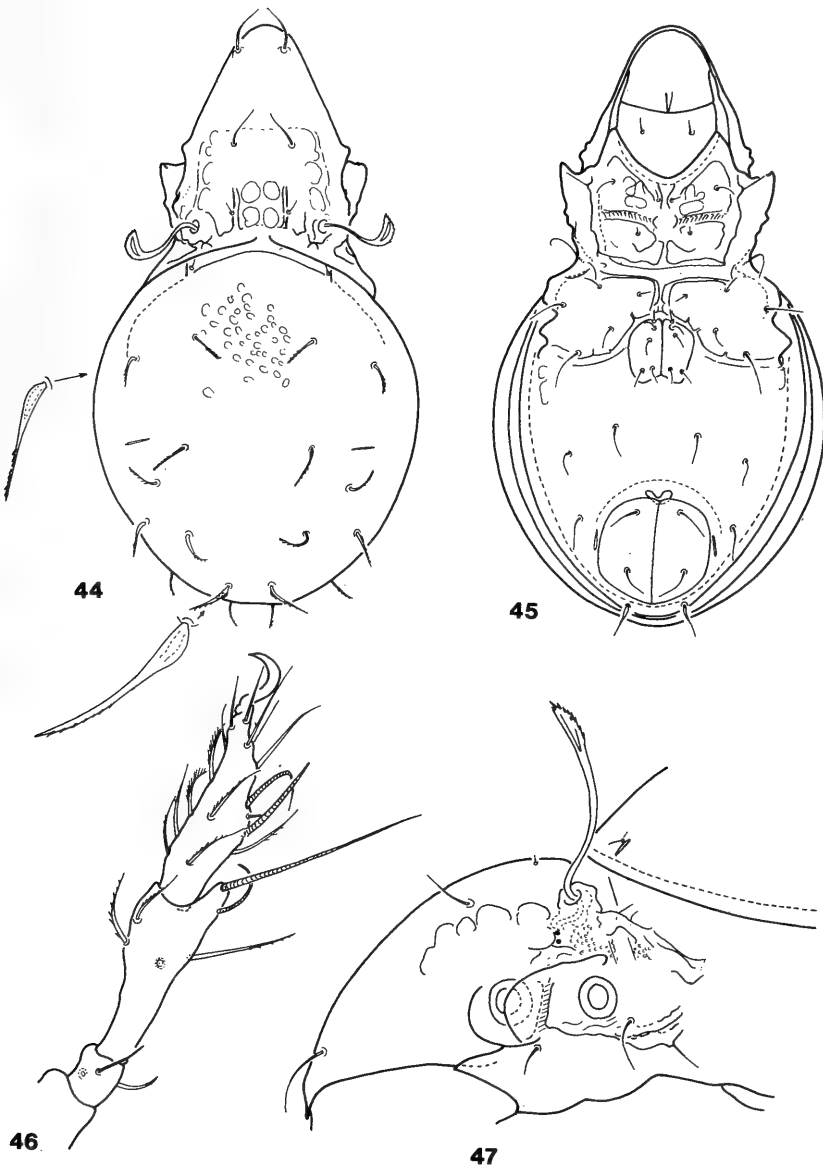
Coxisternal region: A strong sejugal band observable, other epimeral borders – with the exception of *bo*₄ – not or only partly observable. Epimeral surface ornamented by a few polygonal fields or spots. Epimeral setae different in length, but all thin and simple.

Anogenital region: Anogenital setal formula 5-1-2-3. Setae *ad*₁ like notogastral ones, dilated basally, all others thin and simple.

Legs: Tibia of leg I with long and strong spur dorsally, both solenidia arising on it (Fig. 46). All solenidia of tibia and tarsus of leg II blunt, directed forwards.

Material examined: Holotype: Sen-76/2; 1 paratype: from the same sample. Holotype: MHNG, 1 paratype (1161-PO-85): HNHM.

Remarks: The new species is well characterized by its notogastral sculpture and by the shape of its notogastral setae. On this around it may be well distinguishable from all related taxa. In my opinion *Karenella lanceosetoides* (Balogh, 1960) and the new species



Figs 44-47.

Karenella foveolata sp. n. — 44: dorsal side; 45: ventral side; 46: leg I; 47: prodorsum from lateral view.

present transitional forms from *Karenella* Hammer, 1962 to *Corynoppia* Balogh, 1983, therefore, the latter probably will have to be synonymized with *Karenella*, and *Karenella* should be placed close to the *Stachyoppia* – *Striatoppia* group.

***Multioppia calcarata* sp. n.**

M e a s u r e m e n t s . – Length: 271-302 μm , width: 147-158 μm .

P r o d o r s u m : Rostrum widely rounded, rostral setae geniculate, originating near to each other on the dorsal surface. In front of them a transversal lath present. Lamellar setae slightly shorter and thinner than interlamellar ones. Sensillus asymmetrically clavate, with 9-10 long branches and its peduncle with 7-8 short cilia on each side. Exobothridial region (Fig. 53) well granulate.

N o t o g a s t e r : Twelve pairs of characteristic notogastral setae present (Fig. 48), setae *ta* reduced, their insertion also invisible.

L a t e r a l p a r t o f p o d o s o m a : Pedotecta with a very long and strong spur anteriorly (Fig. 51). Pedotecta II small, discidium sharply pointed, slightly curved backwards.

C o x i s t e r n a l r e g i o n : All epimeral setae comparatively short, some of them ciliate. Setae *lc* originating far from pedotecta I. Epimeral surface ornamented by polygonal reticulation, epimeral borders in parts hardly observable. On the sejugal borders one pair of round tubercles (Fig. 49) present, directed posteriorly.

A n o g e n i t a l r e g i o n : All setae short and simple. Anogenital setal formula: 5-1-2-3. Lyrifissure *iad* long.

L e g s : Tibia of leg I (Fig. 52) without tubercles. Solenidia w_1 and w_2 standing far from each other. Solenidium w_1 of leg II (Fig. 50) long, filiform.

M a t e r i a l e x a m i n e d : Holotype: Sen-77/2; 22 paratypes: from the same sample. Holotype and 14 paratypes: MHNG, 8 paratypes (1162-PO-85): MNHM.

R e m a r k s : The new species is well characterized by the anterior spur of its pedotecta I and the completely reduced setae *ta*. On this ground it may be well distinguished from all heretofore known *Multioppia* Hammer, 1961 species.

***Paroppia senegalensis* (Mahunka, 1975) comb. nov.**

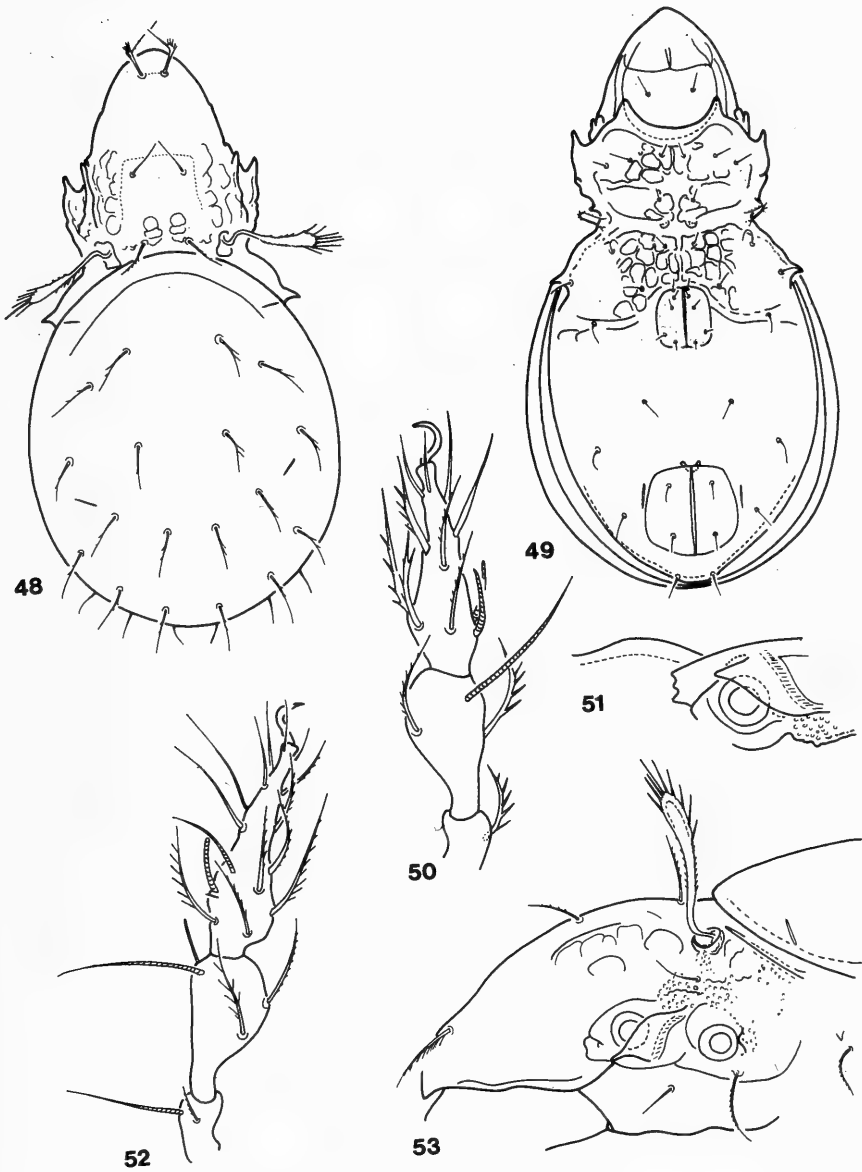
This species belongs without doubt to the genus *Paroppia* Hammer, 1968. On the ground of the newly examined specimens I give some complementary figures (Fig. 54-57). The original description is acceptable, but the prodorsal and notogastral setae are slightly more rigid than they have been figured (MAHUNKA, 1975: 289, fig.: 1-2).

E x a m i n e d m a t e r i a l : Se-72/1: 15 specimens, Se-72/2: 1 specimen,
Se-72/3: 8 specimens, Sen-77/1: 2 specimens,
Sen-77/2: 1 specimen, Sen-77/3: 5 specimens.

***Uroppia hainardorum* sp. n.**

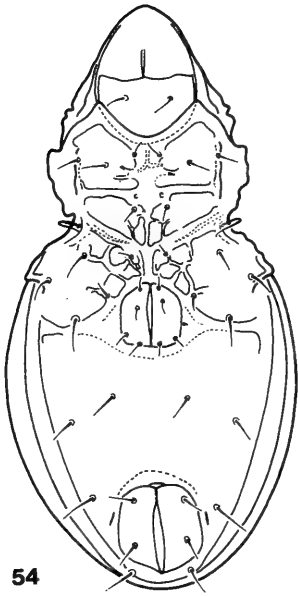
M e a s u r e m e n t s . – Length: 369-395 μm , width: 209-225 μm

P r o d o r s u m : Rostrum conical, rostral setae arising near to the rostral apex, close to each other, curved inwards. Lamellar and interlamellar setae similar, nearly equal

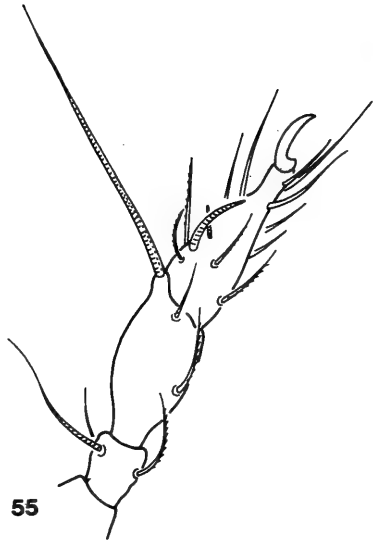


FIGS 48-53.

Multioppia calcarata sp. n. — 48: dorsal side ; 49: ventral side; 50: leg II; 51: pedotecta 1; 52: leg I; 53: prodorsum from lateral view.



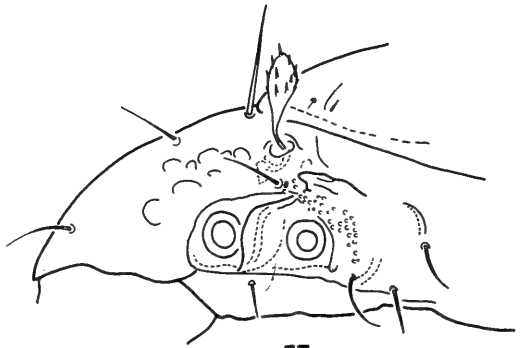
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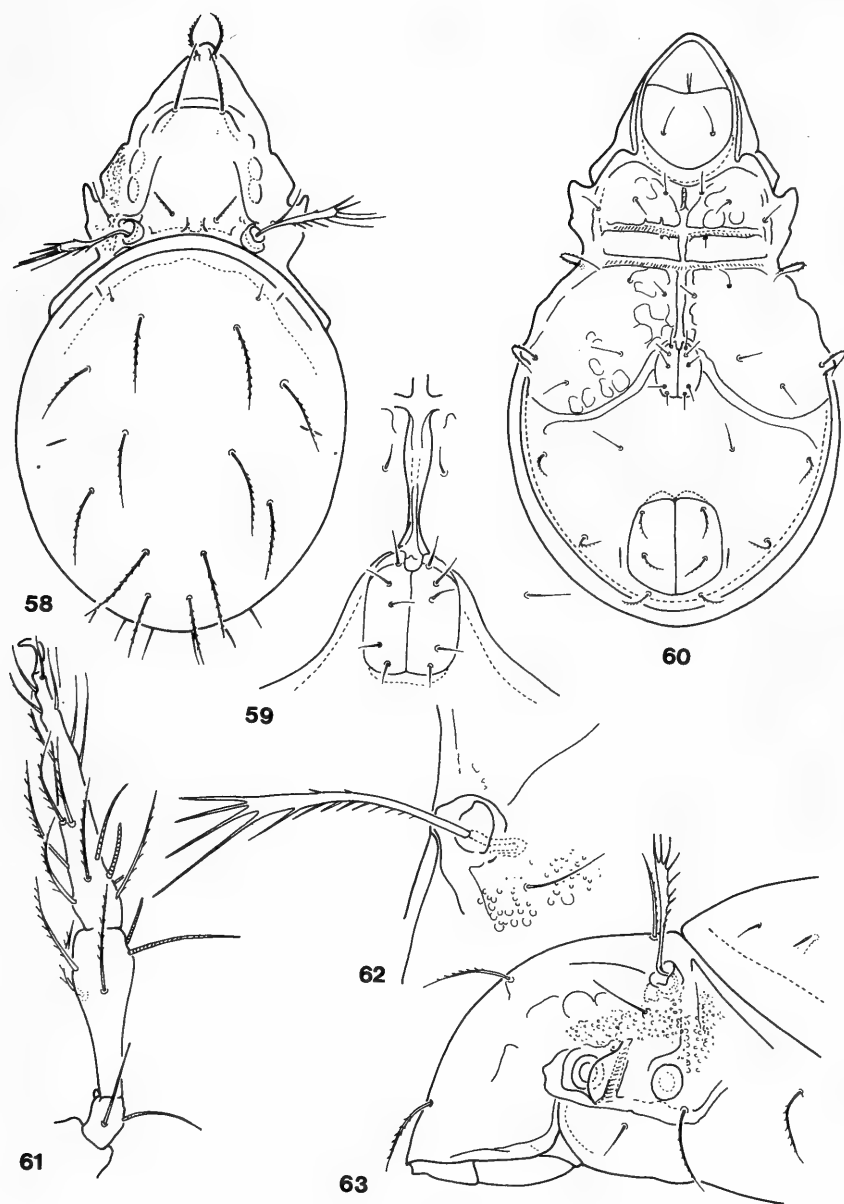
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FIGS 54-57.

Paroppia senegalensis (Mahunka, 1975) – 54: ventral side; 55: leg I; 56: leg II; 57: prodorsum from lateral view.



FIGS 58-63.

Uropia hainardorum sp. n. — 58: dorsal side; 59: epimeral borders and genital plate; 60: ventral side; 61: leg I; 62: trichobothrium; 63: prodorsum from lateral view.

in length (Fig. 63). A strong transversal costula in front of lamellar setae and a sharp longitudinal line present, the latter running anteriorly from bothridium, slightly convergent. Between interlamellar setae some short laths present. Senillus (Fig. 62) gradually thickened, with long branches of various lengths. Exobothridial region strongly granulate.

Notogaster: Ten pairs of notogastral setae present, setae *ta* originating far from dorsosejugal suture, setae *p* standing near to each other. Setae *te* - *r*₃ well ciliate (Fig. 58).

Lateral part of prodorsum: Lateral margin of prodorsum bent characteristically posteriorly. Setae *lc* originating far from pedotecta 1 and much shorter than *3c* and *4c*. Discidium small.

Coxisternal region (Fig. 60): Apodemes and epimeral borders well observable, composing a dense network. Setae - with the exception of *3c* and *4c* - short and simple, the latter two pairs with long cilia. Epimeres ornamented by irregular spots.

Anogenital region: Genital plates (Fig. 59) hollowed out at their anterior median margin. Anogenital setal formula: 5-1-2-3. Genital and aggenital setae simple, thin, all others thicker and with strong cilia. Setae *ad*₃ originating far from *ad*₂, anteriorly, only slightly behind setae *ag*. Lyrifissure *iad* in adanal position, but near to the posterior corner of anal plates.

Legs: All tarsi (Fig. 61) gradually narrowed anteriorly, without a bulbiform basal part. Claws short, comparatively small. Tibia of leg I without process.

Material examined: Holotype; Sen-76/2; 1 paratype: from the same sample. Holotype: MHNG, paratype (1163-PO-85): HNHM.

Remarks: The new species stands very near to the type species of the genus *Uroppia* Balogh, 1983 [*U. acusiensis* (Wallwork, 1961)] described from Ghana. They differ from each other by the following characters:

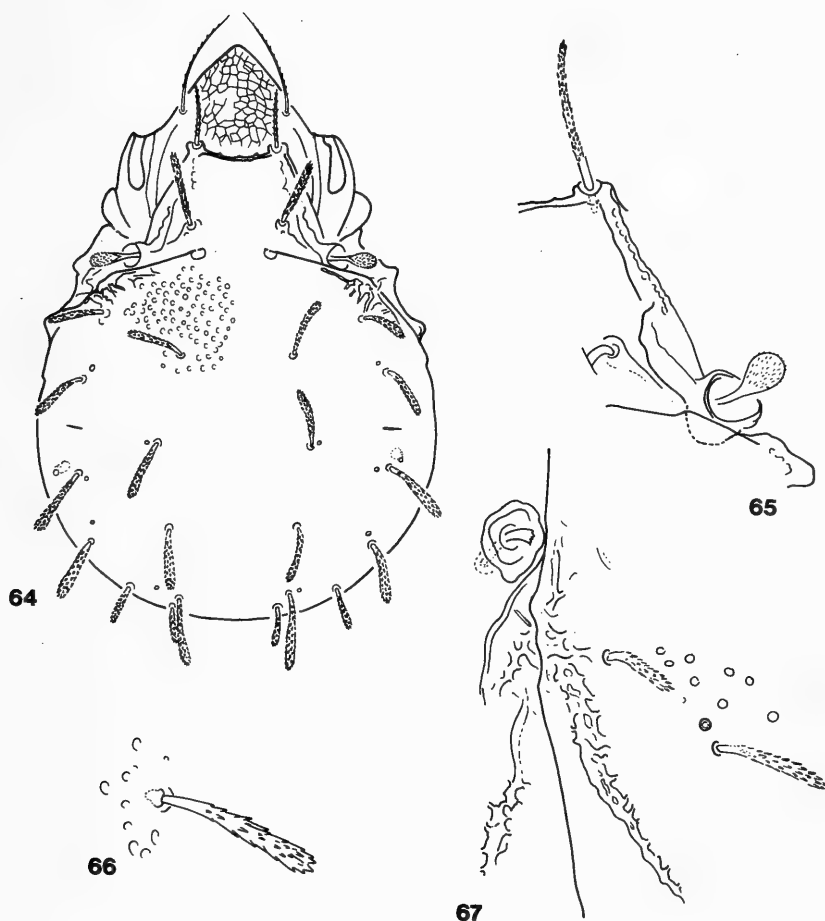
- | <i>U. acusiensis</i> ¹ | <i>U. hainardorum</i> sp. n. |
|---|--|
| 1. Smaller species: measurements:
312-341 x 175-206 μm | 1. Bigger species: measurements:
369-395 x 209-225 μm |
| 2. Setae <i>4b</i> ciliate | 2. Setae <i>4b</i> smooth. |
| 3. Setae <i>ad</i> ₃ arising nearer to apodemes 4 than setae <i>ag</i> . | 3. Setae <i>ad</i> ₃ arising farther from apodemes 4 than setae <i>ag</i> . |
| 4. Lyrifissure <i>iad</i> in apoanal position. | 4. Lyrifissure <i>iad</i> in adanal position. |

Chaunoproctellus gen. n.

Diagnosis: Family *Chaunoproctidae*. Similar to *Chaunoproctus*. Lamellae with very large, wide cusps, translamella narrow. Dorsosejugal suture interrupted medially. Ten pairs of notogastral setae and five pairs of pori present. Epimeral setal formula: 3-1-3-3. Anal and genital apertures originating far from each other, the distance being greater than the length of anal plates. Anogenital setal formula: 6-1-2-2. Lyrifissure *iad* in adanal position. All legs tridactylous.

Type species: *Chaunoproctellus rugosus* sp. n.

¹ Based on WALLWORK's description only.



FIGS 64-67.

Chaunoproctellus rugosus gen. n., sp. n. — 64: dorsal side; 65: lamellar region; 66: notogastral seta; 67: humeral part of notogaster.

Remarks: The new taxon stands near to the genus *Chaunoproctus* Pearce, 1906 but the latter has three pairs of adanal setae and its dorsosejugal suture is not interrupted medially.

***Chaunoproctellus rugosus* sp. n.**

Measurements: — Length: 397-494 μm , width: 276-350 μm .

Prodorsum: Rostrum conical. Rostral setae long, thin, arising on the cusps of turtorium. Lamellae thick, of a complicate structure and sculpture (Fig. 65). Lamellar setae

arising on their cup-shaped cusps, bacilliform, spiculate. Rostral region, before trans-lamellae, ornamented by polygonal sculpture, interlamellar region smooth. Interlamellar setae also spiculate, slightly thicker than lamellar ones (Fig. 70). Bothridium protruding laterally, sensillus short, its head clavate and spiculate.

Notogaster: A small humeral projection present, its surface and a longer posteriorly directed band (Fig. 67) rugose. Whole surface irregularly foveolate. Ten pairs of dilated notogastral setae (Fig. 64) present, setae ps_2 and ps_3 much shorter than the others. Five pairs of pori present, anterior one (Pa) longer than the others.

Lateral part of podosoma: Pedotecta 1 and 2 well developed, its surface also polygonate. Among the lateral porose areae only the humeral one (Ah) visible, instead of the sublamellar one (Al) only a light spot visible. The whole surface of this region rugose.

Coxisternal region (Fig. 68): Only a short part of apodeme 1 and the sejugal one is visible. Epimeral borders also absent. All setae thin, comparatively long, surface ornamented by irregular spots.

Anogenital region: Surface foveolate, but the anterior part, near to the genital aperture, with some irregular spots, similar to the epimeral surface. Anogenital setal formula: 6-1-2-2, all setae short and thin, setae g_6 characteristically bent inwards.

Legs: All legs tridactylous. All trochanters and femora finely rugose or striolate, the other segments smooth. The third and fourth tibia very long, therefore the posterior two pairs of legs much longer than the anterior pairs. Porose areae visible. Tibia of leg I with long process (Fig. 69), bearing solenidium φ_1 , φ_2 originating also on a small tubercle.

Material examined: Holotype: Sen-77/2: 1 paratype: from the same sample, 1 paratype: Se-72/2. Holotype and 1 paratype: MHNG, 1 paratype (1164-PO-85): HNHM.

Remarks: In addition to the generic characters, the new species may also be well separated from the other species belonging to the family *Chaunoproctidae* by the rugose humeral projection and the shape of lamellae.

Baobabula mussardi Mahunka, 1975

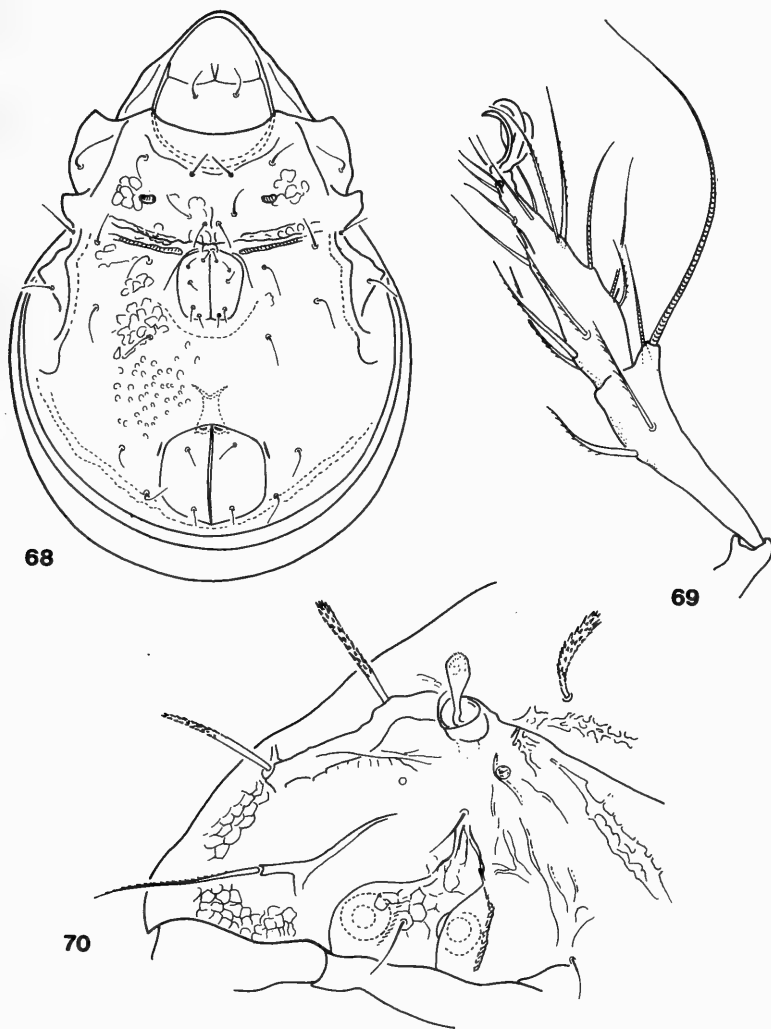
In the original description of the genus I erroneously referred to the areae porosae as respiratory organs. I must correct this: It has four pairs of large sacculi. I remarked that the "sacculi" are very hardly observable, because the "sacks" are mostly round and have a struture like pori (connections of tracheae?) well visible in them (Figs 71-72).

In spite of this change the validity of the genus is unambiguous, but it might belong to the alliance of *Constrictobates* Balogh et Mahunka, 1966.

Perscheloribates minimus sp. n.

Measurements. — Length: 239-281 μm , width: 135-177 μm .

Prodorsum: Rostrum obtuse, rostral setae arising far from each other, in marginal position. Lamellae well developed, a pair of short, bent interlamellar lines present, prelamellae short, not reaching to the insertion of rostral setae (Fig. 75). A transversal band observable behind the rostral setae. Sensillus large, directed outwards, clavate, its head rarely spinose.



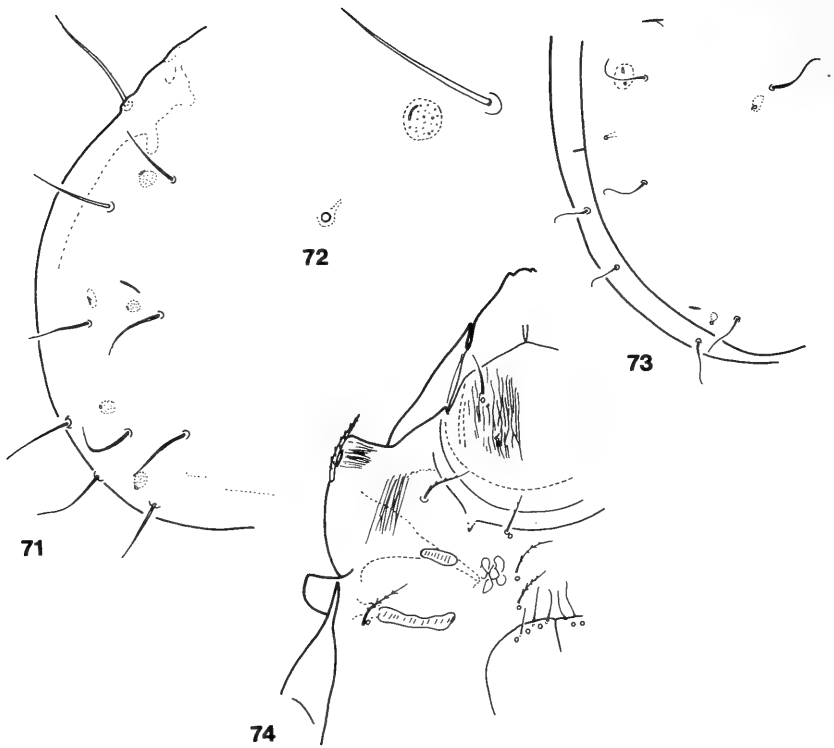
FIGS 68-70.

Chaunoproctellus rugosus gen. g. n., sp. n. — 68: ventral side; 69: leg I; 70: prodorsum from lateral view.

Notogaster: Dorsosejugal suture arched. Notogastral setae reduced, only setae p_1 visible, all others represented by their alveoli. Four pairs of minute sacculi present.

Lateral part of podosoma: As shown in (Fig. 77).

Coxisternal region: Some spots on the epimeral surface visible. Epimeral setae simple, setae $1c$ arising on the outer border of epimer 1.



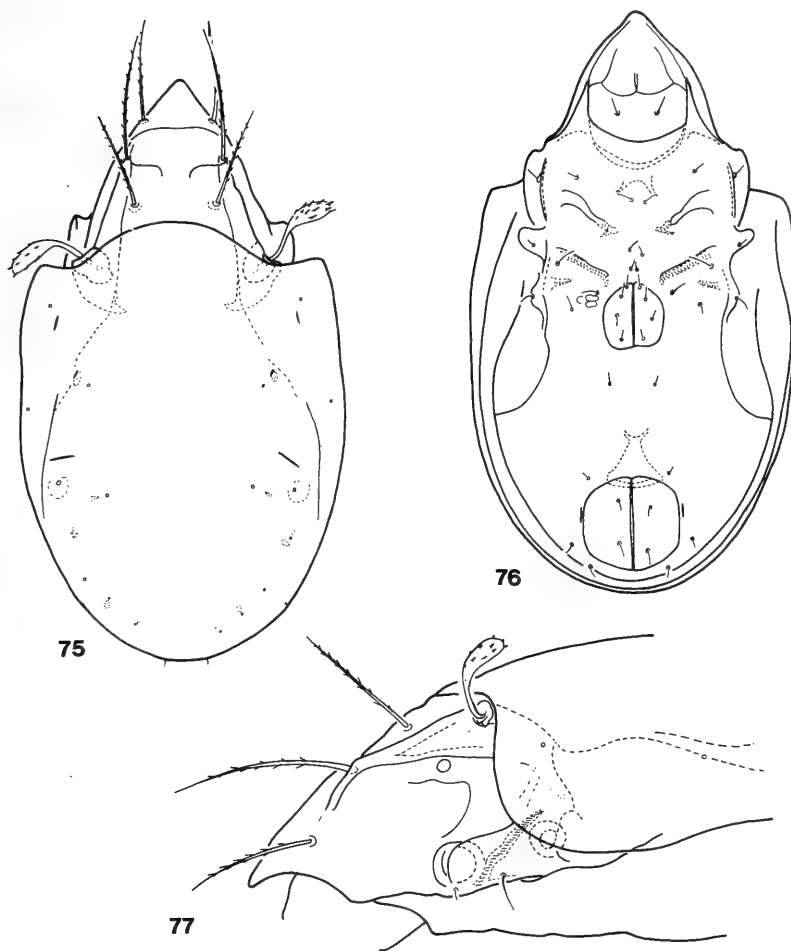
FIGS 71-74.

Baobabula mussardi Mahunka, 1975 – 71: notogaster; 72: sacculi *Sh* and seta *te*
Africacarus calcaratus Wallwork, 1965 – 73: posterior part of notogaster; 74: coxisternal region.

Anogenital region: All setae short and thin, no essential difference among their lengths (Fig. 76).

Material examined: Holotype: Se-72/2; 6 paratypes: from the same sample. Holotype and 4 paratypes: MHNG, 2 paratypes (1165-PO-85): HNHM.

Remarks: The difference among the genera *Perscheloribates* Hammer, 1973, *Ischeloribates* Corpus-Raros, 1980 and some other related genera is rather uncertain, however, the new species strongly resembles *Perscheloribates clavatus* Hammer, 1973, therefore I placed it in this genus. It differs from the type species by the presence of setae p_1 , the short prelamellae and the straight transversal line behind the rostral setae (the latter is well arched in *clavatus*).



FIGS 75-77.

Perscheloribates minimus sp. n. — 75: dorsal side; 76: ventral side; 77: prodorsum from lateral view.

***Scheloribates exiguus* sp. n.**

Measurements. — Length: 394-420 μm , width: 204-227 μm .

Prodorsum: Rostrum apex truncate. Ratio of prodorsal setae $ro < le < in$. Setae *ro* and *le* arising on the lamellae or prelamellae. Lamellae and prelamellae well developed, a thin but well-observable, bent translamella also present (Fig. 78). Its median part with a characteristic thickening. Sensillus (Fig. 79) clavate.

Notogaster: Ten pairs of filiform notogastral setae and four pairs of sacculi present. All sacculi elongate, with slit-like opening (Fig. 82).

Lateral part of podosoma: As shown as in (Fig. 83). Pedotecta I ornamented by some longitudinal wrinkles.

Coxisternal region: Apodemes well developed, *ap*₂, *ap. sej.* and *ap*₃ comparatively long. Epimeral borders not observable. Epimeral surface with polygonal ornamentation (Fig. 80).

Anogenital region: Without any sculpture. Anogenital setal formula: 4-1-2-3.

Legs: All legs tridactylous. Femur of leg II much wider than that of the other legs (Fig. 81).

Material examined: Holotype: Se-76/3; 22 paratypes: from the same sample. Holotype and 14 paratypes: MHNG, 8 paratypes (1166-PO-85): HNHM.

Remarks: The new species is well characterized by its translamella. On this ground it may be distinguished from all heretofore known related *Scheloribates* species.

***Africacarus calcaratus* Wallwork, 1965**

This is the second collecting locality of the species described from Tchad. The Senegalian specimens may well be identical with the original description and figures. But WALLWORK did not mention the sculpture of the mentum and the epimeral region (Fig. 74), and neither did he depict the genal teeth. The long and strong setae *3c* in WALLWORK's figures might be a misinterpretation.

The respiratory system consists of sacculi, *Sa* and *S*₁ well visible, *S*₂ and *S*₃ originating on the posterolateral margin and hardly observable (Fig. 73).

Material examined: Sen-77/3: 2 specimens.

***Allogalumna sinornata* sp. n.**

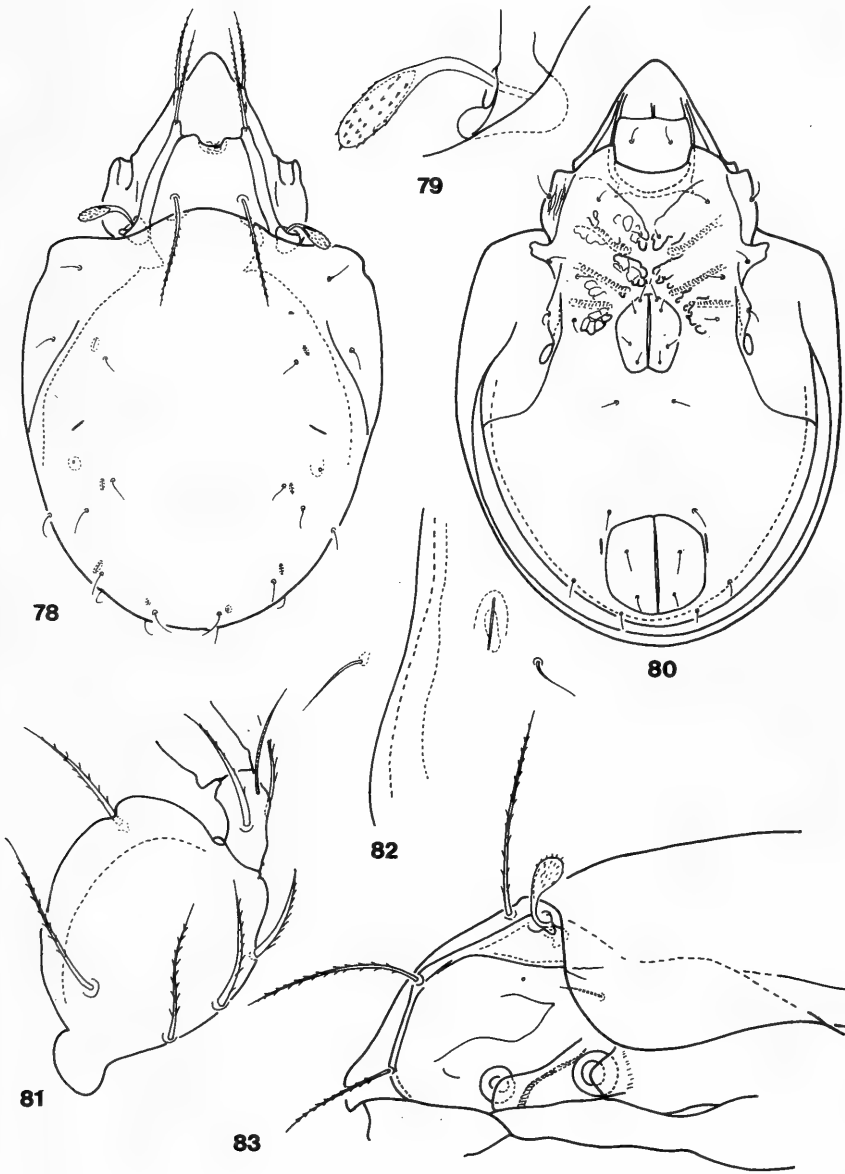
Measurements. — Length: 281-306 μm, width: 226-242 μm.

Prodorsum: Rostral part of prodorsum nearly semicircular in dorsal view. Rostral and lamellar setae very thin, but longer than the minute interlamellar ones. Sensillus asymmetrically fusiform, directed outwards. Sublamellar areae porosae very large (Fig. 85).

Notogaster: Dorsosejugal suture absent medially. Four pairs of large areae porosae present, among them *Aa* very large and round (Fig. 84). One median porus present, ten pairs of large alveoli also well visible.

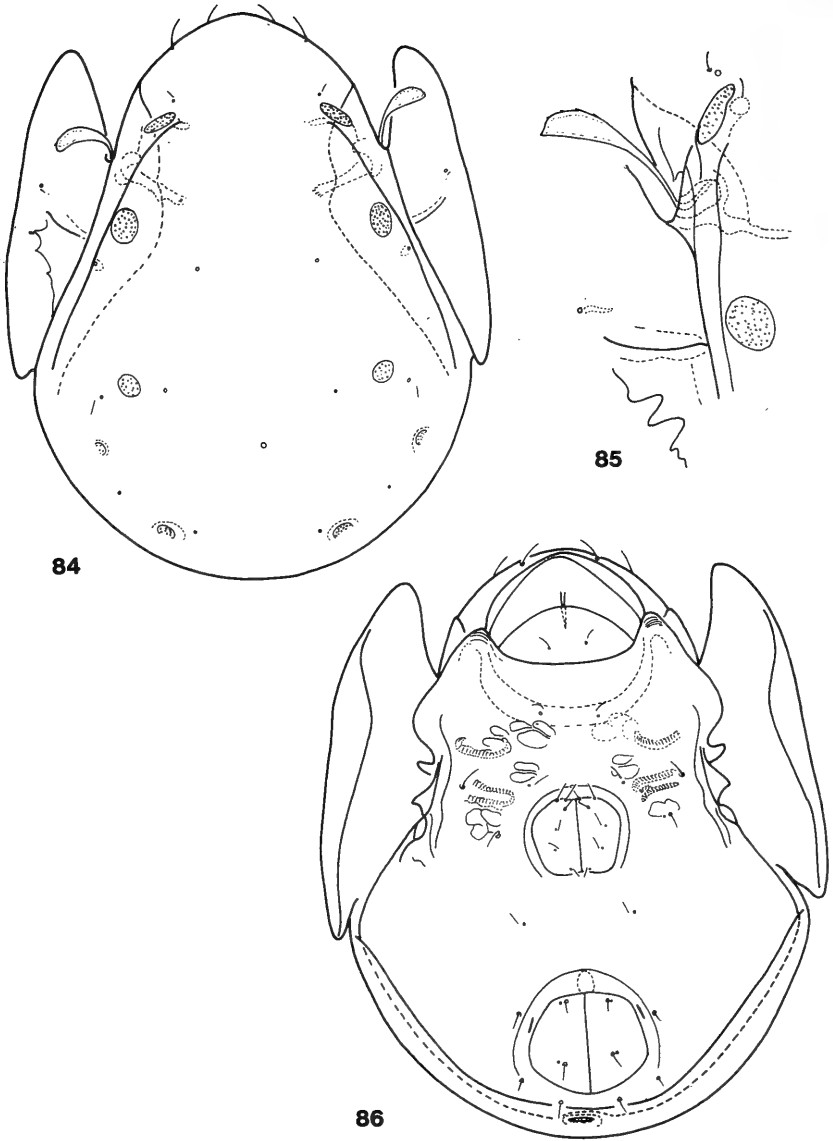
Coxisternal region: Three pairs of apodemes observable, they are nearly equal in length, *ap. sej.* and *ap*₃ connected with each other. Epimeral setae very short (Fig. 86).

Anogenital region: All setae very short, sometimes hardly recognizable, no essential difference among their lengths.



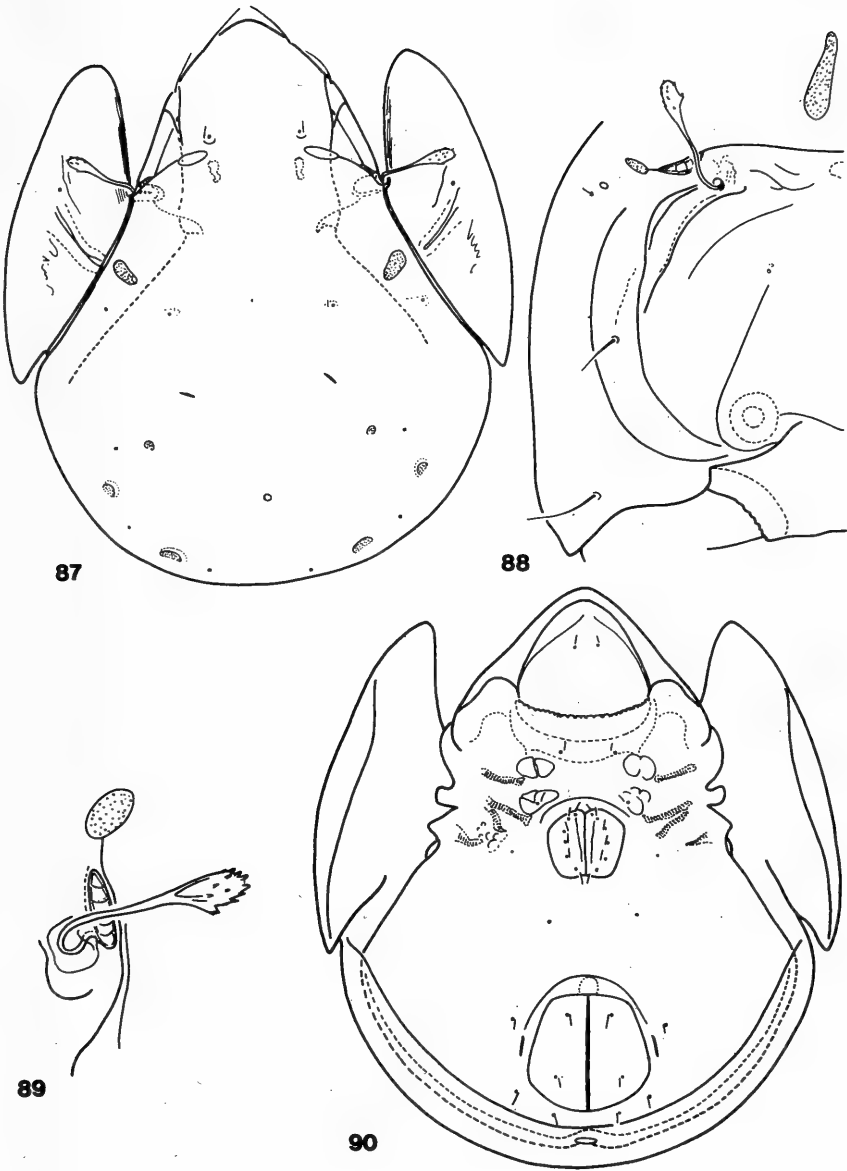
Figs 78-83.

Schelorbates exiguus sp. n. — 78: dorsal side; 79: trichobothrium; 80: ventral side; 81: femur of leg II; 82: sacculi *sa*; 83: prodorsum from lateral view.



FIGS 84-86.

Allogalumna sinornata sp. n. – 84: dorsal side; 85: trichobothrium; 86: ventral side.



FIGS 87-90.

Galumna coronata sp. n. – 87: dorsal side; 88: prodorsum from lateral view; 89: trichobothrium; 90: ventral side.

Anogenital region: All setae very short, only their insertion points well visible.

Material examined: Holotype: Se-72/2; 7 paratypes: from the same sample. Holotype and 4 paratypes; MHNG, 3 paratypes (1167-PO-85): HNHM.

Remarks: The new species stands very near to *A. margaritifera* Balogh, 1960, however, the latter has a well observable ornamentation: like string of pearls along the dorsosejugal suture. Its body is smaller (261-273 x 198-208 μm) and its sensillus slightly larger and broader than in the new species.

***Galumna coronata* sp. n.**

Measurements. – Length: 591-616 μm , width: 461-494 μm .

Prodorsum: Rostrum widely rounded in dorsal view, rostral setae longer than lamellar ones, but interlamellar setae shorter than both other pairs. Lamellar and sublamellar lines (Fig. 88) well observable. Sensillus (Fig. 89) long, clavate, on its head a characteristic "digitiform process" visible, other surface rarely spiculate. A hollow near to the bothridium, divided by some transversals crests.

Notogaster: Dorsosejugal suture absent medially. Ten pairs of alveoli and four pairs of areae porosae present (Fig. 87). Among the latter ones *Aa* elongate, slightly widened to pteromorphae. Surface of pteromorphae with some longitudinal lines along the inner margin.

Coxisternal region: Anterior margin ornamented by a small semicircular formation (Fig. 90). Sejugal and third apodemes connected laterally. Some large light spots present in this region. All setae (epimeral setal formula: 1-0-2-1) minute, setae *3c* and *4c* not visible.

Anogenital region: Genital plates medially with longitudinal line. Anogenital setal formula: 6-1-2-3. One large area porosa postanal is present.

Material examined: Holotype: Se-72/2; 4 paratypes: from the same sample. Holotype and 2 paratypes: MHNG, 2 paratypes (1168-PO-85): HNHM.

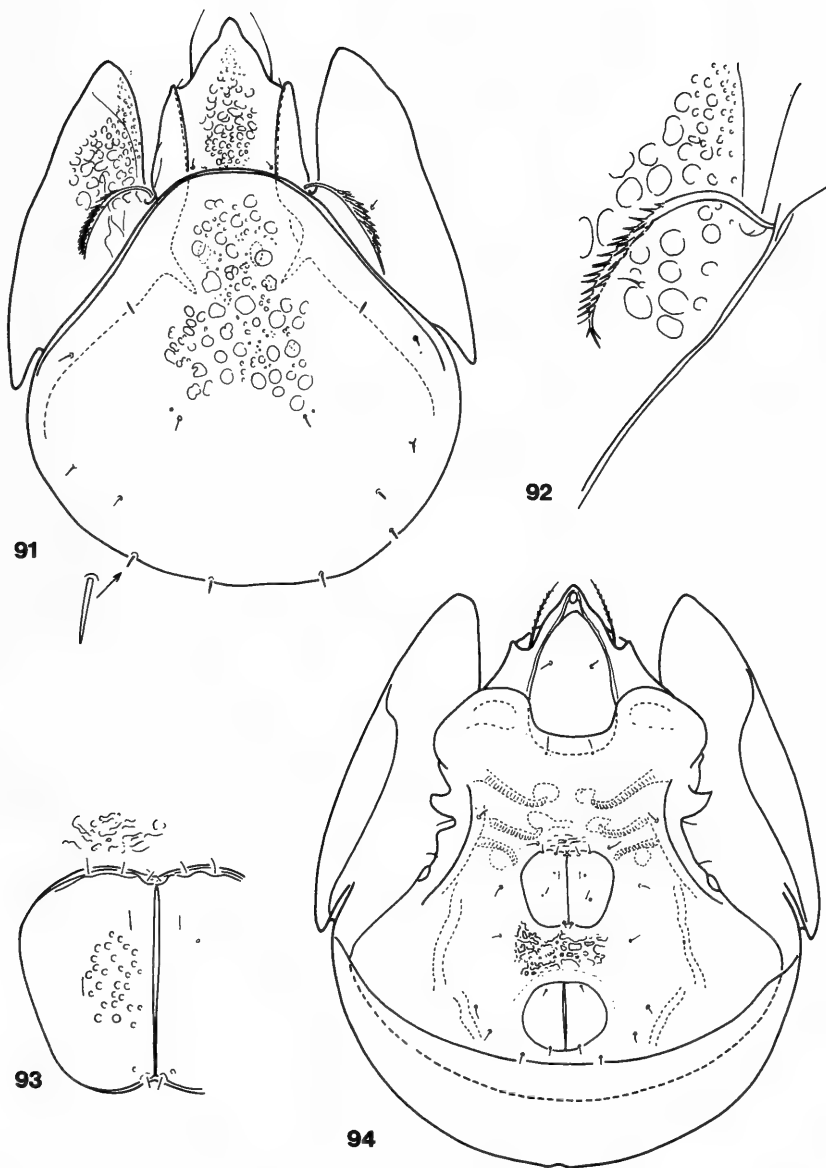
Remarks: The new species is well characterized by the ornamented anterior margin of the coxisternal region and the characteristic digitiform process of the sensillus. On this ground it is well distinguishable from all related taxa.

***Galumnella apiculata* sp. n.**

Measurements. – Length: 374-390 μm , width: 314-336 μm .

Prodorsum: Rostral apex sharply pointed, rostral setae long, reaching out to rostral apex. Prodorsal surface with large areolae medially, and with smaller ones basally. Interlamellar setae minute. Sensillus slightly dilated, with long cilia arranged in two rows (Fig. 91).

Notogaster: Whole surface ornamented by very large and among them much smaller alveoli (Fig. 95). Notogastral setae spiniform. Surface of pteromorphae differs from that of the notogastral one, its anterior margin punctate and gradually passing over to foveolae and alveoli (Fig. 92).



FIGS 91-94.

Galumnella apiculata sp. n. — 91: dorsal side; 92: trichobothrium; 93: genital plates; 94: ventral side.

Coxisternal region: Mentum, anterior and median part of epimeral surface densely punctate or foveolate, in front of the genital aperture also some rugae observable. Epimeral setae (1-0-3-2) comparatively long.

Anogenital region: Ventral plate, around the genital and anal apertures, rugulose and foveolate, laterally and posteriorly only foveolate (Fig. 94). Surface of genital plates as shown in Fig. 93.

Material examined: Holotype: Sen-76/1; 1 paratype: from the same sample. Holotype: MHNG, paratype (1169-PO-85): HNHM.

Remarks: The new species belongs to the "*areolata*"-group, which is characterized by the alveolate, foveolate and/or punctulate surface of prodorsum and notogaster, ribs or wrinkles dorsally not observable. The following species belong to this group:

apiculata sp. n.
areolata Balogh, 1960¹
subareolata Mahunka, 1969²

They are well distinguishable by the following key:

- 1 (2) Prodorsal surface not alveolate, only punctate *areolata* Balogh, 1960
- 2 (1) Prodorsal surface alveolate.
- 3 (4) The whole notogastral surface equally alveolate. Anogenital region rugose *apiculata* sp. n.
- 4 (3) The notogastral surface unequally alveolate, larger alveoli anteriorly and laterally, much smaller ones medially (Fig. 95). Anogenital region (Fig. 98) foveolate *subareolata* Mahunka, 1969

***Galumnella subareolata* Mahunka, 1969**

Dorsal side (Fig. 95): Rostral setae long, but not reaching to rostral apex. Pteromophae punctate anteriorly and marginally, on the inner surface gradually enlarged foveolae and alveoli observable.

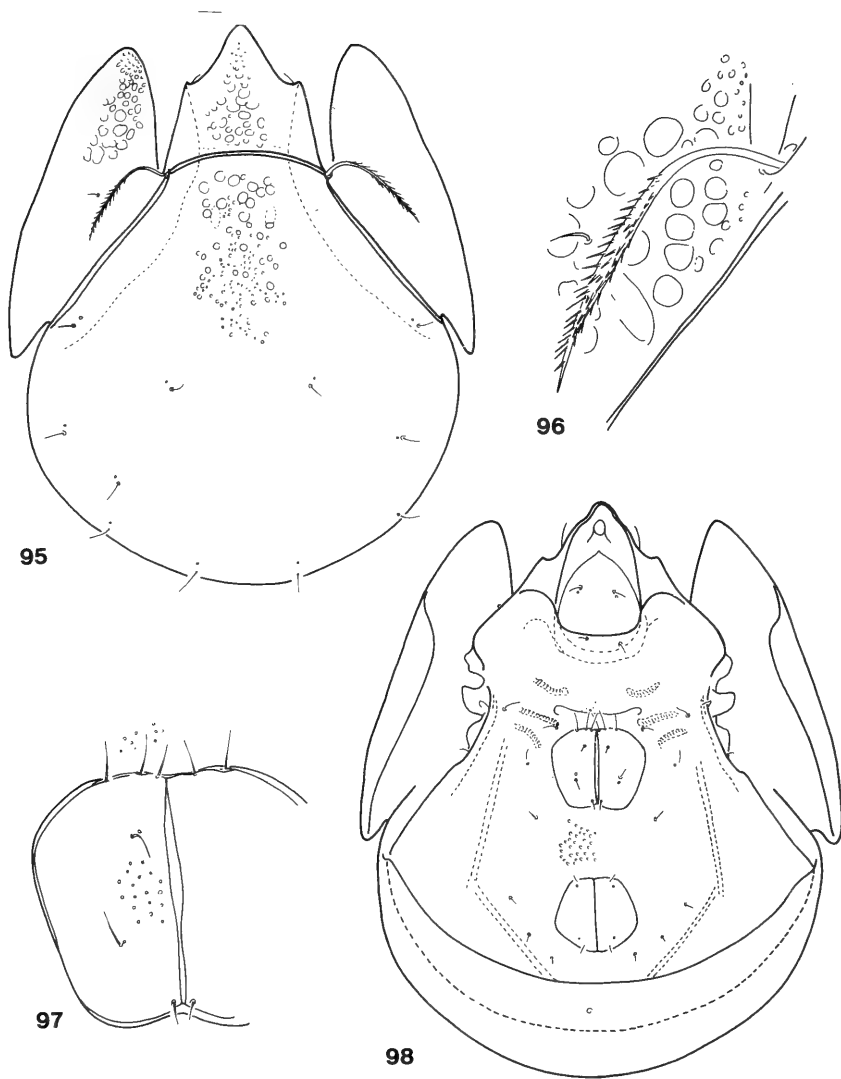
Ventral side (Fig. 98): Epimeral surface sparsely, anogenital region densely foveolate. Epimeral setal formula: 1-0-3-2; all these setae short and thin, hardly observable. Genital and anal plates covered by secretion granules, the surface (Fig. 97) foveolate. Anogenital setal formula: 6-1-2-3; these all setae short.

***Trichogalumnella* gen. n.**

Diagnosis: Family *Galumnellidae*. Dorsal characters similar to *Galumnella* Berlese, 1916. Epimeral neutrichy present, epimeral setal formula: 10-4-5-4 (5). Whole

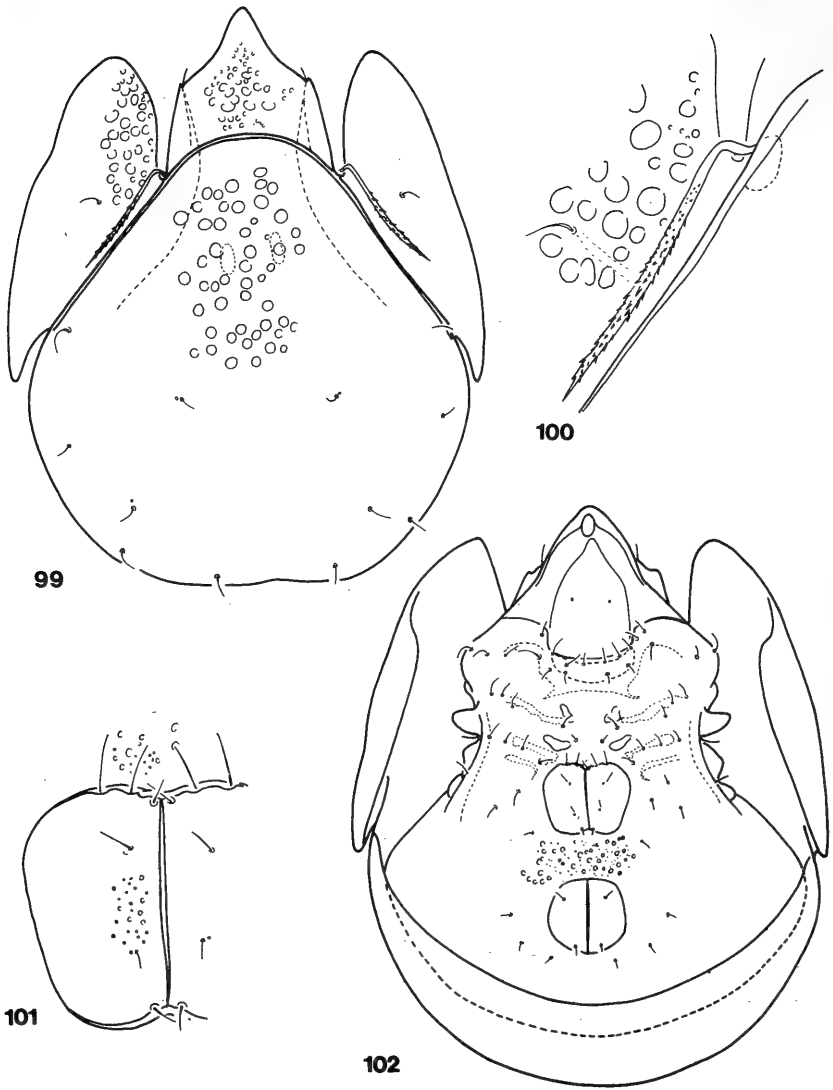
¹ I have published it from Rhodesia (MAHUNKA 1974), without comparing it to the type material, though the description of BALOGH (1960) was too short and no data were given regarding to the ventral characters. Describing the new species I re-examined the Rhodesian material and found that these specimens are well distinguishable from the other *Galumnella* species; they represent a new species for which the establishment of a new genus is necessary.

² The original description was insufficient and the ventral side was not figured. On the ground of the examination of the type series I give a complementary description and some new figures.



Figs 95-98.

Galumnella subareolata Mahunka, 1969 – 95: dorsal side; 96: trichobothrium; 97: genital plates; 98: ventral side.



FIGS 99-102.

Trichogalumella hauseri gen. n., sp. n. — 99: dorsal side; 100: trichobothrium; 101: genital plates; 102: ventral side.

surface distinctly ornamented by alveoli or foveolae. Anogenital setal formula: 6-1-2-3. Lyrifissure *iad* absent. All legs tridactylous.

Type species: *Trichogalumnella hauseri* sp. n.

Remarks: On the ground of the epimeral neotrichy it differs from the other *Galumnella* species.

***Trichogalumnella hauseri* sp. n.**

Measurements. — Length: 463-479 μm , width: 354-375 μm .

Prodorsum: Rostrum wide, without sharply pointed apex. Rostral setae very short, not longer than lamellar ones. Surface punctate anteriorly, foveolate and alveolate medially and basally. Sensillus (Fig. 100) reclinate, spinulose all around.

Notogaster: Whole surface (Fig. 99), even pteromorphae, alveolate, no punctate or punctulate area marginally. Notogastral setae setiform.

Coxisternal region: Mentum punctate, epimeres punctulate and punctate anteriorly and also alveolate medially and laterally. Epimeral setae thin and long (Fig. 102).

Anogenital region: Surface rarely alveolate. Genital and anal plates more densely foveolate. Genitel setae (Fig. 101) comparatively long.

Material examined: Holotype: Rho-69/1; 1 paratype: from the same sample. Holotype: MHNG, paratype (1170-PO-85): HNHM.

Remarks: See the remarks after the generic diagnosis.

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Kutikuläre Wachausscheidungen als plastronhaltende Strukturen bei Larven von Schaum- und Singzikaden (Auchenorrhyncha: Cercopidae und Cicadidae)

von

Benjamin MESSNER* & Joachim ADIS**

ABSTRACT

Cuticular wax secretions as plastron retaining structures in larvae of spittlebugs and cicada (Auchenorrhyncha: Cercopidae and Cicadidae). The abdominal-ventral respiration cavity in larvae of Cercopidae and Cicadidae is covered by \pm densely arranged cuticular cones and circumstigmatal wrinkle areas. Hydrophobia is achieved by a covering of wax, which begins as a fine reticulum and later becomes a continuous wax layer. The wax layer has to be renewed after each larval molting. In Cicadidae, substances which contain no wax are secreted by the cuticula into the respiration cavity as well.

EINLEITUNG

In die Gruppe der zeitweilig oder permanent submers lebenden Plastronträger (MESSNER & ADIS 1992) gehören bei Insekten auch solche Arten, die sich selbständig bzw. freiwillig mit einem flüssigen Medium umgeben. Die Larven der Cercopidengattungen *Cercopis*, *Aphrophora*, *Philaenus* und *Neophilaenus* leben im Schutz ihres schaumig-wäßrigen Kotes und atmen über die Hinterleibsspitze, die zeitweise aus dem Schaummantel herausgehalten wird, über eine abdominal-ventrale Atemhöhle atmosphärische Luft. Vor der Umwandlung zur Imago umgibt sich die Letztlarve mit einem großen, den ganzen Körper umfassenden Luftraum, in dem die Imaginalhäutung schließlich stattfindet.

Die langfristig subterranean lebenden Cicadenlarven werden gelegentlich oder periodisch überflutet und müssen sich gegen eine Benetzung schützen.

Strukturen, die eine Luftschicht oder ein Plastron halten, sind bei den o.g. Zikaden bisher noch nicht beschrieben worden (H.J. Müller, schriftl. Mitt. 1991).

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** Max-Planck-Institut für Limnologie, AG Tropenökologie, Postfach 165, W-2320 Plön, BRD, in Zusammenarbeit mit dem Nationalen Institut für Amazonasforschung (INPA), C.P. 478, BR-69.011 Manaus/AM, Brasilien.

MATERIAL UND METHODEN

Die Larven der Cercopidae *Philaenus*, *Neophilaenus* und *Aphrophora* wurden 1989 u. 1990 in der Nähe von Greifswald gesammelt; die von *Cercopis* im Mai 1991 unter Steinen am Kuhberg von Brno/CSFR. Larven-Exuvien von *Cicadetta montana* Scopoli stellte uns freundlicherweise Herr Dr. F. Sander, Jena, zur Verfügung (Fundorte: 13.6.1981, NSG-Leutral bei Jena und 30.5.1985, NSG-Poxdorfer Hang bei Bürgel). Die noch nicht beschriebenen Cicadidenlarven (U. Fam. Tibicinae) aus Manaus/Brasilien wurden im August 1988 von J. Adis und Mitarbeitern in 10-20 cm Bodentiefe in einem überfluteten Überschwemmungswald einer Insel im Rio Solimões-Amazonas (Ilha de Marchantaria; vgl. IRION et al. 1984) gegen Ende der jahresperiodischen, 6-monatigen Hochwasserphase gesammelt. Außer den luftgetrockneten Exuvien von *Cicadetta montana* wurden alle Larven zunächst in 70% Ethanol fixiert. Vor dem Aufkleben der Tiere auf den Metallblock entfetteten wir die Hälfte der Tiere in 45° heißem Azeton (24-48 h) im Soxhlet-Apparat. Nach einer Goldbedampfung in Argonatmosphäre kamen alle Tiere im Rasterelektronenmikroskop von Tesla (CSFR) zur Untersuchung. [Wir danken Herrn E. Fischer (Greifswald) für die ausgezeichnete Aufnahmetechnik].

ERGEBNISSE

Die Ventralseite des Thorax und des Abdomens ist bei Larven der Cercopidae und Cicadidae durch eine Absenkung bzw. durch umgeschlagene Seitenränder zu einem großen, lufthaltenden Raum geworden, in den die Stigmen einmünden. Der größte Teil der ventralen Kutikula trägt \pm weit voneinander getrennt stehende solitäre (Cicadidae) oder mehrgipflige (Cercopidae) Zapfen (Abb. 1, 2). Im peristigmalen Raum zeigt die Kutikula eine starke Faltenbildung und eine größere Zapfendichte (Abb. 3), die allein schon in der Lage wäre, einen Luftmantel (= Plastron) zu halten. Die Hydrophobie des ventralen Atemraumes kommt bei Cercopidenlarven aber wohl durch die Auflage eines zunächst spinnwebartigen Wachsgeflechtes zustande, das durch 45°C heißes Azeton vollständig abgelöst werden kann (Abb. 4, 5). Bei Larven, die am Ende eines Stadiums sind, ist das ventrale filigrane Wachsgeflecht der Kutikula zu einem geschlossenen Wachsmantel zusammengefließen (Abb. 6). Bei den Larven der Cicadidae ist die anfängliche Wachsaufgabe weniger auffällig; sie besteht bei der brasilianischen Tibicinenlarve aus dünnen Wachsstiften oder Wachspusteln. Bei anderen, wahrscheinlich älteren Larven dieser Art verstärken sich die ventralen Wachsabscheidungen der Kutikula zu Schollen und Krusten. Bei Larven von *Cicadetta montana* fanden wir starke Wachskrusten im ganzen Ventralbereich. An diesen Tieren war besonders interessant, daß selbst eine 48-stündige Extraktion in heißem Azeton die Kutikularaufgabe nicht völlig auflösen vermochte (Abb. 7, 8).

Die unmittelbar vor der Häutung zur Imago auftretende Hydrophobie der gesamten Kutikula der Letztlarve einer Cercopide geht ebenfalls auf eine Wachsabscheidung zurück. Den größten Teil des Körpers bedecken grobe Wachsschollen, die zwischen sich größere und kleinere Zwischenräume offen lassen (Abb. 9). Während die abdominalen Stigmen bei den Cercopidenlarven schlitzförmig offen sind, werden sie bei den Larven der Cicadidae durch eine Vielzahl weißer Fäden unbekannter Zusammensetzung \pm locker verdeckt (Abb. 3).

Die Fadenbündel entspringen dem unteren Stigmenrand, verlaufen zentripetal und richten sich in der Mitte des Stigmas locker auf.

Auch die fädige Stigmenbedeckung der Cicadidenlarven ist von einer Wachsausscheidung bedeckt, d. h. hydrophob.

DISKUSSION

Öle, Fette und Wachse werden bei Insekten und besonders bei Homopteren sehr unterschiedlich als Benetzungsschutz verwendet. So schützt das Sekret der über den ganzen Körper verteilten Öldrüsen viele Scolytiden vor der Benetzung mit dem Pflanzensaft, der bei frisch gefallenen Bäumen reichlich in die Bohrgänge fließt (FRANCKE-GROSSMANN 1956, SCHNEIDER 1991). Das beinlose 2. Larvenstadium von *Margarodes*-Arten (Coccina) umgibt sich mit einer kutikulären Sekretschicht aus Wachs, um lange Trockenperioden subterrän zu überstehen (JACOBS & RENNER 1988). In ähnlicher Weise überdauern Pseudococciden im Amazonasgebiet jahresperiodische Überschwemmungen von 5-7 Monaten Dauer (ADIS & MESSNER 1991). Eine Anzahl gallbildender Blattläuse schützt sich vor der Benetzung mit dem eigenen, flüssigen Kot dadurch, indem die Flüssigkeit mit Wachsflocken umhüllt und damit kugelförmig separiert wird (KUNKEL 1972, SEDLAG 1988).

Die Fähigkeit, über die Kutikula Wachs zu sezernieren, verschafft den Larven aller Cercopidae und auch den Cicadidae die Möglichkeit, einen Atemraum bzw. die Stigmen für das jeweilige Larvenstadium unbenetzbar zu halten.

Da mit jeder Häutung die Wachsschicht verlorengelassen, muß sie von der neuen Larvenkutikula jeweils frisch sezerniert werden. Nur bei der Letztlarve der Cercopiden behält offenbar die Kutikula des gesamten Körpers die Fähigkeit, eine schollige Wachsschicht auszuscheiden, um ihr die zur Imaginalhäutung notwendige Hydrophobie zu geben.

Die Tatsache, daß eine 48-stündige Azetonextraktion im Soxhlet-Apparat die Kutikularauflage im ventralen Atemraum der Larven von *Cicadetta montana* nicht vollständig aufzulösen vermag, deutet darauf hin, daß die Kutikula auch noch andere, nicht fett- oder wachshaltige Substanzen zu sezernieren vermag. Es muß zukünftigen Arbeiten überlassen bleiben, die genaue chemische Zusammensetzung dieser nicht wachshaltigen Substanzen wie auch des fadenartigen Geflechts aufzuklären, das die abdominalen Stigmenöffnungen der Cicadidae bedeckt.



ABB. 1.

Brasilianische Tibicinenlarve (Cicadidae), Sternit-Ausschnitt. REM 4000 : 1

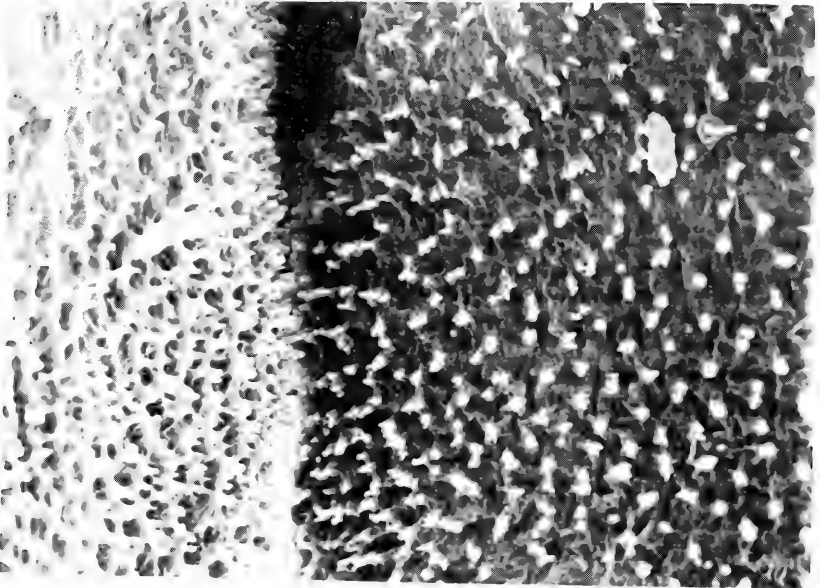


ABB. 2.

Philaenus spumarius – Larve (Cercopidae), Abdomen ventral. REM 1000 : 1

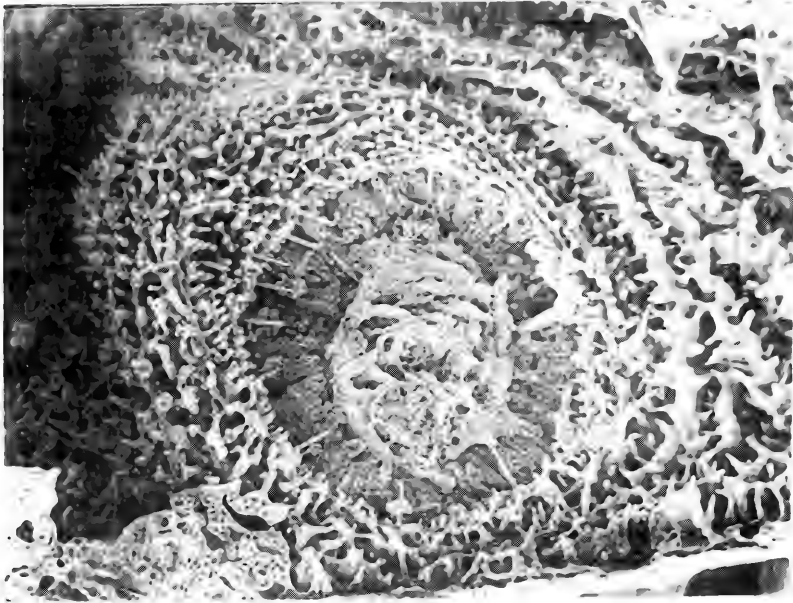


ABB. 3.

Brasilianische Tibicinenlarve (Cicadidae), abdominales Stigma. REM 500 : 1

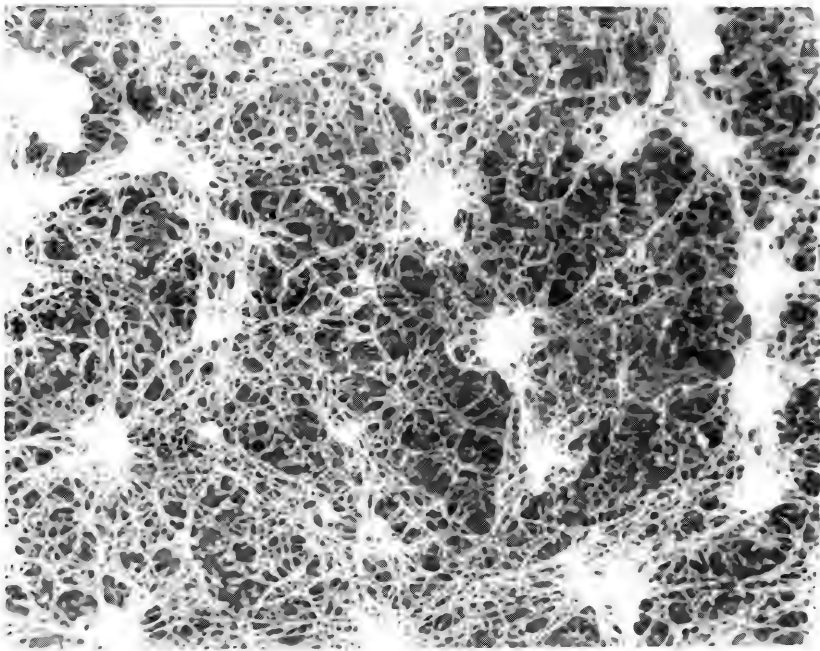


ABB. 4.

Philaenus spumarius – Larve (Cercopidae), Abdomen ventral, unbehandelt. REM 5000 : 1



ABB. 5.

Philaenus spumarius – Larve (Cercopidae), Abdomen ventral, 48 h in heißem Azeton extrahiert.
REM 5000 : 1

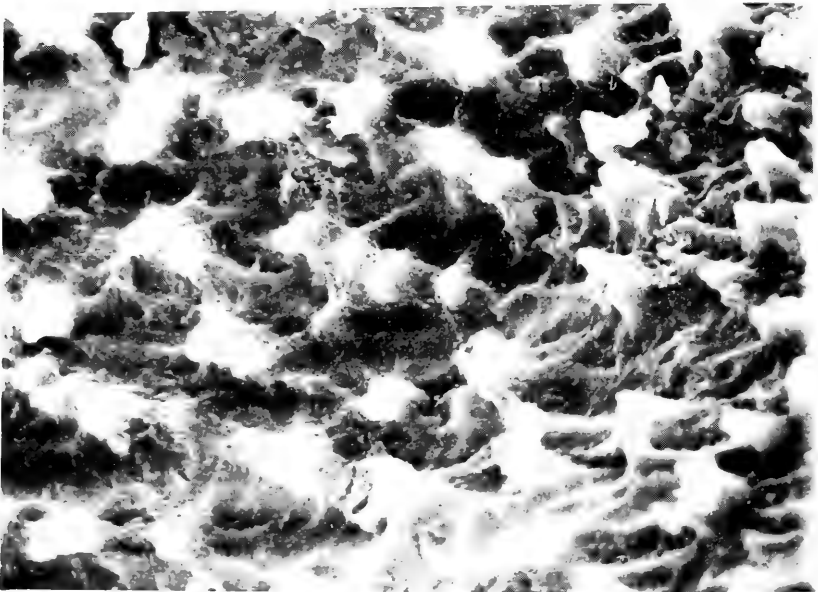


ABB. 6.

Aphrophora salicis – Larve (Cercopidae), Abdomen ventral, unbehandelt. REM 4000 : 1

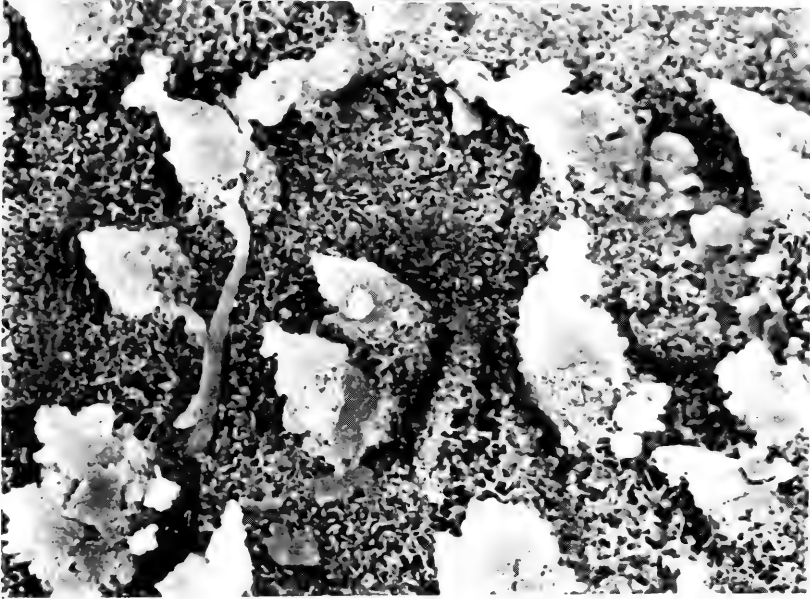


ABB. 7.

Cicadetta montana – Larve (Cicadidae), Abdomen ventral, unbehandelt. REM 4000 : 1

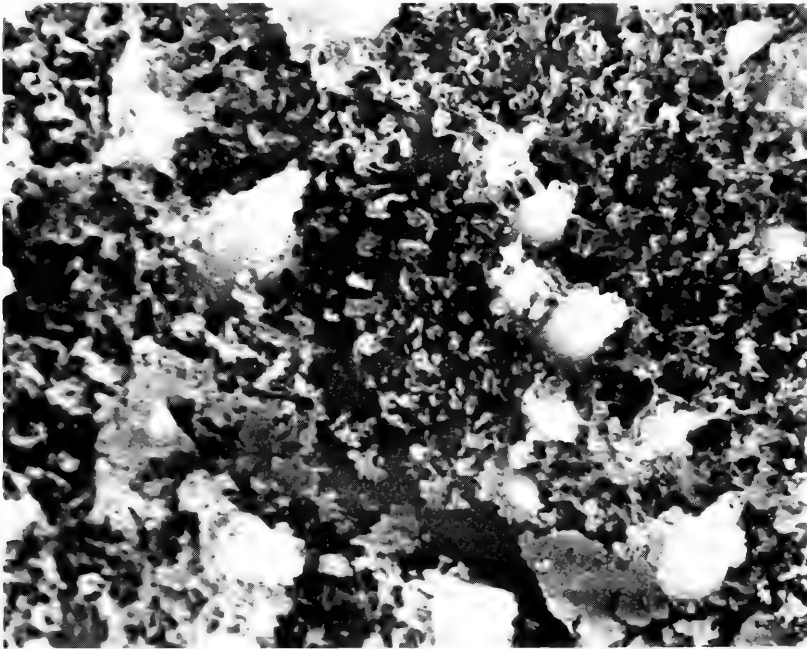


ABB. 8.

Cicadetta montana – Larve (Cicadidae), Abdomen ventral, 48 h in heißem Azeton extrahiert.
REM 5000 : 1

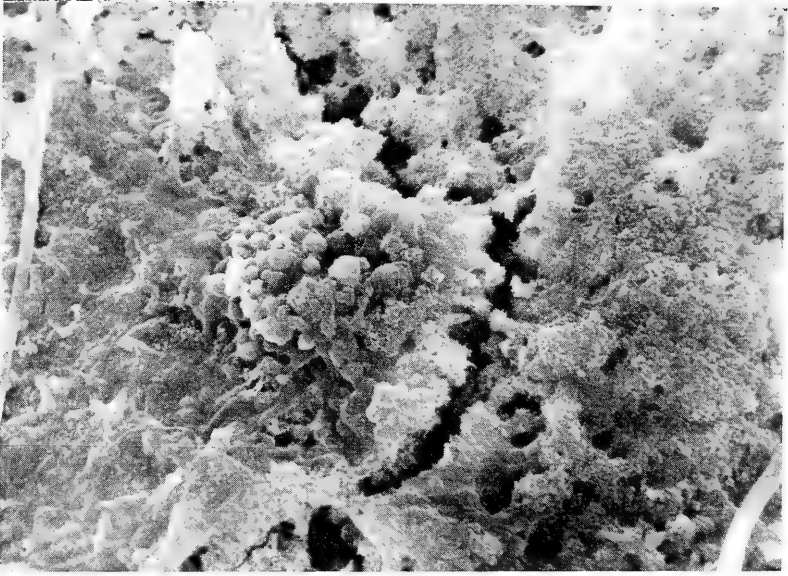


ABB. 9.

Cercopis vulnerata – Letztlarve (Cercopidae), mittlerer Femur, unbehandelt. REM 5000 : 1

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ZOOLOGIA 92

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Genève, 3-4 April 1992
(Annual Conference
of the Swiss Zoological Society)

ABSTRACTS

MAIN LECTURES

Olivier Rieppel (Chicago): The relation of cladistics to evolutionary theory.

“A false analogy has been drawn between taxonomic groups and individuals... This analogy led to the belief that a relationship exists between groups analogous to the genealogical relationship between individuals” (J.S.L. Gilmour, 1940, in Huxley, J. [ed.]: *The New Systematics*, p. 471). Cladistics constitutes an empirical, rational and non-arbitrary “discovery procedure” (G. Nelson) for the reconstruction of an inclusive hierarchy of “groups within groups” (Darwin). Homology becomes unequivocally defined only if tied to monophyly, i.e. synonymized with “synapomorphy”. The test of congruence provides the clue to the level of inclusiveness at which topological relations of similarity are homologous. This methodological procedure is justified with reference to “Gilmour-naturalness”, requesting maximum information content for natural classifications. Taxic homology defines inclusive relations: a mammal is not only a representative of the Mammalia, but also of the Amniota, Tetrapoda, Gnathostomata, Vertebrata etc. The inclusive hierarchy of “groups within groups” is related to the concept of common ancestry, but is not explained by Darwinian mechanisms of evolutionary change which address the exclusive hierarchy of ancestors and descendants (a descendant cannot be part of its ancestor, but must follow its ancestor in time and space). No “discovery procedure” is available to objectify ancestor – descendant relationships, which remain elusive in terms of empiricism and logics. From this results an incompatibility yet complementarity of pattern reconstruction (in cladistic terms) and process explanation (in Darwinian terms). Alternatives to pluralism in comparative biology can only be “Radical Solutions to the Species Problem”. One is to view Darwinism as a “falsified” theory, and to treat causal mechanisms of macroevolutionary change as a “black box” (G. Nelson). The other is to view species (and, by implication, supraspecific taxa) as individuals (M.T. Ghiselin), which deprives speciation and macroevolutionary change of underlying lawfulness.

J. Géry (Sarlat): Rapports entre l'écologie et la systématique chez certains Poissons characiformes néotropicaux.

La taxonomie, l'écologie et la biogéographie sont inextricablement liées, et tout travail de taxonomie, même au stade de la description d'espèce, doit tenir compte, entre autres, des notions de patrons de distribution, de niche, de vicariance, etc., ainsi que de sympatrie et d'allopatricité, pour lesquelles Mayr et al. avaient publié un tableau de discrimination fort pratique qui est rappelé ici. C'est pour toutes ces raisons que j'avais proposé, il y a 30 ans, d'appeler cet ensemble de démarches «l'éco-taxonomie», sans grand succès d'ailleurs.

Cette conférence traite de quelques cas relevant de ces idées:

I. Dans une première partie, les résultats d'une étude sur la faune characoïde (Poissons ostariophyses) d'une partie de la Guyane sont présentés sous forme d'un dendrogramme, obtenu par groupement d'un tableau de similitude des stations qui concernent la faune d'un grand fleuve côtier, le Maroni, à plusieurs hauteurs, d'une part, et la faune de plusieurs petits cours d'eau, les uns appartenant à ce même bassin hydrographique, les autres à un autre bassin éloigné de 250 km à vol d'oiseau.

Le dendrogramme montre que les stations se groupent non pas suivant la géographie, mais suivant l'écologie, c'est-à-dire que la faune des petits cours d'eau, même éloignés, a un coefficient de similitude plus proche que celle des fleuves, comme si l'écologie jouait un plus grand rôle que la géographie dans la répartition actuelle des espèces. Un tel résultat, intuitivement attendu, ne doit pas faire négliger le rôle plus ancien qu'a dû jouer l'histoire physique (géographique) de cette partie relativement stable de l'Amérique du Sud. Cette étude a permis également de tester quelques modèles utilisés en écologie quantitative (espèces constantes et accessoires, modèle d'Arrhénius où le nombre d'espèces est proportionnel à la surface du bassin versant), et de comparer la faune characoïde des Guyanes avec la faune pisciaire de Côte d'Ivoire beaucoup moins riche (comme d'autres bassins africains sont aussi beaucoup moins riches que des bassins néotropicaux équivalents).

II. Une deuxième étude met mieux en évidence le rôle de l'histoire dans la répartition des espèces, en s'intéressant à un genre particulier et probablement très ancien, *Pseudochalceus*, dont la distribution des 5 espèces actuellement connues est restreinte à quelques fleuves côtiers du Nord-Est et du Sud-Est de l'Amérique du Sud, sans qu'aucune forme analogue ait été récoltée entre ces deux régions.

Les espèces offrent deux types de coloration. L'un, présent à la fois en Equateur et dans le Sud-Est du Brésil, est particulièrement bradytélisque si on admet que sa présence aux deux extrémités du continent n'est pas fortuite, mais qu'elle résulte de l'histoire géologique depuis la fin du Crétacé. En Equateur, pratiquement aucune dérive génétique n'a été découverte dans les quelques stations étudiées, tandis qu'au Brésil, les populations, dont il a été possible d'étudier quelques échantillons, ont atteint le niveau racial, au plus subsppécifique. L'autre type, connu seulement du Nord-Est où il habite les fleuves côtiers de Colombie et de l'Equateur, s'est un peu diversifié et représente apparemment trois espèces distinctes. Aucune explication n'a été donnée sur ce comportement évolutif différentiel. En particulier, on ne connaît pas l'avantage sélectif de tel ou tel patron de coloration.

III. Dans le même ordre d'idées, on n'a encore aucune idée sur les pressions de sélection qui agissent sur les petits Poissons de surface *Carnegiella*, purement amazoniens ceux-là, et bien connus sous les noms de Poissons-hachettes ou Poissons-volants. Ils présentent un polymorphisme qui peut être réduit, par une analyse des populations, à deux types, se distinguant par la fasciature de la carène typique de cette famille (les Gasteropelecidae), et par des différences statistiques pour trois caractères: le rapport de la hauteur du corps et du coracoïde sur la longueur standard, et le nombre des rayons ramifiés de la nageoire anale.

L'analyse aboutit, à titre d'hypothèse, à distinguer deux formes, qui seraient peut-être sympatriques au sens large (parapatricques?) dans certains petits cours d'eau de l'Amazonie supérieure et, peut-être, du Rio Negro. Les échantillons de ces régions montrent certains caractères intermédiaires et une variabilité augmentée, ce qui conduit à penser qu'il s'agit de formes en voie de spéciation, encore capable de s'hybrider lorsqu'elles viennent à se rencontrer. Il a été possible de bâtir des cartes de distribution, fondées sur les moyennes des caractères étudiés, sans qu'on puisse trouver les facteurs écologiques qui ont amené une telle distribution. Toutefois les deux types semblent se

distribuer au nord et au sud de l'Amazonie, et il n'est pas exclu que la formation géologique du bassin ait pu agir sur cette répartition.

IV. La distribution géographique de certains caractères, présents ou absents dans des groupes très voisins, peut aussi s'expliquer par ces mêmes facteurs, écologiques et (ou) géographiques: c'est ainsi que la répartition des nombreuses espèces des genres voisins *Hemigrammus* et *Hyphessobrycon*, petits Tétràs connus de tous les aquariophiles, qui ne se distinguent classiquement que par la présence ou l'absence, respectivement, d'écaillés sur la nageoire caudale, semble répondre à un schéma d'ensemble: les espèces à caudale écaillée sont relativement plus nombreuses dans la région guyano-amazonienne. Le même schéma se retrouve dans la répartition respective des *Moenkhausia* et des *Astyanax*.

D'autres cas peuvent être envisagés dans cette optique «éco-taxonomique», en particulier la coloration semblable des «Tétràs néons» du genre *Paracheirodon*, vicariants habitant l'Amazonie supérieure et le Rio Négro, deux bassins dont les biotopes sont assez différents, et le «groupe *rhodostomus*» ou «nez-rouges», encore des espèces bien connues des aquariophiles, dont le pattern de distribution pose la même alternative entre facteur écologique et facteur historique.

François M. Catzeflis (Montpellier): Molécules et morphologie en reconstruction de phylogénies: que choisir?

Reconstruire une phylogénie d'organismes signifie situer ceux-ci dans l'espace taxonomique (systématique) et temporel (paléontologie, horloge moléculaire). Quelle que soit l'école de pensée (néo-darwinienne, phénétique, cladistique) utilisée en cette matière, il s'avère que ce sont les caractères portés par les organismes qui forment le matériau de base pour reconstruire l'histoire évolutive des êtres concernés. Ces caractères ont longtemps été exclusivement morphologiques, basés sur l'anatomie comparée et l'embryogenèse. Une des difficultés majeures du traitement de caractères morphologiques, de l'avis des spécialistes, est de sélectionner avant tout la variation héritable, c'est-à-dire d'exclure les caractères (trop) soumis aux conditions du milieu ou dépendant de l'âge des individus. L'emploi de caractères moléculaires, telles les séquences des protéines (qui appartiennent aussi au phénotype !) ou des acides nucléiques ADN et ARN, renforce la probabilité de traiter des variations héritables. Actuellement, on peut dire qu'il n'y a pas de différence fondamentale, dans le cadre de reconstructions de phylogénies, entre l'emploi des molécules ou de la morphologie, à condition qu'un certain nombre de précautions soient prises afin de diminuer l'homoplasie et d'assurer l'homologie des structures comparées.

Quoi qu'il en soit, la difficulté majeure apparaît après avoir découvert et observé les caractères (et leurs divers états), lorsqu'il s'agit de traiter ceux-ci pour reconstruire des arbres évolutifs.

Plusieurs approches existent aujourd'hui, qui devraient être considérées en parallèle plutôt qu'en compétition exclusive. Chacune de ces approches (distances, parcimonie, maximum de vraisemblance, compatibilité) a ses faiblesses et qualités, et la plus grande difficulté revient à départager l'homoplasie (bruit de fond) des informations phylogénétiques. Ainsi, le maximum de parcimonie, considéré encore récemment comme «le meilleur» traitement de séries de nombreux caractères, apparaît comme fallacieux dans certains cas, notamment ceux où de longues branches évolutives chargées d'autapomorphies ne sont représentées que par un taxon.

L'aspect temporel de l'arbre évolutif provient directement de la lecture et de l'interprétation du registre fossile, et indirectement de l'emploi du concept de l'horloge moléculaire. Cette dernière n'est pas universelle, c'est-à-dire que d'une part différents compartiments du génome évoluent à différentes vitesses chez le même organisme, et d'autre part, une même [= homologue] structure moléculaire peut évoluer à différents taux chez différents organismes, même étroitement apparentés. Comprendre l'étendue de la variabilité de ces deux aspects est fondamental pour pouvoir utiliser correctement les divergences moléculaires comme indicateurs temporels.

Ces différents propos seront illustrés par une série d'exemples, concernant avant tout les Mammifères, et basés sur des phylogénies moléculaires acquises par différentes approches (séquençage, RFLP, hybridations ADN, électrophorèse). Ces arbres moléculaires seront confrontés à ceux dérivés de l'approche morphologique traditionnelle, et un compromis entre les deux approches pourra être dégagé.

R.I. Vane-Wright (London): Age and area revisited – problems with butterflies and island biogeography.

The relationship between the age of a particular natural group and its range size is not predictable. Modern representatives of ancient lineages can occupy very large areas (e.g. the almost cosmopolitan Lybtheidae amongst the butterflies), or be restricted (e.g. the primitive swallowtail *Baronia*, in Mexico), while recent taxa can occupy five continents (e.g. the milkweed butterfly sister species pair, *Danaus gilippus* and *D. chrysippus*), or be very restricted (e.g. the danaine *Amauris nossima* in the Malagasy region). However, whilst it is true that many individual species have far wider ranges than particular genera, families or other higher taxa, there is a statistical relationship: the average range of species is necessarily less than that of genera, and that of genera less than families, and so on. This is so simply because the range of an individual genus can never be less than that of its most widespread included natural groups (lineages), the age and area of a higher group can never be less than that of its oldest included species or any subordinate taxon.

This seemingly trivial relationship of age and area, first discussed by the botanist J.C. Willis, can be used to investigate historical biogeography, even in the absence of rigorous knowledge of phylogenetic relationships. This is demonstrated by butterflies of the Malay Archipelago in relation to our understanding of the collision between the Australian and Asian tectonic plates. Ideas about age and area applied to the butterflies of Africa and Madagascar lead to speculations which could be tested by molecular investigations. Finally, the case of *Amauris comorana* is discussed: an apparently old species restricted to a small island considered to be no more than 120,000 years old. Such examples lead us to question existing phylogenetic and geological conclusions, and our ideas about the mode and tempo of evolution.

Marie-Claude Durette-Desset (Paris): The nematoda Trichostrongyloidea and their vertebrate hosts: an history lasting from the late secondary.

Reconstruction of the phylogenetic history of a parasitic group is clearly difficult due to a lack of fossil forms. Among the nematode parasites of vertebrates, the superfamily Trichostrongyloidea is one of the richest groups in terms of number of species (more than 1000 described) and genera (175) and they therefore offer excellent opportunities to reconstruct their phylogeny. Trichostrongyles occur in the gut and less commonly in the stomach and the lungs of all classes of terrestrial vertebrates except the Perissodactyls and the Proboscidiens. They have a world wide distribution and direct life cycle.

The criteria used in the classification of the Trichostrongyloidea are essentially morphological. Morphological characters are numerous and an attempt has been made to distinguish their relative value. Information concerning the synlophe, which is the apparatus of locomotion and attachment of the worms in the gut of the hosts, has been found essential in order to construct a classification of the superfamily and understand its evolution; thus the morphology of the synlophe has been studied and different phylogenetic lineages have been recognized. This analysis was greatly facilitated by information from two sources:

1. the morphology of the free-living rhabditids, which are the ancestors of the trichostrongyles. This has allowed us to determine the direction of evolution;

2. the ontogeny of the synlophe. The synlophe is often present in the fourth-stage larva and its form in the larva can be considered more primitive than that in the corresponding adult.

The results of this work show that there are three major groups within the Trichostrongyloidea, namely the "Trichostrongylids", the "Molineids", and the "Heligmosomids". In the first two groups, which are the most primitive, the synlophe is always bilaterally symmetrical as in most other nematodes. In the third group, which is the most evolved, the synlophe is never bilaterally symmetrical.

The classification established above takes account of the different morphological characters, but only concerns extant animals. Data provided by the hosts permit us to date the appearance of different lineages and to follow their evolution in time and space. These data come from extant hosts and from paleobiogeography.

1. The evidence from extant host species includes the host distribution of the trichostrongyles in relation to the geographic distribution of the hosts. Our analysis have revealed the following facts:

a. Each family or subfamily of trichostrongyles is characteristic of a group of hosts and/or a specific geographic region.

b. Host groupings, based on evidence from the worms, do not necessarily conform to zoological relationships of the hosts themselves.

c. The same parasite line can occur in the same hosts in the geographical regions which are widely separated from each other.

d. In contrast, the same group of hosts in the same geographical region can have different parasite lineages.

2. The evidence from extinct forms includes the date of appearance of the host in the geological record as well as mammalian migration in geologic time periods:

a. The date of the appearance of the hosts in the geological records permits us to date the origin of the different families of parasites. We postulate that if the host line remains stable, the parasite line will also remain stable. Thus, if an extant host morphologically resembles its ancestor from the Eocene, we may assume that the parasite in that host also resembles its ancestor from the Eocene and can therefore be dated to that epoch. This type of analysis has been carried out for the entire superfamily Trichostrongyloidea.

b. The manner in which host migration interacts with the parasite is very complex and a few examples will be consider, mainly from the caviomorphs, the sciuriforms and the myomorphs.

The combination of evidence from the morphology of the worms and evidence from the paleobiogeography of the hosts allows us not only to explain the present day host and geographic distributions of the parasites but also to reconstruct their evolutionary history.

The phylogenetic tree of the Trichostrongyloidea proposed with Chabaud consists of three main branches which are morphologically clearly defined. Fourteen families of trichostrongyles can be distinguished, of which twelve are included in the three main groups. The other two are cosmopolitan families of little interest because they occur in birds and in rhyngolophes. The distributions of the twelve families are remarkable because all of the most primitive forms and the majority (8) of the families occur in hosts which have a Gondwanian distribution. Four families are found in the Holarctic, i.e., the Trichostrongylidae, Molineidae, Heligmosomidae and Heligmonellidae. The Trichostrongylidae have spread around the world with the lagomorphs and ruminants. The latter three families spread to Laurasia and into the Eutheria by the way of insectivores (Tenrecoidea, Soricoidea and Talpoidea).

According to our hypothesis, the Trichostrongyloidea appeared at the end of the Secondary. At the beginning of the Tertiary most families already existed. Evolution continued throughout the Tertiary and, in certain subfamilies is still occurring today.

The principal evolutionary process in the trichostrongyles and in nematodes in general is the phenomenon of host-switching, i.e. the nematode transfers from one host group to another and undergoes isolation and speciation. Speciation resulting from host-switching may be of little or great evolutionary significance. Host-switching is rendered possible by the presence of free ecological niches resulting from the evolution of new hosts or the migration of hosts into new localities. The type of association between the trichostrongyles and their hosts is therefore relatively loose but is explicable by the biology of the parasite.

SHORT PAPERS AND POSTERS

Bernard D. Flury, Jean-Pierre Airoidi and Jean-Pierre Biber (Bern): Gender identification of Water pipits (*Anthus spinoletta*) using mixtures of distributions.

Distributions with two distinct peaks, also called bimodal distributions, are a frequent phenomenon in biometrical studies. Such mixtures of distributions arise when a population consists

of more than one homogeneous class (or component), but the investigator does not know to which of the components any given specimen belongs. Mixture analysis is a modern statistical technique to deal with this situation; in particular, it attempts to estimate the statistical parameters (means and standard deviations) of each of the components, as well as their proportion in the population. A review of some basic concepts of mixture analysis is presented on a non-technical level and an illustration of the method is given using the wing length of Water pipits, the two components being males and females. Frequency plots of wing length show distinct bimodality which can be ascribed to sexual dimorphism, but the gender of each individual bird is not known. Mixtures of two normal distributions appear to be appropriate for modelling this situation.

Finally, differences between mixture analysis and related methods such as discriminant analysis or cluster analysis are also discussed.

François M. Catzeflis (Montpellier): Tempo and modes of speciation in the rodents Muridae (Mammalia): Molecules versus Morphology.

The Murinae, a possible monophyletic clade among 14 other subfamilies of the Muridae *sensu lato*, is the most successful taxon of the rodents, encompassing at least 115 genera in ca. 460 living species. The evolutionary systematics of this group of "rats and mice" is in a strong need of a synthetic effort including paleontological and neontological approaches, especially above the specific level.

Among the most recent results, the case of the genus *Mus* *sensu lato* is of interest: the living mice can be subdivided into four subgenera, one of them being exclusively African in Recent distribution. The branching pattern, based on DNA hybridization experiments, of the ca. 12 species so far studied is not only in rough agreement with classical morphological data, but clearly supports the monophyly of each subgenus. The molecular time scale, calibrated by fossil data pertaining to the history of *Mus*, *Apodemus*, *Antemus*[†], *Progonomys*[†] and *Rattus*, allows to date approximately each speciation event. Finally, the re-examination of the fossil record pertaining to both Asian and African *Mus* spp. re-inforces the temporal results of the molecular phylogeny.

M. Rowell-Rahier (Basel): Genetic distance between *Oreina* species (Chrysomelinae) with different defensive strategies.
Paper published elsewhere.

F. Saucy and A.-G. Wust Saucy (Lausanne): Genetical differentiation between fossorial and aquatic populations of *Arvicola terrestris*: preliminary results.
Paper published elsewhere.

M. Ruedi, M. Chapuisat (Lausanne) and **D.T. Iskandar** (Bandung): Genetic structure of the Lesser Gymnure (Genus *Hylomys*) in SE-Asia: evidence for two species.

The Lesser Gymnure is a small galericine Insectivore living in the mainland forests of Southeast Asia, including the major islands of Sumatra, Java and Borneo. It is the only representative of the supposed monospecific genus *Hylomys* which is morphologically rather constant over its geographic range. Only marginal subspecific differentiation is currently recognized based on slight pelage colour variations.

We report here the results of 35 gene loci revealed by protein electrophoresis on 23 specimens sampled over most of Southeast Asia. They were compared with an outgroup, *Erinaceus europeus*, member of a distinct subfamily. The surveyed populations of Lesser Gymnures clearly group themselves into two distinct taxa, one of which seems restricted to Sumatra, while the other occupies the whole geographic range. The genetic distance between these groups is two times greater than the

divergence observed within groups; it is of the same order of magnitude as what is usually reported for congeneric mammal species, which supports their specific distinction. The lack of gene flow is also demonstrated by several diagnostic loci defining unambiguously each species. Both are only distantly related to the outgroup, a result which is consistent with their actual classification into two distinct subfamilies (Erinacinae and Galericinae).

Concordant genetic and geographic subdivision of the widespread species further suggest that eustatic sea level changes during the Pleistocene produced predictable patterns in species differentiation.

Manfred Zimmermann (Berne) and **Christian P. Klingenberg** (Edmonton): Static, ontogenetic, and evolutionary allometry: a comparative multivariate morphometric study of the swiss waterstrider species (Hemiptera, Gerromorpha, Gerridae).

Paper published elsewhere.

I. Löbl (Genève): La diversité et la distribution des Scaphidiidae (Coleoptera) de l'Himalaya.

Paper published elsewhere.

S. Ingrisch (Zürich): Intraspecific variation of the grasshopper of the *Chortippus biguttulus* group in the alps (stridulation and morphology).

Paper published elsewhere.

D. Burckhardt (Genève): Host plant and biogeographic relationships of the Indo-Australian plant louse genus *Cecidopsylla* (Homoptera, Psylloidea).

Paper published elsewhere.

P. Cuénoud et **C. Lienhard** (Genève): Les psocoptères du bassin genevois.

Paper published elsewhere.

C. Vaucher (Genève): Le genre *Vampirolepis* (Cestoda), un casse-tête pour l'helminthologiste systématique.

Paper published elsewhere.

N. D. Springate (Genève): The cenchri of Symphyta.

Paper published elsewhere.

R. Desqueyroux-Faúndez et **D. Cambin** (Genève): Nouvelles données sur les Spongillides en Suisse Romande.

Paper published elsewhere.

Adolf Scholl (Berne) and **Ariane Pedrolí-Christen** (Neuchâtel): The genus *Rhymogona* (Diplopoda: Craspedosomatidae), a ring species? – Enzyme electrophoretic data.

Rhymogona is a small genus of the Diplopoda family Craspedosomatidae which comprises seven nominal species. This genus has a very restricted distribution, which extends north of the Swiss Alps to the Black Forest in the northeast and is limited from northwest to southwest by the Vosges,

Côte d'Or and Savoy. Several *Rhyogona* species are known from one or a few localities only. We have initially attempted to study the distribution in detail. Species identification in this genus is based essentially on subtle differences in morphology of genitalia, in several species of males only. Since identification is often not unambiguous, we have used enzyme electrophoresis to study the genetic differentiation of the taxa concerned, and we have asked if electrophoretic data might be used as additional information for species identification.

During these studies it became evident that we are dealing with a ring species which is distributed around the Swiss and French Jura. The electrophoretic analysis reveals five major groups of genetically differentiated populations. Adjacent groups of these populations differ by allele substitutions in one out of twelve enzyme loci surveyed. Populations at the extremes are nominal *R. cervina* and *R. montivaga*, which differ by allele substitutions in four out of the twelve enzyme loci surveyed. These taxa come in contact in the Swiss Jura and in the Swiss Alps, where they form very narrow hybrid zones.

Remo Wenger, Hansjürg Geiger and Adolf Scholl (Berne): Electrophoretic evidence of hybridization of *Pontia daplidice* (Linnaeus, 1758) and *P. edusa* (Fabricius, 1777) (Lepidoptera: Pieridae) in a contact zone in northern Italy.

Our previous electrophoretic studies have indicated the existence of two genetically distinct parapatric taxa within the nominal *Pontia daplidice* (L.) in southern Europe. These taxa differ in allele substitutions at four out of 24 enzyme loci surveyed. Furthermore, analysis of adult morphology revealed differences in the shape of valvae and in the markings of the forewing underside, with slight overlap between both taxa. Laboratory studies indicated no premating but strong postmating barriers in crosses between specimens from France and Greece. Wagener (1988) ranked these taxa as semispecies. We showed that the western European taxon (*daplidice* L., sensu Wagener) flies in France, Spain, Morocco, Israel and Turkey, whereas the eastern European taxon (*edusa* Fabricius, sensu Wagener) is found in Switzerland, Italy, Austria, Yugoslavia, Hungary, Greece and Turkey.

We continued our studies on the distribution of both taxa, with particular emphasis on detecting contact zones. The new data (40 collecting sites in northwestern Italy, 461 specimens) demonstrate that *P. daplidice* extends its range east beyond the Alpes Maritimes into northern Italy. Both taxa meet north of the Ligurian Alps. In a rather narrow hybrid zone south of Alexandria most samples contained both taxa. There were no F_1 -hybrids among more than 300 butterflies from this area, however, most samples contained a fraction (10-30%) of back-cross hybrids. In spite of the fact that these butterflies are considered medium distant migrants, there was no gene flow observed beyond the hybrid zone.

Note sur une étude comparative des jarres primaires de trois espèces d'Equidae: *Equus asinus*, *E. przewalskii* et *E. caballus*.¹

par

Albert KELLER²

Avec 3 figures

ABSTRACT

Note on a comparative study of the guard hair of three Equidae species: *Equus asinus*, *Equus przewalskii* and *E. caballus*. - The author describes and uses the different form of the scaly cuticule, of the medullar structure and cross-section to distinguish the species *E. asinus*, *E. przewalskii* as well as six races of *Equus caballus*. From the specific characters, the author has elaborated a determination key of species and domestic races.

INTRODUCTION

La structure microscopique des poils des mammifères est un moyen très intéressant et souvent déterminant pour reconnaître les familles, les genres, les espèces, parfois même les sous-espèces et les races. Dans cette étude, nous mettons en valeur la forme des différentes structures des écailles de la cuticule, des vésicules médullaires et des coupes transversales des jarres primaires, pour identifier trois espèces d'Equidae, *Equus asinus*, *E. przewalskii* et *E. caballus* (six races domestiques). En effet, l'examen microscopique de ces trois structures pileuses nous a permis de mettre en évidence des caractères propres à chacune des espèces ou races, et d'élaborer une clé de détermination, suivie d'une description de ces caractères pileux.

Le but de cette étude est d'une part, d'apporter une contribution à la connaissance générale de la structure fine des poils des mammifères et d'autre part de démontrer qu'un examen approfondi de ces différentes structures pileuses peut, au sein même d'un genre, permettre l'identification de plusieurs espèces, voire même de races. Je voudrais toutefois attirer l'attention du lecteur sur le fait que les caractères pileux décrits dans ce travail pour

¹ Travail présenté à Zoologia 92.

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distinguer ces Equidés entre eux ne sont pas toujours évidents à reconnaître sans un bon matériel de comparaison.

L'étude comparative et la structure fine des poils des Equidae *Equus przewalskii*, *E. caballus*, et *E. asinus* a déjà fait l'objet de descriptions des caractères morphologiques pileux, ceci dans le cadre de travaux généraux (APPLEYARD 1960, BRUNNER et COMAN 1974, HAUSMAN 1920, LAMBERT et BALTHAZARD 1910, LOCHTE 1938, WILDMAN 1954). En 1971, KRATOCHVIL a formulé une évaluation comparative morphométrique des poils de la crinière et de la queue des espèces *E. przewalskii* et *E. caballus* en utilisant la hauteur des écailles de la cuticule situées sur la partie centrale des poils. Par cette méthode, l'auteur a démontré qu'un rétrécissement des écailles de la cuticule chez *E. caballus* par rapport à *E. przewalskii* pouvait être dû au processus de la domestication. Dans cette présente note, l'observation que nous avons faite des différentes structures microscopiques des poils (écailles de la cuticule, structure médullaire et coupes transversales) de ces espèces équines, ne présentent pas de différences suffisamment importantes nous permettant une quelconque interprétation phylogénique. Cependant, il nous a paru tout de même intéressant d'exposer ici tous les caractères pileux distinctifs et à partir de ceux-ci, d'élaborer une clé de détermination.

MATÉRIEL ET MÉTHODE

Seuls les jarres primaires prélevés sur la partie postéro-dorsale des spécimens ont été retenus pour cette étude. La plupart des échantillons des poils des espèces domestiques nous ont été fournis par D. Decrouez, Muséum de Genève, que nous remercions très chaleureusement ici. L'étude de la structure des écailles de la cuticule a été faite à partir de clichés (gross. 500x) réalisés au moyen du microscope électronique à balayage du Muséum de Genève, par J. Wuest, que nous remercions également ici. La préparation des poils en vue de leur examen microscopique (structure médullaire et coupes transversales) est la même que celle que nous avons utilisée dans nos précédents travaux (Keller, 1978-1980).

Les échantillons de poils proviennent des espèces et races suivantes :

Equus asinus Linné (âne) :

2 spécimens provenant de Condé sur Escaut, France

3 spécimens provenant de Genève.

Equus przewalskii Poliakov (cheval de Przewalski) :

1 spécimen, no MHNG 1701.93, provenant du zoo de Berne.

Equus caballus Linné (cheval domestique) :

Race : selle français : Condé sur Escaut, France

" " " : Manège de Troinex, Genève

" : shetland : Condé sur Escaut, France

" : ardennais : " "

" : haflinger : " "

" : suisse : Abattoirs de Genève

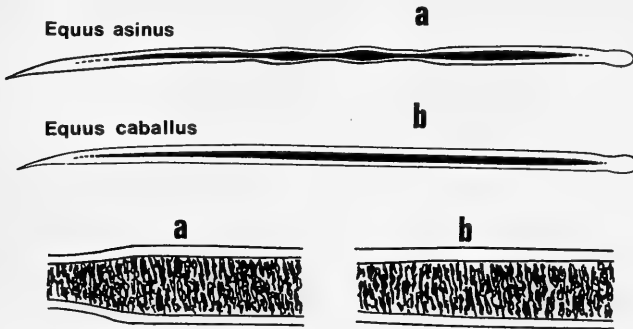


FIG. 1.

RÉSULTAT

CLÉ DE DÉTERMINATION

1. Absence de rétrécissements sur la tige du fuseau cortical des jarres primaires; canal médullaire plus large vers la base de la tige des jarres qu'à leur niveau distal (fig. 1b); coupes transversales ovalaires ou rondes (fig. 3b) 2
- Présence de rétrécissements sur la tige du fuseau cortical des jarres primaires; canal médullaire de même largeur vers la base de la tige des jarres qu'à son niveau distal (fig. 1a); coupes transversales ovalaires, rondes ou réniformes (fig. 3a) *Equus asinus*
2. Structure médullaire réticulo-cloisonnée sur toute la longueur des jarres (fig. 2e) *Equus przewalskii*; *Equus caballus* (selle français, suisse, ardennais, haflinger)
- Structure médullaire noduleuse et fragmentée (fig. 2f)..... *Equus caballus* (shetland)

Equus przewalskii Poliakov

Les jarres primaires ne présentent pas de rétrécissement sur leur tige (fig. 1b). La morphologie des écailles de la cuticule des jarres primaires est pavimenteuse sur les deux tiers des jarres (fig. 2a) et en mosaïque denticulée ou crénelée sur le dernier tiers (partie distale-pointe) (fig. 2b-c). De la base de la tige jusqu'à la partie distale des jarres, le canal médullaire couvre environ les 3/5 de la largeur des jarres. Les cellules de la moelle bien homogènes tout au long du canal médullaire sont réticulo-cloisonnées à bord denticulé (fig. 2e). La forme des coupes transversales est ronde ou ovalaire (fig. 3b).

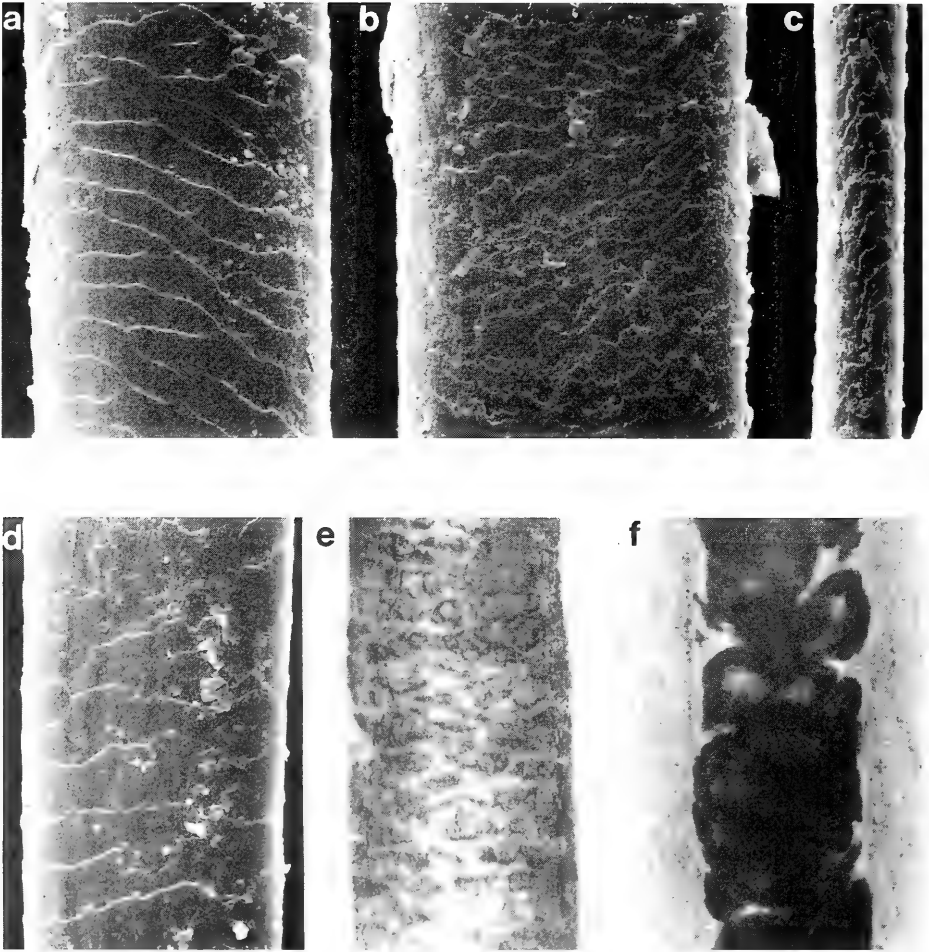


FIG. 2.

Structure écailleuse de la cuticule: a, b, c *Equus caballus*, c, *Equus asinus*; d, structure médullaire: *Equus asinus*, e, *Equus caballus*.

Equus caballus Linné

Les écailles de la cuticule des jarres primaires sont pavimenteuses à bord lisse et en mosaïque denticulée ou crénelée comme chez son congénère sauvage *E. przewalskii*. (fig. 2a à c). La forme des cellules de la moelle est réticulo-cloisonnée à bord denticulé tout au long du canal médullaire des jarres primaires de la plupart des races que nous avons examinées (fig. 2e), excepté chez la race Shetland, dont les cellules médullaires sont noduleuses et quelque peu fragmentées (fig. 2f). Comme chez *E. przewalskii*, le canal médullaire ne subit pas de rétrécissement au niveau de la tige (fig. 1b). La forme des coupes transversales est ronde ou ovulaire (fig. 3b).

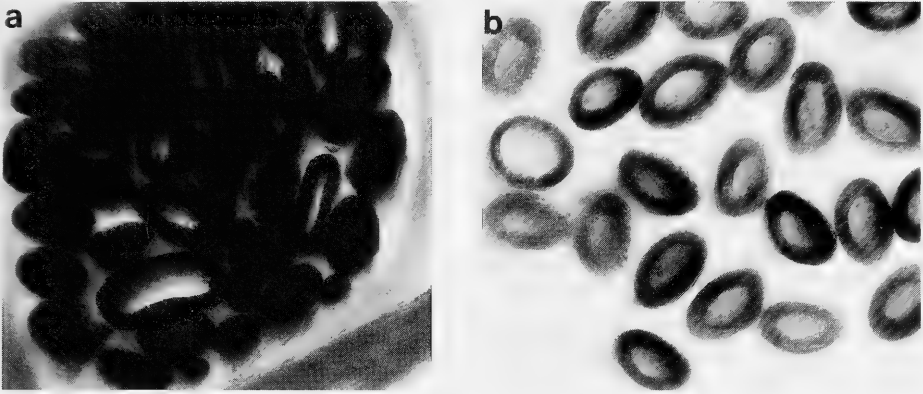


FIG. 3.

Coupes transversales: a *Equus asinus*, b *Equus caballus*.

Equus asinus Linné

Chez l'âne, les jarres primaires montrent des rétrécissements tout au long de la tige (fig. 1a). En partant de la base des jarres primaires, ceux-ci présentent une structure écaillée de la cuticule pavimenteuse légèrement denticulée ou crénelée (fig. 2d) qui couvre les 2/3 du fuseau cortical. Ces écailles se transforment en mosaïque denticulée sur la partie terminale (distale-pointe) (fig. 2b-c). Les cellules médullaires sont réticulo-cloisonnées et montrent un pourtour nettement denticulé (fig. 2e). La forme des coupes transversales est comme chez les espèces *E. przewalskii* et *E. caballus* ronde, ovale, parfois réniforme (fig. 3a).

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Un Palpigrade énigmatique de Thaïlande avec une brève revue des grandes divisions de l'Ordre*

par

Bruno CONDÉ**

Avec 2 figures

ABSTRACT

An enigmatic Palpigrade from Thailand, with a short review of the main divisions of the Order. – The Order Palpigradida, formerly called Microteliphonida, on account of an external similarity to minute whip-scorpions, was discovered in 1885 and, as early as 1901, the type genera of the so-called eukoenenian and prokoenenian trends had been described, the later provided with invaginable ventral sacs on opisthosoma.

Fiva genera only were erected from 1913 to 1991, including a fossil of unreliable position. The recent genera are unequally distributed, four out of six belonging to the eukoenenian series in which *Allokoenenia* is by far the lesser known genus as its only representatives are the three type specimens from West Africa.

Two juvenile specimens, collected in two caves in Thailand, are of uncertain taxonomic position, but more nearly related to *Allokoenenia* than to any other known genus and provisionally referred to it. The unusual length of the last segment and the possibly glandular organ on its ventral side are unique in the Order.

La découverte d'un Ordre d'Arachnides absolument nouveau et original, nommé Microteliphonida (GRASSI 1885), puis Palpigradida (THORELL 1888), avec pour prototype l'espèce périméditerranéenne *Koenenia mirabilis*, a suscité un très vif intérêt et la publication, presque simultanée, de travaux de première heure: WHEELER (1900), BÖRNER (1901), HANSEN (1901), RUCKER (1901). En dépit d'inexactitudes et d'erreurs caractérisées, des représentants des deux principales lignées étaient reconnus et rapportés aux sous-genres *Eukoenenia* ou *Prokoenenia* de BÖRNER, dès 1901, et PEYERIMHOFF faisait connaître la première espèce troglobie en 1902.

L'intérêt pour le groupe s'estompe ensuite jusqu'aux travaux d'anatomie de MILLOT (1942, 1943), mis à part des notes de systématique dues à SILVESTRI qui ajoutent, en 1913, deux genres monotypiques récoltés en Guinée: *Koენიოდეს* et *Allokoenenia*. De 1942 à 1962, P.A. Remy a consacré une vingtaine de travaux aux Palpigrades¹, principalement

* Travail présenté à Zoologia 92.

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¹ Une liste complète des travaux de P.A. Remy figure dans ROWLAND and SISSOM (1980).

endogés, d'Europe, d'Afrique, de Madagascar et des Mascareignes, de l'Inde et Ceylan, d'Amérique centrale et du Sud, et des Hawaï. La plupart sont des espèces du genre *Eukoenenia*, mais trois *Koeneniodes* inédits, ainsi que le premier représentant de la lignée prokoenénienne connu de l'Ancien Monde, sont découverts à Madagascar. Un cinquième genre, récolté dans le milieu interstitiel marin à Madagascar, en Mer Rouge puis au Congo, a été nommé *Leptokoenenia* (CONDÉ 1965 et 1988, MONNIOT 1966). Tout récemment enfin, suivant la découverte de *Prokoenenia* authentiques dans le Sud-Est asiatique, l'espèce malgache est devenue le type du genre monospécifique *Triadokoenenia*, le sixième des genres de Palpigrades vivants (CONDÉ 1991).

L'existence de deux lignées actuelles bien distinctes, dites enkoenénienne et prokoenénienne, est une évidence, mais *Paleokoenenia*, le seul fossile authentique, est inclassable, la présence de vésicules opisthosomiennes, caractère morphologique prokoenénien essentiel, ne pouvant être établie ni réfutée (ROWLAND and SISSOM 1980).

Le choix de BÖRNER (1901) d'adopter les préfixes *Eu-* et *Pro-* pour désigner deux sous-genres, ne tient pas compte explicitement du niveau d'évolution respectif des taxons qu'il distingue par l'absence ou la présence de vésicules et par la forme du premier volet génital femelle, «impair» chez *Eukoenenia*, mais «pair» chez *Prokoenenia*, simple divergence sexuelle en réalité, le mâle de *Prokoenenia* ayant été pris pour une femelle.

La présence, chez les prokoenéniens, de vésicules opisthosomiennes dont les deux paires antérieures apparaissent au second stade (A_2), suivies d'une troisième paire à partir du stade suivant, comme l'existence d'un stade postembryonnaire supplémentaire, par dédoublement du premier en A_1 et A_2 , portent à considérer les eukoenéniens comme des formes ayant subi une contraction du développement postembryonnaire, attestée par la perte d'un stade et l'absence définitive de vésicules. Dans la lignée prokoenénienne, l'acquisition d'une troisième paire de fusules sur le premier volet génital du mâle et l'absence d'organe frontal, propres à *Triadokoenenia*, seraient des caractères dérivés uniques dans le groupe (autapomorphies).

Des six genres actuels de Palpigrades, *Allokoenenia* est, de loin, le plus mal connu, car il ne repose que sur deux femelles et un juvénile de Guinée, et n'a jamais été retrouvé.

C'est pourquoi, à l'occasion de cette très brève revue des principaux types de Palpigrades, il nous a semblé utile de faire connaître un spécimen juvénile encore inclassable avec certitude, mais plus proche d'*Allokoenenia* que de tout autre genre, découvert dans une grotte de Thaïlande.

Ce spécimen et celui faisant l'objet de l'addendum sont déposés au Muséum d'Histoire naturelle de Genève, Département des Arthropodes et d'Entomologie II. La mise au propre de l'illustration est due au talent du regretté M.J. Chevelu pour la figure 1 et à celui de Mme E. Seraoui pour la figure 2 et des compléments à la figure 1; nous lui adressons nos vifs remerciements.

? *Allokoenenia* sp.

Thaïlande. Province de Hua Hin, chef-lieu de Pran Buri, village de Ban Khung Tanot (massif de Kao Sam Roi Yot). Grotte de Tham Sai, réseau fossile de 250 m environ, avec avens d'effondrement, milieu humide, 26.VII.87, P. Leclerc leg.: 1 immature A.

Longueurs. – Corps: 0,64 mm (extension); flagelle 0,20 mm; bouclier prosomien: 0,17 mm; basitarse IV: 62,5 µm; patte IV, à partir du tibia: 0,20 mm; B/bta = 2,77; bta/ti = 0,91.

Prosoma. – Organe frontal médian environ 1 fois 1/2 aussi long que large (1,57), ses branches écartées l'une de l'autre, élargies en palette et terminées en une pointe mousse. Un seul élément fusiforme, acuminé, à chaque organe latéral.

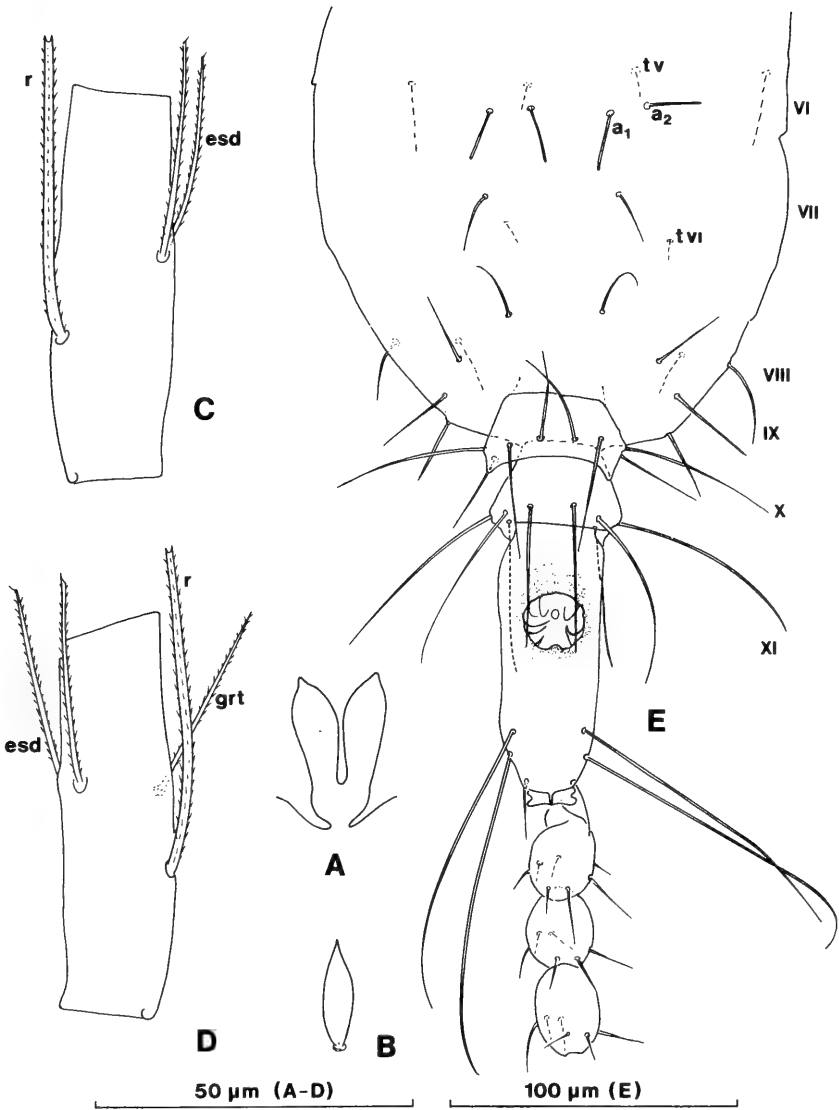


FIG. 1.

? *Allokoenia*, immature A de la grotte de Tham Sai, Thaïlande: A. Organe frontal médian. B. Phanère de l'organe latéral. C. Basitarse de la patte locomotrice IV gauche. D. Basitarse de la patte locomotrice IV droite. E. Opisthosome, face sternale, à partir du VIe segment, et trois articles du flagelle. Explication des lettres dans le texte.

Bouclier portant des soies minuscules, non dénombrables avec certitude en vue ventrale. Segment libre avec 3+3 phanères, l'intermédiaire (t_2) beaucoup plus long que le latéral (t_3) (92/63). Deux courtes soies deuto-tritosternales dans le plan sagittal.

Chélicères avec 7 dents aux mors.

Patte locomotrice IV. Longueurs relatives des articles: $ti = 79$; $bta = 72$; $ta_1 = 39$; $ta_2 = 48$.

Le basitarse est un peu plus court que le tibia (72/79, $bta/ti = 0,91$) et, mesuré au niveau de r , un peu plus de 3 fois (3,13) aussi long que large; la soie raide (r) est épaisse, égale aux 4/5 environ du bord tergal de l'article (94/121,5; $t/r = 1,29$), et est insérée un peu au-delà des 2/5 proximaux de ce bord (45/121,5; $t/er = 2,70$); les soies sternales distales (esd) sont de longueurs comparables (62,67). A droite, il existe un quatrième phanère, inséré plus distalement que r , qui peut représenter soit la soie grêle tergale (grt), soit la soie grêle latérale (gla), l'une comme l'autre normalement absentes chez l'immature A.

Opisthosoma. – Tergites III à VI avec une paire de phanères latéraux (t_3), égaux au 1/4 environ de leur écartement (24/95) en III et au 1/8 seulement (13/106) de IV à VI. Une paire de soies s , plus longues que les t_3 (40-44), de III à V.

Sternite II avec une rangée de 2+2 soies longues et grêles, sternite III avec 2+2 soies, les latérales beaucoup plus longues que les sublatérales, Sternites IV à VI avec chacun deux paires de poils (a_1 , a_2) un peu plus épais que les autres phanères sternaux; les a_1 sont légèrement plus courts que les a_2 (38/42) et en moyenne une fois et demie plus courts que leur écartement (1,42-1,60).

Les segments IX à XI sont de largeur subégale, beaucoup plus étroits que le VIIIe. Les IX et X portent chacun un verticille de 4+4 longues soies; le XIe n'en possède que 3+3, celles de la paire tergale plus de 5 fois plus courtes (5,2) que les autres. Le XIe segment est extraordinairement allongé, un peu plus de 2 fois 1/2 aussi long que large (2,66) et 2 fois plus long que les IX et le Xe ensemble. Face sternale, vers le tiers antérieur, on voit une dépression subcirculaire à parois plissées vers le centre de laquelle s'ouvre un orifice légèrement ovalaire. Une telle formation, de nature glandulaire sans doute, n'a jamais été signalée. L'anneau basal supportant le flagelle est dépourvu de phanères. Le flagelle compte 7 articles dont les longueurs relatives sont 15, 14, 17, 16, 16, 19, 6. Les deux premiers sont moniliformes, les suivants plus allongés, le 6e surtout, le dernier étant minuscule. Aucun ne possède de verticille subapical d'expansions spiniformes, mais seulement 6 ou 7 soies, grêles et courtes sur les 5 premiers, et 6 très longues sur les 2 derniers.

DISCUSSION ET CONCLUSION

La série typique d'*Allokoenenia*, sans désignation d'holotype, se compose de deux femelles adultes et d'un individu juvénile au dernier stade (B) récoltés dans l'humus à Mamou, Guinée française. Faute d'élément de comparaison, le stade A de l'unique espèce, *Allokoenenia afra*, étant inconnu, l'attribution générique du spécimen thaïlandais ne peut être rigoureusement établie et il serait également imprudent de lui attribuer un nom spécifique. On retiendra cependant que la forme générale des segments IX à XI est conforme à la définition du genre: «*Abdominis segmenium nonum undecimo latitudine subaequale*». Toutefois, l'allongement du XIe est unique chez les Palpigrades, de même que la formation, présumée glandulaire, de la face sternale du même segment; on objectera qu'il pourrait s'agir de caractères transitoires propres à la larve A, décrite pour la première fois. L'aspect du flagelle supporterait aussi l'attribution suggérée, par comparaison avec la figure VI (5) de SILVESTRI (1913).

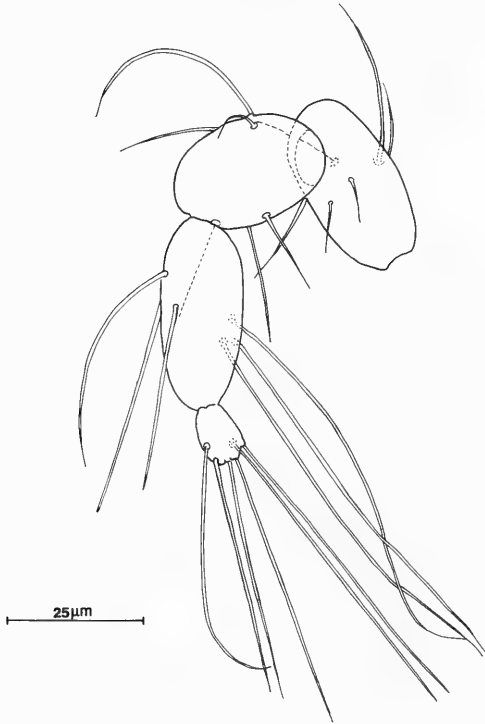


FIG. 2.

? *Allokoenenia*, immature A de la grotte de Tham Sai, Thaïlande. Articles 4 à 7 du flagelle.

Aucun argument biogéographique ne peut infirmer la détermination proposée ici sous réserve, bien au contraire, car beaucoup de genres de Palpigrades ont une vaste répartition dans la zone intertropicale. *Koeneriodes*, par exemple, décrit comme *Allokoenenia* de Guinée (Kakoulima, non loin de Mamou) est bien représenté dans la région madécasse et dans la région orientale, et le spécimen étudié ici a été récolté avec un *Koeneriodes* inédit dont la description est en cours de publication¹.

L'examen, presque 80 ans après la description d'*Allokoenenia*, d'un spécimen qui pourrait lui appartenir et serait alors son quatrième représentant connu, est révélateur de l'état de nos connaissances sur le groupe, d'autant que le cas n'est pas isolé, beaucoup d'espèces n'ayant jamais été revues depuis leur découverte.

La faible densité des populations de Palpigrades, en général, et plus encore leur extrême fragilité lors de la capture et du transport, explique qu'aucun élevage n'ait été mené à bien et que leur tenue en captivité n'ait pas excédé quelques semaines (P. Weygoldt comm. pers.).

ADDENDUM

Cette note était déjà rédigée lorsque P. Leclerc m'a communiqué un second représentant de l'espèce étudiée ici. J'en propose donc une brève description comparative.

¹ *Koeneriodes leclerci* Condé 1992, *Revue suisse Zool.* 99(3): 666.

Thaïlande. Province et District de Yala, près du village de Ban Na Tham, Grotte de Tham Sam Pao To, 14.7.91, P. Leclerc leg.: 1 mâle juvénile (C).

Longueurs. – Corps: 0,95 mm; flagelle manquant; bouclier prosomien: 0,26 mm; basitarse IV: 102 µm; patte IV, à partir du tibia: 0,32 mm; B/bta = 2,55; bta/ti = 0,93.

Prosoma. – 2 éléments à chaque organe latéral. Phanères t_1 à t_3 du segment libre: 62, 57, 48. Deuto-tritosternum: 2+2 soies. Chélicères: 8 dents à chaque mors. Basitarse IV avec 6 phanères (une seule esp): $t/r = 1,48$; $t/er = 2,43$; gl/grt (insérées presque au même niveau) = 0,79.

Opisthosoma. – Aire génitale correspondant à la variante 3 (CONDÉ 1984: 387). Une paire de soies s de IV à VI, un peu plus courtes que les a_1 et a_2 subégaux (27/34,5). Le segment XI presque 2 fois 1/2 plus long que large (2,4) et une fois 1/2 plus long que les IX et X ensemble (1,52). La dépression à parois plissées, décrite chez l'immature A, est clairement visible.

On notera que bien que les deux spécimens proviennent de grottes relativement profondes, humides et abritant des troglobies, ils ne présentent aucun des caractères liés à ce milieu.

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Les dents des sous-familles Hypostominae et Ancistrinae (Pisces, Siluriformes, Loricariidae) et leur valeur taxonomique^{*, **}

par

Sonia MULLER*** et Claude WEBER***

ABSTRACT

The teeth of the subfamilies Hypostominae and Ancistrinae (Pisces, Siluriformes, Loricariidae) and their taxonomical value. – Tooth number and shape vary greatly among hypostomines and ancistrines. Some extreme forms characterize taxa. Morphologic and meristic studies of teeth of *Hypostomus* Lacépède and *Ancistrus* Kner indicate that differences at species or species group level may be obtained among the numerous standard toothed species.

INTRODUCTION

Selon la classification d'ISBRÜCKER (1980 modifiée), plus de 600 espèces réparties en 90 genres forment la famille néotropicale très diversifiée des Loricariidae. Deux sous-familles intéressent cette étude, les Hypostominae et les Ancistrinae, qui regroupent chacune près du tiers des espèces. La plupart d'entre elles sont connues de descriptions anciennes à caractère général. L'étude morphologique des espèces de *Hypostomus* et d'*Ancistrus* nous a amené à observer, notamment sur le matériel type, les caractères dentaires qui sont souvent négligés dans ces descriptions.

Seules quelques formes remarquables de dents caractérisent depuis longtemps certains taxa, comme *Cochliodon* Heckel, 1854. Plus récemment, GOSLINE (1947: 85) souligne l'intérêt de la denture à un niveau plus élevé et rapproche par une forme "stéréotypée" de dent les Plecostominae (Hypostominae et Ancistrinae), les Hypoptopomatinae et les Loricariinae. Actuellement, les auteurs omettent rarement la description de la denture qui, comme le rappelle SCHAEFER (1986: 9, 30), montre une grande variation de nombre et de forme entre les espèces.

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Selon la classification suivie, *Cochliodon* est le seul genre qui se distingue des autres Hypostominae par une grosse dent en forme de cuillère. Chez les Ancistrinae, qui comptent quatre tribus, les Pseudacanthicini regroupent des espèces à prémaxillaires solidaires et à denture réduite. Parmi les Ancistrini, plusieurs genres sont aussi caractérisés par leur denture particulière: *Panaque* Eigenmann & Eigenmann, 1889 (comparable à celle de *Cochliodon*) et, récemment décrits, *Scobinancistrus* Isbrücker & Nijssen, 1989, *Oligancistrus* Rapp Py-Daniel, 1989 ainsi que *Hypancistrus* Isbrücker & Nijssen, 1991.

Toutes ces formes se dégagent nettement de la denture courante, présente chez la majorité des espèces de Hypostominae et d' Ancistrinae, qui n'a fait jusqu'à présent l'objet d'aucune étude morphologique comparative. La dent "standard" est généralement donnée filiforme, en forme de Z et bicuspidée. En dépit de son uniformité apparente, il nous a semblé utile de l'étudier chez *Hypostomus* Lacépède, 1803 et chez *Ancistrus* Kner, 1854, genres riches (respectivement 140 et 54 espèces décrites) et largement distribués.

MATÉRIEL ET MÉTHODES

Nous avons examiné les dents de plus d'un millier de spécimens dont les types de la grande majorité des espèces nominales des genres *Hypostomus* et de toutes celles d'*Ancistrus* sauf quatre, qui sont introuvables ou disparus. De nombreuses investigations ont été faites dans les genres voisins.

Les dents sont dénombrées sur les deux mâchoires. Celles érigées étant généralement usées ou brisées, ce sont des dents de remplacement matures relevées ou prélevées de la première rangée au centre de la mandibule gauche qui sont choisies pour l'étude morphologique.

Beaucoup ont été figurées et mesurées, au moyen d'un projecteur de profil NIKON V12 ou d'un microscope WILD M20, et photographiées à l'aide d'une loupe binoculaire NIKON SMZ10 équipée d'un boîtier FX 35A et d'un appareil de mesure de pose UFX 12. La figure 1 présente les termes utilisés et les mesures prises sur une dent standard.

VARIATION ET ONTOGÉNIE

Nombre: Chez les *Hypostomus* examinés, le nombre de dents d'une mâchoire varie de 6 (chez *H. roseopunctatus* Reis, Weber & Malabarba) à 125 (*Hypostomus* aff. *regani* (Ihering), LS: 187 mm) et chez *Ancistrus* de 18 (*Ancistrus* groupe *bufonius*, LS: 16 mm) à près de 130 (*A. megalostomus* Pearson, LS: 81 mm).

Pour la population de *Hypostomus auroguttatus* Natterer & Heckel étudiée et pour toutes celles d'*Ancistrus*, le nombre de dents augmente en fonction de la taille des spécimens comme il l'avait été montré chez deux espèces (MULLER 1990). Cette augmentation, qui diminue ou cesse pour une taille propre à chacune, est plus importante chez les espèces à dents nombreuses.

Pour la majorité des populations examinées, le nombre moyen de dents comptées sur le dentaire est semblable à celui du prémaxillaire chez les individus de même taille. Ce n'est toutefois pas le cas pour quelques populations d'*Ancistrus* à dents en nombre élevé.

Forme: Pour les différentes espèces des deux genres, les dents ne subissent pas de changement de forme majeur durant l'ontogénie. A l'exception de quelques cas (voir ci-après), la dent possède toujours une couronne comportant une cuspide majeure et une cuspide mineure du côté externe de la mâchoire. La couronne a une taille très variable à l'intérieur de chacun des genres étudiés.

TABLEAU 1.

Constantes d'allométries de la hampe (b1) et de la couronne (b2) en fonction de la LS, de la couronne en fonction de la hampe (b3) (régressions en coordonnées logarithmiques); rapports de la hampe dans la LS (r1) et de la couronne dans la hampe (r2) (grossissement 56x) pour 4 populations d'espèces *Hypostomus auroguttatus* Natterer & Heckel (n=15; LS=78-135 mm), *H. aff. derbyi* (Haseman) (n=13; LS=75-151 mm), *Ancistrus cf. bufonius* (Valenciennes) (n=6; LS=43-81 mm) et *A. hoplogenyis* (Günther) (n=10; LS=30-109 mm).

espèce	constantes d'allométries			rapports morphométriques	
	b1	b2	b3	r1	r2
<i>H. auroguttatus</i>	1.14	0.68	0.59	2.11-2.67 (2.38; 0.18)	1.00-1.41 (1.22; 0.13)
<i>H. aff. derbyi</i>	0.87	0.90	0.88	2.27-3.26 (2.69; 0.32)	1.39-1.88 (1.65; 0.17)
<i>A. cf. bufonius</i>	0.70	0.85	1.20	2.07-2.59 (2.29; 0.20)	1.23-1.42 (1.28; 0.07)
<i>A. hoplogenyis</i>	0.71	0.76	1.06	1.76-2.75 (2.16; 0.32)	2.41-3.62 (2.84; 0.41)

La hauteur de la hampe et la longueur de la couronne, caractères morphométriques utilisés pour la comparaison des espèces, ont une croissance allométrique différente selon les populations étudiées (voir tableau 1). Dans chaque genre, les espèces choisies sont éloignées et présentent des caractères dentaires distincts. *Hypostomus auroguttatus* se caractérise par une allométrie négative particulièrement forte pour la longueur de la couronne dentaire par rapport à la LS et à la hampe, dont l'allométrie est positive. Pour les

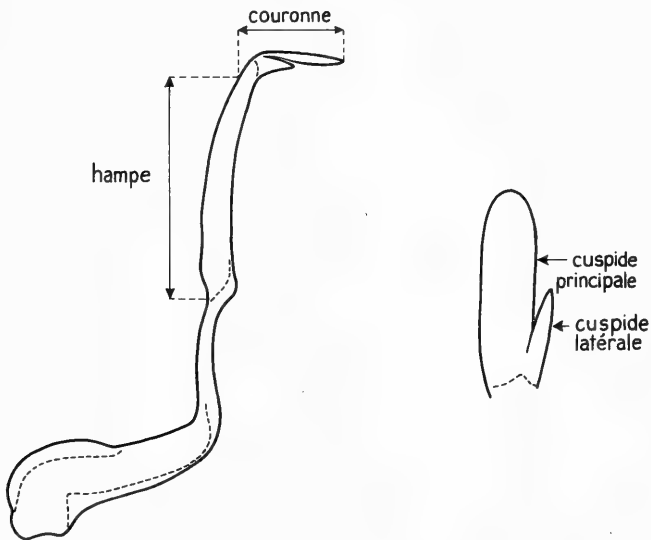


FIG. 1.

Schéma des mensurations d'une dent standard.

deux populations d'*Ancistrus*, ces deux caractères ont une allométrie négative par rapport à la LS. La couronne croît toutefois proportionnellement plus que la hampe pour la population à longue couronne dentaire (*Ancistrus* cf. *bufonius* (Valenciennes)), caractéristique aussi observée chez d'autres espèces d'*Ancistrus* à longue couronne.

RÉSULTATS TAXONOMIQUES

Chez *Hypostomus*, les dents présentent d'importantes variations en nombre, des formes diverses ainsi qu'une relation entre le nombre et la forme. Ces éléments permettent la caractérisation d'espèces et, en corrélation avec d'autres caractères, la formation de groupes d'espèces:

La forme particulière de la couronne dentaire (cuspidé principale plus longue et cuspidé latérale réduite et parfois absente; fig. 2d) est le principal caractère de la diagnose différentielle de *H. piratatu* Weber avec *H. boulengeri* (Eigenmann & Kennedy).

Un groupe d'espèces, que nous nommons *regani*, se distingue par un nombre élevé de dents (de 37 à 125) à couronne longue, associé à une mandibule large. Il se répartit sur une zone s'étendant du Rio Parnaíba au bassin du Parana, incluant des affluents du Rio Sao Francisco, ainsi que le Rio Pilcomayo et le Rio Bermejo supérieur. Entre autres espèces, on y trouve *H. auroguttatus* (fig. 2e).

Un autre groupe que nous appelons *plecostomus* est caractérisé par une mandibule moyenne, garnie de dents à couronne courte (fig. 2f: *Hypostomus* aff. *derbyi* (Haseman)). Il rassemble un grand nombre d'espèces largement distribuées dans l'aire de répartition du genre, parmi lesquelles se trouvent *H. boulengeri*, *H. commersonii* Valenciennes et *H. plecostomus* (Linné). *H. microstomus* Weber et *H. roseopunctatus* possèdent des dents massives en très faible nombre (de 6 à 16) associées à une petite mâchoire (pl. 1a; WEBER 1987: 282, fig. 7). Ces deux espèces, qui montrent beaucoup d'affinités, occupent les bassins voisins du Parana et de l'Uruguay. Le même type de denture se retrouve chez deux autres espèces: *H. margaritifera* (Regan) occupant le bassin du Parana, mais avec des dents en plus grand nombre (de 16 à 27), et *H. carinatus* (Steindachner) provenant de l'Amazonie, avec seulement 12 à 16 dents comptés sur l'holotype qui diffère toutefois complètement des trois autres par la livrée.

Chez *Ancistrus*, l'examen des dents donne également des résultats intéressants espèces et groupes d'espèces.

Par leur nombre très faible (de 23 à 48 pour des individus de 17 à 130 mm), elles sont caractéristiques d'une espèce non-décrite (A) du bassin amazonien.

Par leurs formes uniques dans le genre, elles distinguent deux autres nouvelles espèces également amazoniennes. La première (B) possède des dents à cuspides homologues (fig. 2g) comme chez certains *Peckoltia* (fig. 2a) et *Delturus*. La seconde (C) se caractérise par une dent à cuspidé latérale absente ou minuscule (fig. 2h), comme c'est parfois le cas chez *H. piratatu*.

La longueur de la couronne est particulièrement variable dans ce genre; toute espèce confondue, son rapport dans la longueur de la hampe va de 0,8 à 5,9. Ces extrêmes sont justement observés chez les nouvelles espèces B et C.

Certaines espèces se rapprochent par les caractères dentaires. Les couronnes les plus longues (moins de 1,4 dans la hauteur de la hampe) et un nombre très élevé de dents se rencontrent chez des espèces qui présentent aussi d'autres caractères en commun; nous les regroupons sous le nom groupe *bufonius*. La dent à très longue couronne possède une hampe de taille généralisée (2,1 à 3,2, moy. 2,5 dans la LSx1/56) et s'inscrit grossièrement dans un carré (fig. 2i: *A. bufonius*; pl. 1c: *A. megalostomus*). Ce type de denture se

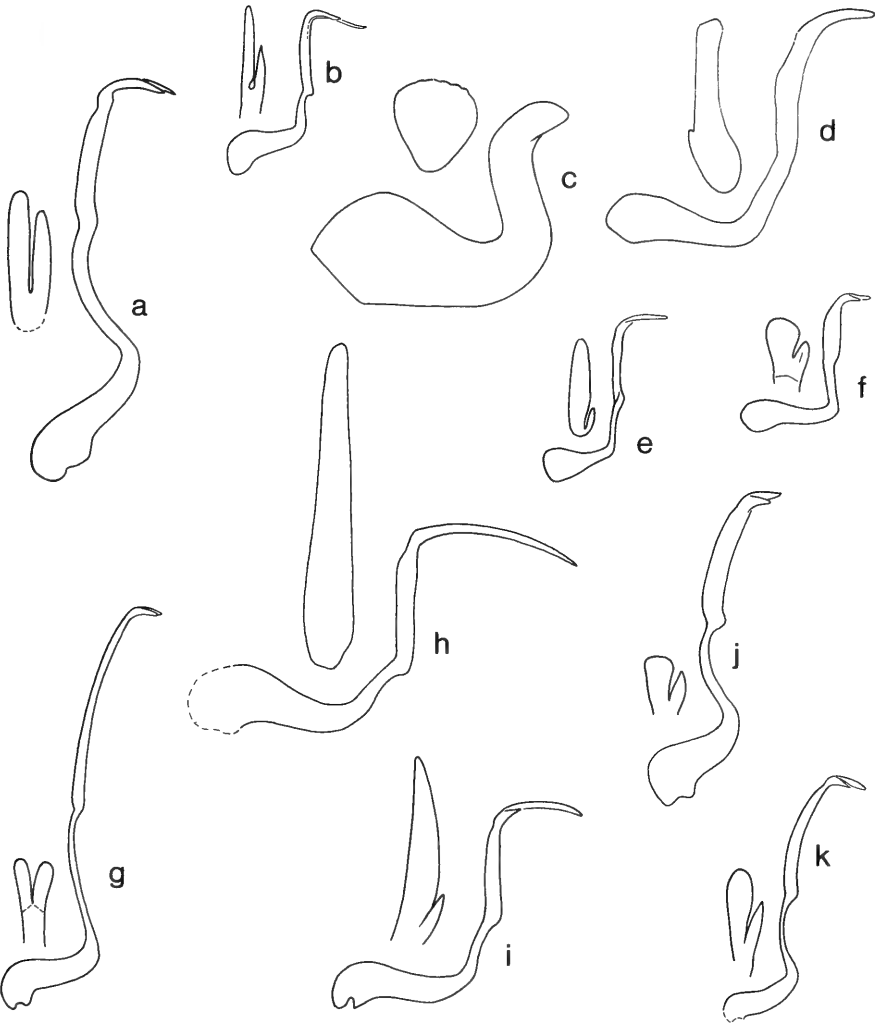


FIG. 2.

Vue latérale de la dent et vue dorsale de la couronne dentaire. a: *Peckoltia oligospila* Günther (LS: 88; 20x); b: *Chaetostoma lineopunctatum* Eigenmann & Allen (LS: 64; 20x); c: *Cochliodon cochliodon* (Kner) (LS: 224; 10x); d: *H. piratatu* Weber (LS: 244; 10x); e: *Hypostomus auroguttatus* Natterer & Heckel (LS: 120; 10x); f: *H. aff. derbyi* (Haseman) (LS: 145; 10x); g: *Ancistrus* sp. B (LS: 110; 20x); h: *Ancistrus* sp. C (LS: 110; 20x); i: *A. bufonius* (Valenciennes) (LS: 103; 20x); j: *A. hoplogenyis* (Günther) (LS: 100; 20x); k: *A. lithurgicus* Eigenmann (LS: 64; 20x). LS: longueur standard en mm; x: grossissement de la vue latérale; couronne agrandie 2 fois par rapport à la dent sauf pour *C. cochliodon*.

retrouve dans d'autres genres, notamment *Chaetostoma* Tschudi, 1845 (fig. 2b). La distribution de ce groupe semble limitée à l'Est des Andes péruviennes et boliviennes, dans les affluents de l'Ucayali et du Madre de Dios. Le type d'*Ancistrus caucanus* Fowler, seul exemplaire que nous ayons pu examiner pour cette espèce, possède également des dents à très longues couronnes (1,1 dans la hampe) mais en nombre moins élevé (environ 50 pour une LS de 52 mm), comparable à celui des nombreuses espèces à denture moyenne que l'on trouve largement distribuées dans l'aire de répartition du genre.

A l'inverse du groupe *bufonius*, on observe des dents peu nombreuses à couronne courte (plus de 2 dans la hauteur de la hampe) et hampe habituelle (1,8 à 3,2, moy. 2,3 dans la LS x 1/56) chez les espèces du groupe *hoplogenyis*, distribuées dans le bassin de l'Amazone ainsi que dans celui de l'Orénoque et le plateau guyanais (fig. 2j et pl. 1b: *A. hoplogenyis* (Günther)). *A. lithurgicus* Eigenmann (fig. 2k) de l'Essequibo et *A. macrophthalmus* (Pellegrin) de l'Orénoque possèdent aussi une couronne courte, mais s'en distinguent par leurs dents fines et longues (LS/hampe x 1/56: 1,2 à 2, moy. 1, 5).

DISCUSSION

La denture des populations à dent standard étudiées montre une variabilité ontogénique non négligeable du nombre de dents, qui s'ajoute à la variabilité individuelle souvent importante. La comparaison du nombre moyen de dents par classes révèle chez *Hypostomus* et *Ancistrus* une grande variation selon les espèces.

Certaines populations (chez *Ancistrus* groupe *bufonius*) ont un nombre de dents significativement différent sur le dentaire et le prémaxillaire. Il pourrait s'agir de caractéristiques spécifiques, certaines ayant plus de dents sur le prémaxillaire, d'autres sur le dentaire. Nous attendons l'examen d'un plus grand nombre de populations, comprenant des individus de toute taille, pour le préciser.

La variabilité morphologique est faible durant l'ontogénie. Nous notons toutefois des allométries caractéristiques de la longueur de la hampe de la dent et de sa couronne. En comparaison, on observe parmi d'autres genres des modifications importantes.

Chez *Cochliodon*, les dents des très jeunes individus sont comparables par la forme avec celles habituellement rencontrées chez les autres Hypostominae. Elles ne sont remplacées par les dents à grosse couronne sans cuspside latérale (fig. 2c) qu'au delà de 60 mm. de LS (LILYESTROM 1984: 44). Dans plusieurs populations de *Liposarcus pardalis* (Castelnau), nous avons observé que les dents standard sont remplacées par des dents unicuspidées à couronne fortement allongée dès 245 mm de LS.

Chez *Hypostomus* et *Ancistrus*, la longueur de la couronne est très variable à l'intérieur des genres, ce qui n'est pas le cas pour d'autres tels *Pterygoplichthys* Gill, 1858, *Liposarcus* Günther, 1864 et *Glyptoperichthys* Weber, 1991 récemment révisés.

Les mesures prises sur les dents permettent de caractériser des groupes d'espèces et, souvent associées à d'autres éléments morphologiques ou morphométriques, précisent certaines affinités.

Plusieurs caractères sont généralement corrélés: la taille des mâchoires, le nombre de dents et la longueur de la couronne. Dans une grande mâchoire, on trouve généralement un nombre élevé de dents à longue couronne et inversément. Nous observons aussi des exceptions à l'image de deux espèces colombiennes, *H. varimaculatus* (Fowler) du bassin du Caqueta et *A. caucanus* du Cauca, qui présentent une couronne longue avec un nombre de dents et une mâchoire tout à fait ordinaires.

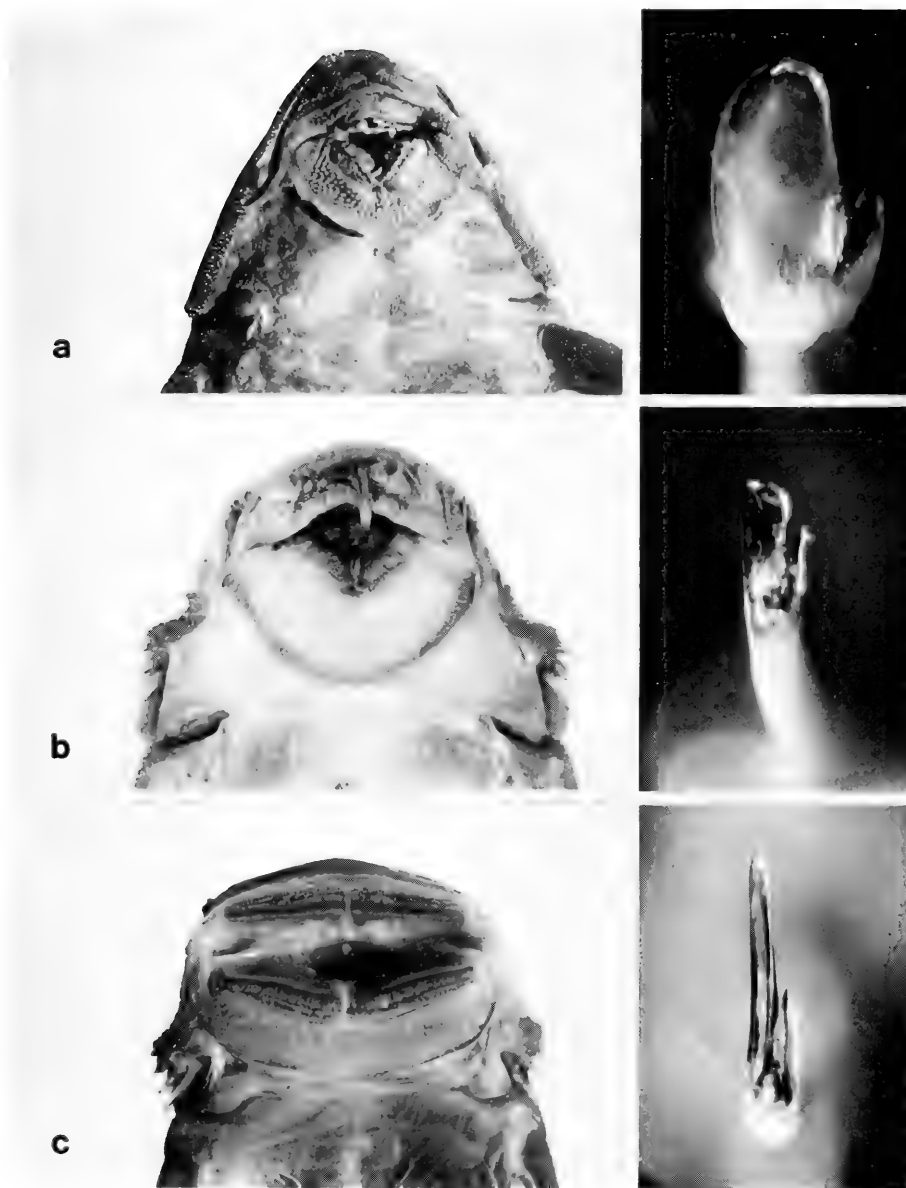


PLANCHE I

Bouche et couronne dentaire. a: *Hypostomus roscopunctatus* Reis, Weber & Malabarba (paratype, MAPA 23125; LS: 190); b: *Ancistrus hoplogenyx* (Günther) (syntype, BMNH 1849.11.8;89; LS: 86.5) (photo bouche: G. Dajoz); c: *Ancistrus megalostomus* Pearson (syntype, CAS 64614; LS: 82,9 mm) (photo bouche: C. Ratton).

Enfin, l'examen systématique des dentures permet la discrimination de plusieurs espèces de *Hypostomus* et d'*Ancistrus* par leurs caractères uniques au sein des genres. Dans le cas de *H. piratatu*, les caractères dentaires sont les seuls discriminants et une étude électrophorétique comparative de certaines populations sympatriques devrait, le cas échéant, confirmer leur validité.

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Evolutionary aspects of development, life style, and reproductive mode in incirrate octopods (Mollusca, Cephalopoda)*

by

Sigurd v. BOLETZKY **

With 7 figures

ABSTRACT

The incirrate octopods are defined as a monophyletic group by a number of characters unknown in the cirrate octopods or in other cephalopods. The biologically most significant incirrate feature is the incubation of eggs by the female. The morphological and behavioural characters underlying this special mode are analysed with regard to developmental processes and their modification related to life style evolution.

1. INTRODUCTION

Common inshore species of the genus *Octopus* Lamarck, 1798 are popular models in comparative invertebrate biology (YOUNG, 1971; WELLS, 1978); in such a context they can be viewed as 'typical cephalopods'. When attention is focussed on diversity *within* the class Cephalopoda, however, the common octopuses turn out to be rather 'special' cephalopods. This observation raises the question of respective systematic positions: what is special about which group of octopods ?

1.1. SYSTEMATICS

Within the cephalopod subclass Coleoidea Bather, 1888 (=Endocochleata, Dibranchiata), the order Octopoda Leach, 1818 is a well defined taxon. It contains two suborders, the Cirrata Grimpe, 1916 (better known as 'finned octopods') and the Incirrata

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Grimpe, 1916, to which the common octopuses belong. YOUNG (1989) proposed a new classification, with an infraclass Octobranchia containing two orders, the Cirroctopoda (=Cirrata) and the Octopoda (=Incirrata). For practical reasons, the old classification is used here, especially to avoid confusion between Octopoda Leach, 1818 and Octopoda Young, 1989 (cf. quotation from YOUNG, loc. cit. in Discussion).

1.2. PHYLOGENETIC BACKGROUND

To appreciate the evolutionary significance of incirrate characters with regard to functional adaptation and phyletic conservation of patterns, the incirrates must of course be viewed in comparison to their supposedly closest relatives, the deep-sea cirrate octopods. The respective positions of the fossil *Proteroctopus* of the Middle Jurassic and *Palaeoctopus* of the Late Cretaceous are not discussed here, because the available morphological data are insufficient (see ENGESER, 1988 for a review). The characters of living octopods can nevertheless be scrutinized in the greater framework of coleoid phylogeny, starting out from the Vampyromorpha (cf. YOUNG, 1989). This taxon was formerly included in the Cirrata because of the great similarity in arm morphology. When the so-called retractile filaments of *Vampyroteuthis* were recognized as an additional pair of rudimentary arms, the Vampyromorpha were made an order of its own (PICKFORD, 1939, 1949).

The evolutionary history of endocochleate cephalopods can be traced back to the lower Devonian (BANDEL *et al.*, 1983; BANDEL & BOLETZKY, 1988). For the present purpose it is sufficient to consider the extant coleoids in relation to those fossil coleoids that had *ten arms of similar length and structure*, a crucial feature that NAEF (1923) used for the definition of a hypothetical 'Protodibranchus'. This arm pattern disappeared with the extinction of the belemnites at the end of the Cretaceous.

The 'belemnoid' arm crown morphology is important for our understanding of coleoid phylogeny because it is the only one from which one can derive the respective patterns of 1) the decapodan cuttlefishes and squids, which have the *fourth arm pair modified* as tentacles, and 2) a group provisionally named 'Vampyropoda' (=Octopodiformes Berthold & Engeser, 1987; name preoccupied) to include the Vampyromorpha Pickford, 1939 with their *modified second arm pair* and the Octopoda Leach, 1818 (lack of probably the second arm pair). The important point here is that these two modifications must have occurred independently, i. e. at two different speciation events, because a simultaneous occurrence of mutually exclusive modifications is inconceivable (Fig. 1a). Prerequisite to this phylogenetic deduction is the existence of unambiguous identities and positional relationships of brachial appendages allowing one to recognize modifications for a given pair of arms (see BOLETZKY, 1992 for a review). These criteria are concerned with the 'integration level' of distinct appendages; they do not involve the specialisations at the next lower level which comprises the armature of the arms and tentacles (suckers, hooks, cirri).

Given the situation described above, any discussion of phylogenetic systematics of the Coleoidea has to cope with (only) two possibilities: either the decapods and the belemnoids are sister groups for which the 'Vampyropoda' are the outgroup, or the 'Vampyropoda' and the belemnoids are sister groups, the decapods being the outgroup (Fig. 1b). The question of which one of these arrangements is true lies outside the scope of this paper.

2. INCIRRATE CHARACTERS

In addition to the absence of brachial cirri warranting the name of the taxon, and hectocotylization of one of the ventro-lateral arms, the Incirrata show a series of characters unknown in the Cirrata or in any other coleoid cephalopod (cf. NAEF, 1923, 1928); the most conspicuous of these are:

1. absence of muscular fins ('finlessness')
2. presence of Kölliker's organs in hatchling skin
3. partial modification of egg case (chorion stalk)
4. reduced encapsulation of egg case (chorion stalk only)
5. egg-care behaviour (or ovovivipary) in the female.

Although none of these characters is known in any other cephalopod, the question remains whether they are uniquely derived (apomorphic) characters of the Incirrata, or whether they (or some of them) could be autapomorphic characters of the octopodan ancestor that were subsequently eliminated in the Cirrata (so they would be plesiomorphic at the level of the Incirrata). So far nothing seems to indicate that the absence of the above characters in the Cirrata could be the result of such an elimination.

An equally important question is how closely related these characters are to one another. Here one has to consider several variables; a behavioural one, namely the post-hatching life style as compared to the adult mode of life, and two morphometrical variables, egg size and body proportions. The behavioural features necessarily lead to the question of how to define the ancestral life style from which the modes of living incirrates must be derived. Before this question can be addressed, the incirrate characters listed above have to be scrutinized in some detail.

Ad 1. The absence of muscular fins in the Incirrata is not total if embryonic development is taken into account. Fin rudiments do appear during organogenesis, in close positional relation to the shell sac as is typical for the coleoids (Fig. 2). The incirrate shell sac is very small from the beginning; it becomes drawn out laterally during early development (APPELÖF, 1898). The resulting transverse tube finally splits into two independent tubes which become embedded in the muscular tissue of the mantle (and can finally disappear, as in *Argonauta*). During this shell sac differentiation the fin rudiments gradually smooth out (NAEF, 1928). What might be taken as rudimentary fins in preserved hatchlings viewed in the scanning electron microscope are fixation artefacts due to shrinkage (Fig. 3); although the position of these ostensible 'buds' corresponds to the location of the shell stylets, no trace of fin tissue is histologically detectable. The character 'absence of muscular fins' could be rephrased to emphasize the rudimentation of the whole fin-shell complex, assuming homology of fin *rudiments* in Cirrata and Incirrata (BOLETZKY, 1982 a). When viewed against the pattern of an unpaired transverse shell sac and associated fins (as present in cirrates), the bipartite shell sac of incirrates suggests a correlation between two apomorphic characters, namely subdivision of the shell sac and truncation of fin differentiation, i. e. 'finlessness'.

Ad 2. The majority of incirrate hatchlings have special tegumentary organs; they were observed in *Argonauta* embryos by KÖLLIKER (1844) and fully described in other incirrates by QUERNER (1927) and more recent authors (e. g. FIORONI, 1962) (Fig. 3). The absence of Kölliker's organs in *Octopus briareus* (Fig. 7) and *O. maya* (BOLETZKY, 1973)

can be viewed as the result of total suppression in specifically modified integument morphogeneses. So far no trace of these organs has been found in embryos of cirrate octopods (BOLETZKY, 1982 b).

Ad 3. During vitellogenesis, cephalopod oocytes may take on a markedly elongate form, but it is only in the Incirrata that this elongation leads to the differentiation of a distinct chorion stalk (Figs 4, 5). The elongate form of the incirrate chorion is also meaningful with regard to embryonic movements that occur in all incirrates so far studied, with the exception of *Argonauta*; this feature could be a side effect of the primary modification of late oogenetic processes (BOLETZKY & FIORONI, 1990) (Fig. 4).

Ad 4. In the incirrates the 'cement' secreted by the oviducal glands (FROESCH & MARTHY, 1975) 'encapsulates' only part of the chorion stalk (Fig. 5). This 'partial egg encapsulation' contrasts with the complete encapsulation of the cirrate eggs; it thus appears as an apomorphic character linked with the formation of a chorion stalk (character 3).

Ad 5. Although visual stimulation by other egg masses can induce spawning in many coleoid cephalopods, post-spawning *egg care* exists only in the incirrate octopods (BOLETZKY, 1986). This unique protective behaviour must be related to the *absence* of protective encapsulation (character 4). In other words, characters 3, 4 and 5 are clearly connected, forming an apomorphic complex of features named the "incubating mode" of reproduction. In the pelagic genus *Ocythoe*, incubation exists in the 'pure' form of ovovivipary (NAEF, 1923). For two families, the Alloposidae and the Amphitretidae, egg-care is not yet documented (Hochberg, pers. comm.).

Before approaching the question of possible relations between the above 'incubation complex' and the characters 1 and 2 (see C.), it is necessary **A.** to review life styles and morphometrics at different stages of the incirrate life cycle, and **B.** to see whether characters 1 and 2 are correlated.

A. LIFE STYLES AND MORPHOMETRICS

A.1. Life styles

a) ADULT LIFE STYLES IN THE INCIRRATA

Eight incirrate families are recognized if the Idiotoopodidae Taki, 1962 are included in the Amphitretidae Hoyle, 1886 (cf. HOCHBERG *et al.*, 1992; disregard the erroneous statement in BOLETZKY, 1978-79, p. 107). Only the Octopodidae Orbigny, 1840 are clearly benthic at the adult stage. R. E. YOUNG (pers. comm. to HOCHBERG *et al.*, 1992) suggests that adult *Alloposus mollis* Verrill, 1880 (of the monotypic family Alloposidae Verrill, 1882) may also be benthic. The remaining six families are pelagic; these are the Argonautidae Tryon, 1879, the Tremoctopodidae Tryon, 1879, the Ocythoidae Gray, 1849 (these three families were grouped with the Alloposidae in a tribe called Argonautida by ROBSON, 1932), the Vitreledonellidae Robson, 1930, and the two "ctenoglossan" families Bolitaenidae Chun, 1911 and Amphitretidae Hoyle, 1886.

In all these families, reproduction takes place in midwater, and the eggs apparently remain with the female until the young hatch out. The most elaborate mode of egg care is achieved by the female *Argonauta* which produces a calcified "brood shell". However, along with housing the egg mass, this pseudoconch serves as a floater; the animal keeps an air bubble in the apex and thus obtains neutral buoyancy (BOLETZKY, 1983). Moreover the brood shell supports the brachial membrane in a food detective function (YOUNG, 1960). A much simpler form of egg carrier is produced by *Tremoctopus*; as in *Argonauta*, the calcified structures are secreted by the dorsal arms (NAEF, 1923). In *Eledonella pygmaea* (family Bolitaenidae), the whole arm crown of the female forms a brood chamber (YOUNG, 1972). Male sexual behaviour in pelagic incirrates can be only partly inferred from the structure of the copulatory arm (hectocotylus). In the "Argonautida" *sensu* ROBSON (1932), the morphologically and morphometrically extreme differentiation of the hectocotylus seems correlated with the capacity to autotomize.

In the benthic Octopodidae, females always spawn on the bottom. Generally single eggs or egg strings are cemented to the wall or ceiling of the den occupied by the female. In a few octopodid species, the females carry egg masses loose and thus can move about while brooding the eggs (see HOCHBERG *et al.*, 1992).

b) POST-HATCHING LIFE STYLES IN THE INCIRRATA

As far as is known (cf. HOCHBERG *et al.*, 1992), the juveniles of pelagic families live in midwater (including the Alloposidae; see above). In the benthic Octopodidae, the representatives of the subfamily Bathypolypodinae Robson, 1931 probably stay on the bottom throughout their life (cf. *Bathypolypus arcticus*, as observed by O'DOR & MACALASTER, 1983). If the new arrangement proposed by VOSS (1988) is accepted, the new subfamilies Graneledoninae and Pareledoninae are entirely holobenthic (Hochberg., pers. comm.). The subfamilies Octopodinae Grimpe, 1921 and Eledoninae Gray, 1849 include numerous species characterized by the same 'holobenthic' mode as *Bathypolypus*, while others have a planktonic post-hatching phase; the mode of life of the latter species can be named 'merobenthic'. Their young animals are actively foraging carnivores that feed on both living planktonic prey and drifting food items (facultative scavenging). They generally remain in midwater until they have grown larger. In some species, newly-hatched animals show temporary settling between phases of active swimming (BOLETZKY, 1977).

A.2. Morphometrics

a) BODY PROPORTIONS OF INCIRRATE HATCHLINGS

The hatchlings of pelagic incirrates are characterized by short arms (generally less than 1/3 of total length) with few suckers. This feature again appears in the newly hatched animals of merobenthic octopodids (Fig. 6), although in the larger hatchlings each of these relatively short arms may carry up to 15 suckers. In contrast, the hatchlings of holobenthic octopodids have arms at least as long as the rest of the body, with more than 20 suckers per arm (Fig. 7).

The body proportions of planktonic hatchlings gradually change due to the positive allometric growth of the arms. In the young merobenthic octopodids, body proportions thus become similar to those of the 'crawl-away' hatchlings of holobenthic species. In *Octopus vulgaris* (and probably in the majority of merobenthic octopodids) the young animals, having reached these body proportions, gradually change from continuous swimming to the adult-type bottom life, which includes only occasional excursions into the water column (ITAMI *et al.*, 1963). This drastic change contrasts with the condition of pelagic incirrates, in which juvenile arm growth is not accompanied by a thorough modification of life style.

b) INCIRRATE EGG SIZES AND HATCHLING FEATURES

Within the Incirrata, the size of a single ovum varies from 0.8 mm in *Argonauta* spp. to 35 mm in *Graneledone* sp. (HOCHBERG *et al.*, 1992). Among the pelagic incirrates, the variation spans only from 0.8 to about 4 mm, however. In contrast, egg sizes vary from about 1.5 mm to 35 mm in the Octopodidae.

ROBSON (1932, p. 25) once expressed egg lengths as percentages of adult mantle-lengths, but his erroneous egg index for *Eledone cirrosa* prevented him from realizing the great difference between *Eledone moschata* (egg length ca 15% of adult mantle length) and *E. cirrhosa* (ca 5%; cf. Fig. 5); adults of the two species are similar in size. This index becomes particularly interesting when absolute egg sizes are similar among species with very different adult sizes. There are several octopodid species that produce eggs measuring about 5 to 8 mm; in the larger species the embryos become planktonic hatchlings with short arms and less than 15 suckers per arm, whereas in the smaller species embryos of the same size end up as benthic hatchlings with long arms and more than 20 suckers per arm (cf. A.2.a). In fact, the ostensibly 'intermediate' egg sizes fall under the same categories as the 'very large' and the 'very small' eggs and are distinguishable by the relative egg size, or egg index (BOLETZKY, 1974, 1977). An index smaller than 10% is indicative of the merobenthic mode, whereas an index greater than 10% reflects holobenthic conditions (occasional behavioural peculiarities in newly hatched animals notwithstanding). An exception is *Octopus fitchi*, a very small species in which the eggs (ca 5 mm) are large relative to the adult mantle-length (ca 30 mm: egg index ca 16); the arms are stout and almost as long as the rest of the body like in hatchlings of holobenthic species, but each arm carries less than 17 suckers, and the post-hatching life style is clearly planktonic (HOCHBERG *et al.*, 1992).

B. CORRELATION OF CHARACTERS 1 AND 2

a) FINLESSNESS AND THE BENTHIC LIFE STYLE

That the incirrates lack fins was long interpreted as a result of adaptation to benthic life (NAEF, 1923). The absence of fins in the pelagic incirrates was then naturally viewed as a condition conserved from a finless benthic ancestor, assuming that fins lost in that ancestor were not "reinvented" in its pelagic descendants. However, a causal relationship between the benthic life style of an octopus and the absence of muscular fins has never been shown to exist. In fact, cuttlefish and sepiolid squids demonstrate that fins may be indispensable even on the bottom as can be seen when these animals bury in soft

substrates: at the outset of burying they can remain on the spot only because the fin movements counteract the propulsive effect of the funnel jet by which substrate particles are blown up. Fins can be expected to have disappeared from the morphogenetic program only if they were *incompatible* with the functional morphology corresponding to a given life style. There is no indication of such incompatibility in relation to the benthic life style as it appears in the Octopodidae.

b) FINLESSNESS AND THE PELAGIC LIFE STYLE

Among the pelagic incirrates, one condition may appear incompatible with the presence of fins; this is the presence of a brood shell in female *Argonauta*. However, one cannot reasonably assume that this highly elaborate female structure represents an ancestral incirrate condition. A feature really incompatible with the presence of fins could be character 2 of our list, i. e. presence of Kölliker's organs in the juvenile skin. The way these organs function, especially when they evaginate and spread the setal tufts, suggests that they would interfere with fin activity if fins still existed along with them. Provided that tuft spreading occurs under higher nervous control and has a parachute effect in midwater when the animal remains motionless (BOLETZKY, 1978-79), the establishment of Kölliker's organs can be considered in relation to the pelagic life style. At the level of the incirrate ancestor, this of course holds only for small body sizes at which the tufts can generate enough drag to slow sinking. In other words, the formation of Kölliker's organs is likely to reflect an originally *juvenile adaptation* to pelagic life. Finlessness thus appears as the obligatory counterpart of the juvenile 'setaceousness', in other words characters 1 and 2 of our list are probably correlated.

C. CORRELATION OF CHARACTER COMPLEXES

Nothing so far mentioned provides an indication of any relationship between the complex of characters 1 and 2 and the complex of characters 3, 4 and 5 of our list. Such a link appears only when *hatching* is considered. In the merobenthic and pelagic incirrates, Kölliker's organs play an essential, though passive, role during hatching (BOLETZKY, 1978-79). The setal cores of these organs provide a "shingle" structure to the hatchling skin and thus prevent its slipping back into the chorion when the animal makes the stretching movements necessary to work itself through the hatch opening (which is produced by enzymes released from the hatching gland). Notwithstanding exceptions like *Scaevargus unicirrhus* where short arms are used during hatching (BOLETZKY, 1984), the role of the setal cores seems essential in the small young having very short arms that remain passive during hatching (in contrast to the holobenthic octopodids where the crawl-away hatchlings *always* use their long arms to work themselves out of the chorion). However, the shingle structure of the skin is effective only if the hatch opening has a solid edge. This condition is fulfilled by the relatively thick, stiff chorion of incirrate eggs.

Another question is whether this particular function during hatching is the primitive function of Kölliker's organs. The complex structure of these organs, especially the elaborate musculature that permits repeated spreading and retraction of the tufts during post-hatching life, and the fact that the organs cover also the arms where they are not needed for hatching, suggest that their function during hatching is a secondary adaptation

superimposed on a primary function related to the post-hatching mode of life. A prerequisite of this secondary adaptation must have been the modification of the encapsulation process, which changed from the complete encapsulation seen in the cirrates to partial encapsulation of the egg. This evolutionary transformation is conceivable only in combination with a special timing of egg release allowing the follicular chorion attachment to be drawn out into a distinct chorion stalk. Internal fertilization, a likely prerequisite, was already achieved in the octopodan ancestor, as demonstrated by the Cirrata (cf. VILLANUEVA, 1992); *Vampyroteuthis* appears to have external fertilization similar to the decapods (PICKFORD, 1949).

3. DISCUSSION

Starting from the feature 'finlessness' through the related 'setaceousness' and its implications in both the post-hatching life style and the hatching mechanism, our survey arrives at the question of the evolutionary origin of the incirrate mode of reproduction. Considering the constraints placed on egg shaping and timing of egg release, attention is naturally drawn to ovovivipary, the special incubation mode of *Ocythoe*. Could this mode represent the primitive condition from which the post-spawning egg care was derived? Is the inverse process more likely? Or is the 'intermediary' condition of *Argonauta*, where eggs are released only after the first cleavage stages (NAEF, 1928), closer to the primitive condition from which the other two were derived?

These questions inevitably raise the problem of the ancestral life style under which incubation became established. Given that seven of the eight living incirrate families are pelagic, it appears likely that the 'most generalized' life style represents the ancestral condition. But this hypothesis remains very vulnerable as long as it is only based on the respective numbers of extant families representing the pelagic or the benthic life style. An indication supporting the above hypothesis could be the existence of a pelagic juvenile phase in many octopodids (merobenthic species). This juvenile phase is likely to be a *conserved* feature that stems from a pelagic ancestor. Advantages of this conservation could have been greater availability of small prey animals in midwater (BOLETZKY, 1977, 1981) and low selective pressure in a relatively 'simple' open water environment where the limited behavioural repertoires of very small juveniles suffice (BOLETZKY, 1987). Thus the planktonic juvenile phase would have been *eliminated* in the holobenthic species. It is indeed easier to imagine an evolutionary parallelism resulting from convergent suppressions of the pelagic phase than the inverse, namely independently emerging pelagic juvenile phases. With the latter hypothesis, it would be particularly difficult to explain why the planktonic hatchlings tend to be so similar, and why they resemble so closely those of the pelagic incirrates.

One may of course argue that perhaps the pre-octopodid ancestor was already characterized by juvenile life style switching; this would have allowed the holopelagic life cycle of the majority of incirrates to emerge through a paedomorphic 'abbreviation' by suppression of the ancestral adult mode. This could be the hypothesis underlying the comment of YOUNG (1989, p. 235-236) on a cryptic incirrate character related to the receptor system of the statocyst: "The division of the crista into nine sections is a unique apomorphic feature of the order Octopoda; it is not present in Cirroctopoda, which presumably never possessed it. The feature was possibly developed to provide for the wide

range of frequency of turning during walking and swimming. It is surprising to find that the crista is still so divided in all the pelagic octopods examined". The question can of course be reversed: is it surprising to find that the crista is so divided in all the pelagic incirrates ? Not if one assumes that the benthic octopodids are derived from a pelagic ancestor. Efforts should now be concentrated on the identification of sister group relationships within the incirrates. Do the octopodids have an immediate common ancestor with one of the other incirrate subgroups, or is the octopodid lineage derived from a basic dichotomy so that the Octopodidae were the sister group of all other incirrates ?

Two variants of a peculiar behavioural feature in some pelagic incirrates deserve special attention. One is the use of the own brood shell as a buoyant device by female *Argonauta* (cf. 2.A.1.a), the other is the use that male *Ocythoe* make of empty tests of doliolids and salps as drifting 'homes' (NAEF, 1923). The great similarity of these behavioural patterns suggests that the typical arm posture of a benthic octopodid sitting in its den is homologous to the respective attitudes of female *Argonauta* and male *Ocythoe* in their pelagic 'homes'. It is conceivable that the behaviour pattern corresponding to such a 'rafting' mode of life provided the initial condition for the establishment of an adult benthic mode. The inverse process seems conceivable only if the supposed benthic ancestor already had a planktonic juvenile phase.

In conclusion, the most generalized life style in incirrates is characterized by active swimming and drifting; ontogenetically this is an elaboration of a pelagic juvenile phase. This phase has probably been *eliminated* in many species of the benthic family Octopodidae. To derive the wide variety of incirrate modes from a holobenthic ancestor, through repeated 'invention' of the pelagic juvenile phase, seems rather problematic. Egg incubation in incirrates may thus be surmised to have emerged in the adaptive context of a benthic-pelagic or pelagic life style.

SUMMARY

This paper reviews the common features of the octopodan subgroup Incirrata from an evolutionary point of view, raising questions of functional adaptation and co-adaptation of morphological and behavioural characters. The most conspicuous difference between incirrate octopods and other cephalopods is the 'incubating mode' of reproduction (post-spawning egg care or ovovivipary). As the cirrate octopods, which are the likely sister group of the incirrates, show no signs of incubation, the evolutionary origin of this novel mode of incirrate reproduction can only be 'reconstructed' through careful weighing of the relative importance of characters that are more or less closely related to reproduction. Developmental features provide particularly interesting cues (e. g. truncation of fin development, formation of special tegumentary organs) allowing one to approach the question of the ancestral life style from which the pelagic and benthic modes of extant incirrates must be derived.

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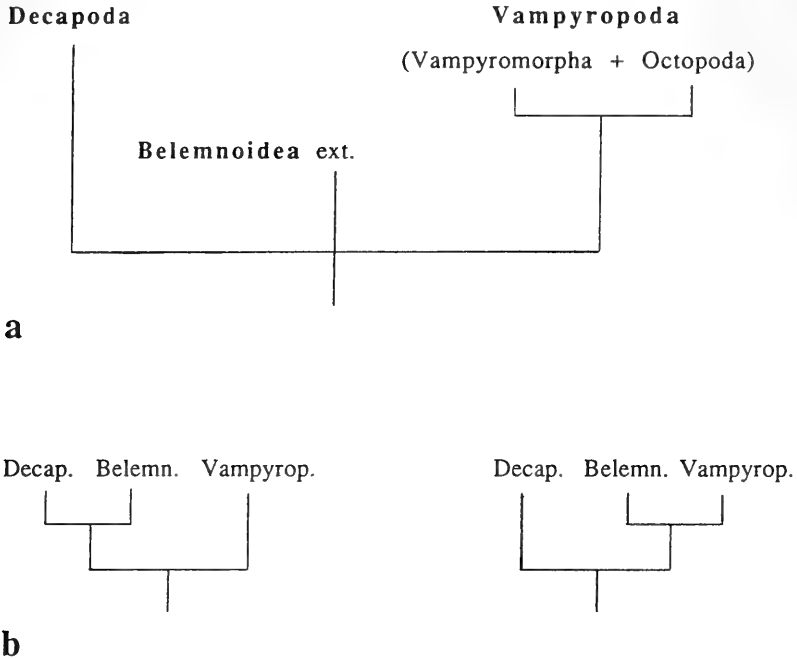


FIG. 1

a. Phylogenetic relationships between the living coleoid groups Decapoda (five arm pairs, fourth pair modified) and Vampyropoda (five arm pairs, second pair modified) via the extinct Belemnnoidea (five arm pairs without distinct modifications). The trichotomy is shown unresolved in terms of sister group relationships. b. The two conceivable sister group relationships (the theoretical third one, supposing Decapoda + Vampyropoda with Belemnnoidea as the outgroup, is inconceivable for morphological reasons, as explained in the text).

FIG. 2

Lateral view of a live embryo of *Octopus vulgaris* in its chorion, the large outer yolk sac (at right) and the chorion stalk (at left) are not shown. At this advanced organogenetic stage (stage XII of Naef, 1928), one can recognize the organ complexes surrounding the dark yolk mass: a voluminous buccal mass (b), the stubby arms (a), the funnel tube (f), and the cap-like mantle with the fin rudiments (arrow) overlying the rudimentary shell sac (arrow head).

FIG. 3

Preserved hatchling of *Octopus vulgaris* in caudo-dorsal view (SEM), with the posterior mantle apex at the lower left. The elevations marked by arrowheads correspond roughly to the position of fin rudiments in decapod embryos, but they are fixation artefacts due to shrinkage (see text). The small arrows point at some of the small elevations producing the "shingle" structure of the hatchling skin; the tips of the setal cores of Kölliker's organs have broken through the skin surface only in the nuchal region (upper right).

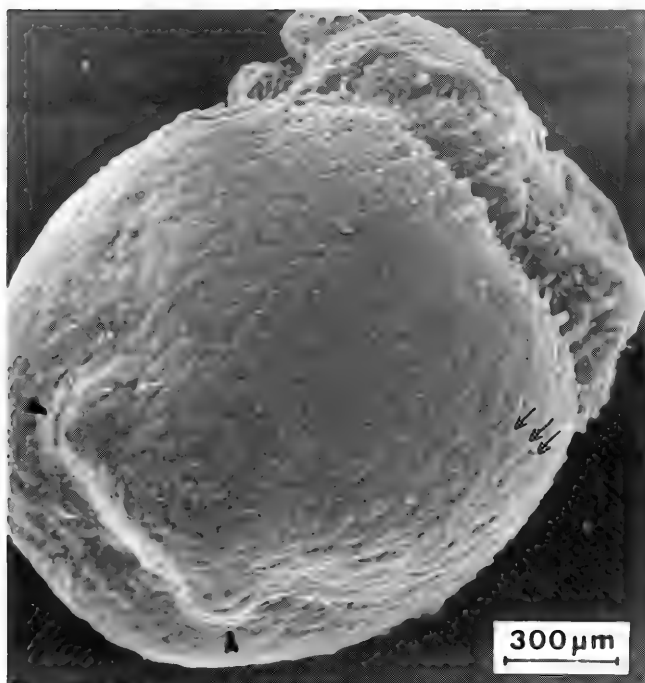
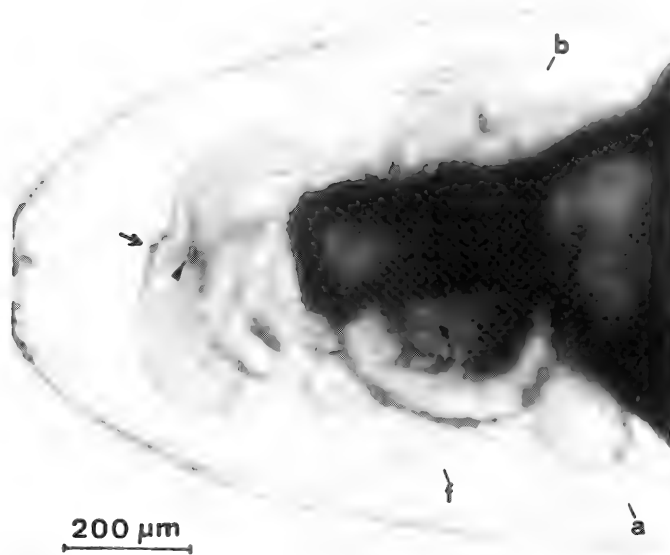




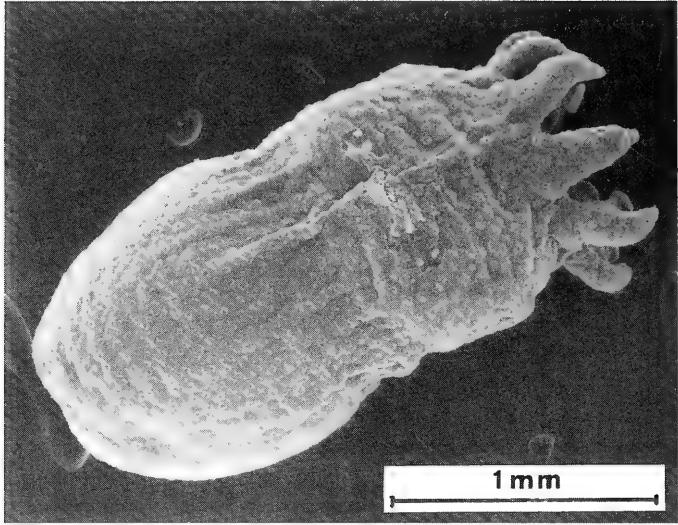
FIG. 4

Live embryo of *Argonauta argo*, with pigmented eyes (e), tightly enclosed in its chorion, with the chorion stalk (arrow) at the upper right. The outer yolk sac lies at the stalk side, the mantle of the embryo at the side of the micropyle (arrow head). At organogenetic stages, incirrate embryos normally show inverse orientation inside the chorion (see text).



FIG. 5

Egg strings from the octopodids *Eledone cirrhosa* (left and middle) and *Octopus vulgaris* (right). The arrow points at the embedding site of a long chorion stalk in the 'cement' secreted by the oviducal gland; the egg string in the middle shows a 'tidier' arrangement with deep chorion stalk embedding (arrow head) and formation of a central cement axis, similar to that of the *Octopus vulgaris* egg string (central axis not visible). Despite the great difference in egg size, hatchlings of both species have short arms (cf. Fig. 6) and live for some time in the plankton (see text).



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FIG. 6

Scanning electronmicrograph of an *Octopus vulgaris* hatchling in dorsal view. Note the short arms with a few relatively large suckers (upper right).

FIG. 7

A live *Octopus briareus* hatchling with its long arms and numerous suckers adhering to the substrate (glass dish) during crawling. This is a bottom living 'miniature octopus' hatched from a very large egg, showing no signs of pelagic life style.

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Abundance, species richness, host utilization and host specificity of insect folivores from a woodland site, with particular reference to host architecture

by

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With 3 figures

ABSTRACT

We studied the local abundance, species richness, host utilization and host specificity of insect folivores associated with 10 deciduous woody and 10 perennial herbaceous plant species growing in a woodland site in the Swiss Jura. Regional species richness of insect folivores on their hosts, inferred from compilation of insect faunas for Central Europe, was highly correlated with local species richness, as estimated by a 7-month field survey. Woody hosts sustained more insect species and a higher proportion of chewers, than herbaceous plants which, in turn, sustained a higher proportion of leaf miners. Overall insect abundance was not affected by plant architecture. On average, 56 % of the species feeding upon a particular host were specialists, with no apparent effect of plant architecture, but proportions for herbaceous plants fluctuated from 0 to 100 %. At the regional scale, 85 % of the variance in herbivore species richness was explained by the height of the host, its taxonomic relatedness and its leaf water content. At the local scale, 88 % of the variance could be explained, with a significant contribution of host phenology. The variances explained by models describing other local variables - such as herbivore abundance, number of specialist species, proportions of ectophagous/endophagous species and leaf palatability - were generally lower, with, sometimes, a significant contribution of sampling effort. Although confirmation will be needed from more extensive studies, particularly encompassing plants growing in other habitats, we suggest that the influence of variables such as leaf water and host phenology may have been underestimated as predictors of herbivore species richness.

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INTRODUCTION

Since the seminal paper of SOUTHWOOD (1961) about the number of insect species associated with various British trees, there has been growing interest in the host-related determinants of insect species richness on particular plant species. These determinants include the abundance of the host and its distribution; its age of establishment; the number of habitats within which it grows; its taxonomic relatedness and isolation; its architecture and biomass; its leaf size and shape; and whether it is deciduous or evergreen (SOUTHWOOD, 1961; LAWTON and SCHRÖDER, 1977; LAWTON and PRICE, 1979; STRONG and LEVIN, 1979; BIRKS, 1980; CLARIDGE and WILSON, 1981, 1982; NEUVONEN and NIEMELÄ, 1981; RIGBY and LAWTON, 1981; FOWLER and LAWTON, 1982; KARBAN and RICKLEFS, 1984; KENNEDY and SOUTHWOOD, 1984; CORNELL, 1985; LEATHER, 1986; CORNELL and KAHN, 1989; JONES and LAWTON, 1991).

Most authors examined the whole herbivore community associated with particular plants, but some studies concerned restricted herbivore groups and/or restricted host taxa (above references). However, few studies attempted to predict the guild structure of herbivore communities (as represented by the number of species of chewers, sap-suckers, leaf miners and gall formers) from host-related variables, with the notable exception of CORNELL and KAHN (1989) analyzing data for British trees (KENNEDY and SOUTHWOOD, 1984). Among other things, these authors concluded that models centered on the specialist/generalist dichotomy may prove to be more satisfactory in explaining the organization of herbivore communities than models derived from the relative importance of guild categories. CORNELL (1989) also advised paying attention to the ratio between ectophages (i.e., chewers) and endophages (i.e., other guilds) on plant species. To date, there is no published attempt to examine the number of specialist species, or their relative proportion, within a particular plant community.

Usually, information about herbivore loads on particular host plants is compiled from published insect faunas. This practice provides reliable material for insect species richness analyses (e.g., NIEMELÄ and NEUVONEN, 1983; LEATHER, 1990) but presents several impediments to estimating the proportion of specialist and generalist species feeding on a particular plant using the entomocentric information provided by such literature. First, hosts for polyphagous species may not be extensively listed, hosts may be identified by their generic names only or by general quotations (such as "on herbaceous plants" or "on various trees and shrubs", etc.), and the quality of information is generally poorer for herbaceous plants than for trees (LEATHER, 1986). Second, in these faunas the apparent sampling effort (which is confounded with plant citation) is not identical among hosts: often sampling/mention of hosts of economic importance and/or of extended distribution is prevalent (see NIEMELÄ and NEUVONEN, 1983). Some correction for the sampling intensity is needed (e.g., KARBAN and RICKLEFS, 1983) but this is less important if species-area effects are to be demonstrated (REY *et al.*, 1981). However, sampling effort may be crucial when investigating the relative proportion of specialist species, because increasing sampling effort is likely to append a high number of generalist species to a particular host (i.e., if sampling is unlimited, all highly-generalist species present locally may eventually be collected on a certain plant).

Most studies of host-related determinants in herbivore species richness used multiple regression for statistical analysis. Three points are worth noting regarding the models generated by such analyses. First, certain attributes of foliage, which may influence herbivores feeding on leaves, may not explain much of the variance of insects associated with the wood, reproductive organs and roots of the host. Care must be taken to exclude those from the analyses if particular attention is given to the predictive value of

independent variables related to host-foilage characteristics. Second, it is well documented that both species richness (e.g., CORNELL, 1985) and insect host-range (e.g., FOX and MORROW, 1981) differ when measured at local and regional scales. Therefore, as far as possible, it may be important to consider models predicting these two variables at both scales. Thirdly, woody and herbaceous plants are thought to display different sets of chemical defences and/or different apparency to herbivores (e.g., FEENY, 1976). Thus, host-related determinants of herbivore species richness may also differ between these two categories of hosts (see LEATHER, 1986).

Our study aimed at documenting both the regional and local species richness of insect folivores associated with several host plants, with particular reference to host architecture. We sought to identify the major host-related attributes which appear to contribute significantly to herbivore species richness on these hosts. As far as possible, we tried to control and to reduce differences in sampling effort among host plants. In particular, we asked the following questions: (a) do models explaining insect species richness differ when considered at the regional and local scale?; (b) do patterns of abundance, seasonal distribution, species richness, composition of guilds and host specificity of folivore communities differ according to plant architecture?; (c) what are the best models for the prediction of the above patterns in the light of host-related attributes? We use the term "specialist" in the usual meaning of herbivores feeding upon a single species, genus or family of plants, while "generalist" refer to insects feeding on several plant families (e.g., NEUVONEN and NIEMELÄ, 1981).

MATERIAL AND METHODS

STUDY SITE AND HOST PLANTS

The study site encompassed the upward slopes of the Swiss Jura situated in the Vendôme - Bonmont area: Grande Côte and Petite Côte de Bonmont, Combe de la Mey, Les Deplumeaux (Vaud, Switzerland, approximately 46° 25' N, 6° 09' E). Sampling was restricted to an altitude of 600 - 750 m. The woodlands in this area represent a mosaic of associations including principally Lathyro-Quercetum, Coronillo-Quercetum, Cardamino-Fagetum and Luzulo-Fagetum (HAINARD and TCHÉRÉMISSINOFF, 1973).

The host plants investigated included 10 deciduous woody plants (trees and shrubs) and 10 perennial herbaceous plants (Table 1). Since it was not always possible to identify hosts with certitude in the field, some of them were combined into "aggregates" (Table 1). Hereafter, the host plants and aggregates are designed by their generic names. All hosts were relatively common and widespread within the study area. As far as possible, they were chosen as representatives of different plant families growing in similar ecological situations, inside woods and/or on their margins.

INSECT SAMPLING

Sampling and other field analyses were performed by the senior author from April to October 1990 (11 sampling occasions). Hosts, and, for trees, only accessible branches (< 2 m high), were visually searched at random and during day-time for insect herbivores. Foliage insects, galls and mines were counted and collected: insects associated with wood, flowers, seeds and roots were not considered. As far as possible, insects were reared (when collected as juvenile instars) and identified. Due to difficulties in their identification, thrips

TABLE 1.

Host plants investigated and the number of associated species of insect folivores recorded from the literature and collected during the survey. For aggregates, the first named species indicates the most common host.

Hosts	Plant family	Nospecto	Nospecie
a) Woody hosts			
<i>Salix caprea</i> L. and hybrids	Salicaceae	446	46
<i>Corylus avellana</i> L.	Betulaceae	186	31
<i>Fagus sylvatica</i> L.	Fagaceae	122	38
<i>Quercus petraea</i> Lieblein - <i>Q. robur</i> L. - <i>Q. pubescens</i> Willd. aggr.	Fagaceae	445	48
<i>Crataegus oxyacantha</i> L. - <i>C. monogyna</i> Jacq. aggr.	Rosaceae	180	35
<i>Sorbus aria</i> Crantz and hybrids	Rosaceae	100	31
<i>Acer opalus</i> Miller and hybrids	Aceraceae	83	31
<i>Fraxinus excelsior</i> L.	Oleaceae	80	25
<i>Lonicera xylosteum</i> L.	Caprifoliaceae	88	20
<i>Viburnum lantana</i> L.	Caprifoliaceae	35	18
b) Herbaceous hosts			
<i>Arum maculatum</i> L.	Araceae	4	3
<i>Paris quadrifolia</i> L.	Liliaceae	5	3
<i>Dentaria heptaphylla</i> Villars	Cruciferae	27	13
<i>Lathyrus vernus</i> Bernh.	Leguminosae	53	8
<i>Euphorbia amygdaloides</i> L.	Euphorbiaceae	41	5
<i>Mercurialis perennis</i> L.	Euphorbiaceae	7	6
<i>Orthilia secunda</i> L.	Pyrolaceae	5	3
<i>Melittis melisophyllum</i> L.	Labiatae	8	8
<i>Galium odoratum</i> (L.) Scop.	Rubiaceae	17	5
<i>Solidago virgaurea</i> L.	Compositae	45	7

and imagines of aleyrodids were counted only. Sample time and number of sampling occasions were identical for each host. However, the foliar area sampled varied among hosts: one sampling occasion consisted of > 20 samples (one different plant each) for herbaceous hosts and 10 samples (one different branch or branchlet of 30 - 50 leaves) for woody hosts. In each sample, the number of young and mature leaves/leaflets were counted. For each host and sampling occasion the mean leaf area (measurements of five leaves, totals of lower and upper sides) was determined with a transparent grid. This enabled an estimation of the leaf area sampled in each sample. Herbivore abundances were corrected by total leaf area sampled and expressed as number of individuals per 500 cm² of leaf area (i.e., the sample size closest to the average sample size for all hosts). This allowed us to compare herbivore abundance between host plants and to compute an index of herbivore abundance averaged from all sampling occasions (variable Index, see below).

EVALUATION OF INSECT HOST-SPECIFICITY

Insect host-specificity was derived from the relevant literature (see next section) and, in cases of difficult identification, deduced from field observations. In addition, chewers

were tested for feeding on the 20 hosts. Two or more individuals, kept within glass vials with 100 % R.H., were presented with fresh leaves (young or mature) of study hosts for 24 h. Feeding was scored as follows: 0 (no feeding), 1 (attempting to feed), 10 (small consumption of foliage) and 100 (extensive consumption of foliage). A logarithmic scale was chosen to emphasize regular and extensive feeding. Prior to testing, insects were fed with leaves from their presumed host and allowed to reach late instars in order to avoid inclusion in the analyses of "incidentals" (insects which rest on the foliage and do not feed; variable Incid, see below), and poor correspondence between oviposition and performance which may occur in some instances (e.g., THOMPSON, 1988). Because host-specificity indicated by these feeding tests refers to laboratory conditions, it was preferred, when available, to use the information found in the literature, which is usually relevant to field conditions. Because of problems with identification of aphids, the species of this group could not be assigned to either specialists or generalists according to the literature. Since most aphids are specialists (BÖRNER, 1952), all species collected were assigned to this category.

VARIABLES RETAINED FOR STATISTICAL ANALYSES

We inferred the regional species richness of herbivores from the literature and the local species richness from our field sampling. The data were analyzed with forward step-wise multiple regression analyses. The following dependent variables were considered. First, an estimate of the number of insect folivores associated with the 20 hosts at the regional scale was obtained by scanning the following insect faunas from Central Europe (in a few cases Northern Europe) and their host plant records (variable Nospecto): Heteroptera (STICHEL, 1955-1962); Auchenorrhyncha (OSSIANNILSSON, 1978-1983); Sternorrhyncha (BÖRNER, 1952; VONDRAČEK, 1957; ZAHRADNIK, 1963; KOSZTARAB and KOZAR, 1988); Coleoptera (FREUDE *et al.*, 1966-1983); Symphyta (Lorenz and Kraus, 1957); "Microlepidoptera" (SWATSCHEK, 1958; HANNEMANN, 1977; PALM, 1989; HERING, 1932); "Macrolepidoptera" (BECK, 1960; FORSTER and WOHLFAHRT, 1955, 1960, 1981); leaf miners (HERING, 1957); and gall formers (BUHR, 1964-1965). This literature also provided estimates of the regional richness in chewers, sap-suckers, leaf miners and gall formers for each plant species (variables Chwto, Saptto, Mineto, Gallto). Since we did not identify thrips, they were disregarded to ensure valid comparisons between regional and local scales. When generic host-records were available only, they were assumed to apply to the plant species considered.

An estimate of the local species richness of all insect folivores (and of particular insect guilds) within the study site was provided by the number of species recorded on each host during all sampling occasions (variables Nospecie (Table 1), Chw, Sap, Mines and Galls). Other dependent variables included Index and Incid, already defined, the local number of specialist species (Speciali), the local percentage-ratio of specialist species (Ratiospe, %), of ectophagous and endophagous species (Ratioect and Ratioend, %), and the mean scores for each host in feeding experiments for young leaves, mature leaves and all leaves combined (Scoyoung, Scomatu and Scotot, units = relative scores). Since feeding tests involving insects and plants from which they were collected were excluded from the analysis, these scores represented a measure of plant palatability relatively independent of the number of chewers collected from the host.

The independent variables used in the analyses are defined in Table 2, and some only, due to space limitations, are detailed further in Appendix 1. Water content and specific weight of young and mature leaves were determined by oven-drying at 100 °C [20

discs punched from each host, collected on the same day, at noon, in late May (young leaves) and early August (mature leaves)]. Despite the difficulty of characterising host biochemistry, we attempted to use two different variables related to host chemical defences. First, an index of the diversification of plant chemical defences was provided by the variable *Chemic*, which represented the number of broad categories of chemical compounds present in the host and known to be active against herbivores. The choice of the chemical categories followed ROSENTHAL and JANZEN (1979) and included: toxic non-protein amino-acids, cyanogenic compounds, alkaloids, glucosinolates, terpenoids, saponins, flavonoid pigments, tannins, other phenols, coumarins, cardenolides, phytoecdysones and accumulation of silica. This information was abstracted from HEGNAUER (1962-1989), GIBBS (1974) and RAFFAUF (1970). Second, an estimation of the isolation of host chemical defences was provided by the variable *Disschem*, which was the similarity measure (euclidean distance) with an average and hypothetical host possessing the most common categories of chemical defences (i.e., the categories found in more than 10 of the 20 study plants). In July 1990, the abundance of the 20 host-species was recorded in 50 plots of 10 x 10 m within the study site. These plots were representative of locations sampled and provided estimations of the local abundance of hosts (*Locabund*), their local distribution (*Locadist*) and aggregation (*Aggrega*). The variable *Compac* represented a measure of the compactness of host foliage. For herbaceous hosts, this was defined as the leaf area of the whole plant and for woody hosts as the total leaf area supported by 50 cm of branch.

Both dependent and independent variables were $\log(x+1)$ transformed (natural base) in order to satisfy the assumption of normality. In most cases, transformation of data improved the fit to the models. The step-wise multiple regressions were computed with α -to-enter/remove = 0.150 (BENDEL and ALFIFI, 1977) and are presented with their adjusted coefficient of determination. Variables with a tolerance value < 0.2 were deleted from the model, to avoid multicollinearity problems. More conservative models were also computed, with the regression being halted after the last variable with a significant ($p < 0.05$) parameter entered the model.

RESULTS

COMPOSITION OF HERBIVORE FAUNAS

The estimation of regional species richness of insect folivores as recorded in the literature from Central Europe was highly correlated with the estimation of local species richness provided by the field survey (Table 1; $r = 0.85$, $p < 0.001$). Regional and local species richness also correlated with the total number of arthropod herbivores (insects and mites) recorded from corresponding British tree genera studied by KENNEDY and SOUTHWOOD (1984) ($r = 0.98$, $p < 0.001$ and $r = 0.91$, $p < 0.01$, respectively). The species richness of chewers, sap-suckers, leaf miners and gall formers was similarly well correlated between local and regional scales ($r = 0.75$, 0.88 , 0.78 and 0.76 , respectively, $p < 0.001$ in all cases). Although these general correlations appear to be good, Table 1 suggests that assessments of local herbivore richness may have been underestimated by the field survey on the following plants: *Salix*, *Quercus*, *Lathyrus*, *Euphorbia* and *Solidago*. In particular, few Chrysomelidae and Symphyta were collected from *Quercus* and *Salix*; no leaf miners from *Lathyrus*; few leaf miners and Chrysomelidae from *Euphorbia*; and no Lepidoptera from *Solidago*. It may also be of interest to note that, with

TABLE 2.

Independent variables determined for each host and used in multiple regression analyses. Variables indicated with '*' were determined empirically.

Coding variable	Description
Lwc *, Lwcy *	leaf water content of young and mature leaves [% DW]
Slw *, Slwy *	specific leaf weight of young and mature leaves [g-4 x cm-2]
Chemic	number of broad categories of chemical defences (see text)
Disschem	dissimilarity of chemical defences with an average and hypothetical host (see text)
Congensp	taxonomic relatedness: no. of congeneric species in AESCHIMANN and BURDET (1989)
Confamsp	taxonomic isolation: no. of confamilial species in AESCHIMANN and BURDET (1989)
Locasp *	no. of congeneric species present within the study site (1)
Abund	abundance of woody hosts in Switzerland (Anon., 1988) [1000 m ³]
Locabund *	local abundance (total no. individual censused, see text)
Aggrega *	local aggregation (coefficient of variation for local abundance, see text)
Distger	distribution in West Germany (no. of 10 x 10 km squares in HAEUPLER <i>et al.</i> , 1988)
Distsw	distribution in Switzerland (no. sampling sectors in WELTEN and RUBEN SUTTER, 1982)
Distsg	distribution in West Germany and Switzerland (Distger + Distsw) (2)
Locadist *	local distribution (no. plots in which the host was present, see text)
Height	maximum height in AESCHIMANN and BURDET (1989) [cm]
Leafar *	leaf area of a single leaf/leaflet [cm ²]
Shape	leaf shape: 1 = entire; 2 = dented; 3 = lobed; 4 = dented-lobed
Width *	ratio max. width to max. length of leaf/leaflet
Compac *	foliage compactness (leaf area within 50 cm of branch, see text) [cm ²]
Pheno *	no. of days during which young leaves (leaves pale green and of tender texture) were observed within the study site in 1990
Hairs *	no. of hairs per cm ² of area (leaf underside)
Habitats	no. of habitats occupied by the host in AESCHIMANN and BURDET (1989)
Areatot *	total sum of leaf area sampled [m ²]

(1) Determined on the basis of field notes and on the distribution atlas of WELTEN and RUBEN SUTTER (1982)

(2) Swiss sampling sectors represented in average 100 km².

the exception of *Solidago*, these plants are represented by many congeneric species which are often mentioned by their generic names in published insect faunas. At both the regional and local scales, woody plants sustained significantly more herbivore species than herbaceous plants ($t = 5.61$, $p < 0.001$ and $t = 7.96$, $p < 0.001$, respectively). The proportion of incidental insects collected was lowest in *Arum*, *Crataegus*, *Euphorbia* and *Solidago* (between 0 and 0.7 % of the total number of individuals censused, Table 3) and highest in *Paris*, *Orthilia*, *Mercurialis* and *Melittis* (between 8.7 and 48.0 %). In total, 2.2 % of insects collected from study hosts were considered to be incidentals.

The distribution of species within the different guilds, as recorded during the field survey, is indicated for each host in Fig. 1. At the regional scale, corresponding data were tested by contingency table analysis for non-uniformity. This showed that the distribution of species was significantly non-uniform among woody hosts (G-test, $G = 121.0$, $p < 0.001$), as already noted by CORNELL and KAHN (1989) for British trees, and also among

TABLE 3.

Local dependent variables recorded from host plants: index of herbivore abundance, number and percentage of specialist species, number of incidental insects collected, total number of individuals censused and mean scores obtained in feeding experiments (young and mature leaves, all leaves combined and number of insect species tested).

Host	Index	(s.e.)	Speciali (Ratiospe)	Incid	Censused	Scoyoung	Scomatu	Scotot	n
<i>Salix</i>	1.94	(0.56)	33 (71.7)	14	405	35.3	36.1	35.6	49
<i>Corylus</i>	0.99	(0.17)	14 (45.2)	19	343	19.6	25.6	22.8	47
<i>Fagus</i>	2.26	(0.42)	18 (47.4)	19	793	45.2	36.8	42.1	68
<i>Quercus</i>	3.44	(0.41)	30 (62.5)	24	1046	36.8	22.1	29.3	57
<i>Crataegus</i>	3.88	(0.66)	24 (68.6)	1	343	31.0	18.5	26.1	51
<i>Sorbus</i>	1.87	(0.25)	15 (48.4)	9	643	24.3	20.6	22.6	47
<i>Acer</i>	2.68	(0.42)	17 (54.8)	15	1445	37.1	28.0	33.3	70
<i>Fraxinus</i>	0.95	(0.14)	12 (48.0)	6	342	30.4	8.6	20.5	62
<i>Lonicera</i>	1.54	(0.35)	17 (85.0)	11	183	12.9	14.1	13.5	53
<i>Viburnum</i>	1.72	(0.45)	12 (66.7)	18	687	10.5	15.7	13.5	52
<i>Arum</i>	0.59	(0.17)	0 (0)	0	17	0.2	0	0.1	35
<i>Paris</i>	0.44	(0.10)	3 (100.0)	2	23	0.2	8.0	3.2	36
<i>Dentaria</i>	1.33	(0.32)	9 (69.2)	15	174	0.6	10.1	4.1	41
<i>Lathyrus</i>	0.91	(0.22)	2 (25.0)	2	30	23.9	12.2	18.3	40
<i>Euphorbia</i>	13.89	(2.81)	4 (75.0)	2	469	5.9	13.5	8.9	43
<i>Mercurialis</i>	0.29	(0.07)	4 (66.7)	4	23	15.1	6.2	11.7	47
<i>Orthilia</i>	0.47	(0.16)	1 (33.3)	1	9	1.5	6.9	4.3	31
<i>Melittis</i>	0.34	(0.07)	2 (25.0)	12	25	0.7	1.8	1.0	33
<i>Galium</i>	1.17	(0.39)	2 (40.0)	1	27	0.5	0.1	0.4	37
<i>Solidago</i>	7.34	(0.87)	6 (85.7)	6	855	0.1	15.7	6.9	32

herbaceous hosts ($G = 49.2$, $p < 0.01$). The same type of distribution was also tested for non-uniformity between an average woody host and an average herbaceous host (sum of all species per guild in each host category). This revealed a significant influence of host architecture on the distribution of species within guilds ($G = 34.4$, $p < 0.001$): the proportion of leaf mining species was high in herbaceous plants, while that of chewers was high on woody hosts. Similar analyses were difficult to perform with local data because the frequencies were too low in many cells. However, comparison of average woody and herbaceous hosts showed no significant effect of host architecture at the local scale ($G = 5.8$, $p = 0.122$).

At the regional scale, the distribution of species within ectophagous and endophagous types was non-uniform among woody and herbaceous hosts ($G = 46.0$, $p < 0.001$ and $G = 19.8$, $p < 0.05$, respectively), and non-uniform between the average woody and herbaceous hosts ($G = 4.5$, $p < 0.05$). The latter sustained a high proportion of endophages. At the local scale the trends were different: the distribution was uniform among woody plants ($G = 8.2$, $p = 0.516$), non-uniform among herbaceous plants ($G = 33.3$, $p < 0.001$), and uniform between host categories ($G = 0.1$, $p = 0.722$).

HERBIVORE ABUNDANCE, HOST UTILIZATION AND INSECT HOST-SPECIFICITY

Mean abundances of insect folivores, as determined during the whole interval of the field survey, are presented in Table 3. They did not differ significantly between woody and herbaceous hosts ($t = 0.38$, $p = 0.708$), but the most extreme values were recorded on

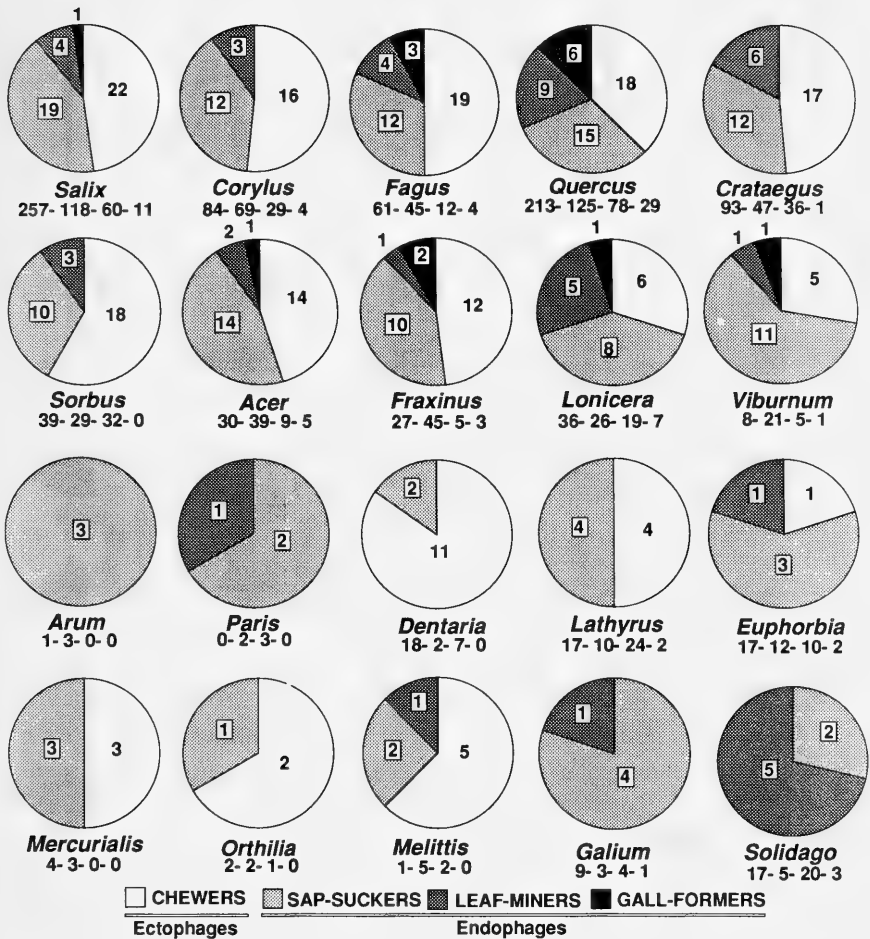


FIG. 1.

Distribution of the number of species per guild, as recorded for each host during the field survey. Regional data are indicated below each host.

the latter (highest values: *Euphorbia* and *Solidago*; lowest values: *Mercurialis* and *Melittis*). Seasonal abundance of herbivores was significantly non-uniform among woody plants and among herbaceous plants (unpubl. data; $G = 1659.7$ and $G = 3090.2$, respectively, $p < 0.001$). Seasonal distribution was also non-uniform between average woody and herbaceous hosts ($G = 1172.7$, $p < 0.001$): herbivore abundance was high in late April - early May on the former, decreased in mid-July and rose again by mid-October, whereas on the latter, it increased until the end of June, fell sharply by early July and increased again later, but not as markedly as previously.

The number of species collected on young foliage, mature foliage and on both foliage types is indicated in Fig. 2. This provided only a rough idea of host utilization (i.e., the use

of young and mature foliage), because sampling effort differed between foliage types (on average 4 out of 11 sampling occasions were concerned with young foliage), and collection of an herbivore on a particular type of foliage does not imply that it can use it successfully. Contingency tests showed that "host utilization" was uniform among woody and herbaceous hosts ($G = 9.8$, $p = 0.365$ and $G = 5.8$, $p = 0.759$, respectively), and also between average woody and herbaceous hosts ($G = 0.03$, $p = 0.865$). A different assessment of host utilization by insect chewers was given by the scores obtained during feeding experiments (Table 3). In some instances, young foliage was apparently more palatable than mature foliage (*Fagus*, *Quercus*, *Crataegus*, *Sorbus*, *Acer*, *Fraxinus*, *Lathyrus* and *Mercurialis*), in other cases the opposite applied (*Corylus*, *Lonicera*, *Viburnum*, *Paris*, *Dentaria*, *Euphorbia*, *Orthilia* and *Solidago*), and there was no clear trend in others (*Salix*, *Arum*, *Galium* and *Melittis*). Paired t-tests indicated that palatability was not significantly different between young and mature foliage within woody ($t = 1.97$, $p = 0.08$) and herbaceous hosts ($t = 0.97$, $p = 0.356$). However, the palatability of both foliage types was much higher in woody than in herbaceous hosts ($t = 5.79$, $p < 0.001$).

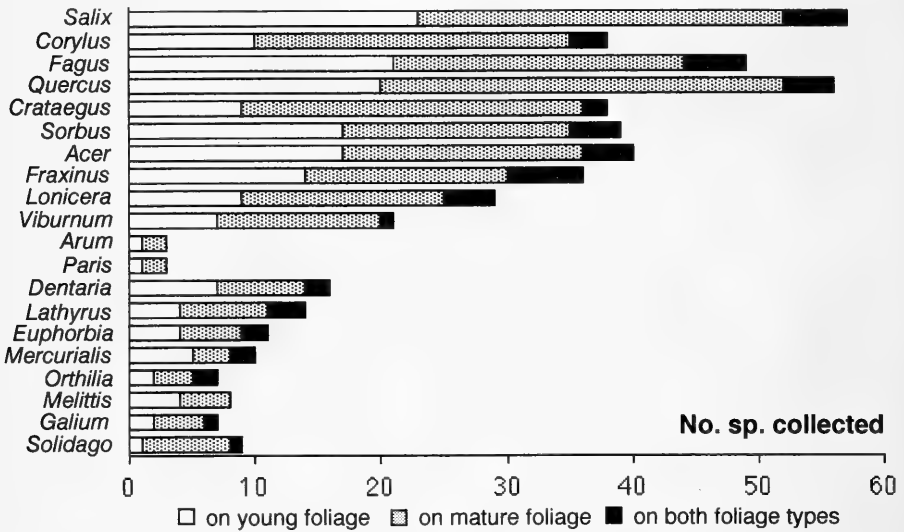


FIG. 2.

Number of species collected on different types of foliage during the field survey.

The number of specialist species (and their percentage of the total number of species) collected on each plant is indicated in Table 3. The highest specialist ratios were found on *Paris*, *Solidago*, *Lonicera*, *Euphorbia*, while the lowest occurred on *Arum*, *Lathyrus* and *Melittis*. Overall, these ratios were not significantly different between woody and herbaceous hosts ($t = 0.72$, $p = 0.486$), and, on average, amounted to $55.9 \pm 5.38\%$ (s.e.) when all hosts were considered. Similarly, contingency table analysis did not reveal any influence of plant architecture on the distribution of species within specialist and generalist types ($G = 0.6$, $p = 0.439$). The scores for chewer species tested in feeding experiments are summarized in Fig. 3. Few species accepted more than 5 hosts as suitable for feeding. Both this data set and the former indicate that most of the insects collected were specialists.

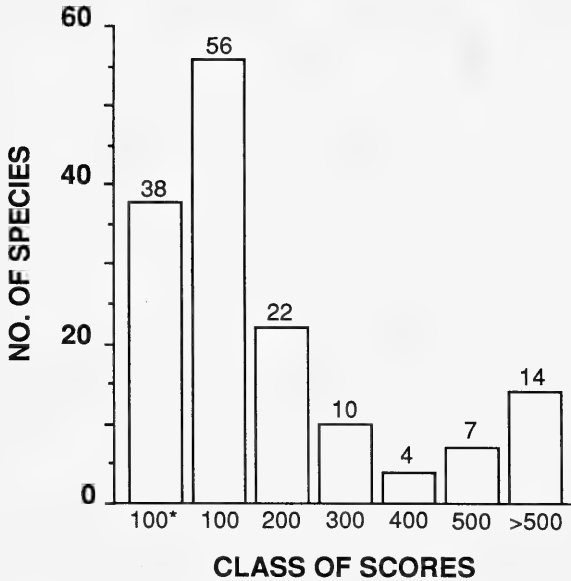


FIG. 3.

Scores of feeding experiments for chewing species. The first class of score (100*) refers to the number of species which could only be tested once, on the host from which they were collected.

MULTIPLE REGRESSION ANALYSES

A correlation matrix for selected dependent variables is presented in Table 4. A weak positive correlation existed between the overall abundance of herbivores and the palatability of mature leaves. This suggested that this last factor was important for large build-ups of herbivore populations during the growing season. The proportion of specialists was not correlated significantly with herbivore abundance. The species richness and the proportions of specialists and ectophages were positively correlated with the palatability of leaves, particularly that of young leaves.

The results of multiple regressions analyses are detailed in Table 5, with particular reference to the composition of herbivore communities at the regional and local scales. For the former, 85 % of the variance was explained by the height of the host, its taxonomic relatedness, water content of young leaves, and, to a lesser extent, by its taxonomic isolation. At the local scale, 88 % of the variance could be explained, with height and host phenology entering first and second in the regression. In general, the predictors of models for regional and local data were different. The local species richness of chewers could only be significantly accounted for by the total leaf area sampled, a measure of the sampling effort, and water content of young leaves.

Table 6 summarizes the multiple regressions with particular reference to plant architecture. The predictors were also quite different between host categories. For woody hosts, 58 % of the variance could be accounted for by the number of habitats in which the host grows and its height (regional data). In contrast, 69 % of the variance was explained in herbaceous plants by leaf width. The number of insect specialists collected on these hosts depended also upon leaf width.

TABLE 4.
Lower correlation matrix (Pearson coefficient) for selected dependent variables.

	Index	Ratiospe	Scoyoung	Scomatu	Ratioect
Ratiospe	0.35	—	—	—	—
Scoyoung	0.18	0.29	—	—	—
Scomatu	0.45 *	0.63 **	0.70 ***	—	—
Ratioect	-0.06	0.29	0.66 **	0.54 *	—
Ratioend	0.26	-0.15	-0.16	-0.25	-0.78 ***
Nospecie	0.25	0.35	0.82 ***	0.72 ***	0.57 **
Nospecto	0.49 *	0.40	0.77 ***	0.75 ***	0.42

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 5.

Summary statistics of stepwise multiple regression analyses performed on the 20 hosts, with particular reference to the composition of herbivore communities at the regional and local scales. The order of the variables in the final equation follows the step in which they entered the regression. Data in brackets indicates the R^2 of the conservative model (see text), and the corresponding number of variables which entered the regression (same order, starting from the left).

Dep. var.	Regression equation	R^2	F-test	(R^2 , n)
(a) Regional data				
Nospecto	11.79 + 0.60 Height*** + 0.49 Congensp** - 2.95 Lwcy* + 0.20 Confamsp	0.85	28.9***	(0.83, 3)
Chwto	6.60 + 0.48 Height*** + 1.96 Pheno*** - 3.78 Width** - 3.22 Lwc	0.83	24.1***	(0.80, 3)
Sapto	14.09** + 0.53 Height*** - 3.40 Lwcy** + 0.25 Congensp*	0.90	56.3***	—
Mineto	13.05 - 3.56 Lwc* + 0.92 Habitats + 0.37 Congensp* + 0.34 Confamsp* + 0.29 Height*	0.76	13.1***	(0.60, 2)
Gallto	-0.10 + 0.28 Height** + 0.37 Congensp* - 3.23 Disschem	0.60	10.4***	(0.53, 2)
(b) Local data				
Nospecie	-2.98** + 0.40 Height*** + 0.78 Pheno**	0.88	72.2***	—
Chw	11.06 + 0.50 Areatot** - 3.53 Lwcy**	0.72	25.6***	—
Sap	-5.05*** + 0.31 Height*** + 0.88 Pheno*** + 0.72 Chemic**	0.93	80.5***	—
Mines	13.94*** - 3.34 Lwc*** + 1.11 Habitats**	0.69	22.6***	—
Galls	0.03 + 0.18 Height** - 2.04 Disschem*	0.64	17.6***	—

Significance of parameter estimates: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7 details the models relevant to local independent variables. Herbivore abundance was related principally to the number of habitats in which the host grows, its distribution in Switzerland and its local aggregation. The number of specialist species was dependent upon the height and the phenology of the host. The proportions of specialists, ectophages and endophages could not be adequately explained by our variables. The palatability of the different types of foliage depended on several predictors, among which were more particularly sampling effort and leaf water. Not surprisingly, sampling effort was the most significant predictor explaining the number of incidental insects collected, but there were also weak contributions from host aggregation, chemical defences and pubescence.

TABLE 6.

Summary statistics of stepwise multiple regression analyses performed with particular reference to host architecture. Presentation follows Table 5.

Dep. var.	Regression equation	R ²	F-test	(R ² , n)
(a) Woody plants				
Nospecto	-0.84 + 2.22 Habitats* + 0.50 Height*	0.58	7.3*	—
Nospecie	15.21** - 2.87 Lwc**	0.56	12.4**	—
Speciali	Not significant	—	—	—
(b) Herbaceous plants				
Nospecto	4.74*** - 5.76 Width**	0.69	20.8**	—
Nospecie	0.23 + 0.20 Confamsp* -0.22 Distsg* + 0.54 Pheno	0.75	9.8**	(0.67, 2)
Speciali	2.54*** - 3.57 Width*	0.53	11.0*	—

TABLE 7.

Summary statistics of stepwise multiple regression analyses performed for local dependent variables. Presentation follows Table 5.

Dep. var.	Regression equation	R ²	F-test	(R ² , n)
Index	5.57** + 1.68 Habitats*** - 0.62 Distsw** - 0.42 Aggrega* - 0.18 Leafar	0.56	7.0**	(0.51, 3)
Speciali	-5.43** + 0.38 Height*** + 1.22 Pheno**	0.79	36.1***	—
Ratiospe	Not significant	—	—	—
Ratioect	34.17** - 7.24 Lwcy*	0.25	7.5*	—
Ratioend	Not significant	—	—	—
Scoyoung	13.46 + 0.50 Height*** - 3.98 Lwcy* + 1.73 Chemic	0.70	15.7***	(0.66, 2)
Scomatu	17.50* + 0.35 Areatot* -3.73 Lwcy* - 1.62 Chemic*	0.66	13.5***	—
Scotot	9.35 - 3.46 Lwc** + 0.38 Areatot* + 0.74 Pheno	0.74	18.9***	(0.71, 2)
Incid	1.40 + 0.48 Areatot*** - 0.44 Aggrega - 1.49 Chemic* + 0.11 Hairs	0.76	15.7***	(0.66, 1)

DISCUSSION

SAMPLING PROCEDURE

The limitations of our study are straightforward. Local estimates of species richness rely on data obtained during only a 7-month field survey. The number of sibling species may have been underestimated in the field, but there is no reason to believe that this factor was biased towards particular host plants. Sampling bias appeared identical among hosts, but insects associated with trees were collected from low branches only (sampling effort as measured by the total leaf area sampled is a different problem which is addressed below). The insect data are valid for common species, easy to discover on the foliage during day-time. Some herbivores may spend most of their time hidden in the leaf litter, and may feed on their hosts during short periods only. Those species, along with nocturnal and highly active ones, are likely to have been underestimated by the field survey. Increasing the

number of sampling occasions might also have increased the contrast in species richness between particular hosts. Furthermore, our data set is relevant only to part of a particular plant community, namely plants growing in woodlands of the collinean level. Inclusion of other plant species, particularly those growing in different habitats, might have altered the patterns described.

REGIONAL AND LOCAL PATTERNS OF SPECIES RICHNESS

The general correlation between estimates of species richness at the regional and local scales was good. In particular, estimates of local species richness were close to those of regional richness for plants which, presumably, are infrequently surveyed by entomologists and/or cited in insect faunas (e.g., *Melittis*, *Mercurialis*, *Arum*). However, the predictive models for herbivore species richness at the regional and local scales differed greatly in terms of the relative contribution of the significant variables. Some ecological factors - such as local aggregation and phenology of the host - may act as significant selective agents, influencing locally the commonness and rarity of certain species. However, their influence may be cancelled out at the regional scale, i.e., when host attributes are examined over a larger number of ecological situations and habitats. CORNELL (1985) pointed out that if local interactions are strong, then correlation between species richness at the regional and local scales should be weak. However, the regional data of our study do not formally represent regional data *sensu* CORNELL (1985), since both distributional and insect data did not relate to the entire geographical range of host plants, because of the lack of suitable data (see below).

INFLUENCE OF PLANT ARCHITECTURE ON OBSERVED PATTERNS

The slight increase in herbivore density observed on most woody hosts in mid-October corresponded probably to searching for hibernation sites and, thus, appeared to be directly related to plant architecture. Herbaceous plants sustained a higher proportion of leaf mining species, and, more generally, of endophages, than did woody hosts. However, these trends were more marked for regional data than for local data. Concealment of species in herbaceous plants is likely to be related to several factors. Amongst others, avoidance of predators and parasitoids and/or weather effects may be crucial when the architecture of the host is relatively simple. At the local scale, herbivore abundance and proportion of specialists were not significantly different between the two host categories. Although the last observation was unexpected, the variance in the proportion of specialists was much higher in the case of herbaceous than woody hosts. This suggests that biochemical conditions for herbivores are more varied in the former than in the latter. Indeed, out of the 14 species which could be considered as highly generalist (feeding score > 500), only one was collected from herbaceous plants. Different authors have emphasized that non-apparent plants, such as herbs, may have evolved towards chemical diversification (e.g., FUTUYMA, 1976; SCRIBER and FEENY, 1979). At both regional and local scales, herbivore species richness was differently explained on woody and herbaceous hosts but there was no obvious contribution of plant biochemistry (however, see discussion of this variable below).

HOST-RELATED VARIABLES AND THEIR PREDICTIVE VALUES

The effects of certain variables, which were determined locally, such as water content of young and mature leaves and host phenology, were significant at the regional scale.

However, it remains to be seen if their predictive value is really significant when intraspecific differences are accounted for, when average values are determined over most of the area of distribution of hosts, and when host plants growing in different habitats are included in the analyses.

Sampling effort, as represented by the total leaf area sampled per host, had a significant effect in the models describing the local species richness of chewers, the number of incidental insects collected and the palatability of mature leaves. That effect was primarily due to sampling of much smaller foliage areas for herbaceous hosts than for woody hosts (Appendix 1), a deliberate procedure to maximise time investment during sampling. After removing the effect of sampling, in testing residuals as dependent variable, leaf water and leaf area only had a significant effect on the local species richness of chewers, but the variance explained was low ($R^2 = 0.30$). These conclusions differ slightly from those of KARBAN and RICKLEFS (1984) who found that, after removing the effect of sampling effort, Lepidoptera species richness could not be explained significantly by chemical traits (including leaf water) of the foliage of 33 deciduous tree species in Ontario.

The height and the leaf water of the host were important predictors in the various models tested. They may reflect differences in plant architecture, but also seem to possess intrinsic predictive power. This was demonstrated by introducing a dummy variable accounting for plant architecture: this variable did not enter in the regressions describing species richness at the regional scale, and when it entered in other models, it did not totally cancel the effect of height and leaf water. No satisfactory estimation of total leaf area for woody hosts, which would probably have been highly correlated with height, could be introduced in the models. Total leaf area did not significantly affect herbivore species richness on herbaceous plants. Since leaf water is usually correlated with leaf nitrogen and limits its assimilation, this factor is important in the nutrition of insect herbivores (MATTSON and SCRIBER, 1987). However, leaf water was negatively correlated with species richness. This may be related to the observation that leaf water content often reflects different strategies of plant chemical defences, such as the distribution of carbon- and nitrogen-based secondary compounds (MATTSON and SCRIBER, 1987). Alternatively, plants with low water content may grow in sunny or xeric conditions, which, in turn, may be more suitable for sylvestral herbivores exploiting cool and shady habitats, such as reported here. Since leaf water is likely to vary through seasonal and daily cycles (SCRIBER, 1977), the analyses presented here, which are based on discrete leaf water measurements, should be confirmed by more extensive studies.

NIEMELÄ and HAUKIOJA (1982) presented evidence that the extent of the shoot-growth period in deciduous trees affects the seasonal distribution of Macrolepidoptera species richness. Furthermore, RAUPP *et al.* (1988) showed that the distribution of some generalist Lepidoptera is strongly influenced by phenological differences in host suitability. In our study, an estimation of the number of days during which young leaves were available at the study site proved useful for predicting the regional species richness of chewers, the local species richness of folivores in general, of sap-suckers and of specialists. Young leaves were still available on certain tree species after most of the foliage had matured (particularly on *Salix*), or secondary shoot-growth occurred during summer. These "islands" of young foliage often sustained high grazing damage, as reported in NIEMELÄ and HAUKIOJA (1982), and might have increased herbivore species richness locally. These observations remain to be tested at the regional scale. They are unlikely to be general and will probably depend on the particular host plants included in the analyses, since the palatability of young leaves was not always higher than that of mature leaves.

Taxonomic relatedness and isolation, as represented by the variables Congensp and Confamsp, contributed significantly to several models at the regional scale. These observations concur with other studies (see introduction). Since Congensp and Congenfam accounted for additional and different proportions of the variance in the models, with the former variable being often more significant, this suggests that their effects may be more important respectively for monophagous and oligophagous insects. The "local" taxonomic isolation of the host appeared less important and, in contrast with other studies (e.g., KENNEDY and SOUTHWOOD, 1984), the number of plant species recorded within the plant order of the host explained less variance than the previous variables.

Many authors studying models of herbivore species richness on their hosts considered that at least some of the variance left unexplained could be attributed to the chemical defences of the host (e.g., CLARIDGE and WILSON, 1982; JONES and LAWTON, 1991). In our study, this factor influenced marginally some of the models tested, but this need not imply that it has little influence on herbivore species richness. Other variables, such as taxonomic relatedness and isolation (CLARIDGE and WILSON, 1982) may better describe the influence of host biochemistry. The number of broad chemical categories accounted for a small proportion of the variance in local species richness of sap-suckers and in the palatability of the foliage. However, it was a very crude index of the diversity of chemical defences, since it did not contain information about the concentration levels and the chemical diversification of secondary compounds within the categories of defences defined. The chemical dissimilarity with an hypothetical host accounted for some variance in the regional species richness and the local number of gall forming species. This variable is as good as the choice of the average host. In this simple analysis, the average host turned to be equivalent to *Quercus* (Appendix 1), and, therefore, it was not surprising that the variable Disschem influenced the model describing the number of gall forming species, which are well-diversified on *Quercus* (e.g., BUHR, 1964-1965).

The regional distribution of host did not contribute to the variance in herbivore species richness at the regional scale. Although species-area relationships account for a significant proportion of the variance (20-90 %) in species richness (references cited in the introduction), recent analyses by CLARIDGE and EVANS (1990) showed that using more accurate distributional data may result in a sharp decrease of the variance explained. Currently, distribution maps of all study hosts are not available for Europe, or for Central Europe. We chose the Swiss and German data as a substitute for regional distribution because they were accurate and concerned adjacent areas. Data covering more extended and adjacent regions of Europe would have probably increased the importance of host regional distribution for herbivore species richness. Another related variable, local host aggregation, was important in some models, whereas local host distribution and abundance were insignificant.

Although most of the hosts analysed included plants growing in woodlands only, the number of habitats occupied by the host was also important in several of our models, as reported in other studies. Inclusion in the analysis of other plants growing in various habitats would have probably increased further the significance of this factor. Lastly, the age of establishment of the host could not be considered in our analyses, since similar data as are available for trees (BIRKS, 1980) were not available for shrubs and herbaceous plants.

PREDICTIVE MODELS FOR INSECT TROPHIC CATEGORIES AND HOST-SPECIFICITY

To date, the information compiled for British trees by KENNEDY and SOUTHWOOD (1984) represents the best regional-scale data of this kind. CORNELL and KAHN (1989) used

this data set to predict insect species richness by trophic categories. They found that between 54 % and 83 % of the variance, depending on insect guild, could be explained by host abundance, taxonomic isolation, age of establishment and "evergreenness". The present study suggests that an additional part of the variance could be accounted for by leaf water-content and host phenology. Inserting leaf water in the model describing species richness of British data (7 tree genera were common to both studies) resulted in an improvement from 38 % of variance explained (only tree abundance significant) to 62 % (tree abundance first, leaf water second).

ZWÖLFER and BRANDL (1989) suggested that the organization of endophytic herbivore communities is more structured than that of ectophytic herbivore communities. Assuming that a highly structured community should also be highly predictable, our data neither support nor refute their hypothesis, as proportions of endophagous and ectophagous species were both difficult to predict. Most information available regarding the proportion of specialist species feeding on particular host plants has been obtained from compilation of insect faunas. For instance values reported by NEUVONEN and NIEMELA (1981), ROWELL-RAHIER (1984) and LEATHER (1985) range from 10 % to 66 %. The high proportions of specialists reported in the present study (average 56 %) result probably from the bias of the sampling procedure towards abundant species, which are more likely to be specialists (see GASTON and LAWTON, 1988). Although the effect of sampling effort was controlled in our study, no model could be satisfactorily fitted to account for the proportion of specialists. This contrasts with the variance explained in herbivore and specialist species richness (88 % and 79 %, respectively) and emphasizes how much is still to be learnt in the field of insect-plant interactions. Despite the significant effects of sampling effort, the number of incidental insects collected appeared to be related to host aggregation and chemical defences. These factors may be important in processes of host colonization by introduced insect species.

In conclusion, this study revealed that some host-related attributes, rarely considered in other studies of a similar kind, may have some predicting power in models describing the organisation of herbivore communities on their host plants. Other host-related attributes which were not considered here, such as the history of interactions between insects and their hosts, and the genetic variability of the host population (MADDOX and ROOT, 1990), may also have significant effects on herbivore communities. Furthermore, this is likely to be true of other variables not directly related to the host, such as the local abundance and foraging efficiency of predators/parasitoids, and the history of speciation within insect taxa. Integration of all of these factors, if possible, should greatly improve our understanding of insect-plant interactions.

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APPENDIX 1.
 Selected independent variables used in multiple regression analyses. Coding variables and units as in Table 2.

Host	Lwc	Lwcy	Height	Chemic	Disschem	Locabund	Aggrega	Distiger	Distsw	Locadist	Congensp	Confamsp	Width	Pheno	Habitats	Areatot
<i>Salix</i>	59.4	66.6	1000	5	0.365	7	424.3	2016	341	3	28	32	0.50	162	4	14.7
<i>Corylus</i>	61.5	67.4	900	4	0.258	23	223.8	2017	320	12	1	10	0.76	102	2	18.7
<i>Fagus</i>	54.5	70.5	3500	4	0.258	425	65.2	2013	289	49	1	6	0.69	104	1	19.8
<i>Quercus</i>	51.5	65.2	4000	5	0	50	221.7	1541	225	13	4	6	0.60	128	2	16.4
<i>Crataegus</i>	54.4	53.7	400	6	0.447	13	239.9	1885	254	9	2	137	0.65	128	2	4.6
<i>Sorbus</i>	54.6	67.5	1500	5	0.365	97	126.6	600	331	32	6	137	0.67	104	2	27.8
<i>Acer</i>	58.3	67	1200	4	0.258	147	156.5	1	48	34	6	6	1.23	130	1	40.0
<i>Fraxinus</i>	65.4	75.9	3500	6	0.447	59	186.2	2039	302	23	2	6	0.40	55	1	17.0
<i>Lonicera</i>	65.2	73.7	200	5	0.365	98	132.3	1313	323	31	8	15	0.61	122	2	3.3
<i>Viburnum</i>	64.3	60.3	250	6	0.258	33	184.5	743	283	14	2	15	0.70	131	2	25.7
<i>Arum</i>	88.9	86.8	50	6	0.447	10	693.0	1165	210	1	2	4	0.80	71	2	1.3
<i>Paris</i>	78.1	81.9	30	5	0.632	58	338.8	1488	302	7	1	67	0.60	62	1	2.3
<i>Dentaria</i>	80.0	79.9	60	3	0.516	243	250.5	10	101	16	5	149	0.27	89	1	9.1
<i>Lathyrus</i>	68.8	76.7	35	6	0.447	175	214.4	722	226	22	18	150	0.35	84	1	3.2
<i>Euphorbia</i>	71.5	66.3	60	6	0.447	184	159.3	244	122	22	20	23	0.29	96	2	2.1
<i>Mercurialis</i>	74.6	79.1	35	8	0.447	1421	130.9	1514	272	34	3	23	0.44	99	1	4.8
<i>Orthilia</i>	61.9	74.2	20	4	0.258	52	385.5	447	254	4	1	8	0.69	60	1	0.9
<i>Melittis</i>	70.0	78.6	50	6	0.447	217	123.9	154	117	37	1	78	0.44	49	1	3.9
<i>Galium</i>	69.7	83.3	30	6	0.258	794	138.9	1557	282	27	32	30	0.24	92	1	0.6
<i>Solidago</i>	72.0	83.5	90	4	0.447	248	168.9	1746	380	32	4	309	0.20	82	5	5.0

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Notes sur quelques *Brycon*
des bassins de l'Amazone, du Parana-Paraguay
et du Sud-Est brésilien
(Pisces, Characiformes, Characidae)

par

J. GÉRY* & V. MAHNERT**

Avec 15 figures

ABSTRACT

Notes on some *Brycon* (Pisces, Characiformes, Characidae) from the Amazon, Parana-Paraguay and South-Eastern Brazil systems. — Most of the types of the *Brycon* spp. from the river systems enumerated in the title have been studied, together with additional material from the Amazon and La Plata system. From the Amazon basin, four species are recognized and redefined in the group with the well-known colour-pattern of *B. melanopterus*, viz. *B. cephalus*, *B. melanopterus*, *B. bicolor* and an undescribed species from the Rio Madeira basin. In Paraguay, two species have been recently collected and are redescribed, viz. *Brycon orbignyanus* and *B. microlepis*, often called *B. hilarii* by authors. It is shown that the true *B. hilarii*, together with *B. opalinus* and *B. orthotaenia*, are restricted to the South-East of Brazil.

INTRODUCTION

Jusqu'au catalogue de HOWES (1982), seules des études sporadiques, la plupart partielles et surtout consacrées aux espèces de l'Amérique centrale et du Nord-ouest de l'Amérique du Sud, avaient été publiées sur le genre de Characidae *Brycon* Müller & Troschel, 1844 (espèce-type par désignation de Jordan & Evermann: *Brycon falcatus*):

STEINDACHNER (1876, discussion de *Megalobrycon*); MEEK & HILDEBRAND (1916, Panama); EIGENMANN (1922, Colombie et Equateur, avec la collaboration de Hildebrand); HILDEBRAND (1938, Panama); DAHL (1943, 1971, Colombie); CAMPOS (1950, collection du Département de Zoologie de Sao Paulo); BÖHLKE (1958, Equateur); MYERS & WEITZMAN

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(1960, liste des espèces décrites depuis 1910); et GÉRY (1964, clé des espèces du «groupe *falcaus*» et 1978, clé compilée des espèces).

La systématique des quelque 40 ou 45 espèces valables (sur environ 60 décrites), et particulièrement des espèces guyano-amazoniennes et du système de la Plata (Paraguay-Parana), présentait donc encore beaucoup d'incertitudes.

HOWES (op. cit.) a eu le mérite, non seulement de citer in extenso les références des noms publiés dans le genre *Brycon* au sens large, de revoir et de donner une description complémentaire de onze des types du British Museum et du Muséum national de Paris, mais aussi de grouper les espèces de manière assez satisfaisante, la biogéographie recoupant d'assez près l'anatomie. Grâce à ce travail, les characologistes disposent d'une base leur permettant d'entreprendre la révision de tel ou tel groupe intéressant ou mal connu.

Dans ce travail, nous discuterons certains *Brycon* amazoniens et paraguayens, en terminant par des remarques sur *Brycon opalinus* et les espèces de l'est brésilien.

Nous employons les méthodes de comptage et de mesures de Howes (op. cit.), avec deux exceptions: les écailles longitudinales sont comptées jusqu'à la fin de la ligne latérale (y compris celles qui s'étendent sur la caudale, généralement au nombre de 5 ou 6), et les écailles transversales jusqu'à la base de la ventrale et non jusqu'à la ligne ventrale médiane.

(1) NOTE SUR CERTAINS *Brycon* DE L'AMAZONIE CENTRALE

Le groupe dont l'approche est la plus délicate paraît être celui des trois ou quatre *Brycon* habitant la cuvette centrale amazonienne. Il est important de pouvoir mettre un nom scientifique sur ces espèces, en raison de l'intérêt économique potentiel de l'une d'entre elles, le «*Matrinchao*». Cette forme est récoltée près de Manaus, où elle n'est pas rare; elle vit en général avec une espèce jumelle (ou considérée comme telle) appelée «*Jatuarana*», souvent confondue, ces deux espèces étant le plus souvent appelées *Brycon melanopterus* (cf GÉRY 1978, WERDER 1983, WERDER & SOARES 1984). Le *Matrinchao*, étudié depuis plus de dix ans à la Station de Pisciculture de l'Institut de Recherches amazoniennes (INPA), s'est révélé être d'une croissance très rapide (taille «portion» atteinte en quelques mois, pour une taille maximale d'environ 40 cm). On peut donc espérer un excellent rendement commercial avec des techniques voisines de celles de la trutticulture, d'où l'intérêt de fixer son statut taxonomique et de permettre le choix de la forme à élever en toute connaissance de cause.

Les spécimens de *Brycon* ayant servi à la présente étude, en dehors des types, sont déposés au Département d'Ichtyologie du Muséum d'Histoire naturelle de Genève. Nous remercions M. Ulrich Werder qui a attiré notre attention sur le sujet traité dans cette note, et qui a mis à notre disposition le matériel biologique nécessaire.

(a) Caractères des *Brycon* récoltés dans l'Amazonie centrale: les deux principales espèces ont le patron de coloration caractéristique de *B. melanopterus* auct., à savoir une large bande noire oblique partant de la base de la nageoire anale pour se terminer sur le lobe supérieur de la caudale, une tache humérale et une série de lignes longitudinales le long des rangées d'écailles. Cette coloration commune, ainsi qu'un nombre très voisin d'écailles et de rayons aux nageoires, expliquent qu'elles aient été souvent confondues par les zoologistes, tandis que les pêcheurs locaux les distinguent parfaitement. Un examen attentif révèle en effet quelques différences:

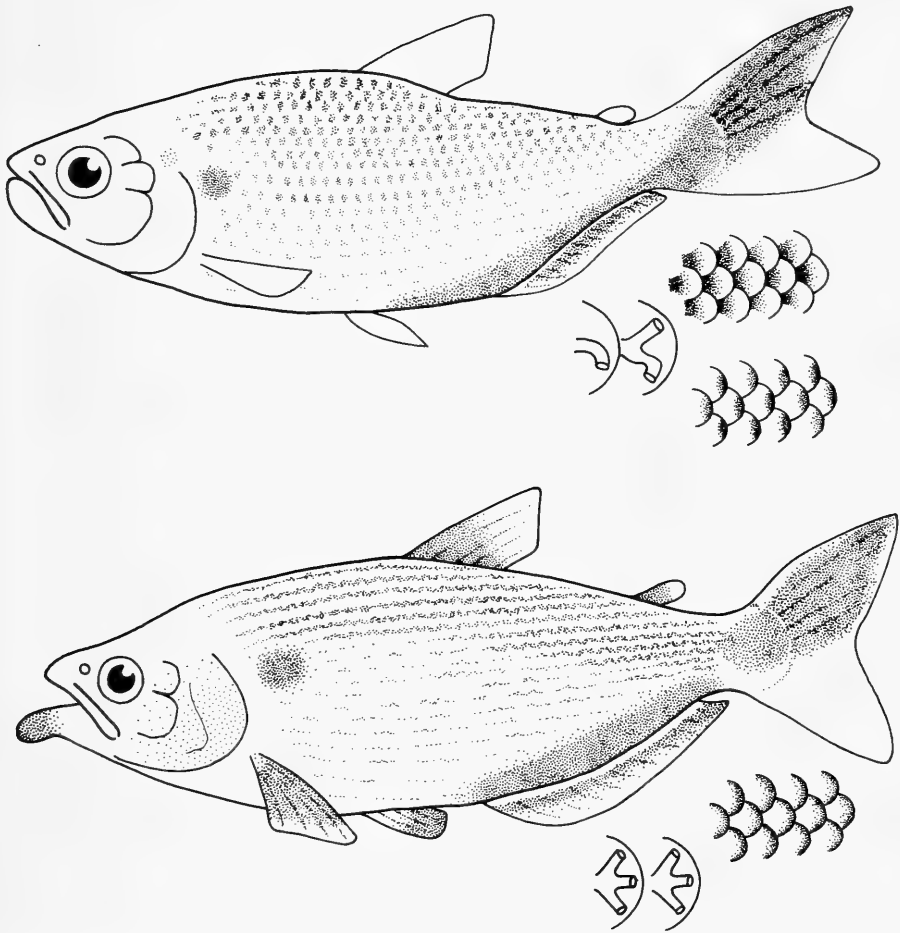


FIG. 1.

Patron de coloration (schématique) de *Brycon* spp. de l'Amazonie centrale: en haut le Jaturana, en bas le Matrinchao

La bande noire du *Jaturana* commence bien en avant des ventrales, passe sous le pédicule caudal et est pratiquement continue avec la tache caudale; la base de l'anale est droite, le diamètre de la tache humérale correspond à celui de la pupille, les nageoires ne sont pas marquées (sauf l'anale et la caudale), et les lignes longitudinales sont formées par des points foncés situés au centre des écailles. *In vivo*, il existe une petite tache rouge au sommet de l'opercule et les ventrales sont jaunes.

Chez le *Matrinchao*, la bande noire commence au-dessus des premiers rayons de l'anale, et s'interrompt généralement au niveau du pédicule caudal, surtout chez les spécimens adultes; la base de l'anale est légèrement convexe, le diamètre de la tache humérale correspond à celui de l'œil, le menton, la base des nageoires dorsale et de

l'adipeuse, les pectorales et les ventrales sont marquées de noir (de même que l'anale et la caudale), et les lignes longitudinales, en zigzag, sont formées par le bord foncé des écailles. *In vivo*, la joue et l'opercule sont rouges, ainsi que la base des ventrales.

Les différences anatomiques sont résumées dans le tableau suivant:

	<i>Jatuarana</i>	<i>Matrinchao</i>
L.S. maxi.	ca 250 mm	ca 400 mm
Plus grande hauteur	au niveau des ventrales	entre P. et V.
Squamae	13-14/66-69/6-7	13-14/65-67/8-9
Branchiospines	10-13/14-16	14-16/15-21
Pectorales	i, 11-13, courtes	1, 13-14, longues
Canaux de la L.L. (à âge égal)	courbés vers le bas ou bifurqués	généralement trifurqués
1er postorbitaire (4e infraorbitaire)	égal ou à peine plus haut que la pupille	égal ou à peine moins haut que le diamètre oculaire
Vertèbres précaudales	22-23	25
Vertèbres caudales	22-23	21
Supraneuralia	8-9	10

Le nombre des écailles au-dessous de la ligne latérale (jusqu'aux ventrales), le nombre des branchiospines, le nombre des vertèbres et des supraneuralia (sur radiographies), et la forme des canaux de la ligne latérale, semblent discriminants (à condition, pour les canaux, de comparer des individus de même taille, car le nombre de canaux semble augmenter avec l'âge chez les *Brycon*; dans le cas du *Jatuarana*, plus petit, la structure des canaux, plus simple, pourrait être qualifiée de néoténique). On note aussi une tête un peu plus longue chez le *Matrinchao*, ainsi qu'un espace interorbitaire moins convexe et croissant relativement plus vite que la longueur de la tête (allométrie majorante, fig. 2). En revanche, aucune différence significative n'a été notée pour les caractères souvent utilisés chez les *Brycon*, tels que le nombre des rayons de l'anale ou la forme et le nombre des dents (d'après la comparaison point par point de 12 ex., 6 de chaque espèce, sympatriques du Lac Janauca près de Manaus, aimablement confiés pour examen par M. Ulrich Werder, et de la mesure, pour étude des allométries, de 11 autres *Jatuarana* et de 21 autres *Matrinchao*).

(b) Identification des espèces

Par ordre de priorité historique¹, les espèces suivantes ont été décrites du bassin amazonien, ainsi que des Guyanes et de l'Orénoque:

Chalceus amazonicus Spix in Spix & Agassiz, 1829 («Amazone»)

Brycon falcatius Müller & Troschel, 1844 (Guyana; type du genre *Brycon*)

Brycon pesu Müller & Troschel 1845 (Guyana; type du genre *Holobrycon*, rejeté par Howes, loc. cit.)

Brycon carpophagus Valenciennes in Cuv. & Val., 1849 (Essequibo, Amazone)

Brycon brevicauda Günther, 1864 (Rios Tocantins et Capim)

¹ L'espèce la plus ancienne, *Chalceus opalinus* Cuvier, traitée plus loin, n'appartient pas à la faune amazonienne.

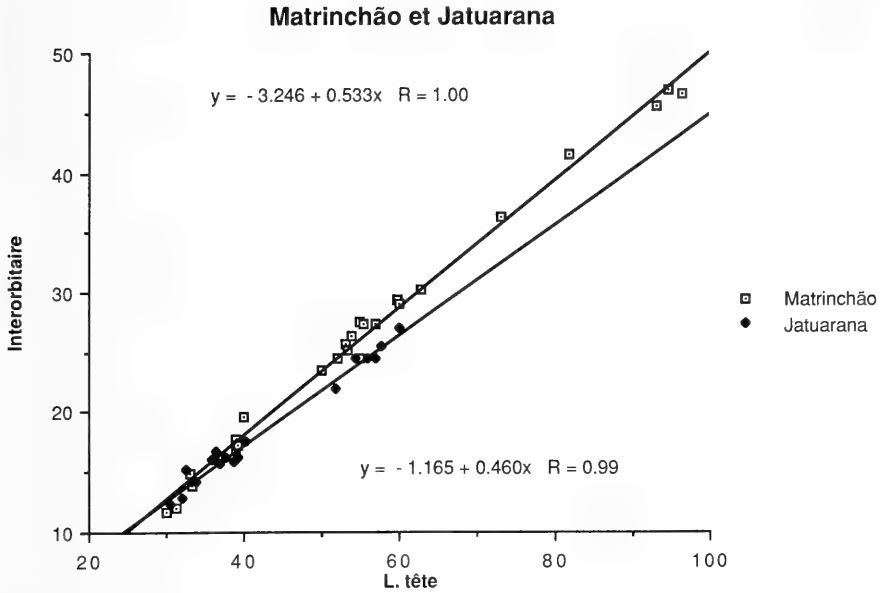


FIG. 2.

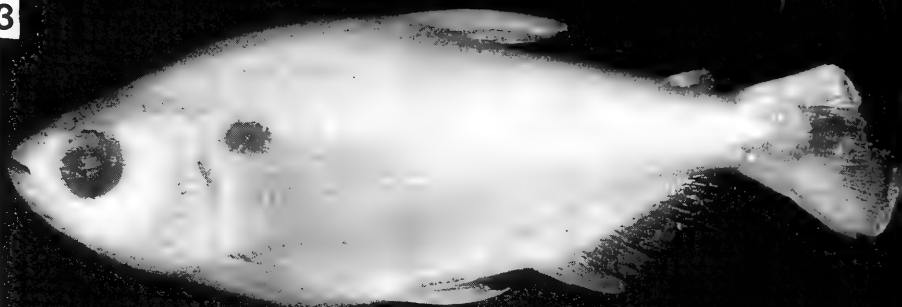
Espace interorbitaire avec allométrie majorante comparée à la longueur de la tête chez le Matrinchao.

- Megalobrycon cephalus* Günther, 1869 (Haute Amazonie; type du genre *Megalobrycon*, rejeté par Howes, loc. cit.)
Brycon capito Cope, 1872 (Rio Ambyiacu, Haute Amazonie)
Megalobrycon melanopterus Cope, 1872 (id.)
Megalobrycon erythropterus Cope, 1872 (id.)
Brycon longiceps Steindachner, 1879 (Vénézuéla)
Brycon stolzmanni Steindachner, 1879 (Rio Maranon)
Brycon stuebelii Steindachner, 1882 (Iquitos, Haute Amazonie)
Brycon bicolor Pellegrin, 1909 (Orénoque)
Brycon siebenthalae Eigenmann, 1912 (Aruka River, Guyana)
Brycon coquenani Steindachner, 1917 (Rio Coquenau, Vénézuéla)
Brycon pellegrini Holly, 1829 (Manaus)
Brycon matrinchao Fowler, 1941 (R. Parnaiba ou Amazone)
Brycon coxeyi Fowler, 1943 (Rio Pastazza, Haute Amazonie)

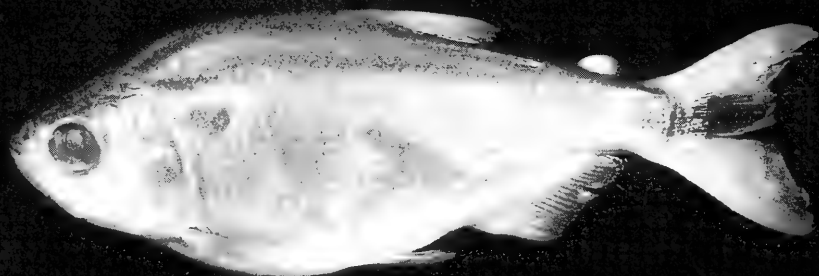
D'après Howes (op. cit.), *B. amazonicus* serait un nomen dubium, *B. capito* un juvénile non identifiable, *B. stuebelii* un synonyme de *B. falcatus*, *B. matrinchao* un synonyme de *B. brevicauda* et *B. pellegrini* un synonyme de *B. cephalus*.

En vue d'attribuer au *Jatuarana* et au *Matrinchao* un nom adéquat, il faut éliminer les espèces dont le patron de coloration est différent: c'est le cas de:

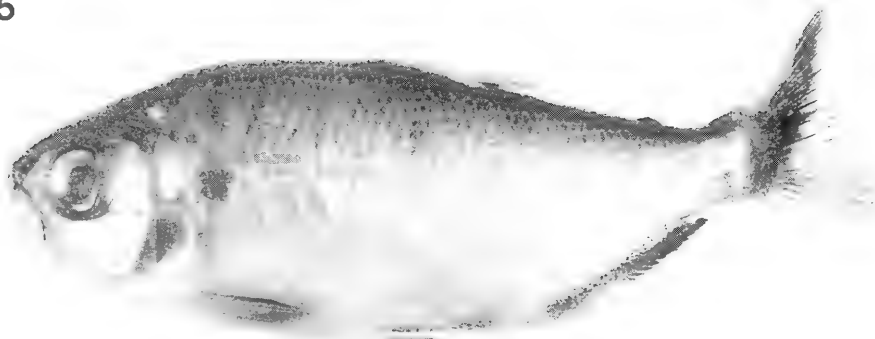
3



4



5



– *B. falcatus* et de *B. brevicauda* (voir plus loin), qui ont une marque caudale en forme de croissant couvrant de façon symétrique les deux lobes, et non seulement le lobe supérieur et la partie moyenne de la nageoire

– *B. pesu*, très différent

– *B. carpophagus* (Val.) (non CASTELNAU, 1855 pl. 34 fig. 3, qui est une autre espèce comme l'a montré HOWES (op. cit.), peut-être ce que les auteurs appellent *B. orthotaenia*, voir plus loin) et *B. siebenthalae*, tous deux de Guyana et apparemment synonymes: ils n'ont aucune marque caudale

– et de *B. erythropterus*, *stolzmanni*, *longiceps*, *coquenani* et *coxeyi*, de Haute Amazonie et du Vénézuéla, qui tous ont une tache au milieu du pédicule caudal, s'étendant sur la nageoire chez *B. erythropterus* et *coxeyi* (*B. erythropterus* fait l'objet d'un commentaire dans ce travail – voir plus loin).

Deux des trois espèces qui restent à la disposition du réviseur, en raison de leur patron de coloration, *B. cephalus* et *B. bicolor*, ont été examinées par HOWES (op. cit.), qui en a donné une bonne description complémentaire. *B. bicolor*, dont nous avons nous-même revu les types, peut, au moins provisoirement, être exclu de la discussion en raison de son patron de coloration (pas de tache humérale et pas de bande au-dessus de l'anale), et de la localité de capture (Orénoque).

La troisième espèce, *B. melanopterus* (Cope, 1872), a été figurée et caractérisée par son descripteur, qui en a souligné deux traits typiques, à savoir la bande oblique continue sur le bord inférieur du pédicule et la tache rouge du sommet de l'opercule, ainsi que par le premier réviseur FOWLER (1907), qui donne 13 comme nombre des branchiospines inférieures: ces caractères sont ceux qui viennent d'être fournis pour le *Jatuarana*. Avant examen des types, on peut admettre que le nom scientifique le plus ancien de cette forme amazonienne est *B. melanopterus* (Cope, 1872).

Comme il a été établi que les deux espèces du bassin central étaient différentes, il s'ensuit que le *Matrinchao* doit s'appeler *Brycon cephalus* (Günther, 1869). Ceci est corroboré par le patron de coloration décrit par HOWES (op. cit.), à savoir les lignes en zigzag entre les écailles et non à travers leur centre, la grande tache humérale, la bande noire anale ne s'étendant pas en avant de la nageoire, la coloration des nageoires, ainsi que par quelques caractères méristiques (en dépit de la mauvaise condition des 2 syntypes).

Compte tenu du fait que HOWES (op. cit.) a dénombré les écailles transversales jusqu'à la ligne médiane ventrale, et les écailles de la ligne latérale sans les pores situés sur la base de la caudale, on peut vérifier que les comptes d'un des types de *B. cephalus* (?13/58 /?12, ce qui correspond à 13/58+6 ou 8/9) ne s'écartent pas sensiblement de ceux du *Matrinchao*. Quant à la différence dans le compte des rayons pectoraux (i, 12 au lieu de i, 13 ou 14), elle peut aussi s'expliquer par une différence d'appréciation dans le dénombrement des très petits rayons, souvent rudimentaires, du côté ventral de la nageoire. Ces quelques incertitudes ont pu être levées par G. Howes (in litt., 30.9.1982) qui a bien voulu nous confirmer l'hypothèse de l'attribution du *Matrinchao* à l'espèce *B. cephalus*: «It is my opinion, from a re-examination of the two syntypes and from your key, that all specimens listed on p. 18 of my catalogue are conspecific with those types.

FIGS 3-5.

Brycon cephalus, Lago do Castanho (3); *Brycon erythropterus*, Iquitos (4); *Brycon melanopterus*, Alto Guaporé à Vila Bela (5).

Furthermore, in their gill-rakers counts, colouration and other characters you list they conform to what you term *Matrinchao*.»

(c) Le raisonnement ci-dessus procède par élimination et son caractère circulaire est patent, mais il semble inévitable. En désignant *B. melanopterus* et *B. cephalus* comme noms respectifs des deux *Brycon* communs de la cuvette amazonienne, il aboutit à la réfutation de la synonymie suggérée par HOWES (op. cit.): *erythropterus* = *melanopterus* = *cephalus*, hypothèse que l'un de nous avait lui-même émise (Géry, 1978) à propos de *erythropterus* seul. En fait, il existe bien 3 espèces. L'examen de spécimens provenant de Haute Amazonie et de Bolivie montre qu'une forme très proche de *B. cephalus* possède plus d'écaillés en ligne latérale: cette forme doit être appelée par le nom le plus ancien, *B. erythropterus* (Cope, 1872) (à nouveau par élimination). Comme pour les espèces précédentes, on peut relever des incertitudes concernant quelques caractères décrits par COPE (1872) (l'espèce n'a jamais été révisée, ni même vue par FOWLER 1907 à l'occasion de la révision des espèces de Cope): les individus du Maranon et de l'Ucayali, observés par nous, sont plus hauts (hauteur 2,75-3,45 dans la L.S. au lieu de 4), avec la tête plus longue (3,10-3,70 dans la L.S., au lieu de 4). La formule des écaillés transversales (13-15 / 8-10) ne diffère guère de celle de *B. cephalus*, mais les écaillés sont plus nombreuses en ligne latérale: 69-79 au total, alors que *B. cephalus* ne dépasse pas 68 ou 69 écaillés; les pores de la ligne latérale ne sont pas bifurqués chez de petits spécimens de la localité typique, mais ils le sont chez de grands individus du bassin du Rio Madeira en Bolivie; le nombre des vertèbres précaudales (25-26) correspond à celui de *B. cephalus*, tandis que le nombre des supraneuralia (8) correspond à celui de *B. melanopterus* (tableau II); la coloration rappelle tout à fait celle d'un *Salminus* (une tache humérale ovale, des lignes en zigzag le long du corps, entre les rangées d'écaillés, dont la netteté dépend probablement de la préservation et de l'âge de l'individu, et une tache caudale allongée horizontalement, rigoureusement symétrique et se continuant sur les rayons médians); les grands individus de Bolivie mentionnés plus haut ont les nageoires paires, ainsi que les derniers rayons de l'anale, noirs ou noirâtres. Les caractères différentiels des trois espèces apparaissent dans la clé qui termine cette note.

D'après les récoltes à notre disposition, il semblerait que *B. cephalus* ne soit pas présent à Iquitos, mais dans l'Ucayali, et que *B. erythropterus* n'existât pas à Manaus, les deux espèces pouvant être vicariantes. Dans cette hypothèse (fort fragile), la localité typique de *B. cephalus* («Upper Amazon») devrait être restreinte à l'Ucayali.

(d) Une quatrième espèce encore non nommée, dont le patron de coloration s'approche singulièrement de celui de *B. cephalus* et *B. melanopterus*, a été récoltée dans le Rio Aripuana, près de l'Ilha do Castanhal, par l'équipe ichthyologique de l'INPA, il y a une douzaine d'années. Bien que, par plusieurs caractères méristiques et la présence de points au centre des écaillés, elle puisse être attribuée à *B. breviceauda*, il pourrait s'agir d'une forme nouvelle en raison de la tache caudale ne prenant que le lobe supérieur (la tache est en croissant chez *B. breviceauda*). Les 5 petits (101-126 mm LS) exemplaires conservés à l'INPA sont décrits ci-après, en vue d'une éventuelle et future description officielle de cette intéressante forme (un sixième individu provenant du Lago Amana – latéral du Rio Japura –, récolté en 1980, pourrait aussi appartenir à cette espèce). Nous laissons le soin de nommer cette espèce, s'ils le jugent opportun, à nos collègues de Manaus, qui ont le matériel à leur disposition.

Brycon sp., 5 ex., 101-126 mm LS (Collections de l'INPA, Manaus): Hauteur (au niveau de la dorsale) 2,60-2,75 et tête (sans membrane) 3,50-3,75 dans la LS; dorsale

sensiblement au milieu du corps, un peu en avant chez les plus grands, très légèrement en arrière chez les plus petits; œil 3,0-3,45 (allométrie minorante), espace interorbitaire 2,40-2,75 (allométrie majorante), maxillaire 2,85-3,05, museau, plutôt pointu, 3,50-3,65 et partie post-oculaire (horizontalement jusqu'à l'opercule) 2,45-2,65, dans la longueur de la tête; pédicule caudal 1,1 à 1,4 fois plus long que haut. Squamae 51-57 (en comptant tous les pores, bi- ou trifurqués, de la ligne latérale, laquelle est basse sur le pédicule), 9 ou 10 / 5 1/2 ou 6 en une rangée transversale entre dorsale et ventrale, 17-18 autour du pédicule et 18-20 en série prédorsale; ii,9 rayons à la dorsale, iii,22(i) à 24(i) rayons à l'anale, dont la base est droite, et i,12-13 rayons à la pectorale, qui est relativement longue, mais n'atteint pas tout à fait l'origine de la ventrale. Dents au nombre de 10 ou 11 à la rangée externe du prémaxillaire, 24-26 au maxillaire, 11 à la rangée mandibulaire externe (4 fortes dents pentacuspides et 7 plus petites) et environ 12 à la rangée postérieure et interne, plus une dent conique en arrière de la symphyse, bien développée (de chaque côté des mâchoires); premier postorbitaire (infraorbitaire 4) de hauteur égale ou supérieure à 1/2 diamètre oculaire; branchiospines au nombre de 14 / 15-17. Patron de coloration voisin de celui de *B. melanopterus*: une tache humérale ronde ou ovale d'environ 1/2 à 2/3 du diamètre oculaire; une large tache pédiculaire symétrique se continuant sur le lobe supérieur de la caudale, le lobe inférieur seulement grisâtre; une bande noire sur la partie inférieure de l'abdomen et le long de la base de l'anale, à partir de la racine de la ventrale, ne s'étendant pas sur la partie inférieure du pédicule caudal; une série de points au centre des écailles formant des lignes longitudinales; base des rayons anaux, ainsi que l'extrémité du lobe anal, noires, dorsale et adipeuse incolores (la dorsale avec un fin liseré distal), pectorales incolores, pointe de la ventrale noirâtre.

TABLEAU I.

Principaux caractères de deux espèces, *Brycon* sp. (Rio Aripuana) et *B. bicolor* (2 des types)

	<i>Brycon</i> sp. (Aripuana)	<i>B. bicolor</i> (Orénoque)
Nb. d'ex.	5 ex.	2 ex.
L.S. (mm)	101-126	112-122
Hauteur	2,60-2,75	2,60
Tête	3,50-3,75	3,45-3,55
Dorsale	env. milieu	env. milieu
Oeil	3,0-3,45	3,45-3,60
Espace interorb.	2,40-2,75	2,30-2,60
Maxillaire	2,85-3,05	2,85-2,90
Museau	3,50-3,65	3,45-3,70
Pédicule caudal	1,1-1,4	1,0-1,3
Squamae long.	51-57	62-66
Sq. tr.	9 ou 10 / 5 1/2 ou 6	14/6-7
Sq. pédic.	17-18	18-20
Sq. prédors.	18-20	—
Anale	iii,22 - 24	iii,24 - 25
Pectorale	i,12-13	i,13-14
Dents pmx. ext.	10 ou 11	7-8
maxillaires	24-26	26-29
mdb. int.	12?	22-23
Branchiospines	14 / 15-17	13-15 / 15-16
Tache humérale	1/2 à 2/3 de l'œil	= pupille

Par rapport à *B. brevicauda* Günther, 1864, dont l'un de nous (J.G.) avait donné en 1964 une description complémentaire, et dont les types ont été révisés par HOWES (op. cit.), cette espèce diffère non seulement par la coloration mentionnée plus haut, mais aussi par certains caractères: hauteur plus grande, maxillaire plus court mais avec plus de dents, écailles et branchiospines un peu moins nombreuses. Par rapport à *B. bicolor* (également révisé par HOWES (op. cit.), et revu par nous), qui a la même coloration caudale que *B. melanopterus* et *B. cephalus*, mais qui, selon Howes, en est distinct, les différences semblent se résumer à la dimension de la tache humérale et la présence d'une bande au-dessus de l'anale, et surtout à des écailles nettement moins nombreuses (9-10/51-57/5 1/2-6 au lieu de 14/62-66/6-7) et des dents mandibulaires internes moins nombreuses (environ 12 au lieu de 22-23). Il s'agit néanmoins, apparemment, d'une espèce assez proche de *B. bicolor* Pellegrin.

Le tableau I donne les caractères des deux espèces (mesures prises par le même opérateur (J.G.). L'un des trois exemplaires types de *B. bicolor*, N° 87.746, est en mauvais état: il n'en a pas été tenu compte dans le tableau et dans la clé ci-après:

(e) CLÉ DE DÉTERMINATION DES ESPÈCES CITÉES

- 1a. Une bande noire oblique allant de la base de la nageoire anale au lobe supérieur de la caudale, interrompue ou non sur le pédicule caudal; généralement pas plus de 70 écailles perforées (total) en ligne latérale
- 2a. Sq. 9-10/51-57/5 1/2-6, 17-18 circumpédiculaires, 18-20 en série prédorsale; hauteur 2,60-2,75 dans la L.S.; 24-26 dents maxillaires (lignes longitudinales formées de points au centre des écailles; base de l'anale droite; pectorales i,12-13, n'atteignant pas tout à fait les ventrales; branchiospines 14/15-17).....
..... *Brycon* sp. (aff. *bicolor*)
- 2b. Sq. 12-14/62-70/6-9 1/2, 18-23 circumpédiculaires et 23-26 en série prédorsale
- 3a. Hauteur 2,60; 26-29 dents maxillaires (sq. 14/62-66/6-7; pectorales i,13-14; tache humérale égale à la pupille) *Brycon bicolor* (Pellegrin)
- 3b. Hauteur 2,95-3,30 en général; pas plus de 20-22 dents maxillaires
- 4a. Sq. tr. 6 ou 7 de la LL aux ventrales; pectorales i,11-13, courtes, n'atteignant pas les ventrales; canaux de la ligne latérale bifurqués; premier postorbitaire étroit, pas plus d'1/2 œil; plus grande hauteur au niveau des ventrales; base de l'anale droite; lignes longitudinales formées de points au centre des écailles; tache humérale égale à la pupille, nageoires paires généralement incolores, bande anale commençant avant les ventrales et se continuant sous le pédicule; *in vivo*, une tache rouge à la partie supérieure de l'opercule
- *Brycon melanopterus* (Cope)
- 4b. Sq. tr. 8-9 1/2 de la LL aux ventrales; pectorales i,13-14, longues, atteignant généralement les ventrales; canaux de la LL trifurqués; premier postorbitaire développé, sa hauteur presque aussi grande que le diamètre oculaire; plus grande hauteur entre pectorales et ventrales; base de l'anale convexe; lignes longitudinales formées de dessins en zigzag entre les écailles; tache humérale presque aussi grande que l'œil; nageoires paires généralement noirâtres; bande anale commençant un peu avant la nageoire et ne s'étendant pas sous le pédicule; *in vivo*, partie postérieure de la tête rouge (surtout la joue)
- *Brycon cephalus* (Günther)
- 1b. Une bande noire au-dessus de la base de l'anale et une tache pédiculaire médiane se continuant sur les rayons caudaux médians; 69-79 écailles perforées en ligne latérale (sq. tr. 13-15/8-10, 22-24 circumpédiculaires, 24-26 prédor-

sales; hauteur 2,75-3,45 – parfois moins ? – dans la L.S.; 15-18 dents maxillaires; pectorales i,13-14, n'atteignant pas les ventrales; canaux de la ligne latérale bi-ou trifurqués; branchiospines 13-15/16-18; lignes longitudinales formées de dessins en zigzag entre les écailles; tache humérale presque aussi grande que l'œil; nageoires paires foncées *Brycon erythropterus* (Cope)

(2) NOTE SUR LES *Brycon* DU PARAGUAY.

Les différentes expéditions du Muséum de Genève au Paraguay (voir GÉRY *et al.*, 1987, pour la liste des stations), ont permis de récolter 2 espèces de *Brycon*. L'une, rare au Paraguay mais, semble-t-il, commune dans le Rio de la Plata, est conforme à *Brycon orbignyanus* (Valenciennes, 1849) dont nous donnons plus loin la synonymie et la description complémentaire (surtout sous forme de tableau).

La seconde espèce récoltée, à écailles petites et nombreuses, a été citée de façon confuse, soit comme *Brycon microlepis* Perugia, soit comme *Brycon hilarii* (Valenciennes), parfois comme deux espèces, ainsi que l'indiquent les listes bibliographiques suivantes (qui ne comprennent la plupart du temps que des citations sans examen des spécimens). Il s'agit, d'après l'examen des types respectifs, d'une seule espèce, et incontestablement de *B. microlepis*. *B. hilarii* semble ne pas exister au Paraguay (une description complémentaire commentée de cette espèce figure dans la note (3)).

a) *Brycon microlepis* Perugia

Brycon microlepis Perugia, *Annali Mus. civ. Stor. nat. Genova*, 2(18): 149, 1897 (Alto Paraguay); BOULENGER, id., 2(19): 127, 1898 (id.); EIGENMANN, MCATEE & WARD, *Ann. Carnegie Mus.*, 4: 153, 1907 (cit.); EIGENMANN, *Rep. Princeton Univ. Exp. Patagonia*, 3: 431, 1910 (cit.); BERTONI, *Cat. sist. Vert. Paraguay*: 11, 1914 (cit.); PEARSON, *Proc. Calif. Acad. Sci.*, ser. 4, 23: 109, 1937 (cit. Paraguay); BERTONI, *Revta Soc. cient. Paraguay* 4 (4): 55, 1939 (cit.); FOWLER, *Arq. Zool. S. Paulo*, 6 (2): 338, 1950 (cit.); GÉRY, *Characoids of the World*: 338, 1978 (clé); HOWES, *Bull. Br. Mus.*, 43 (1): 34 et 36, 1982 (cit.).

Chalceus hilarii, non Valenciennes, KNER, *Denkschr. k. Akad. Wiss. Wien*, 18: 10-11, 1860 (Rio Cujaba).

Brycon hilarii, non Valenciennes, BOULENGER, *Boll. Mus. Zool. Anat. comp. Torino*, 15 (370): 3, 1900 (Corumbá); EIGENMANN & OGLE, *Proc. U.S. natl. Mus.*, 33: 30, 1907 (Paraguay); EIGENMANN, MACATEE & WARD, *Ann. Carnegie Mus.*, 4 (7): 153 (cit.); EIGENMANN, *Rep. Princeton Univ. Exp. Patagonia*, 3(4): 55, 1911 (cit.); BERTONI, *Cat. sist. Vert. Paraguay*: 11, 1914 (cit.); FOWLER, *Proc. Acad. nat. Sci. Philad.* 84: 357, fig. p. 346, 1933 (Descalvados, Mato Grosso); PEARSON, *Proc. Calif. Acad. Sci.*, (4) 23: 109, 1937 (cit. Paraguay); BERTONI, *Revta Soc. cient. Paraguay*, 4 (4): 55, 1939 (cit.); CAMPOS, *Pap. avuls. Dept. Zool. S. Paulo*, 9 (10): 140, 1950 (Mato Grosso p.p.); FOWLER, *Arq. Zool. S. Paulo*, 6 (2): 336-337, 1950 (cit.).

Brycon hilarlii (sic), non Valenciennes, EIGENMANN & KENNEDY, *Proc. Acad. nat. Sci. Philad.*, 55: 523-524, 1903 (Arroyo Trementina).

15 exemplaires ont été récoltés:

Bassin du Rio Paraguay:

- 1 ex., MHNG 2053.97, 250 mm L.S., Arroyo Tagatya-mi, est de Puerto Max, coll. 20-22/10/1979
- 3 ex., MHNG 2156.45 et 46, 216-270 mm L.S., Concepcion, gué de l'Arroyo Tagatya-mi, coll. C. Weber et C. Dlouhy, 10.10.1983
- 2 ex., MHNG, 2239.26, 255-280 mm L.S., Gué de l'Arroyo Tagatya-guazu, coll. 21-22.10.85

- 1 ex., MHNG 2239.27, 177 mm L.S., Concepcion: Laguna Negra, 15 km E. de Paso Bareto, coll. 18.10.1985
- 3 ex., MHNG 2396.26, 155-195 mm L.S., Concepcion, Estancia Primavera, coll. 31.10.1987
- 1 ex., MHNG 2053.96, 210 mm L.S., Concepcion: Estancia Estrella, Río Apa, coll. 16.10.79
- 2 juv. (1 coloré à l'alizarine), MHNG 2358.58, L.S. max. 97 mm, coll. H. Bleher, 3.1987

Bassin du Río Parana:

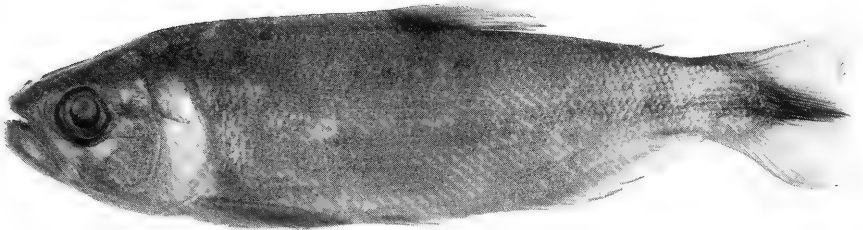
2 ex., 310-343 mm L.S., en face de Puerto Iguazu, coll. C. Dlouhy 1.2.1987 (# 100188 et 100304)

Et 3 ex. extra-territoriaux (bassin du haut Paraguay):

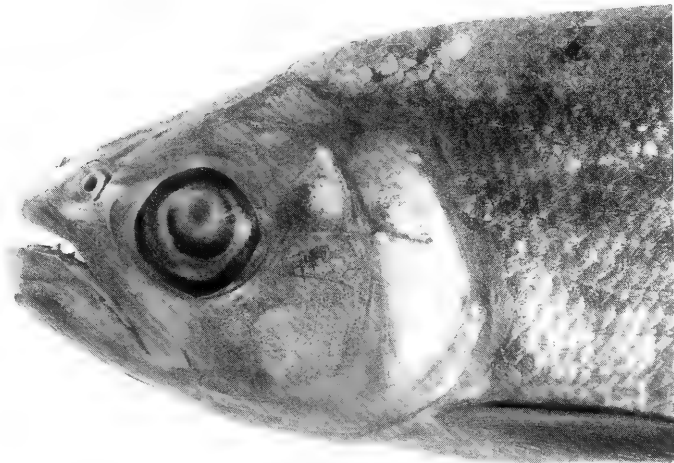
2 ex., 146-163 mm L.S., Lago Sinha Mariana, 30 km en aval de Barao de Melgaço, Rio Cuiaba, coll. Géry & al., 30/11/1979

1 ex., env. 150 mm L.S., Barao de Malgaço, Rio Cuiaba, coll. K. Silimon, Mus. Cuiaba, 1978.

6



7



FIGS 6-7.

Brycon microlepis Perugia, holotype (MSNG 36916), Bahia Negra.

Description des exemplaires paraguayens:

L.S. maximale 343 mm. Hauteur du corps 2,8-3,3, longueur de la tête 3,7-4,5, distance prédorsale 1,9-2,0 et distance préventrale 2,0-2,2 dans la L.S. Diamètre oculaire 3,6-4,3, espace interorbitaire 2,1-2,5 et longueur du maxillaire 3,0-3,3 dans la longueur de la tête. D.ii,9, A.iv,23-26, les rayons garnis de crochets chez les mâles adultes, P.i,13-14 et V.i,7; 74-82 écailles perforées (total) en ligne latérale, laquelle se continue sur le rayon caudal médian, 15-17 / 8-9 (jusqu'aux ventrales) transversales, 26-28 autour du pédicule caudal. Canaux de la ligne latérale courbés vers le bas ou bifurqués chez les spécimens de 95-150 mm L.S., à 3 ou 4 branches (190 mm L.S.), 5 ou 6 branches (210-265 mm L.S.) et jusqu'à 10 branches chez le spécimen de 343 mm L.S., la complexité des canaux étant en rapport avec l'âge.

Dents prémaxillaires 7-10 / 2-3 / 7-9, maxillaires 14-15, mandibulaires environ 17, dents symphysaires internes présentes. Hauteur du 4e interorbitaire plus faible que le diamètre oculaire, plus petit (95 mm L.S.) à plus grand (250 mm L.S.) que le diamètre pupillaire. Branchiospines au nombre de 14-16 en bas du premier arc branchial. Vertèbres au nombre de 45-46, dont 24-25 précaudales et 21-22 caudales.

Une tache ronde humérale, plus grande que la pupille; une bande longitudinale variable, commençant au-dessus du tiers postérieur de l'anale, ou au début du pédicule, et se continuant sur la nageoire caudale jusqu'à son extrémité ou presque. Le lobe caudal médian est prolongé en pointe chez les individus de taille inférieure à 200 mm L.S., les lobes caudaux sont rousés (au moins chez l'individu du Rio Apa).

Comparaison du type de *B. microlepis* avec les récoltes récentes:

	Type de <i>B. microlepis</i>	Spécimens du Paraguay
L.S.	116 mm	jusqu'à 340 mm
Haut.	3,4	2,8-3,2
Tête	3,3	3,7-4,5
Prédors.	1,8	1,9-2,0
Préventr.	2,0	2,0-2,2
Oeil	3,4	3,6-4,3
Esp. I.-O.	2,4	2,1-2,5
Maxill.	2,85	3,0-3,3
A.	iii,25	iv,23-26
Sq. long	80	74-82
Sq. transv.	16/9	15-17/8-9
Sq. pédic.	28 -	26-28
Pmx.	10/4/7	7-10/2-3/7-9
Mx.	19	14-15
Mdb.	9 + ?	17
Brsp.	17	14-16

Les caractères méristiques relevés sur ces spécimens récents correspondent à ceux de *Brycon microlepis* Perugia, 1897, de Bahia Negra, Chaco Boreale, Alto Paraguay, comme le montrent la description complémentaire suivante du holotype et la comparaison des deux échantillons, tandis que les discordances dans certaines proportions peuvent s'expliquer par les allométries, l'holotype de *B. microlepis* étant un individu juvénile:

Holotype de *Brycon microlepis* Perugia, N° MSNG 36916, Bahia Negra, L.S. 116 mm; hauteur 3,4, tête 3,3, distance prédorsale 1,8, et distance préventrale 2,0 dans la L.S. Diamètre oculaire 3,4, espace interorbitaire 2,4, et maxillaire 2,85 dans la longueur de la tête. D.ii,9; A.iii,25; P.i,12, longues, atteignant les ventrales. Squames 16 / 80 (75 + 5) / 9, 28 circumpédiculaires; Canaux de la ligne latérale courbés vers le bas ou bifurqués. Dents prémaxillaires 10 / 3 / 7, maxillaires 19, mandibulaires 4 (6-7 cuspidés) + 5 triscuspides à coniques; présence d'une paire de dents internes symphysaires. Branchiospines au nombre de 17 en bas du premier arc branchial. Vertèbres au nombre de 46, dont 25 précaudales et 21 caudales. Supraneurales au nombre de 10.

En conclusion, le nom correct des individus du Paraguay est *Brycon microlepis* Perugia, 1897, seule espèce (en dehors du Nord-Ouest de l'Amérique du Sud) à posséder jusqu'à 82 écailles (au total) en ligne latérale.

En effet, l'examen des types de *Brycon hilarii* (Valenciennes) montre que *B. microlepis* a été mal identifié comme *B. hilarii* par les rares auteurs qui ont pu étudier des spécimens paraguayens (BOULENGER 1900, EIGENMANN & KENNEDY 1903 et FOWLER 1932). Ces auteurs ont probablement été trompés par le chiffre très exagéré («quatre-vingt») du nombre des écailles longitudinales donné par Valenciennes, ainsi qu'il ressort de la description du type de l'espèce et de sa description complémentaire. Nous donnons plus loin, à propos des *Brycon* du Sud-Est brésilien, les éléments qui nous permettent d'avancer cette hypothèse.

(b) *Brycon orbignyanus* (Valenciennes, in CUVIER & VALENCIENNES, 1849)

Chalceus orbignyanus Valenciennes, in CUVIER & VALENCIENNES, *Hist. nat. Poiss.*, 22: 249, 1849 (La Plata); ? KNER, *Denks. Akad. Wiss. Wien*, 18: 11, 1860 (Rio Guaporé); GÜNTHER, *Cat. Fishes B.M.*, 5: 333, 1864 (cit)

Brycon orbignyanus, EIGENMANN & EIGENMANN, *Proc. U.S. natl Mus.*, 14: 55, 1891 (cit.); BERG, *Anales Mus. nac. Buenos Aires*, 4 (2a):123-125 (Rio Parana, Rio de la Plata); BOULENGER, *Boll. Mus. Zool. Anat. comp. Univ. Torino*, 12 (279):4, 1897 (Bolivia); EIGENMANN, *Cat. Fishes S. Am.*: 431, 1910 (cit.); BERTONI, *Fauna Paraguaya, Peces*: 11, 1914 (cit. Paraguay); DEVINCENZI, *An. Mus. nac. Montev.* (2), 1(5):174, 1924 (Rio Uruguay); MARELLI, *Mem. Mrio O. Publ.* 1922-1923: 559, 1924 (Prov. Buenos Aires, Rio Parana, Rio de la Plata); DEVINCENZI & BARATTINI, *Album ictiologico del Uruguay*, 2a Ser., Pl.13 fig. 2, 1928 (Uruguay); BERTONI, *Revta Soc. cient. Paraguay*, 4 (4): 55, 1939 (cit. Paraguay); RINGUELET, *Not. Mus. La Plata*, 5, Zool. (34): 105, 1940 (Rosario); DEVINCENZI, in DEVINCENZI & TEAGUE, *An. Mus. Hist. nat. Montev.* (2), 5(4):73, 1942 (Uruguay, fig.); POZZI, GAEA, 7(2): 254, 1945 (Rio de la Plata, Rio Parana, Rio Paraguay); THORMALEN DE GIL, *Revta Mus. La Plata* (N.S.), 5 (Zool.): 351-440, 1949 (monographie); DE BUEN, *Publ. Client. S.O.Y.P.* (2):83, 1950 (cit. ?); FOWLER, *Arq. Zool. S. Paulo* 6 (2): 337, 1950 (cit.); CORDINI, *Mrio. Agric. y Ganad., Publ. misc.*, 410: 32, 37, 1955 (Rio Parana); RINGUELET & ARAMBURU, *Mrio Asuntos Agrarios Bs. As.* N° 119: 13, 1957 (Parana-Plata); MARTINEZ ACHENBACH & BONETTO, *An. Mus. Prov. C. Nat. Fno. Ameghini*, 1(2): 10, 1957 (Rio Parana medio); GNERI & NANI, *Suma geogr., Peuser*, 5: 248, 1960 (fig.); RINGUELET & ARAMBURU, *Agro*, Ano 3 (7): 31, 1962 (cit.); MARINI & LOPEZ, *Eval. Rec. nat.*, 7: 81, 1963 (cit.); RINGUELET, ARAMBURU & ARAMBURU, *Los Peces argentinos de agua dulce*: 135-137, 1967 (Rio de la Plata, Rio Parana); GÉRY, *Characoids of the World*: 339, 1978 (clé); PANATTIERI & BARCO, *CYTA, Mrio. Agric. Ganad. Santa Fé*, 16: 20-22, 1980 (Sta Fe); BONETTO, CANON VERON & ROLDAN, *Ecosur* 8 (6): 29-40, 1981 (Rio Parana); HOWES, *Bull. Br. Mus.*, 43(1): 38, 1982 (cit.); PANATTIERI & DEL BARCO, *CYTA, Mrio. Agric. Ganad. Santa Fé*, 29: 32-33, 1982 (Sta. Fe); OLDANO & TABLADO, *Stud. neotrop. Fauna Environm.* 20 (1): 49-58, 1985 (Rio Parana medio).

Chalceus rodopterus Valenciennes, in CUVIER & VALENCIENNES, *Hist. nat. Poiss.*, 22: 249, 1849 (Buenos Aires); LAHILLE, *Revta Mus. La Plata*, 6: 269, 1895 (Rio Santiago).

Brycon rodopterus, EIGENMANN & EIGENMANN, *Proc. U.S. natl Mus.*, 14: 55, 1891 (cit.).

Brycon lineatus Steindachner, *Sber. Akad. Wiss. Wien*, 53: 211, pl. 2, 1866 (La Plata); EIGENMANN & EIGENMANN, *Proc. U.S. natl. Mus.*, 14: 55, 1891 (cit.); EIGENMANN, *Cat. Fishes S. Am.*: 431, 1910 (cit.); POZZI, *Gaea*, 7(2): 254, 1945 (Rio de la Plata, Rio Parana, Rio Paraguay); FOWLER, *Arq. Zool. S. Paulo* 6 (2): 337, 1950 (cit.); RINGUELET & ARAMBURU, *Agro*, Ano 3 (7): 31, 1962 (cit.); MARINI & LOPEZ, *Eval. Rec. nat.*, 7: 81, 1963 (cit.).

Brycon orthotaenia (non Günther, 1864), GÜNTHER, *Ann. Mag. nat. Hist.*, London, (5) 6: 13, 1880 (Rio de la Plata).

A propos de cette espèce, HOWES (op. cit.: 39) ne donne pas de liste synonymique parce que: «... until the types of all these species (*orthotaenia*, *rodopterus*, *lineatus*) have been compared any such compilation will be virtually useless». Ayant pu étudier les types en question, nous avons proposé cette synonymie (sans tenir compte de certaines orthographes simplificatrices), et confirmé que *B. rodopterus* (fondé sur des individus juvéniles) et *B. lineatus* (fondé sur un exemplaire tératologique ?) sont bien des synonymes de *B. orbignyanus*. D'après la liste des publications et nos récoltes, cette espèce ne remonterait pas dans le Rio Paraguay et s'arrêterait au Parana moyen. Les citations suivantes de *Brycon orbignyanus* concerneraient d'autres espèces: CAMPOS, *Pap. avuls. Depto Zool., S.P.*, 9 (10): 139, 1950 (rio Aguapei, rio Piracicaba, rio Mogi-Guaçu); HOWES, *Bull. Brit. Mus. (N.H.)*, zool. Ser., 43 (1): 38, 1982 (rio das Velhas).

4 exemplaires ont été récoltés (Lac Itaipu, bassin du Rio Parana):

- 2 ex., MHNG 2476.96 et 97, 105-152 mm L.S., Canendiyu, lac Itaipu à la hauteur du Salto Guiara, coll. C. Dlouhy, 20.6 et 18.7.1989
- 1 ex., MHNG 2152.56, 198 mm L.S., Canendiyu, lac Itaipu à la hauteur de l'arroyo Pyra-Pita, coll. C. Dlouhy
- 1 ex., en face de Puerto Iguazu, coll. 1.2.1987.

B. orbignyanus, espèce bien connue surtout depuis la monographie de THORMALEN de GIL (1949), est caractérisé de la façon suivante: hauteur 3,0-3,5 et tête 3,1 (juvéniles) à plus de 4 fois dans la longueur standard (tête particulièrement courte pour un *Brycon*); dorsale insérée un peu en arrière du milieu du corps; œil 3,5 (juv.)-4,4, espace interorbitaire 2,3 (adulte)-2,9, et maxillaire 2,9-3,2 dans la longueur de la tête; squamae 56-63 en ligne latérale (totale), 11-12/6-7 jusqu'aux ventrales en série transversale, et 20-22 autour du pédicule caudal; iii,25-26 rayons à la nageoire anale, i,13-14 aux nageoires pectorales; une vingtaine de dents maxillaires; 17-18 branchiospines sur l'arc branchial inférieur; 28 vertèbres précaudales et 20-21 vertèbres caudales, 11-12 supraneuralia. Le nombre élevé des vertèbres précaudales et des supraneuralia nous paraît être caractéristique de l'espèce (voir aussi plus loin à propos de *B. lineatus* et tableau II)¹.

La coloration après fixation ressemble à celle de *B. erythropterus*, d'Amazonie supérieure, qui a plus d'écailles et moins de vertèbres et de supraneuralia (tableau II).

Nous donnons sous forme de tableau hors-texte (tableau III) les caractères relevés sur les types et sur deux exemplaires du Rio Parana récoltés dans le lac Itaipu et en face de Puerto Iguazu. (Le type de *B. lineatus* (NMW 62943, rio de la Plata), examiné à notre demande par H. Ahnelt et C. Weber, semble ne différer en rien de *B. orbignyanus*, sauf par le moindre nombre des vertèbres précaudales (21) et des supraneuralia (8) (tableau II): il s'agit apparemment d'un spécimen tératologique). Le lectotype de *Brycon orbignyanus*

¹ D'une manière générale, le nombre des vertèbres et des supraneuralia nous paraît être un élément supplémentaire en vue d'une meilleure compréhension des affinités des *Brycon* spp. Le recours systématique à la radiographie, quand elle est réalisable et sur des individus préservés dans leur intégralité, semble particulièrement prometteur dans ce groupe, d'autant plus que la dissection est impossible sur les spécimens-types.

TABLEAU II.

Comptes des vertèbres et des supraneuralia (SUPNEUR) de certains *Brycon* (PRECAUD= vertèbres précaudales; CAUD=vertèbres caudales; TOT=total des vertèbres).

ESPÈCES	PRECAUD	CAUD	TOT	SUPNEUR
<i>B. cephalus</i>				
Cano Yarina (1 ex.)	25	21	46	
Lago Janauaca (2 ex.)	25	21-22	46-47	10
Lago Castanha (1 ex.)	25	21	46	
<i>B. melanopterus</i>				
Iquitos (3 ex.)	22-23	22-23	44-45	8-9
Manacapuru (2 ex.)	22-23	22-23	45	
Guaporé (1 ex.)	22	22	44	
<i>B. erythropterus</i>				
Iquitos (3 ex.)	25-26	21-22	46-48	8
<i>B. orbignyanus</i>				
Syntypes (2)	28	20-21	48-49	
Paraguay (1 ex.)	28	20	48	11-12
<i>B. rodopterus</i>				
Syntypes (2)	28-29	20-21	49	
<i>B. lineatus</i>				
Holotype	21	20	41	8
<i>B. travassosi</i>				
Holotype	28	21	49	12
<i>B. microlepis</i>				
Holotype	25	21	46	
Paraguay (6 ex.)	24-25	21-22	45-46	10

TABLEAU III.

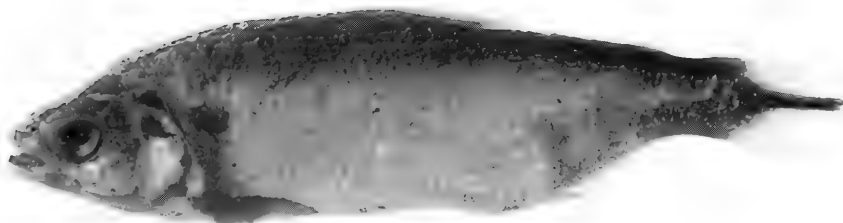
Principaux caractères des types de *B. orbignyanus*, *B. rodopterus*, *B. travassosi*, et d'exemplaires paraguayens de *B. orbignyanus*.

Caractères	<i>B. orbignyanus</i>	<i>B. rodopterus</i>	<i>B. travassosi</i>	Paraguay
	2 syntypes (La Plata)	2 syntypes (B. Aires)	holotype (R. Bodoquena)	2 specimens (Parana)
L.S.	144-161 mm	78-81 mm	212 mm	190-355 mm
L.S./Haut.	3,45-3,50	ca. 3,65	2,8	3,0-3,1
L.S./Tête	3,9-4,0	3,0-3,1	4,2	3,8-4,1
L.S./Préd.	1,9	1,8	1,8	1,8-2,0
Tête/Oeil	3,85	3,50-3,70	3,8	4,2-4,4
Tête/IntOr.	2,55-2,60	2,80-2,90	2,45	2,30
Tête/Max.	3,2	2,9	3,18	3,2
Anale	iii,25-26	iii,25-26	iv,22	iii,24-26
Pectorales	i,13	i,14	i,13	i,13-14
Squamae	12/62	12/56	12/59	11-12/61-63
Sq. pédic.	?	?	20	22
Dents max.	20	14-16	17	16-17
Brsp. inf.	18	17	19	19
Vertèbres	28+20+21	28-29+20-21	28+21	28+20
Supneuralia	-	-	12	11-12

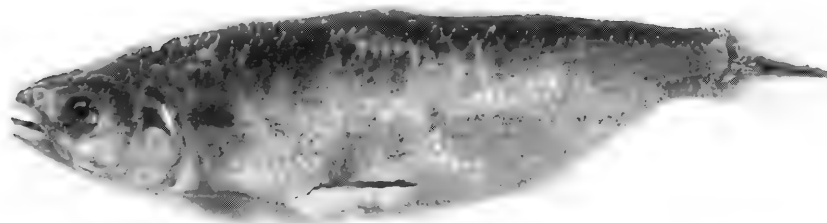
8



9



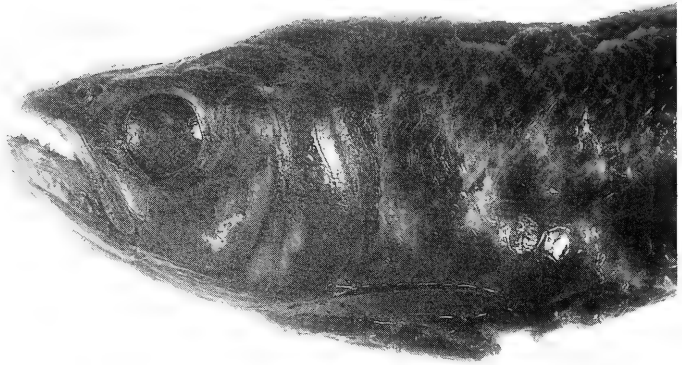
10



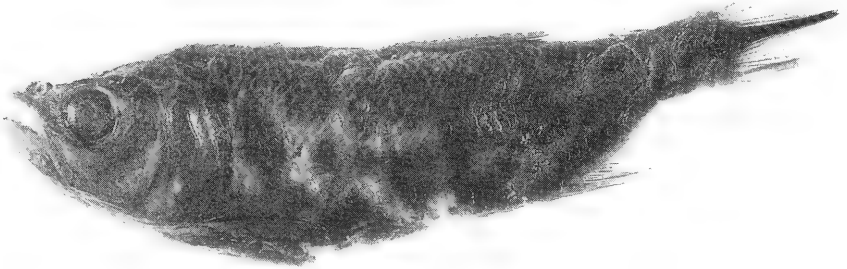
FIGS 8-10.

Brycon orbignyanus (Val.), spécimens types (MNHN A 9835), La Plata.

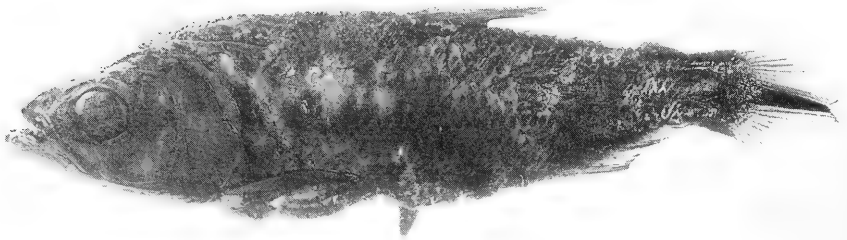
11



12



13



FIGS 11-13.

Brycon rodopterus (Val.), syntypes (MNHN A 9834), Buenos Aires.

(Valenciennes) est ici désigné: il s'agit du plus grand exemplaire, portant le N° MNHN 9835, d'environ 161 mm L.S. Le second exemplaire (même N°, environ 144 mm L.S.) est le paralectotype.

Les deux *Brycon* du Paraguay se distinguent aisément par le nombre des écailles:

- 1a. Sq. 15-17/74-82 (tot.) / 8-9 (jusqu'aux ventrales), 26-28 autour du pédicule caudal *B. microlepis*
 1b. Sq. 11-12/56-63 (tot.) / 7 (jusqu'aux ventrales), 22 autour du pédicule caudal
 *B. orbignyanus*

(c) A propos de *Brycon travassosi* Campos, 1950

Brycon travassosi Campos, *Pap. avuls. Zool. Sao Paulo*, 9 (10): 141-142, 1950 (Rio Bodoquena, Pantanal, Mato Grosso do Sul); MYERS & WEITZMAN, *Stanford Ichthyol. Bull.*, 7 (4):103 (cit.); BRITSKI, *Pap. avuls. Zool. Sao Paulo*, 22 (19): 202, 1969 (rev. type); GÉRY, *Characoids of the World*: 342, 1978 (clé); HOWES, *Bull. Br. Mus.*, 43(1): 45, 1982 («Possibly a synonym of *B. orbignyanus*»).

Il semble pertinent de discuter le statut taxonomique de *Brycon travassosi* Campos, 1950, du Pantanal du Mato Grosso (bassin du Rio Paraguay), espèce dont nous avons pu examiner l'holotype et unique spécimen connu, grâce à H.A. Britski:

Holotype en alcool, 212 mm de longueur standard, Rio Bodoquena, Estado do Mato Grosso, Brasil; Lauro Travassos Filho col. 1941, N° MZUSP 3811 (exemplaire en assez mauvais état, cavité branchiale ouverte, abdomen éviscéré).

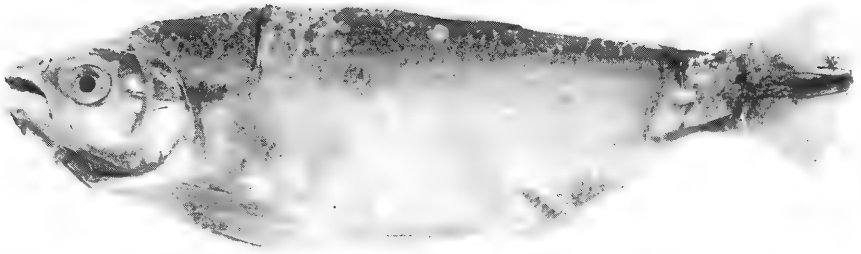
Le nombre des vertèbres, des supraneutralia et les structures dentaires de cette espèce (voir tableaux II et III) sont en faveur de son appartenance au «type *B. orbignyanus*» («groupe *B. orbignyanus*» partim, de HOWES op. cit.:46), qui semble bien caractérisé par les vertèbres précaudales au nombre de 28-29, et les dents larges, jusqu'à 5 cuspidés). L'habitus, le nombre des écailles, et la plupart des proportions, ne sont pas très différents de ceux de *B. orbignyanus*. Toutefois le moindre nombre de rayons anaux (iv, 22 au lieu de iii ou iv, 25-26), ainsi que la hauteur du corps, paraissent séparer les deux espèces, à un niveau taxonomique que le manque de matériel récent de *B. travassosi* ne nous permet pas d'apprécier.

(3) NOTE ET REMARQUES SUR LES SPECIMENS-TYPES DES *Brycon* DU SUD-EST BRÉSILIEN

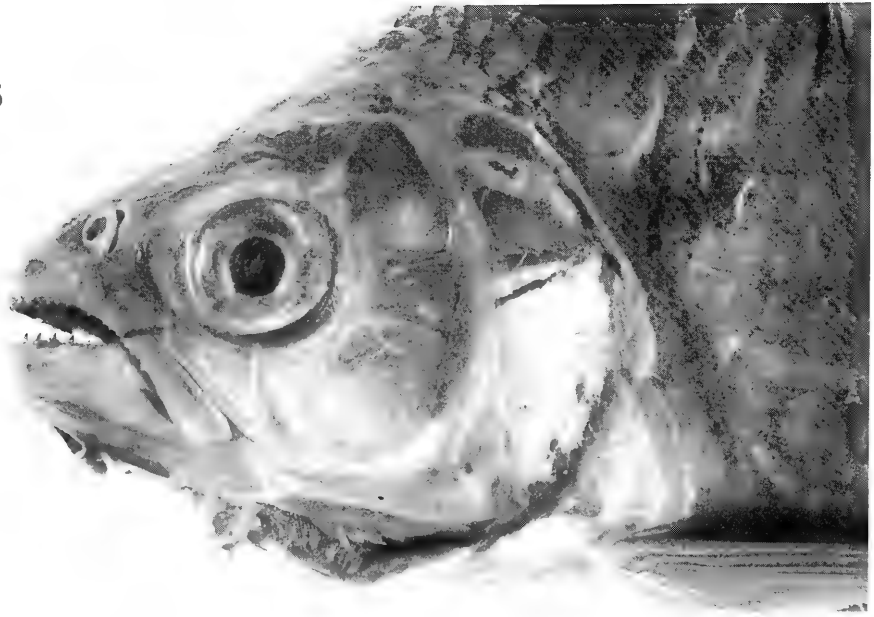
Le souci d'identifier correctement nos spécimens paraguayens nous a amenés à examiner les types des régions voisines, et particulièrement les types du Muséum national d'Histoire naturelle (Paris): outre ceux déjà cités, *Chalceus hilarii*, *C. orbignyanus* et *C. rodopterus*, nous avons revu *Chalceus opalinus* Cuvier, 1819, *Chalceus carpophaga* non Valenciennes, CASTELNAU, 1855 (ainsi que *Chalceus carpophaga* Valenciennes, 1849), *Chalceus devillei*, et *Brycon reinhardtii* (paratype); nous avons pu connaître les principaux caractères de *B. lineatus* (déjà cité) et du spécimen déterminé comme *Brycon opalinus* par KNER, 1860 et nommé *Brycon nattereri* par GÜNTHER, 1864, grâce à C. Weber et H. Ahnelt; *Brycon bahiensis* et *Brycon orthotaenia* ont été révisés par HOWES (op. cit.): leurs caractères sont bien connus; enfin BRITSKI (1969) a donné une description complémentaire de *Brycon travassosi* Campos, 1950. Seul *Brycon lundii* ne nous est pas familier, mais nous admettons volontiers avec HOWES (op. cit.) qu'il s'agit d'un synonyme de *B. orthotaenia*.

Le résultat de notre examen suit, fondé uniquement sur l'étude de spécimens anciens: il ne s'agit donc pas d'une révision, mais de remarques taxonomiques et zoogéographiques, faute de matériel récent approprié.

14



15



FIGS 14-15.

Brycon travassosi Campos, holotype (MZUSP 3111), Rio Bodoquena, Estado do Mato Grosso.

(a) *Chalceus opalinus* CUVIER, *Mém. Mus. Hist. nat.*, 5, 1819, texte p. 351, fig. 1 pl. 26. C'est le premier *Brycon* (au sens moderne) décrit. Sa localité typique est difficile à préciser; en effet, le seul exemplaire cité par Cuvier aurait été envoyé par A. de St-Hilaire:

«Ce poisson est originaire des rivières du Brésil, d'où il a été envoyé... par M. Auguste de Saint-Hilaire.»

Ce holotype incontestable est assez bien figuré, mais sa description est succincte (sq. 45; A.20; P.14; tr. 12 ou 13 au-dessus de la ligne latérale d'après la figure) et sans mention de la taille, indiquant seulement qu'elle est à peu près celle du Chalcée à grandes écailles (*Chalceus macrolepidotus* Cuvier, 1818). L'holotype de cette dernière espèce, donné comme étant long de 7 pouces (env. 180 mm) sur 2¹/₄ de haut (env. 57 mm), mesure en réalité env. 250 mm de longueur standard (un peu moins de 10 pouces) sur env. 60 mm de haut (moins de 2 pouces 1/2).

Dans l'*Histoire naturelle des Poissons*, VALENCIENNES (1849 pp. 244-246) écrit: «... j'ai sous les yeux les exemplaires qui ont servi à l'établissement (de *Chalceus opalinus*)...» et il donne dans sa description «A.28» alors que Cuvier n'avait compté que 20 rayons anaux. L'exemplaire cité en premier est manifestement celui qui a servi à Valenciennes pour sa description complémentaire: «Nous en possédons un exemplaire long de dix-sept pouces (env. 435 mm) originaire du Rio Tiquilenhonha (= Jequitinhonha); il a été donné par M. A. de Saint-Hilaire, en août 1822.

Un autre exemplaire a été rapporté de Rio Janeiro par M. de Lalande».

Mais c'est ce dernier exemplaire qui est mentionné comme holotype par BERTIN (op. cit.): «1 ex., N° A.8613, Holotype – Rio de Janeiro, Delalande.

320 mm, sec sur verre, bon état».

Bertin se fonde sur l'opinion de Eigenmann, cité par lui p. 18, qui pense que les localités des types respectifs de *Chalceus fasciatus* («Rio de Janeiro, Brésil – P.A. Delalande») et de *Chalceus opalinus* («Rio San Francisco, Brésil – A. Saint-Hilaire») ont été inversées.

Le Poisson étudié par Cuvier, et par conséquent l'unique type, est bien l'exemplaire désigné par Bertin, et ceci pour plusieurs raisons (nous remercions vivement M. Laurent Lauzanne de l'aide qu'il a apportée à la solution de ce problème):

L'exemplaire du Jequitinhonha est trop grand (17 pouces) pour être le type de Cuvier; de plus, il semble bien, comme Valenciennes le mentionne expressément, avoir été donné au Muséum après le mémoire de CUVIER (1819) (où ne figurent que deux espèces récoltées par le botaniste A. de Saint-Hilaire dans le Rio S. Francisco, soit *Chalceus fasciatus* (?) et le «Serrasalme» piraya, un nom latinisé ultérieurement).

De plus, l'exemplaire N° A.8613 a bien l'anale «un peu altérée», il est à peu près de la même longueur que le type de *Chalceus macrolepidotus* et il correspond bien à la figure de CUVIER (1819, Pl. 26 fig. 1).

De toutes façons, la discussion est assez académique car les deux spécimens du Muséum, holotype N° A.8613, L.S. 263 mm, «Rio de Janeiro» et N° A.8612, L.S. 355 mm, «Rio Jequitinhonha» paraissent bien appartenir à la même espèce.

Description complémentaire de *Chalceus opalinus* Cuvier, 1819 (les valeurs du N° A.8612, indiquées entre parenthèses):

L'holotype de *B. opalinus* (A.8613) est un spécimen sec, empaillé et verni, monté sur plaque de verre, d'environ 310 mm de longueur totale et 263 mm de L.S. (355 mm de L.S., spécimen également sec). Le pédicule caudal est assez abîmé, ainsi que la nageoire anale, où l'on compte toutefois nettement plus de rayons que Cuvier, probablement iii,23 (intacte, probablement iii,24); squamae 47 (47 ?) à droite, 49 (45) à gauche, 7/4 (7/4-5) transversales jusqu'aux ventrales, les canaux de la ligne latérale seulement bifurqués, 14? (16?) écailles prédorsales et 14? (15?) écailles circumpédiculaires (ces deux comptes très incertains); pectorales i,14 (i,13), la longueur de la nageoire 65% (?) de la distance

pectorale-ventrale; la hauteur du corps (proportion peu fiable chez les spécimens secs) est faible, 3,75 (3,80) dans la L.S.; les distances prédorsale et préventrale font 54% (52% et 51%), la base de l'anale 20,5% (22,5%) (1,4 fois (1,25) dans la longueur de la tête), et la hauteur du pédicule 9% (?), de la L.S.; la tête est plutôt courte, 3,5 (3,6) fois dans la L.S.; espace interorbitaire 3,33 (2,8), orbite 5,45 (5,40), maxillaire 3,0 (3,1), mandibule 2,1 (2,1) et museau 4,33/3,65 (4,3/3,5) (projection/oblique) dans la longueur de la tête. Le grand sousorbitaire fait 78% (84%) de la joue. Les dents sont petites, tricuspidées pour la plupart; au prémaxillaire, 10-11 (10-11) externes, 2 internes (2), serrées contre les externes et disposées entre les 1-2 et 2-3 internes; 9 (9-8) internes, la 3e légèrement en avant; le maxillaire, relativement long, porte 25 (25) dents à droite et 28 (26) dents à gauche, en comptant les racines des dents brisées; mandibule difficile à étudier sur le type (mieux visible sur le N° A.8612); probablement 10 ou 11 (16) dents dans la rangée externe, les médianes usées, et une dizaine (17?) de dents postérieures en une rangée interne; une dent conique symphysaire du côté gauche seulement (id., en crochet). Aucun patron de coloration n'est actuellement visible sur le type, mais on croit distinguer une tache à la fin du pédicule sur l'autre spécimen.

Outre la localité typique, cette espèce pose d'autres questions, notamment celle de savoir pourquoi elle a été si rarement mentionnée après CUVIER & VALENCIENNES (op. cit.), et surtout presque jamais récoltée. En dehors des catalogues de EIGENMANN & EIGENMANN (1891), EIGENMANN (1910) et HOWES (op. cit.), *B. opalinus* n'a été cité que par MUELLER & TROSCHEL (1844), qui ont assigné *Chalceus opalinus* à leur nouveau genre *Brycon*, KNER (1860) et GUENTHER (1864). Seul KNER a pu en étudier des spécimens (2 ?) ex. secs récoltés par Natterer à Irisanga, Rio Mogi-Guaçu, que GUENTHER (1864), sans avoir vu le type de *B. opalinus*, a pensé être différents et nommé *B. nattereri*. KNER (1860) avait souligné que ses exemplaires correspondaient parfaitement à la figure et au compte des écailles tels que donnés par CUVIER (sq. 8/50/4), mais que l'anale avait 23 rayons et que la base de la caudale était marquée d'une grande tache noire. Ce sont ces deux caractères différentiels qui ont motivé la création de *Brycon nattereri* fondé sur les exemplaires de Kner. Rappelons que les 2 ex. du Muséum de *B. opalinus* peuvent être définis par sq. 7/45-49/4-5, A.iii (ou iv), 23-24 et peut-être par la présence d'une tache à la fin du pédicule caudal.

La description complémentaire de *Brycon bahiensis* Günther, 1864, faite par HOWES (op. cit.), fait penser que les trois espèces (*B. opalinus*, *nattereri* et *bahiensis*) pourraient n'être qu'une seule et unique forme.

(b) *Brycon hilarii* (Valenciennes in Cuvier & Valenciennes, 1949).

Résumé de la description originale et historique:

Chalceus hilarii Valenciennes, in CUVIER & VALENCIENNES, 1849 (*Histoire naturelle des Poissons*, tome 22, p. 246).

«... M. de Saint-Hilaire avait rapporté avec l'espèce précédente...» (c'est-à-dire le grand individu de *Chalceus opalinus*, voir plus haut) «un autre Chalcée... ce poisson a la tête plus courte et plus grosse. L'intervalle entre les yeux plus large et plus convexe. L'œil plus grand, beaucoup plus rapproché du bout du museau. La bouche a des intermaxillaires plus longs, et les maxillaires plus courts; ... grosseur considérable des dents, etc.»

«... nous aurions pu tirer la dénomination spécifique de ce poisson de la petite relative de ses écailles, qui sont beaucoup plus petites que dans les espèces précédemment décrites» (*Chalceus macrolepidotus*, *C. ararapeera* et *C. opalinus*).

«... Une large tache noire couvre la base de la queue, les lobes de la caudale et l'anale.

Nous avons un exemplaire rapporté du Rio San Francisco, long de vingt pouces».

«M. de Castenau nous en a procuré plusieurs autres pris dans l'Amazone et dans d'autres rivières du Brésil...» (2 exemplaires conservés jusqu'à nos jours).

BERTIN (1948) cite les spécimens décrits par Valenciennes de la façon suivante:

«Syntype A.8616, 450 mm, sec, bon état; Rio S. Francisco, A. St. Hilaire (1822)»

Syntypes A. 9893-9894, 2 ex. secs, en bocal, Amazone, Castelnau». Ces exemplaires, en mauvais état, proviennent en réalité de Salinas, bassin du Rio Jequitinhonha (CASTELNAU, 1855: 68), et non de l'Amazone.

Description complémentaire de *Brycon hilarii* (Valenciennes): revu en 1980, l'exemplaire sec de L.S. 415 mm, N° A.8616-81-25-71, Rio San Francisco, St. Hilaire 1922, est désigné ici comme lectotype.

Il a les caractères principaux suivants: hauteur environ 4, tête environ 3,85 et distance prédorsale environ 2,15 dans la L.S.; le museau est court, ainsi que le maxillaire, environ 3,8 dans la tête, avec environ 20 dents; D.ii,9(1); A. ?? iii, 20 avec une erreur de 2 rayons en plus ou en moins; P ?, courtes, n'atteignant pas les ventrales.

Squamae certainement pas moins de 60 et pas plus de 65, 13 ou 14 / environ 10 en transversale; une paire de dents coniques mandibulaires. Patron de coloration indistinct.

Les 2 exemplaires de Castelnau, N° A. 9893 et A.9894, conservés à sec en flacon, sont en très mauvais état. Le moins mal préservé, N° A.9894, environ 170 mm L.S., a peut-être 11/62/5 écailles (sur la figure de CASTELNAU, 1855, pl. 36 fig. 1, on ne compte que 46 écailles). Le patron de coloration figuré par Castelnau ne semble pas comporter de tache caudale. Il est impossible de dire s'il s'agit de la même espèce, qui doit être caractérisée par le seul lectotype (voir plus loin les remarques sur la distribution de l'espèce).

Nous avons du mal à expliquer l'énorme différence entre le chiffre de VALENCIENNES (op. cit.) pour les écailles longitudinales («quatre-vingt») et celui relevé sur l'holotype (60 à 65, compte tenu des erreurs de comptage). Il ne peut s'agir d'une substitution de spécimen, le N° A.8616 représentant incontestablement le type de l'espèce, étant donné sa taille et les données d'époque qui l'accompagnent. Un lapsus calami semble pouvoir être écarté, Valenciennes ayant insisté sur la petitesse relative des écailles (les espèces décrites en même temps que *Chalceus hilarii*, c'est-à-dire *Chalceus orbignyanus*, *C. rodopterus* et *C. carpophaga* (ex. de Castelnau, non type) ont respectivement 62, environ 56 et environ 50 écailles en ligne latérale, ce qui n'est guère moins que le compte réel de *B. hilarii*). Enfin la confusion avec *Salminus hilarii* (faite par BERTIN, 1948) en raison de l'homonymie, est impossible à envisager de la part de Valenciennes. Le type de cette dernière espèce est en effet relativement petit (165 mm L.S.) et les paralectotypes les plus grands (maximum 345 mm L.S.), d'ailleurs conservés en alcool, sont encore loin d'atteindre la taille du type de *Chalceus hilarii* (415 mm L.S.). La marge du nombre d'écailles en ligne latérale est de 60-69 chez ces *Salminus* (cf. GÉRY & LAUZANNE 1990), très différente du chiffre de 80. L'erreur ne peut être due, selon nous, qu'à une mauvaise transcription en toutes lettres, sur le manuscrit définitif, du chiffre (60 ??) mentionné dans les notes originales.

(c) *Brycon carpophagus* (non Valenciennes), CASTELNAU 1855 (pp. 68-69: «*Chalceus carpophagus* Cuv. Val.», Pl. 34 (fig. 3)

HOWES (op. cit.: 17), d'après l'examen de K.A. Banister, a émis l'hypothèse que le spécimen décrit par CASTELNAU, 1855, sous le nom de «*Chalceus carpophagus* Cuv. Val.», n'était pas conspécifique avec le type de l'espèce, et que ses caractères seraient plus

voisins de deux de *B. orthotaenia*. Notre étude des spécimens du Muséum nous permet de corroborer cette hypothèse.

Le spécimen récolté par Schomburgk en Guyane anglaise, cité en premier par VALENCIENNES in CUVIER & VALENCIENNES (1949: 252-253), est ici désigné comme lectotype de *Chalceus carpophagus* (bien qu'il ait été cité en second comme syntype par BERTIN, loc. cit., après l'exemplaire de Castelnau, cité en premier). Ce type (déjà revu par HOWES, loc. cit., chiffres entre parenthèses), est un spécimen en alcool de 285 (280) mm de L.S., N° A.9832, caractérisé de la façon suivante: hauteur 2,8 (34%) et tête (assez courte) 4,2 (24%) dans la longueur standard; dorsale en avant du milieu du corps, distance prédorsale à 51% (53%) de la L.S.; A.iii,23 (iv,23), P.i,14 (i,15), n'atteignant pas les ventrales; squamae en ligne latérale 60, à 2 près (58 + écailles caudales); 11/7 (12/9 jusqu'à la ligne médiane) transversales, environ 22 (?) prédorsales et 18 (?) circumpédiculaires; museau de la longueur moyenne; maxillaire avec une vingtaine de dents (22), mandibule avec une paire de dents postérieures symphysaires très petites; grand sousorbitaire couvrant presque toute la joue, sauf une zone nue de 2-3 mm; aucune coloration visible.

Le spécimen désigné ici comme paralectotype est en mauvais état, mou et sans écailles. Il porte le N° 98 (81.25.3.1), de L.S. de 254 mm environ et a été récolté par Montravel dans «le fleuve Amazone». Les quelques caractères observables (anale, poches écailleuses etc.) plaident pour la conspécificité.

C'est ici l'occasion de signaler que le type de *Brycon siebenthalae* Eigenmann, 1912, 170,5 mm de L.S., N° 53353, provenant de l'Aruka River en Guyana, et revu au Field Museum de Chicago il y a 25 ans par l'un de nous (J.G.), présente tous les caractères de *B. carpophagus* (contrairement à la mention de la clé, le spécimen n'a pas les rayons caudaux médians prolongés). Comme il provient du même territoire, il s'agit très probablement d'un synonyme. Sa denture a été figurée in GÉRY (1978), mais l'espèce n'est pas citée dans la clé et la synonymie probable n'est pas mentionnée. Le patron de coloration est encore visible: une grande tache ovale horizontale dans la région humérale, une série de lignes entre les écailles et pas de marque caudale. Les pectorales et les ventrales sont noirâtres.

Le troisième exemplaire, indiqué en premier par BERTIN (1948) comme syntype (probablement parce qu'il avait été figuré par CASTELNAU (1855), mais postérieurement à la première description, ce qui supprime un argument pour le choix du lectotype), appartient à une espèce différente:

Chalceus carpophagus non Val., CASTELNAU, 1855, N° A.8615, coll. Castelnau, «Rio de Sabara», Minas Gerais (= Ril das Velhas à 50 km au sud de Lagoa Santa). L'exemplaire sec d'environ 310 mm de L.S. est caractérisé de la façon suivante: hauteur 3,4 et tête (courte) 4,5 dans la longueur standard; dorsale légèrement en avant du milieu du corps, distance prédorsale à 50,5% de la L.S.; A. iii,28 ou 29, P. i,12, n'atteignant pas les ventrales; squamae en ligne latérale 50; 11/4 1/2 transversales, 20 ou 22 prédorsales et 18 (?) circumpédiculaires; canaux de la ligne latérale ramifiés; museau court; maxillaire avec environ 24 dents, mandibule avec une paire de dents postérieures symphysaires non réduites; grand sous-orbitaire couvrant presque toute la joue (sauf une zone nue de 1-2 mm); aucune coloration visible.

Même en tenant compte du fait que la comparaison entre un spécimen sec et un spécimen conservé en alcool est hasardeuse, on doit conclure que, par rapport à *B. carpophagus*, l'exemplaire de Castelnau est beaucoup plus allongé, avec beaucoup moins d'écailles longitudinales et au-dessous de la ligne latérale, et une anale nettement plus longue. Il pourrait représenter la même population que celle qui a été appelée *Brycon lundii* par LUETKEN (1874), car les caractères et les localités typiques sont identiques, à

condition d'admettre que Lütken ait compté toutes les écailles avec canaux, y compris celles qui bordent le posttemporal et le supracleithrum (la seule spèce du Rio Sao Francisco avec 60 ou plus écailles de la ligne latérale est *B. hilarii*, très différent, qui figure pour mémoire dans le tableau suivant). Nous admettons aussi provisoirement la synonymie avec *B. orthotaenia* (bassin du Rio Itapicuru), en attendant de pouvoir étudier un matériel abondant du Rio Sao Francisco. Le tableau suivant montre les similitudes entre ces espèces:

	<i>B. carpophagus</i> sensu Castelnau	<i>B. lundii</i> d'après Lütken	type de <i>B. orthotaenia</i> d'après Howes	type de <i>B. hilarii</i>
LS	310	ca 380	330	415
Haut.	30%	ca 35%	33%	25%
PD	50,5%	ca 51%	53%	47%
Tête	22%	ca 23%	21%	26%
Sq.	11/50/4 1/2	11/59-61/8 (fig. 10/55/5)	10/48/6 1/2	13-14/60-65/10
A.	iii,28	iii,27-29	iii,26	iii,20?
P.	i,12	i,13-14	i,12	?
Mx.	24	?	22	ca 20

En résumé, il pourrait n'exister dans le Sud-Est et l'Est du Brésil (Haut Parana, Rio Sao Francisco, fleuves côtiers etc.) que trois *Brycon*:

Une forme à anale longue (A. iii, 26-29 env.), *B. orthotaenia* Günther, 1864 (synonyme probable *B. lundii*), qui correspond également au *B. carpophagus* (non Valenciennes) de Castelnau, localisée dans le Rio Itapicuru et le Rio Sao Francisco (y compris le Rio das Velhas).

Deux formes à anale plus courte (A. iii ou iv, 20-24 env.), *B. opalinus* (Cuvier, 1819) (synonymes probables *B. nattereri* Günther, 1864 – pour *opalinus* sensu Kner – et *B. bahiensis* Günther, 1864), qui habite du Rio Mogi-guaçu à «Bahia», et *B. hilarii* Valenciennes, 1849, du Rio Sao Francisco. Toutes deux semblent rares, peut-être en danger dans certains rios, et sont (ou ont été) peut-être sympatriques dans le Rio Itapicuru. Tous deux se distinguent aisément par le nombre des écailles: 7/45-49/4-5 pour *B. opalinus* contre 13-14/60-65/10 pour *B. hilarii*.

On notera que deux de ces formes font partie du groupe d'espèces amazoniennes («*Brycon falcatus*-group») de Howes (op. cit.) dont il faut étendre la distribution. Quant à *B. opalinus*, il semble bien faire partie du même groupe, mais l'absence de matériel non historique ne nous permet pas de préciser ses caractères anatomiques.

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Some new data on the Nicoletiidae (Insecta: Zygentoma) from Europe and Asia Minor

by

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With 29 figures and 1 map

ABSTRACT

In this paper, several samples of the Nicoletiidae genera *Coletinia* and *Lepidospora* are studied. The material has been collected in Sardinia, peninsular Italy, Yugoslavia, Greece, Austria and Turkey. *Lepidospora* (*L.*) *escherichi* is redescribed upon Ipiro and Levke island specimens and *Lepidospora escherichi sensu* Wygodzinsky (1980), from Kós and Rhodes islands, is considered as a new taxon, *Lepidospora* (*L.*) *wygodzinskyi* n. sp.

INTRODUCTION

The Nicoletiidae (*Zygentoma*) of Europe and mediterranean basin are represented by elements of two subfamilies. The plesiomorphic *Protrinemurinae* (MENDES, 1988) are known to occur only in aegean Greece – the troglobiont *Protrinemura mediterranea* has been described from Iraklia (MENDES, *op. cit.*) – and in Turkey – *Trinemophora bitschiana* (WYGODZINSKY, 1959), probably an edaphic species, is known from the vicinity of Izmir. The *Coletiniinae*, with the exception of some rare edaphic *Lepidospora* s.s. noticed from Sicily, peninsular Italy (Tuscany), Greece, Turkey and Israel, belong to the genus *Coletinia*, restricted to the northern and eastern mediterranean basin, which species are edaphic or cavernicolous.

Nowadays, the known distribution of the Nicoletiidae *Coletiniinae* in this area, if we consider the reliable determinations only, is as follows:

PORTUGAL – *C. mendesi* Wygodzinsky, edaphic (WYGODZINSKY, 1980). SPAIN – *C. capolongoi* Wygodzinsky, troglobic (WYGODZINSKY, 1980); *C. asymetrica* Bach *et al.* edaphic (BACH, MENDES & GAJU, 1985); *C. mendesi* Wygodzinsky, edaphic (BACH, MENDES & GAJU, 1985). FRANCE – *C. jeanneli* (Silvestri), troglobic (SILVESTRI, 1938).

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CORSICA – *C. corsica* (Chopard), edaphic (CHOPARD, 1924). SARDINIA – *C. subterranea* (Silvestri), edaphic (WYGODZINSKY, 1980). PENINSULAR ITALY – *C. subterranea* (Silvestri), edaphic (SILVESTRI, 1902) (WYGODZINSKY, 1980); *C. maggii* (Grassi), edaphic (PARONA, 1888) (GRASSI & ROVELLI, 1889) (WYGODZINSKY, 1980) (MENDES, 1981). SICILY – *C. maggii* (Grassi), edaphic (GRASSI, 1887) (GRASSI & ROVELLI, 1889); *C. subterranea* (Silvestri), edaphic (WYGODZINSKY, 1980); *C. setosula* Wygodzinsky, (?) edaphic (WYGODZINSKY, 1980); *L. (L.) grassii* (Escherich), edaphic (ESCHERICH, 1905) (WYGODZINSKY, 1980). MALTA – *C. maggii* (Grassi), edaphic (MENDES, 1981). YUGOSLAVIA – *C. maggii* (Grassi), edaphic (WYGODZINSKY, 1980). BULGARIA – *C. bulgarica* (Kosaroff), (?) edaphic (KOSAROFF, 1939). GREECE (Corfu island) – *C. subterranea* (Silvestri), edaphic (SILVESTRI, 1908); – *L. (L.) escherichi* Silvestri, edaphic (SILVESTRI, 1908). TURKEY – *C. longissima* Mendes, troglitic (MENDES, 1988); *L. (L.) aquilonaris* (Wygodzinsky), edaphic (Wygodzinsky, 1959) ? (PACLT, 1974) ? (WYGODZINSKY, 1980). ISRAEL – *L. (L.) silvestrii* Wygodzinsky, edaphic (WYGODZINSKY, 1942).

Further samples composed by female or juvenile specimens only, have been pointed out (WYGODZINSKY, 1980) to SPAIN (*Coletinia* sp I and sp II, both cavernicolous), to PENINSULAR ITALY (*Coletinia* sp III and *Lepidospora* sp) and to YUGOSLAVIA (*Coletinia* sp IV), edaphic.

The sample of *C. subterranea* referred to the Eastern Pyrenean, France, by DENIS (1923), corresponds undoubtedly to any other species in the genus; it has been pointed, indeed, «... ne montre pas d'appendice en languette à l'Ant. II gauche...», a quite typical feature of the SILVESTRI's 1902 species.

In the present paper, we deal with several samples of *Coletinia* and with a few specimens of *Lepidospora* s.s.; unfortunately, many of the former are composed by females only, which unables an accurate determination. The specimens have been collected in the Sardinia island, peninsular Italy, Yugoslavia (Dalmatia), Greece (ionian area) and Turkey. *Lepidospora escherichi* Silvestri "redescribed" by WYGODZINSKY (1980) upon Kós and Rhodes material, is considered as a new taxon, *L. (L.) wygodzinskyi* n. sp.; almost topotypical material from the Silvestri's greek species (collected in Levkás island and in the western Ipiros, geographically quite close to Corfu), allow the redescription of *Lepidospora escherichi*, which description was based upon immature specimens only.

The material is deposited in the following entomological collections: Centro de Zoologia do Instituto de Investigação Científica Tropical (CZ), E. Christian Collection (ECC), Gruppo Speleologico Sassarese (GSS), Museum d'Histoire naturelle de Genève (MG), Museo civico di Storia Naturale "Giacomo Doria" (MGD), Museo regionale di Scienze Naturali di Torino (MT), Forschungsinstitut und Museum Senckenberg (MS) and Università di Genova (UG).

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Coletinia longissima Mendes, 1988

Examined material: TURKEY – Silifke, Astim Dilek Magara, 11/VII/1988, col. F. Gardini, R. Rizzario & S. Zoia, 3♂♂ 2♀♀ 6 immature specimens (UG) 1♂ 1♀ (CZ).

This troglitic species was quite recently described (MENDES, 1988) upon material from the same area; the types were collected some 20 Km NE of Silifke though in a

distinct cave (the Asthma Cave), quite probably part of the same cave-system. The specimens under study fully agree with the original description though some of the adults (of both sexes) are clearly longer than the firstly known ones; the longer ♂ and ♀ attain a body length of 18.9 mm (5 mm more than in the bigger type-specimen) and one of the studied ♀ ♀, which terminal filament is not damaged, shows a total length of 39.0 mm; the cerci of this same specimen, quite probably undamaged, are as long as 19.2 mm.

Coletinia maggii (Grassi, 1887)

Nicoletia phytophila PACLT, 1961 *nec* Gervais, 1844 n. syn.

Examined material: AUSTRIA – Vienna, Stadtpark (=city park) under stones near composts, 15/V/1990, col. H. Gross, 2♂♂ (CZ); *ibid.* 28/V/1990, 1♂ (ECC). ITALY – Lippiano (near Arezzo), ?/VIII/1909, col. Dr. Andreini, 1♂ (MGD); Varazze (Liguria occ.), 28/III/1959, n° 188, 1♂ (MS).

The sample from Varazze (MS) was determined as *Nicoletia phytophila* by PACLT (1961); during a short visit to the Senckenberg Museum and thanks to the kindness of Dr. Schröder, we had the chance to study this only slide which includes one typical male of *Coletinia maggii*. *Nicoletia phytophila* enters, so, as a new synonymy of the Grassi's species. The geographical distribution of this taxon, known till now to extend from Malta and Sicily through continental Italy to Dalmatia, is clearly widened northwards and the species reported for the first time in Central Europe; the presence of typical adult males of *Coletinia maggii* in northeastern Austria, collected in a garden (outside greenhouses) may correspond to a well established introduced population or may represent no more than the lack of carefully carried *Zygentoma* prospections in Slovenia, Karintia and Styria. The actual finding of *Coletinia maggii* in Vienna problemizes again the taxonomic position of the "*Nicoletia*" registered in Central Europe and particularly of those noticed from Hungary (PACLT, 1959 and 1974), which status has never been clarified: *Nicoletia phytophila* Gervais, 1844 or *Coletinia maggii* (Grassi, 1887) ?

Coletinia subterranea (Silvestri, 1902)

Examined material: ITALY (SARDINIA) – Campeda, 28/IV/1908, col. A. Doderò, 1♂ (MGD); Daieri, 2/V/1908, col. A. Doderò, 2♂♂ (MGD).

The species was known from Sardinia exclusively by the specimens collected in Bosa and reported by WYGODZINSKY (1980). The males now pointed to Campeda and to Daieri agree closely to the redescription of the species (WYGODZINSKY, *op. cit.*).

Coletinia cf. subterranea (Silvestri, 1902)

Examined material: ITALY (SARDINIA) – Voragine "Sa Nurra 'e Leone", Monte Coazza, Dorgali, Nuoro, 8/XII/1985, col. R. Loru, n° 810 Dorgali, 1♀ (GSS); Grotta Pisanu (o di Gurenno), Monte Coazza, Dorgali, Nuoro, 3/I/1987, col. G. Grafitti, n° 872 Dorgali, 1♀ (GSS); no precise location, no date, col. A. Doderò, 1♀ (MGD). Italy (Sicily) – Ficuzza, 25/V/1906, col. A. Doderò, 1♀ (MGD).

The registered samples are considered under *C. cf. subterranea* (Silvestri), on account of some minor differences and due to the absence of collected males, though the main morphological characteristics agree fairly with those presented in the redescription of

the species (WYGODZINSKY, 1980). The only ♀ from Ficuzza is uniformly yellowish brown and no differences on integument colour have been observed; the faint pigmentation must correspond, as WYGODZINSKY (*op. cit.*) referred, to a not fully developed specimen – the body length attained 7.4 mm. Both ♀♀ from the Dorgali district and the only specimen from the MGD collection, with the general characteristics of the species (the ovipositor is thin and long, extending behind the IX stylets by 2.75-3.6 times these stylets length), present, however, a few setae in the hind border of the Xth urotergite (Fig. 1); furthermore, the ♀♀ from Monte Coazza caves, collected both in dark area, in stalagmitic soil or in stalagmitic concretions and 200-300 m far off the entrance, though not very well preserved, seem to be more thin and delicate than the typical specimens of *Coletinia subterranea*.

Coletinia sp. A

Examined material: YUGOSLAVIA – Krk island, near the chapel of Sveti Fusca, NW of the village Vrh, under a big stone in *Quercus ilex* bush, 20 m inland of the shore, 5 m asl, 28/VII/1987, col. E. Christian, 1 ♀ 1 ♀ immature (CZ); Ibid., Sveti Fusca Bay, west of Vrh, *Quercus pubescens* wood, under stones, 3 m asl, 26/VII/1988, col. E. Christian, 1 ♀ immature (CZ).

Both samples from the Krk island include females and one only is an adult specimen; its ovipositor is short and robust, 20-23 articulated and extending behind the IX stylets by about twice their own length; the subgenital plate is parabolic, rounded in the distal margin and setose, and the cephalic capsule shows a “*capolongoi*-type” chaetotaxy (Fig. 2); the bigger ♀ Xth urotergite (Fig. 3) remains that of *Coletinia subterranea* (WYGODZINSKY, 1980) though its posterior depression seems not so clear; it is completely different from the Xth tergite of *Coletinia maggii* – noticed from the Ombla valley, in Dalmatia (WYGODZINSKY, 1980) – as it is from the same tergite of *Coletinia* sp. III – collected in the neighbouring Sistiana (WYGODZINSKY, *op. cit.*) – the only Nicoletiidae in the area. Only the eventual capture of adult males in Dalmatia and/or Istria, will allow to know the exact taxonomic status of these samples.

Coletinia sp. B

Examine material: ITALY – Voltaggio, 27/VI/1908, col. A. Doderò, 1 ♀ (MGD).

This only ♀ with 8.2 mm of body length, collected a few miles north of Genova, belongs quite probably to *Coletinia maggii*; the ovipositor is 23-25 articulated and extends beyond the IXth stylets by about 2.5 times their own length; presents a subgenital plate very alike those I observed in other ♀♀ of this species, shows a frontal chaetotaxy typical of this species, with short setae and a few macrochaetae; the Xth urotergite (Fig. 4) presents, however, a greater number of lateral marginal setae and much stronger apical setae in the under surface.

Coletinia spp.

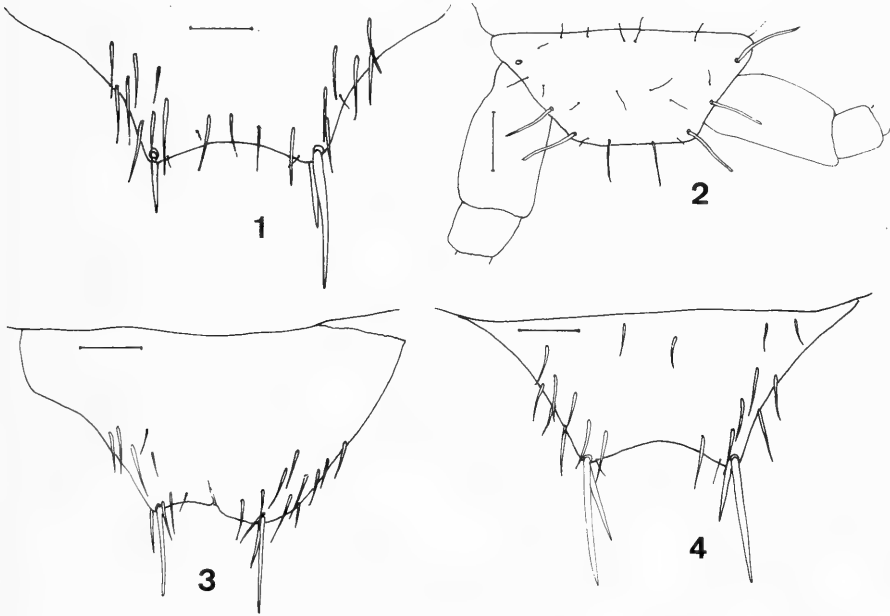
Examined material: FRANCE – Galerie du Pré à Vincent, St. Didier au Mont d'Or, Rhône, 11/VII/1986, col. M. Meyssonier, 1 young ♂ (MG). ITALY – Voltaggio, 20/IX/1909, col. F. Sotari, 1 juv (MGD). ITALY (SARDINIA) – Doliali, Dorgali, Gr. Pisanu, 15/XI/1985, n° 215 SINU, col. P.M. Giachino, 1 young ♂ (MT).

The registered specimens are too young to allow a more detailed determination; the young ♂ from Sardinia was accompanied by the following label: “*Nicoletia jeanneli*

Silvestri det. P.M. Giachino 1986"; though devoided of sexual secondary characteristics, which will allow a specific determination, it is much more probable that this specimen will correspond to the species wch adults have been collected in this same cave, *Coletinia* cf. *subterranea* as stated before.

Lepidospora (L.) *escherichi* Silvestri, 1908

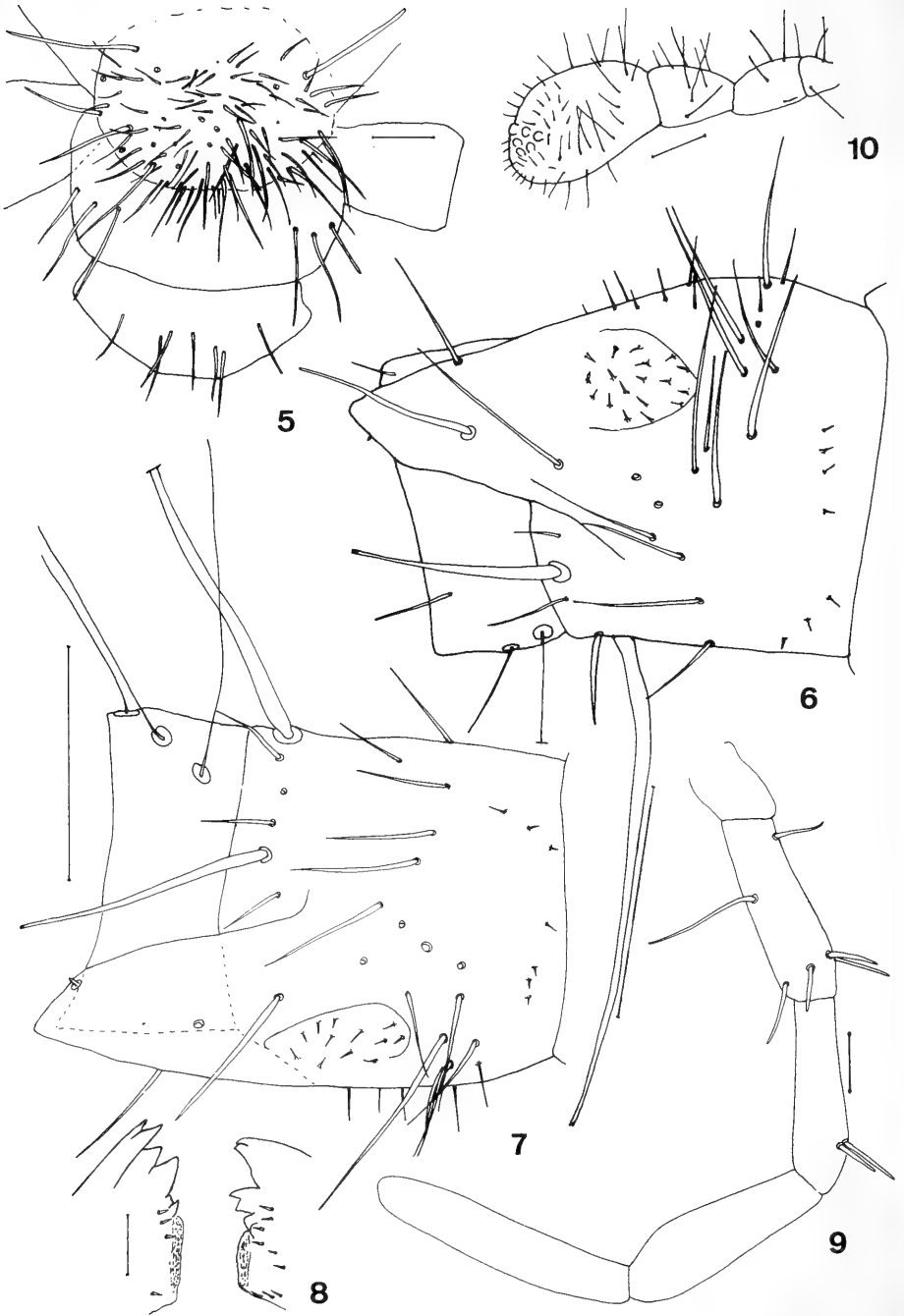
Examined material: GREECE – Leucade (= Leukás or Levkás), au-dessus de Phryni, oliviers et macchia, 27/III/1971, col. V. Mahnert, n° GR-71/36, 1♂ 1♀ (MG) 1♂ 1♀ (CZ); Epire (= Ipiros), au nord de Kestrión, 30 m, sous arbustes, 5/V/1973, col. V. Mahnert, n° EP-73/96, 1♂ (MG).



FIGS 1-4.

Fig. 1. *Coletinia* cf. *subterranea* ♀, specimen from the MGD Xth urotergite; Fig. 2. *Coletinia* sp. A ♀, frontal chaetotaxy of the adult specimen; Fig. 3. Ibid., Xth urotergite; Fig. 4. *Coletinia* sp. B ♀, Xth urotergite. Scales: 0.1 mm.

Lepidospora escherichi was described from Corfu (=Kerkira) (SILVESTRI, 1908) and, as latter reported (WYGODZINSKY, 1980), all the type material was immature; in this same paper, WYGODZINSKY "redescribes" the species upon adult males and females collected in the aegean island of Kós and points its presence (based on further young specimens) in the not very far Rhodes island. On account of the several similarities presented by the Corfu and the aegean specimens it was stated (WYGODZINSKY, 1980: 23): "... In order not to continue burdening the literature with names of unrecognizable species, I have redescribed *Lepidospora escherichi* from adults... collected on Kós, which, although not topotypical is



reasonably close... to make specific identity a distinct possibility...". The study of the adult specimens collected in the Levkás island and in western littoral Ipiros, both geographically much closer to the type locality of Corfu, and the conspicuous dissimilarities presented by the ionian and the aegean specimens, led us to consider the material obtained in Phryni and in Kestrión as conspecific with *L. escherichi*, and the specimens from Kós and Rhodes (the aegean islands) as part of a not yet named taxon (while described in detail under the name of *L. escherichi*) we will analyse afterwards.

Based on the ionian insular and western mainland specimens considered above, and having in mind that the only real description of this species is, indeed, the original one, based in non-adult material, we will proceed, right away, to its redescription.

Body length: 5.1-5.2 mm (♂) 5.0-5.4 mm (♀); thorax length (1.9-2.0 mm (♂) 1.8-1.9 mm (♀)); thorax width: 1.5-1.6 mm (♂) 1.6-1.7 mm (♀). Body limuloid, elongated. Hypodermal pigment absent, the general colour yellowish white or ivory. Macrochaetae yellowish brown, the stronger ones apically bipid. Scales typical, whitish, with abundant rays, little while clearly visible and very abundant.

Head without special features, the frons with a few strong and long macrochaetae and numerous shorter and thinner setae, as in Fig. 5. Antennae of ♀ without special characteristics. Pedicellus of ♂ (Figs 6 and 7) with a strong distal inner apophysis, longer than wide at base, conical, provided with a very little antepical conule and with an inner subovoid fovea; distal area of the apophysis extending beyond the level of the first flagellar article.

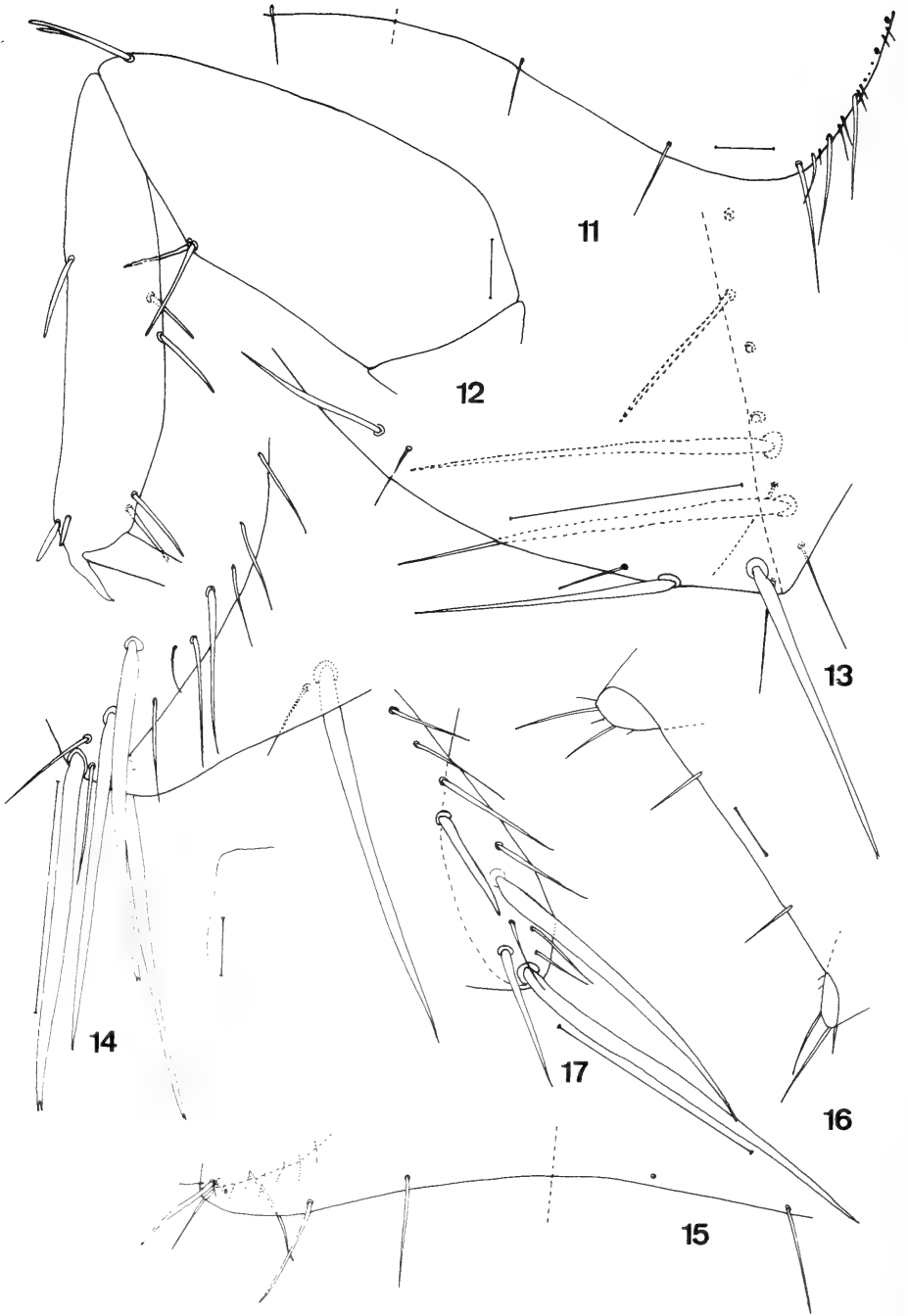
Mandibles typical, with numerous acute and sclerotized distal teeth, as in Fig. 8. Maxillae as in the remaining species of the genus; galea with two strong apical conules, the lacinia equally long and with an inner pectinated area which extends close to the distal outer tooth, the bigger one of the pair. Maxillary palp as in Fig. 9, with a few strong macrochaetae in the 2nd and in the distal dorsal area of the 3rd article; distal article about 5 times longer than wide and 1/5 longer than the penultimate ($n/n-1 = 1.26-1.33$). Labium typical, the labial palp as in Fig. 10.

Nota scaly, with thin and short setae and isolated macrochaetae along the lateral borders (Fig. 11) and with 2+2 short setae in the posterior margin; among the scales, in the disc, abundant minute isolated thin cilia. Legs robust, the tibia of P III (Fig. 12) about 4 times longer than wide, with one only dorsal (with the exception of the distal dorsal short ones) and 4 ventral thin macrochaetae, clearly shorter (ca 3/4) than the tibial diameter; femur with a pair of ventral distal and an isolated dorsal distal macrochaeta. Praetarsus without special features, the lateral claws longer than the empodium, this one clearly setulated.

Urotergites I-VIII with 4+4 posterolateral (or 2+2 posterolateral and 2+2 close infralateral) macrochaetae, the external ones accompanied in the outer and ventral area by 5-6 thin setae, as in Figs 13 and 14; in the 1st urotergite, 1+1 or 2+2 short and delicate sublateral macrochaetae, in the remaining II-VIII tergites 2+2 stronger and longer macrochaetae wide spaced as in Fig. 15. IXth urotergite without strongly produced posterolateral lobes, with 1+1 sublateral macrochaetae only (Fig. 16), its lateroventral chaetotaxy as in Fig. 17, the inner macrochaeta of each pair distinctly shorter than the

FIGS 5-10.

Lepidospora (L.) escherichi Silvestri, 1908. Fig. 5. Chaetotaxy of the frons, clypeus and labrum; Fig. 6. ♂ pedicellus of antenna; Fig. 7. Ibid., from one other specimen; Fig. 8. Mandibles; Fig. 9. Maxillary palp; Fig. 10. Labial palp. Scales: 0.1 mm.



outer one mainly in the ♂. Urotergite X of the ♀ as in fig. 18, clearly emarginated, the angle formed by the inner margins of the apical notch of 90-100°; lateral margins with a row of 5-7 setae; macrochaetae of the posterolateral angles long and stout, longer than the marginal setated area. Xth ♂ urotergite (Figs 19 and 20) deeply emarginated, the sides of the emargination forming an angle of ca. 50°, the posterolateral lobes triangular and wide; dorsal surface with a lateral row of strong setae and 1+1 similar antedistal setae, the terminal macrochaeta absent; ventral surface provided with 8-10 sclerotized brownish conules, the most anterior longer and clearly thinner, the remaining ovoid; apical peg the largest.

Urosternite I with a triangular sternite and 1+1 wide lateral coxites, typical. Urosternites II-VII with a pair of stylets (Figs 21 and 22), entire, with 1+1 short and stout submedian macrochaetae close each other besides several thinner setae; those from the vesicles (in sternites II-VI) are longer, those from the pseudovesicles (in the VIIth) as long as the remaining; disc of the urosternites scaly, with isolated tiny cilia. Coxite VIII of ♂ (Fig. 23) with the submedian area protruding between the stylets and with about 8-10 stout and long macrochaetae, almost all clearly longer than the submedian ones of the preceding sternites (twice longer and acute pointed – those of the II-VII are apically bipid); longer macrochaetae as long as 2/3-3/4 of the distance between the most external pair. IXth stylets stout, much longer and stronger than the preceding pairs, provided with some very strong setae and with two ventral long macrochaetae (Fig. 24). Paramera as in Figs 24 and 25, cylindrical, 4.5-5 times longer than wide, shorter than the level of the insertion of the stylet hind macrochaeta, attaining the length of 2/3 of the IXth stylets. Subgenital plate of the ♀ (Fig. 26) widely parabolic, with an irregular row of marginal short setae. Ovipositor strong, fusiform (Fig. 26), extending beyond the apex of the IXth stylets by their own length. Gonapophyses with 11 articles, the VIIIth clearly stronger, their chaetotaxy as in Figs 27 and 28.

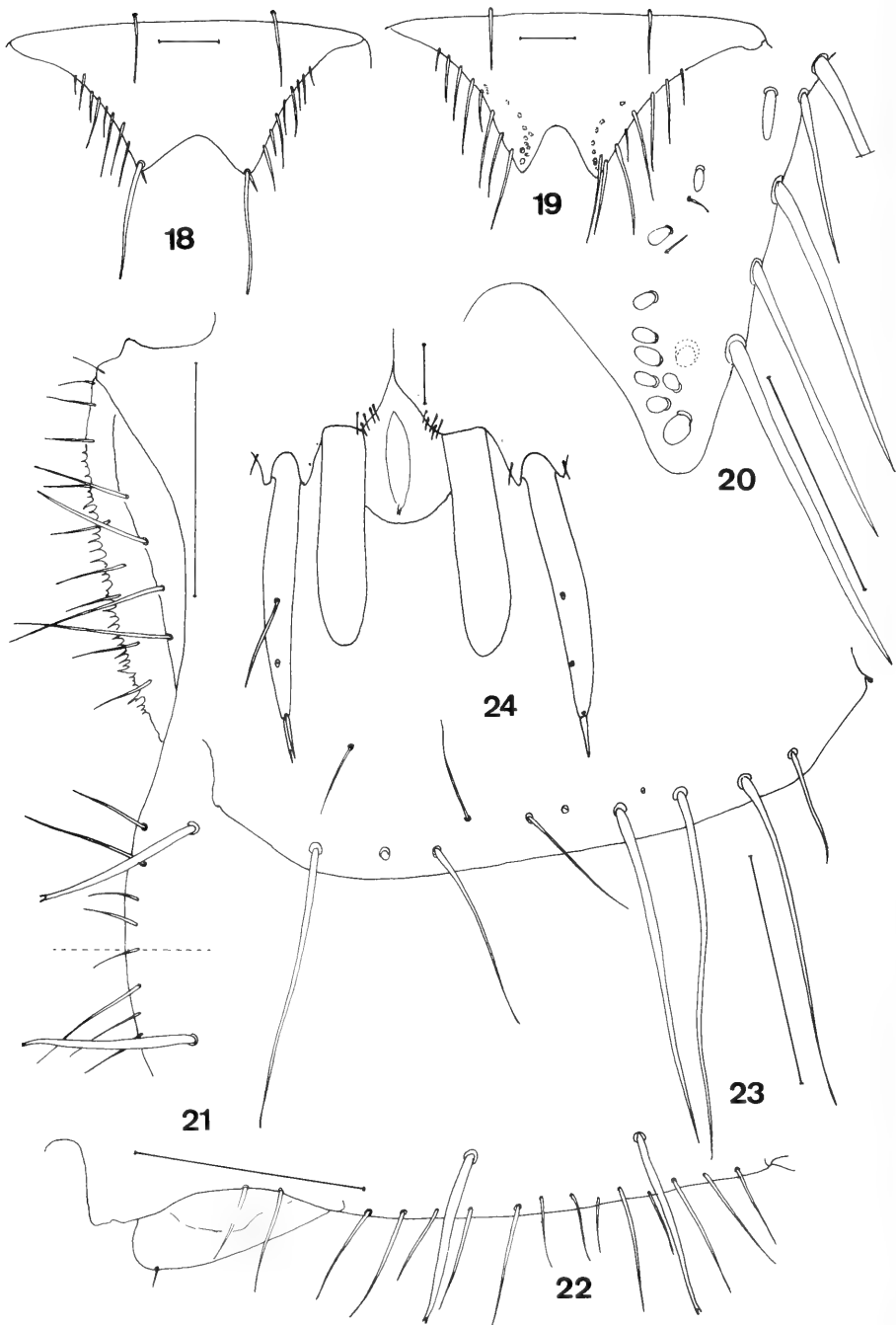
Cerci of ♂ and all the terminal filaments of ♀ with the usual chaetotaxy, the terminal median filament with very strong and elongate ventral macrochaetae. Dorsal surface of ♂ terminal filament (Fig. 29) with 10-12 sclerotized pegs in the basal area, arranged in 2 (exceptionally 3) longitudinal rows.

D i s c u s s i o n : *L. escherichi* Silvestri, seems to approach, among the described mediterranean species, *L. aquilonaris* (at least the type material from Alexandretta, in as much as the sample from the european Turkey – PACLT, 1974 – has not been confirmed as belonging to this same species); the shape of the ♂ Xth urotergite and its specialized chaetotaxy are quite alike; however, this so briefly described turkish taxon (WYGODZINSKY, 1959, as *Lepidospora silvestrii aquilonaris*) shows a Xth ♂ urotergite less deeply emarginated, with a distinct while similar specialized chaetotaxy and the sclerotized pegs are clearly thinner than in the ionian SILVESTRI's species; furthermore, the number of pegs in the basal dorsal terminal filament is clearly higher in the turkish species.

Relatively to the aegean species which has been "re-described" as *L. escherichi* (see afterwards), the differences are quite evident; they concern several features as: the shape

FIGS 11-17.

Lepidospora (*L.*) *escherichi* Silvestri, 1908. Fig. 11. Hind border and posterolateral area of mesonotum; Fig. 12. P III; Fig. 13. Detail of the chaetotaxy of Ist urotergite; Fig. 14. Infralateral chaetotaxy and external sublateral macrochaeta of the VIIIth urotergite; Fig. 15. Vth urotergite; Fig. 16. IXth urotergite; Fig. 17. *Ibid.*, infralateral chaetotaxy. Scales: 0.1 mm.



of the ♂ pedicellar apophysis; the shape of the lateral lobes of the ♂ Xth urotergite and the number and shape of the ventral pegs; the distinct elongation of the tibiae (mainly Ti III) and the dorsal chaetotaxy of the femur; the number and mainly the length and robustness of the hind border macrochaetae in the ♂ VIIIth urostermite; the number of sclerotized pegs in the ♂ terminal median filament; the more elongated ovipositor; the length of the posterolateral Xth urotergal macrochaetae in the ♀.

***Lepidospora* (L.) wygodzinskyi n. sp.**

Lepidospora escherichi WYGODZINSKY, 1980 nec Silvestri, 1908.

As referred before, the samples of *Lepidospora* collected in the aegean islands of Kós and Rhodes (which correspond to the only known material of this new taxon), has been considered by WYGODZINSKY (1980) as *Lepidospora escherichi* and the material from Kós – the specimens from Rhodes are all immature – served as the base to his “redescription” of the SILVESTRI's species. The text and figures presented are quite detailed and are sufficient to characterize the new *L. wygodzinskyi*.

The species is named after its describer, who noticed and figured accurately the main morphological characters as pointed, Dr. P.W. Wygodzinsky. It is, furthermore, an homage to a great entomologist, deceased in the 27th January 1987, whose first publication on thysanurans (in 1939) was the start to an extraordinarily scientific career (see TÉRAN, 1987 and SCHUH & HERMAN, 1988) with a production of almost 250 papers; 70 among these, concern Microcoryphia and/or Zygentoma and include one of the largest contributions to the knowledge of these two orders: the original description of 11 genera and 146 species of Microcoryphia and of 16 genera and 80 species of Zygentoma in addition to an endless list of redescrptions.

As far as we know, the mediterranean *Lepidospora* are completely allopatric, extending from Sicily and peninsular Italy to Greece, Turkey and Israel (MAP 1).

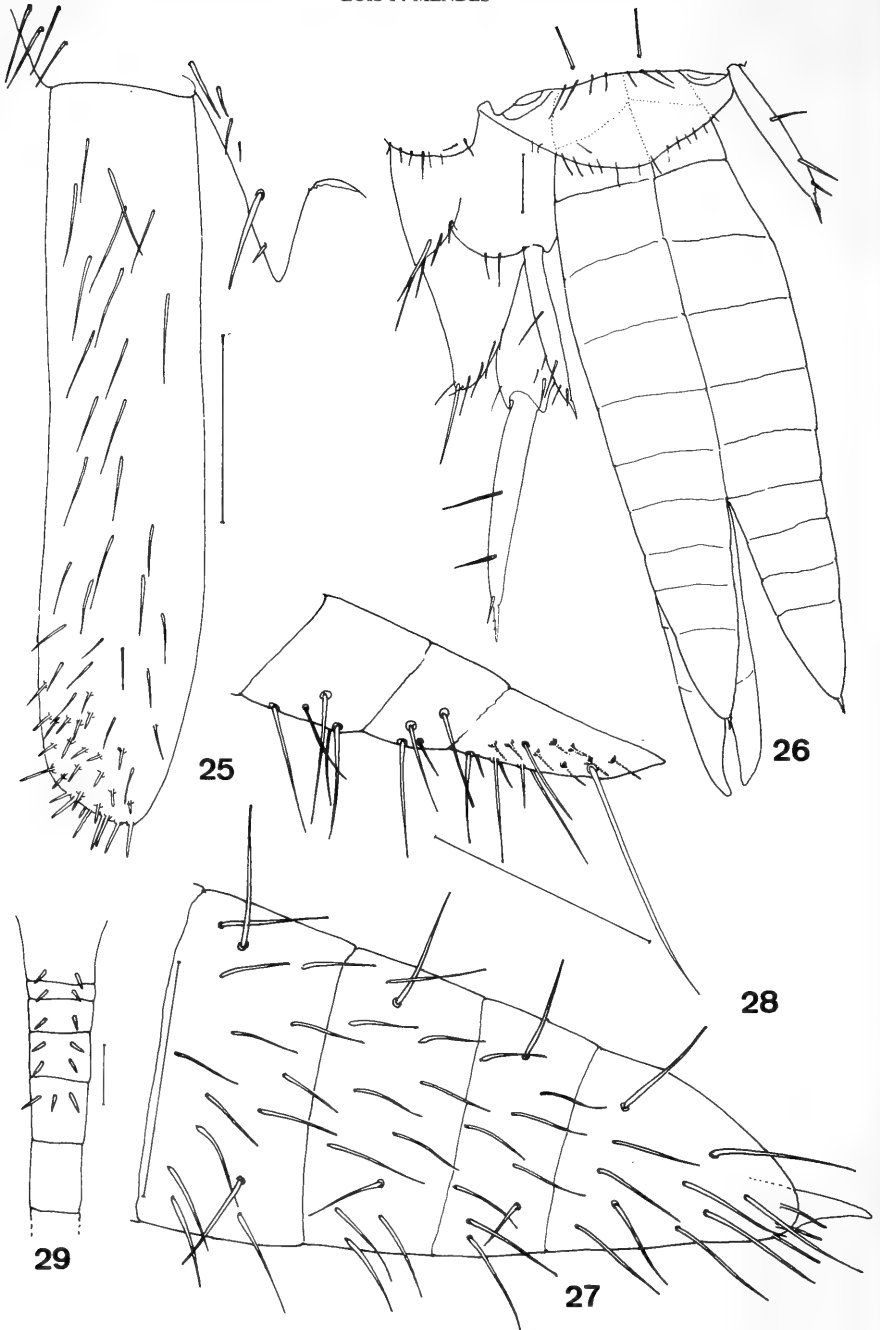
The palestinian taxon (WYGODZINSKY, 1942) seems much more closely allied to the species described from the Kurdistan and southern Iraq as already stated (MENDES, 1985), on account of the much higher number of sensorial pegs in the ventral ♂ Xth urotergite.

The *status* of the sicilian and of the mainland italian *Lepidospora* populations remains, as discussed by WYGODZINSKY (1980), quite problematic, as neither from Sicily nor from Tuscany adult specimens are actually known – nor even the validity of *L. grassi* has been definitely established, as no further material has been studied after the description of *Nicoletia grassi* (ESCHERICH, 1905).

As already discussed (WYGODZINSKY, 1980) the species from Kós seems particularly close to the ionian *L. escherichi* and to the turkish *L. aquilonaris* by the type of chaetotaxy in the Xth urotergite of ♂, but it is completely distinct on account of the shape of the ♂ antennal pedicellar apophysis and of the morphology of the lateral lobes of the ♂ Xth urotergite; both these features seem to be species-specific.

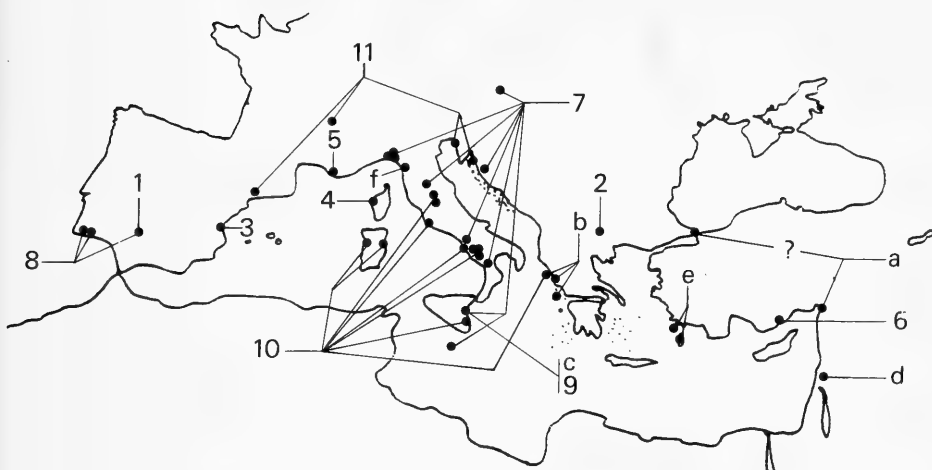
FIGS 18-24.

Lepidospora (L.) *escherichi* Silvestri, 1908. Fig. 18. Xth urotergite of ♀, dorsal view; Fig. 19. Xth urotergite of ♂, dorsal view; Fig. 20. Ibid., detail of the ventral pegs; Fig. 21. Vth urostermite; Fig. 22. VIIth urostermite; Fig. 23. VIIIth urostermite of ♂; Fig. 24. Genital area of ♂. Scales: 0.1 mm.



FIGS 25-29.

Lepidospora (L.) escherichi Silvestri, 1908. Fig. 25. Paramerum; Fig. 26. Genital area of ♀ and subgenital plate; Fig. 27. VIIIth gonapophyses, distal articles; Fig. 28. IXth gonapophyses, distal articles; Fig. 29. Pegs of the ♂ dorsal basal terminal filament. Scales: 0.1 mm.



MAP 1.

Known distribution of the Coletiniinae of Europe and Asia Minor. Genus *Coletinia* (n. 1-11); genus *Lepidospora* (n. a-f). 1. *C. asymmetrica*; 2. *C. bulgarica*; 3. *C. capolongoi*; 4. *C. corsica*; 5. *C. jeanneli*; 6. *C. longissima*; 7. *C. maggii*; 8. *C. mendesi*; 9. *C. setosula*; 10. *C. subterranea*; 11. *Coletinia* spp. a. *L. (L.) aquilonaris*; b. *L. (L.) escherichi*; c. *L. (L.) grassi*; d. *L. (L.) silvestrii*; e. *L. (L.) wygodzinskyi*; f. *Lepidospora* s.s. spp.

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Mayflies from Israel (Insecta; Ephemeroptera)

I.- Heptageniidae, Ephemerellidae, Leptophlebiidae & Palingeniidae*

by

Michel SARTORI¹

With 45 figures

ABSTRACT

This paper is the first part of a work dealing with the mayfly fauna of Israel. Eleven species are reported here. The most diversified family is the Heptageniidae with six species belonging to six different genera: *Rhithrogena znojkoï* (Tshernova), *Epeorus zaitzevi* Tshernova, *Ecdyonurus asiaeminoris* Demoulin, *Electrogena galileae* (Demoulin) (comb. nov.), *Afronurus kugleri* Demoulin and *Heptagenia samochai* (Demoulin) (comb. nov.). *E. zaitzevi* is new for the fauna of Israel. The male of *H. samochai* is described for the first time and the synonymy with *H. lutea* Kluge (syn. nov.) is proposed. Eggs of the six species are described and illustrated. Keys are provided for nymphs and adults. Ephemerellidae are represented by a single species, *Ephemerella mesoleuca* (Brauer). Leptophlebiid species are: *Paraleptophlebia submarginata* (Stephens), *Choroterpes (Ch.) picteti* Eaton and *Choroterpes (Euthraulus) ortali* nov. sp. described at all stages. New features to distinguish the nymphs of the Mediterranean *Euthraulus* species are provided. One species of Palingeniidae has been found in the collections of Bet Gordon Museum in Deganya: *Palingenia orientalis* Chopra. The female of this species is described for the first time. *P. orientalis* disappeared from the investigated area in the early fifties.

Some geographical data are given on the distribution of the species inside and outside the investigated area, as well as some ecological observations. For instance, underwater emergence is reported for the first time in the genus *Afronurus*.

INTRODUCTION

The mayfly fauna of the Near East or Levant is still not well known. In a work devoted to the northern part of this area (mainly Turkey, Syria, Lebanon), KOCH (1988) lists the main important literature references available until now for this region.

Concerning Israel, the study and collecting of Ephemeroptera can be divided into three main periods.

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¹ Museum of Zoology, Palais de Rumine, P.O. Box 448, CH-1000 Lausanne 17, Switzerland.

The first one (1930-1960) is related to the work of Y. Palmoni from Bet Gordon Museum, who collected some mayflies, mainly in Lake Kinneret and Lower Jordan River area.

The second one (1967-1971) is the important contribution by SAMOCHA (1972), who dealt with a general survey of the Ephemeroptera of this country. With the help of this material, DEMOULIN (1973) published the first taxonomical work and described four new species of the family Heptageniidae.

The third one (1977-1990) is related to the work of the Inland-waters Ecological Service laboratory (IES) with the help of the River Surveillance System of the Nature Reserves Authority, Israel. During that time, more than 5'500 samplings have been made in more than 2'000 stations.

Recently, I had the opportunity to study the important collection of Dr. M. Samocha, deposited at Tel-Aviv University, as well as the huge collection of the Institute of Life Sciences in Jerusalem. The whole material was available through the courtesy of Dr. R. Ortal (Department of Zoology, The Hebrew University of Jerusalem and Nature Reserves Authority, Israel) who I sincerely thank for his cooperation. Moreover, I had the opportunity to travel twice to Israel in 1990 and 1991 and to collect material in the most important localities.

Almost twenty years after DEMOULIN (1973), I have to repeat the following foreword. Some localities where the material comes from, as well as some places where I had the opportunity to travel and collect material (mainly in the Golan Heights) are actually within the boundaries of Israel (cease-fire line of June 1967), but the property of such territories is always controversial.

This first contribution deals with the families Heptageniidae, Ephemerellidae, Leptophlebiidae and Palingeniidae. The remaining families will be published later by other specialists.

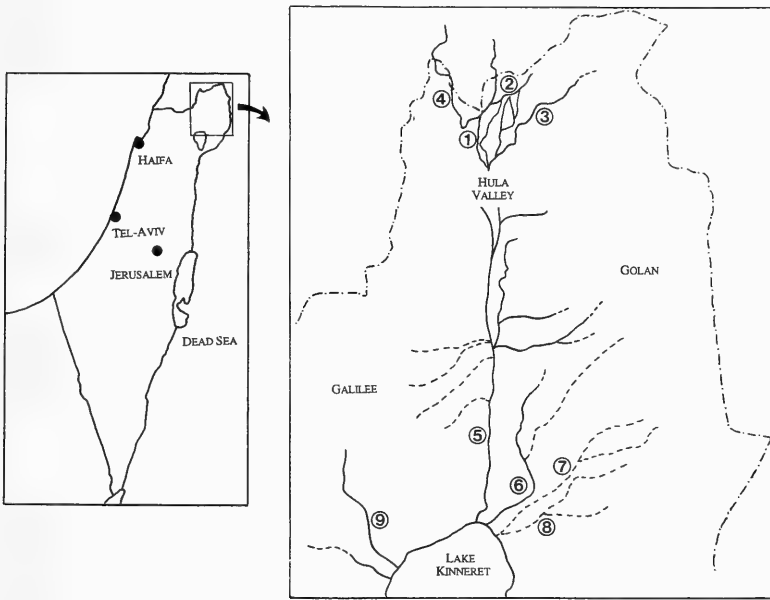
INVESTIGATED AREA

Nine among the eleven species belonging to the above mentioned families are only found in the North Eastern part of the country, i.e. mainly Hula Valley and Golan (map 1). This area is the only one to provide suitable habitats for the Heptageniidae, Ephemerellidae and most of the Leptophlebiidae. The fact that no representatives have been found in the streams and rivers of Lower and Upper Galilee (except two tributaries of Lake Kinneret, N. Amud and N. Zalmon), which offers also a good diversity of habitats, is probably due to the generally higher water temperatures of these streams (BROMLEY, 1988), as well as to human impacts on the environment (R. Ortal, comm. pers.). Other areas, such as Judea, Samaria, Negev and the coastal plain, do not possess cold permanent running waters, and so are only colonized by Caenidae and Baetidae species.

Concerning the two other taxa, the palingeniid species has been found in the Lower Jordan River (between Lake Kinneret and the Dead Sea), whereas one leptophlebiid species, belonging to the genus *Choroterpes* (subgenus *Euthraulius*) has been found only in some restricted places near the Dead Sea (N. Arugot, En Gedi).

HEPTAGENIIDAE

As already mentioned, this family has been worked by DEMOULIN (1973). Some complements are brought to the fore in this study. The Israeli fauna is peculiar in that it is composed of six genera, each comprising only a single species.



MAP 1.

Investigated area and detail of the North Eastern part with the main important watercourses. Dotted lines: temporary waters. 1: Nahal Senir (Hasbani River); 2: Nahal Dan, 3: Nahal Hermon (Banias); 4: Nahal Iyon (Ayoun River); 5: Upper Jordan River; 6: Nahal Meshushim; 7: Nahal Yadudiyya; 8: Nahal Daliyyot; 9: Nahal Amud.

KEY FOR THE IDENTIFICATION OF THE NYMPHS

This key is based on the one proposed by HEFTI & TOMKA (1989) for the European genera of Heptageniidae.

- 1 Nymph with two cerci, but no terminal filament *Epeorus zaitzevi*
- Nymph with two cerci and one terminal filament 2
- 2 External borders of pronotum elongated caudally (fig. 5) ... *Ecdyonurus asiaeaminoris*
- External borders of pronotum not elongated caudally 3
- 3 First gill lamellae expanded ventrally and bigger than the other ones
- *Rhithrogena znojkoji*
- First gill lamellae not expanded ventrally and shorter than the other ones 4
- 4 Galea and lacinia with a row of setae on the ventral side (fig. 4); head trapezoid;
- VIIth pair of gills with a tuft of filaments (fig. 6) *Heptagenia samochai*
- Galea and lacinia with scattered hairs on the ventral side (fig. 3); head rounded;
- VIIth pair of gills without a tuft of filaments (figs 8-9) 5
- 5 Anterior margin of labrum with a median notch (fig. 1); inner face of the femora
- with a distinct dark spot; VIIth gill broad and rounded (fig. 8) *Afronurus kugleri*

- Anterior margin of labrum concave, without a median notch (fig. 2); inner face of femora with a transversal dark band; VIIth gill almost pointed (fig. 9) *Electrogena galileae*

KEY FOR THE IDENTIFICATION OF THE IMAGOS

- 1 Upper face of femora with a distinct red to violet spot 2
- Upper face of femora without such spot (Caution! on lower face, a spot may be present!) 3
- 2 Tergites uniformly coloured; male and female genitalia as in fig. 11 and fig. 16 respectively *Rhithrogena znojkoï*
- Tergites with posterior margin bordered with a darker narrow band (fig. 38); male genitalia as in fig. 10 *Epeorus zaitzevi*
- 3 Transversal veins in the costal and subcostal fields broader than the others, tinted with violet (fig. 21) 4
- Transversal veins in the costal and subcostal fields normally build, brown or yellow, but never tinted in violet 5
- 4 Transversal veins in the costal field sinuous (fig. 21); male and female genitalia as in fig. 13 and fig. 18 *Heptagenia samochai*
- Transversal veins in the costal field not sinuous; male and female genitalia as in fig. 12 and fig. 17 *Ecdyonurus asiaeminoris*
- 5 Body colour reddish-brown; male and female genitalia as in fig. 15 and fig. 20 *Electrogena galileae*
- Body colour light brown or even yellowish; male and female genitalia as in fig. 14 and fig. 19 *Afronurus kugleri*

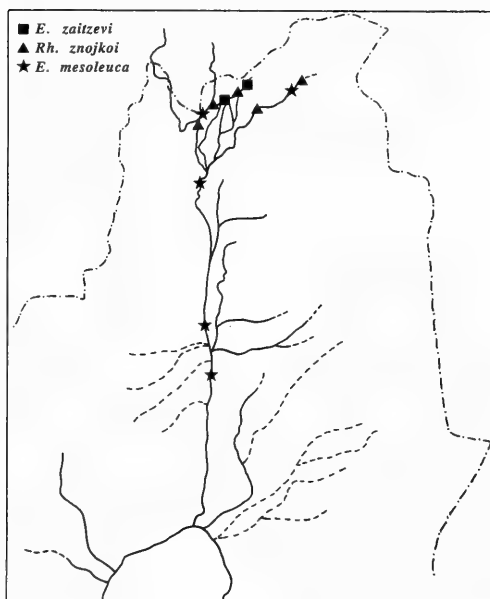
Epeorus zaitzevi Tshernova, 1981*Epeorus* sp. SAMOCHA, 1972*Epeorus* sp. DEMOULIN, 1973*Epeorus znojkoï* BRAASCH, 1978a nec TSHERNOVA, 1938*Epeorus zaitzevi* KAZANCI & BRAASCH, 1988 (injust. emend.)*Epeorus zaicevi* KOCH, 1988 (injust. emend.)

Material examined: 1♀ subimago, 16 N, more than 300 L from 122 samples in 7 localities along the Dan River.

For a description of the ♂, see TSHERNOVA (1981) and KAZANCI & BRAASCH (1988). For a description of the nymphs, see BRAASCH (1978a).

Despite the lack of ♂ imagoes, we agree with Braasch's opinion (in KOCH, 1988), that specimens illustrated by DEMOULIN (1973) belong to *E. zaitzevi*. The nymphs are similar to those described by BRAASCH (1978a) (sub. nom. *E. znojkoï*). Moreover, a peculiar feature of this species is the presence of a narrow dark band on the posterior margin of each abdominal tergite (see TSHERNOVA, 1981 fig. 3 p. 225, and also fig. 38). This character is visible both in nymphal and winged stages.

As for all known species of the genus *Epeorus* (DEGRANGE, 1960), the eggs of *E. zaitzevi* bear no peculiar exochorionic structures, nor polar cap (fig. 39). 2-3 micropyles visible in the equatorial area.



MAP 2.

Distribution of *E. zaitzevi*, *Rh. znojkoii* and *E. mesoleuca*. For explanations, see map 1.

Distribution: *E. zaitzevi* has been found only in the headwater of the Jordan (map 2) and seems to be exclusively restricted to the torrential part of the Dan River (see also POR *et al.*, 1986). In the visited localities, this species is rather common but is never abundant. So far known also from Caucasus (Armenia) (TSHERNOVA, 1981), Turkey (KAZANCI & BRAASCH, 1988) and from Syria (KOCH, 1988).

Rhithrogena znojkoii (Tshernova, 1938)

Ecdyonurus znojkoii TSHERNOVA, 1938

Rhithrogena sp. SAMOCHA, 1972

Epeiron znojkoii DEMOULIN, 1973

Rhithrogena sp. DEMOULIN, 1973

Epeorus znojkoii TSHERNOVA, 1981

Rhithrogena znojkoii THOMAS & DIA, 1982

Material examined: 1♂, 23 N, 77 L from 43 samples in 9 localities along the Banias, Dan and Hasbani Rivers.

The adults of *Rh. znojkoii* have been redescribed by THOMAS & DIA (1982), and the nymphs and eggs by SARTORI & SOWA (1992), where its affinities and proper status have been quoted. In the investigated area, *Rh. znojkoii* can be easily separated from all other species, both in adult and nymph stages. Differential diagnoses are available in SARTORI &

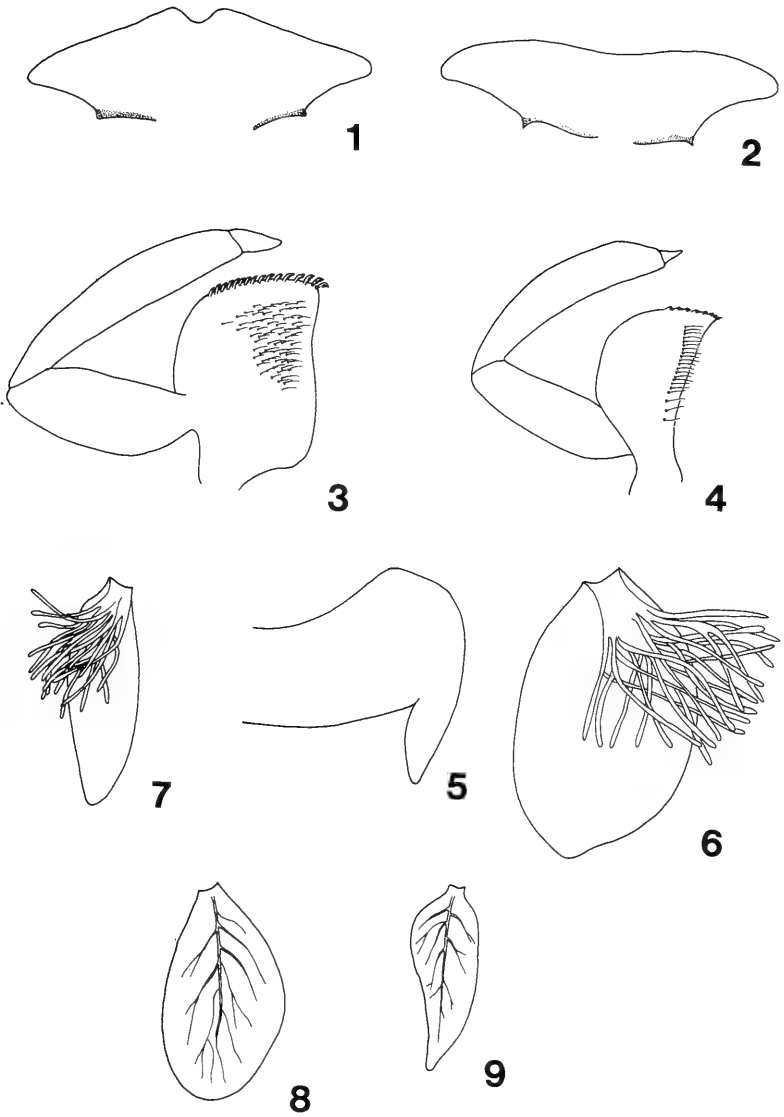
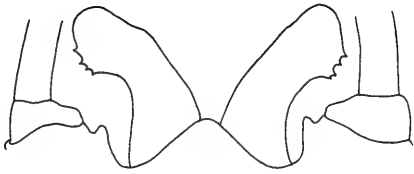
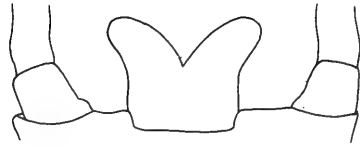


FIG. 1-9.

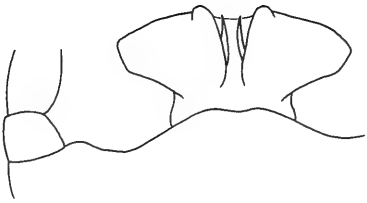
Heptageniidae nymphs. *A. kugleri* (1, 8), *E. galileae* (2, 3, 9), *H. samochai* (4, 6), *E. asiaeminoris* (5, 7). 1, 2: labrum; 3, 4: maxilla; 5: right half of the pronotum; 6-9: 7th gill.



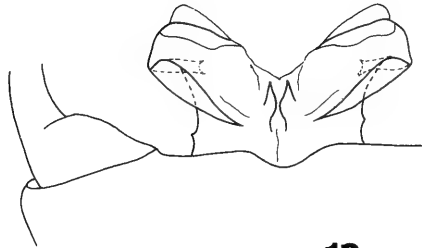
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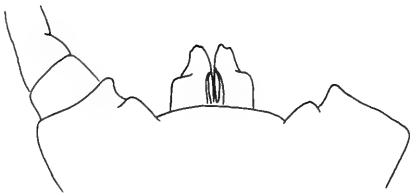
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12



13



14



15

FIGS 10-15.

Heptageniidae male genitalia in ventral view. 10: *E. zaitzevi*; 11: *Rh. znojkoji*; 12: *E. asiaeminoris*; 13: *H. samochai*; 14: *A. kugleri*; 15: *E. galileae*. Fig. 10 redrawn after KAZANCI & BRAASCH, 1988.

SOWA (op. cit.). The eggs of *Rh. znojkoii* are easily recognizable by the tooth-like shape of the exochorionic structures (fig. 40).

Distribution: *Rh. znojkoii* seems to be restricted to the Hula Valley, and particularly to the Dan and Hasbani Rivers, where this species is never abundant (map 2). Known also from Caucasus (Armenia) (TSHERNOVA, 1938), Lebanon (THOMAS & DIA, 1982; DIA, 1983; MOUBAYED, 1986), Turkey (KAZANCI & BRAASCH, 1988; KOCH, 1988) and Syria (KOCH, 1988).

Ecdyonurus asiaeminoris Demoulin, 1973

Ecdyonurus galileae SAMOCHA, 1972 nec DEMOULIN, 1973!

Material examined: 2♂, 6♀, 79 N, more than 260 L from 75 samples in 10 localities along the Dan, Hasbani and Baniyas Rivers.

This species belongs to the so-called "venosus group", and is really easy to recognize, especially in larval stages. The seventh pair of gills bears also a tuft of tracheous filaments, as the six previous ones (fig. 7). Only one species shares the same feature: *E. insignis* Eaton, an inhabitant of European rivers. The transversal veins tinted with violet in the fields C and Sc of the forewings also allow separation of the winged stages. *E. asiaeminoris* presents no clear affinities with other members of the genus *Ecdyonurus* known to occur in Near- and Middle East, although some similar characters with *E. ornatipennis* Tshernova could be found (TSHERNOVA, 1938; BRAASCH, 1980a). The eggs of *E. asiaeminoris* are characterized by medium size KCTs, regularly arranged on the chorionic surface, except on one pole where they are bigger and all closer (fig. 41). Small rounded tubercles are also found on the surface. 7-8 micropyles present in the sub-equatorial area.

Distribution: this species seems to be restricted to the Hula Valley, and especially Hasbani River after the confluence with the Dan River (map 3). The species occurs really scarcely in Baniyas and Tel Dan for instance, but is abundant in Dan river from Dan 5 locality (see POR *et al.*, 1986; ALLAN *et al.*, 1988 for localisation of the sites). *E. asiaeminoris* has never been quoted outside this area, and is unknown from Turkey, Lebanon or Syria for instance.

Afronurus kugleri Demoulin, 1973

Afronurus kugleri SAMOCHA, 1972

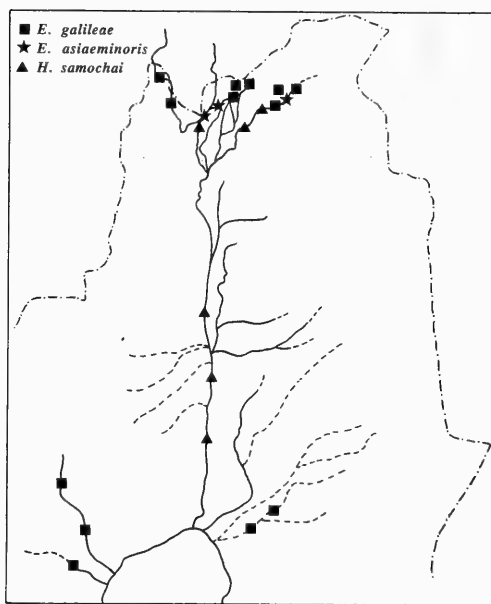
Afronurus kugleri DIA, 1983

Afronurus kugleri MOUBAYED, 1986

Afronurus kugleri KOCH, 1988

Material examined: 27♂, 22♀, 91 N, more than 450 L from 119 samples in 43 localities along 17 watercourses.

A. kugleri is the second species of this genus known from the Mediterranean area. It shares some common features with its closest relative *A. zebratus* (Hagen) known exclusively from Corsica and Sardinia. The main differences between these two species concern the galea-lacinia of the nymphs. In *A. kugleri*, the distal part of the galea-lacinia bears 13-15 combs, the median ones with 9-10 teeth (fig. 22), whereas in *A. zebratus*, 19-21 combs can be found, the median ones with 15-18 teeth (fig. 23). The peculiarities of egg exochorionic structures of *A. zebratus* (GAINO & MAZZINI, 1987; GAINO *et al.*, 1987) can also be observed in *A. kugleri*. The whole surface of the chorion is covered with KCTs (fig. 42), and resembles what is found in *A. zebratus*.



MAP 3.

Distribution of *E. galileae*, *E. asiaeminoris* and *H. samochai*. For explanations, see map 1.

Distribution: *A. kugleri* is the most widespread Heptageniidae in Israel. It occurs in the Hula valley, the Golan Heights as well as in the Upper Jordan River (map 4). Known also from Lebanon (DIA, 1983; MOUBAYED, 1986) and from Turkey and Syria (KOCH, 1988).

A. kugleri seems to be more tolerant than other Heptageniidae, especially with regards to the temperature, i.e. this species can colonize other streams and rivers where the other ones are missing for (N. Meshushim, N. Samakh, N. Yahudiyya, N. Zavitan for instance).

During our researches in the field, as well as during the rearings, we had the opportunity to observe the subimaginal emergence of *A. kugleri*. It was surprising to find this species has an underwater emergence. The nymphs begin to molt a few centimeters below the water level (under artificial conditions), the subimagoes then "swim" rapidly towards the surface for emergence. Until now, underwater emergence was known to occur only in the genus *Electrogena* (KIMMINS, 1941 and pers. obs.). The fact that *A. kugleri* (and probably also *A. zebratus*) exhibits the same behaviour also confirms the strong morphological and biochemical relationships between these two genera (HEFTI & TOMKA, 1989).

***Electrogena galileae* (Demoulin, 1973) comb. nov.**

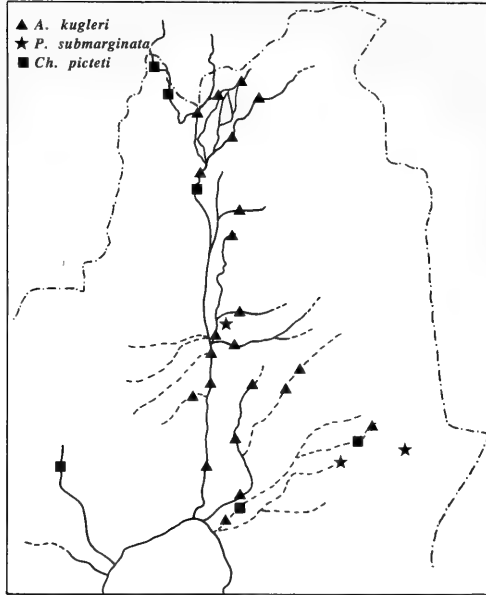
Ecdyonurus golanicus SAMOCHA, 1972 nomen nudum

Ecdyonurus galileae DEMOULIN, 1973

Ecdyonurus galileae DIA, 1983

Ecdyonurus galileae MOUBAYED, 1986

Ecdyonurus galileae KOCH, 1988



MAP 4.

Distribution of *A. kugleri*, *P. submarginata* and *Ch. picteti*. For explanations, see map 1.

Material examined: 56♂, 14♀, 162 N, more than 270 L from 96 samples in 28 localities along 14 watercourses.

By its distinctive features both in nymphal and adult stages, *E. galileae* clearly belongs to the genus *Electrogena* Zurwerra & Tomka, 1985. But a comparative study of *E. galileae* with its close relatives is still not possible at the moment. This is mainly due to the great number of species only partly described during the last decade from nearby areas, mainly Caucasus and Transcaucasus (BRAASCH, 1978b, 1980a, 1980b, 1983). Nevertheless, the status of *E. galileae* as *species propria* is certainly good for it can be distinguished from all other species described before 1973. The eggs of this species are typical for the genus and resemble those of *E. grandiae* for instance (GAINO *et al.*, 1987). They are characterized by medium size KCTs and rounded tubercles covered by granular ground matrix. 4-5 micropyles are found in the equatorial area (fig. 43).

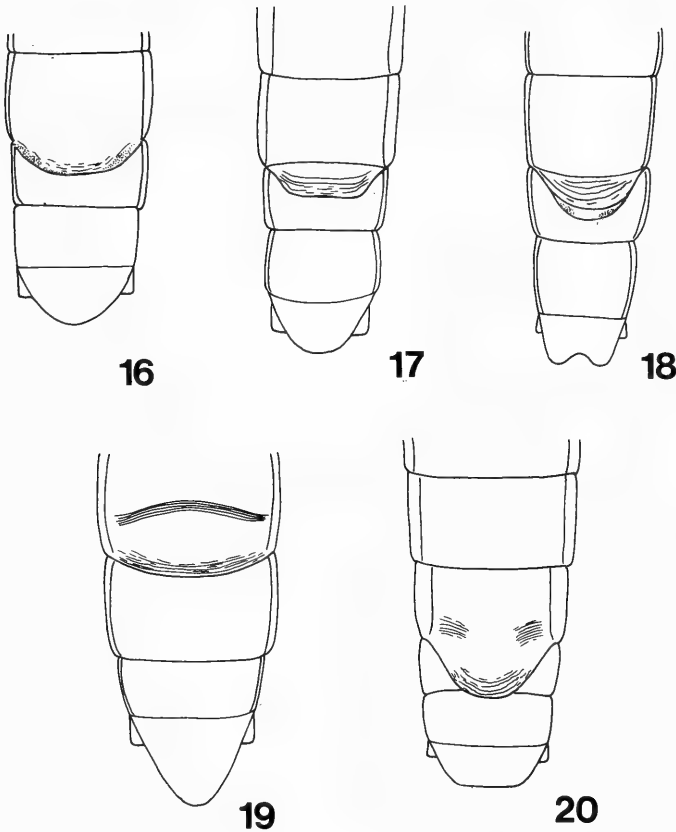
Distribution: In Israel, *E. galileae* occurs mainly in the Hula valley, where it is particularly abundant in the sources regions, such as Tel Dan springs, Banias (map 3). Also reported from Lebanon (DIA, 1983; MOUBAYED, 1986) and Syria (KOCH, 1988). But I am not sure the citations outside Israel are correct. The examination of undetermined material from Lebanon (A. Dia & A.G.B. Thomas leg.) indicates that there are at least two species belonging to the genus *Electrogena* in this country, neither of them related to *E. galileae*.

***Heptagenia samochai* (Demoulin, 1973) comb. nov.**

Sigmoneuria samochai SAMOCHA, 1972

Sigmoneuria samochai DEMOULIN, 1973

Heptagenia lutea KLUGE, 1987 (syn. nov.)



FIGS 16-20.

Heptageniidae female genitalia in ventral view. 16: *Rh. znojki*; 17: *E. asiaeminoris*; 18: *H. samochai*; 19: *A. kugleri*; 20: *E. galileae*.

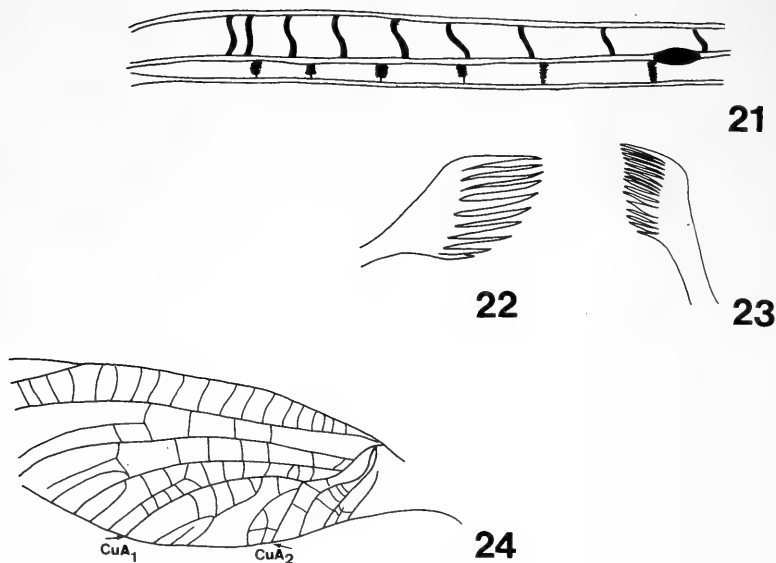
Material examined: 37♂, 37♀, 19 N, 94 L from 31 samples in 17 localities along the Dan, Hasbani, Baniyas and Upper Jordan Rivers.

The ♂ imago of this species was not known from DEMOULIN (1973). We give here below its first description.

Size: body length: 11.9 - 14.5 mm; forewing: 11.3 - 12.0 mm; cerci: 22.0 - 25.0 mm.

Eyes uniformly greyish. Antennae with yellowish-brown pedicel and whitish funicule.

Thorax more or less uniformly yellowish-brown. A small, dark elongated spot on the metapleurites. Forelegs light brown, with blackish junction between tarsi and tibiae. Middle and hindlegs yellowish. Wings translucent. Longitudinal veins brown. Transversal veins of the costal and subcostal fields tinted with violet or black. In the proximal part of the forewing, transversal veins of the costal field slightly sinuous, those of the subcostal field tinted in violet and more or less quadratic (fig. 21).



FIGS 21-24.

21. Proximal part of the costal and subcostal fields of the forewing in *H. samochai*; 22: comb of the galea-lacinia in *A. kugleri*; 23: comb of the galea-lacinia in *A. zebratus*; 24: cubito-anal field of the forewing in *P. orientalis*.

Abdomen colourless, except tergites I-III whitish and segments VIII-X whitish-brown. Cerci whitish, every other junction strongly coloured in violet.

Genitalia (fig. 13): general colour whitish. Styliiger plate with a median smooth concave incision. On each penis lobe, ventral tooth long and regularly curved. Titillators short, pointed and straight.

The eggs of *H. samochai* are similar to those found in other species, such as *H. sulphurea* (Müller) or *H. coeruleans* (Rostock) for instance (DEGRANGE, 1960). They are characterized by medium size KCTs, bigger on the polar cap, and a great number of micropyles (8-12) in the equatorial area (fig. 44).

As already mentioned by BRODSKY (1980) and by KLUGE (1989b) the genus *Sigmoneria* has no phylogenetic existence, and therefore has to be regarded as a junior synonym of *Heptagenia*. *H. samochai* is a very distinct species, both in imaginal and larval stages, and presents no clear affinities with species such as *H. coeruleans* or *H. longicauda* (Stephens). By the shape of the cross veins in the C and Sc fields, *H. samochai* resembles *H. perflava* Brodsky, 1930 but can be separated on the shape of the penis lobes and titillators. Another related species is *H. lutea* Kluge, described from Caucasus, Armenia, Azerbajdzan, Georgia and Iran (KLUGE, 1987). I had the opportunity to compare *H. samochai* with specimens coming from Elbourz mountains in Iran (near Bujnurd, coll. F. Schmid). These specimens completely fit the description given by KLUGE (op. cit.), and therefore can be regarded as *H. lutea*. The only differences found between *H. samochai* and *H. lutea* are the shape of the cross veins in the subcostal field, triangular in *H. lutea*, whereas quadratic in *H. samochai* as well as

the margin of the styliger plate, smoother in *H. lutea* than in *H. samochai*. We could compare only the male imagoes but strong affinities are also visible in the nymphal stage, especially in the labrum and gill shape (see figs. 42-45 & 50 in KLUGE, 1987). Moreover, it is also Kluge's opinion (in litt.) that *H. lutea* has to be regarded as a junior synonym of *H. samochai*.

Distribution: *H. samochai* is mainly restricted to the Hula valley and the Upper Jordan River (map 3). Outside Israel, *H. samochai* is also found in Georgia, Armenia, Kimea and Elbourz mountains (KLUGE, 1987, 1989a).

EPHEMERELLIDAE

This family is represented in the investigated area by a single species.

Ephemerella mesoleuca (Brauer, 1857)

Ephemerella maculocaudata IKONOMOV, 1961b

Ephemerella sp. n. SAMOCHA, 1972

Ephemerella mesoleuca KOCH, 1988

Material: 6♀, 9 N, 23 L from 14 samples in 6 localities along the Hasbani, Baniyas and Upper Jordan Rivers.

The specimens from Israel perfectly fit the diagnosis of *E. maculocaudata* Ikononov, 1961 given by SOLDAN (1982) on the basis of material collected in Bulgaria. But recently, STUDEMANN & TOMKA (1989) have proposed the synonymy between these two species. Although some variations such as the size and position of the transversal dark band on the cerci can be noticed between populations (see also ALBA-TERCEDOR, 1991) they have to be regarded as belonging to the same species *E. mesoleuca* (D. Studemann, comm. pers.).

Distribution: *E. mesoleuca* has been found mainly in the Upper Jordan River (map 2). It is also known from Baniyas and Hasbani Rivers where Samocha collected it, but this species has not been found again in these localities since 1971, where it has probably disappeared from.

Found also by KOCH (1988) in Syria (Orontes) but evidence of its distribution in other Levantine countries, mainly Lebanon and Turkey, is not yet established.

LEPTOPHLEBIIDAE

In his work, SAMOCHA (1972) reported three leptophlebiid species from Israel, none of them specifically identified, and belonging to the genera *Paraleptophlebia* and *Choroterpes* (subgenera *Choroterpes* and *Euthraulius*). In the examined material, only these three taxa have been found, each of them represented by a single species.

Paraleptophlebia submarginata (Stephens, 1835)

Paraleptophlebia sp. SAMOCHA, 1972

Material examined: 1♂, 4 L from only 4 samples in 4 small watercourses (En Abu Fakusa, En Jalabina, En Qusbyie, Nahal Gamla).

The Israeli specimens completely fit the diagnosis for this species, and therefore present no differences with European populations. Both nymphs and imagoes are easy to recognize.

Distribution: probably one of the less abundant species in Israel. *P. submarginata* seems to be restricted to the Golan Heights (map 4), and has not been found in other places, especially in the Hula valley. Outside the country, the species is known from Iran (BRAASCH, 1981) and Turkey (KAZANCI, 1986). This species is widespread in Europe (PUTHZ, 1978).

***Choroterpes (Choroterpes) picteti* Eaton, 1871**

Choroterpes (s.s.) sp. n. SAMOCHA, 1972

Material examined: 5♂, 5♀, 20 N, 35 L from 12 samples in 8 localities along 8 watercourses.

This species, thought to be new by SAMOCHA (1972), is in fact the same species which occurs in Europe. Its distinctive features from other new species described recently from the Mediterranean area, such as *Ch. volubilis* Thomas & Vitte, 1988 (Morocco) or *Ch. borbonica* Belfiore, 1988 (southern Italy) are well marked, especially the shape of the penis lobes and the colouration of the forewings.

Distribution: *Ch. picteti* has been found in the Golan Heights and also in the Hula valley (map 4). Known also from Lebanon (DIA, 1983) and Turkey (KAZANCI, 1984).

***Choroterpes (Euthraulus) ortali* nov. sp.**

Choroterpes (Euthraulus) sp. SAMOCHA, 1972

Material examined: 1♂ imago holotype (with its nymphal exuviae); 2♂♂ imagoes, 1♂ subimago, 3♀♀ imagoes, 2♀♀ subimagoes, 15 nymphs paratypes: Israel, Dead Sea Area, Nahal Arugot (En Gedi), -300 m below sea level, 12.V.1991 (coll. M. Sartori). Other paratypes: 1♂ imago, 1♂ subimago, 2 nymphs, same locality, 15.V.1990 (coll. R. Ortal & M. Sartori); 3 nymphs, same locality, 6.XII.1990 (coll. R. Ortal). Other material (not type specimens): more than 500 larvae and nymphs from the same wadi (coll. Nahal Arugot project); 1 larva, Ein Doyuq, 8.III.1970 (coll. Avrahami) and 1 larva, En Mishmar, 25.II.1970 (coll. Gasith). All specimens preserved in alcohol except one ♂ paratype partly in microscopic preparation (wings, genitalia). Holotype and most of the paratypes housed in the Musée de Zoologie, Lausanne. 1♂ imago, 1♂ subimago, 1♀ imago, 1♀ subimago and 4 nymphs paratypes are deposited in the Museum of Zoology of the Tel-Aviv University.

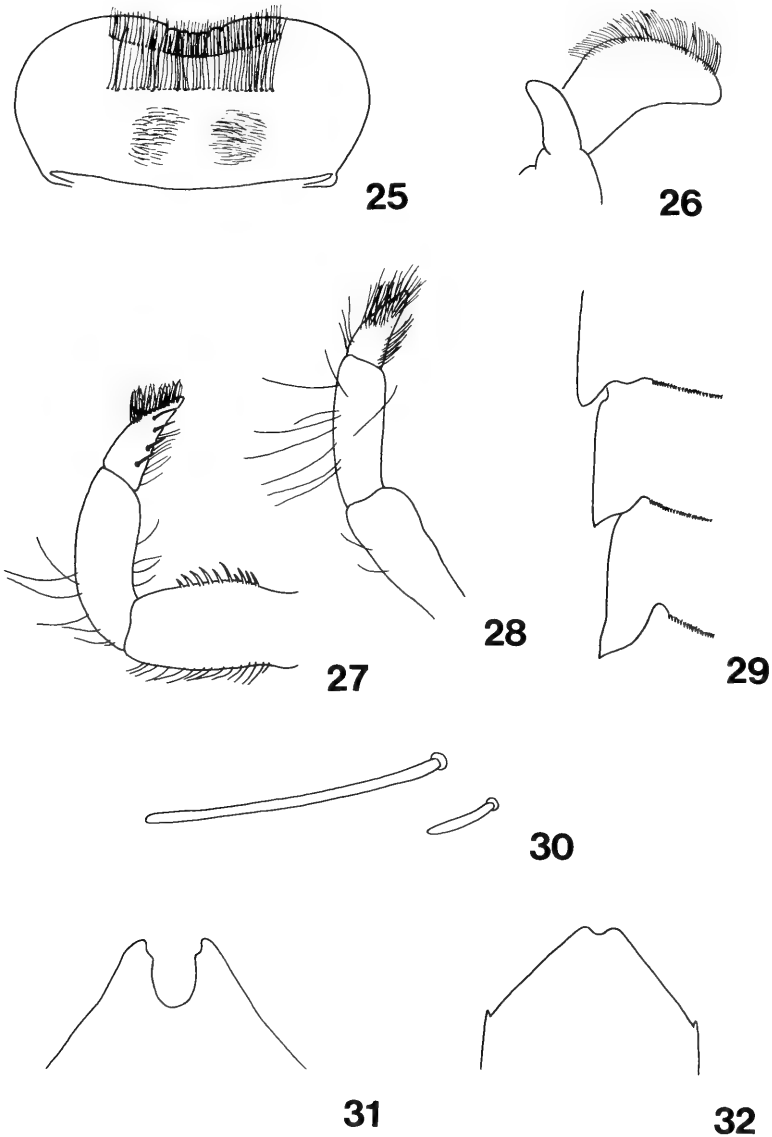
Description

Nymph

Sizes (without cerci): ♂ nymphs up to 6.3 mm; ♀ nymphs up to 7.5 mm.

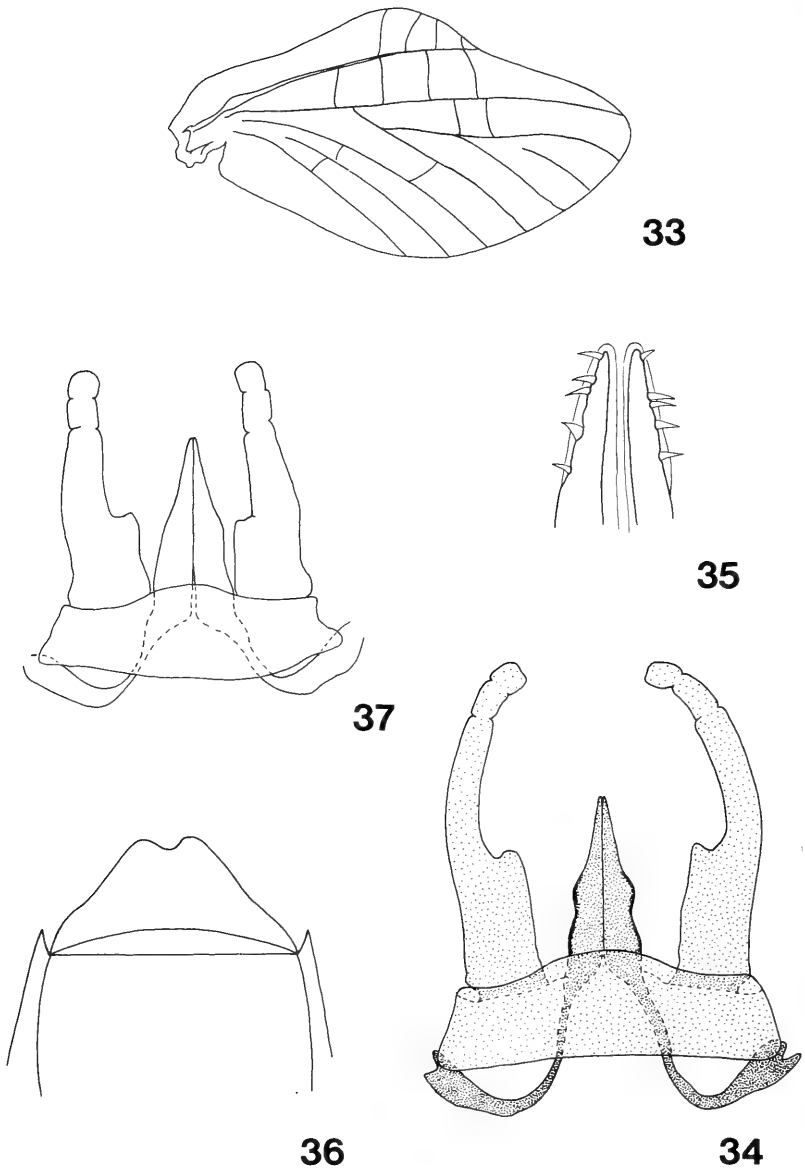
Head medium brown; thoracic sclerites dark brown. Legs yellowish-brown. Upper face of femora with an elongated dark spot in the distal part. Abdominal tergites greyish-brown, sternites yellowish-brown. Cerci light brown, proximal part darker.

Anterior margin of the labrum with a very smooth emargination, and with two rows of fine setae (fig. 25). Antero-lateral projection of the lacinia with a small projection. 2nd/3rd segments of the maxillary and labial palps ratio about 1.7 (figs 27-28). Hypopharynx as in fig. 26. Legs with the same kind of ornamentation as in *Ch. (Eu) arabica* (SARTORI & GILLIES, 1990). Hind tibiae with a row of 24-27 external bristles (fig. 30). Tarsal claws moderately hooked, with 13-14 teeth. Gills typical of the subgenus *Euthraulus*, with gill I lanceolate, and gills II-VII with two lamellae plate-like and terminated in three slender, subequal processes. Lateral margin of terga VII-IX as in fig. 29. IXth sternite of male and female nymphs as in fig. 31 and fig. 32 respectively.



FIGS 25-32.

Ch. (Eu.) ortali nov. sp. Nymph. 25: labrum; 26: left half of the hypopharynx; 27: labial palp; 28: maxillary palp; 29: lateral margin of abdominal tergites VII-IX; 30: bristles on the outer margin of hind tibiae; 31: sternite X in male nymph; 32: sternite X in female nymph.



Figs 33-37.

Ch. (Eu.) ortali nov. sp. Male imago (33-35), female imago (36), male subimago (37). 33: hind wing; 34: genitalia in ventral view; 35: detail of the penis lobes in ventral view; 36: subanal plate; 37: genitalia in ventral view.

Male imago

Size: body length: 7.8 - 8.2 mm; forewing: 6.4 - 6.6 mm; cerci: 8.8 - 9.4 mm.

Upper part of the eyes brownish-red. Thoracic sclerites dark brown. Femora of all legs greyish-brown with an elongated spot in the distal part of the upper face, as in the nymphs. Femoro-tibial joints medium brown. Tibia and tarsi yellowish-brown. Abdominal terga greyish-brown, sterna lighter except the IXth medium brown.

Forewings translucent, except basis of C, Sc and R veins medium brown, and pterostigmatic area milky. Pterostigma with 9-12 simple transverse veins. Rs vein forked a little bit nearer to base of wing than attachment of vein MP_2 to MP_1 . MA forked over half of distance from base to margin. MP vein asymmetrical. 4 longitudinal veins in the cubital area. Hindwings with a rounded and symmetrical process; subcostal vein reaching the costa immediately behind the process (fig. 33).

Genitalia

Subgenital plate medium brown; forceps yellowish-brown. Hind margin of the subgenital plate regularly convex, without incision. First segment of the forceps very broad in the proximal half, suddenly reduced in the apical half, forming a small rounded inner process (fig. 34). Penis lobes well developed, scissor-like, pointed at their apex which bears about 5 small spines (fig. 35).

Female imago

Size: body length: 5.8 - 6.2 mm; forewing: 6.5 - 6.8 mm; cerci: 6.0 - 7.5 mm.

Thorax dark brown, wings entirely translucent. Abdominal tergites medium brown, sternites greyish-brown. Subanal plate elongated with a median incision (fig. 36).

Male subimago

General colour as for the ♂ imago, but more contrasted.

Wings entirely greyish, except the proximal part of the forewings greyish-brown. Genitalia as in fig. 37.

Female subimago

General colour of the abdomen reddish brown. Wings greyish.

Eggs

General shape ovoid. Length: 170-180 μm , width: 95-105 μm . Exochorionic structures with cross and asteroid costae (fig. 45). In the middle of them, a small adhesive element is present which is bigger on one pole.

Affinities

In nymphal stage, *Ch. (Eu.) ortali* shares some common features with other representatives of the Mediterranean area. It can be separated from *Ch. (Eu.) lindrothi* (Peters, 1980), *Ch. (Eu.) balcanica* (Ikonov, 1961) and *Ch. (Eu.) assimilis* Gaino & Sowa, 1985 by the shape of the labrum, especially the less marked median emargination. Other mouth parts rather similar, as well as gills. Legs ornamentation can also provide good features to separate these four species, especially on the hind legs. The shape and number of the bristles on the outer margin of the hind tibiae are rather constant in each species. In *Ch. ortali*, there are 24-27 long, subparallel bristles, rounded at the apex, whereas they are shorter, less numerous and enlarged at the apex in *Ch. assimilis*, and much longer, less numerous, and pointed at the apex in *Ch. lindrothi*. In *Ch. balcanica*, they seem to be shorter and less numerous (see IKONOV, 1961a, fig. 9, p. 6).

In winged stages, *Ch. ortali* can be compared with certainty only to *Ch. lindrothi* and *Ch. arabica*, for male imagoes of *Ch. balcanica* and *Ch. assimilis* are still unknown. Genitalia of *Ch. ortali* are quite different from those of *Ch. lindrothi*, especially in the shape of the penis. It presents some affinities with *Ch. arabica*, but can be separated by the shape of the first segment of the forceps, as well as by the outer margin of penis lobes. ♂ subimago of *Ch. ortali* can be distinguished from the one of *Ch. assimilis* by the shape of the penis lobes. On the basis of wing venation, distinctive features are hard to find between *Ch. ortali* and *Ch. balcanica*, although the subcostal vein of the hind wing seems longer in *Ch. balcanica* than in *Ch. ortali*.

Finally, the eggs of *Ch. ortali* are easily distinguishable from those of *Ch. assimilis* (no exochorionic structures), *Ch. lindrothi* and *Ch. arabica* (polar cap, size and shape of the costae).

Distribution: *Ch. ortali* has been found to occur widely in one tributary of the Dead Sea, Nahal Arugot, where this species is rather common. Prospections in the nearby wadi Nahal David where surprisingly fruitless. Information on the type locality is available in FURTH (1983). Known so far only from that area.

Derivatio nominis: this species is named after Dr. Reuven Ortal (Jerusalem) for his tremendous help during the whole study.

PALINGENIIDAE

The occurrence of a Palingeniidae species in the Jordan River has been known since the mid-thirties (BODENHEIMER, 1935). But the specific identification of the population living in this watercourse was still enigmatic. BODENHEIMER (1935) reported the mass-flight of the gigantic species *Palingenia jordanica*, but unfortunately gave no description of this mayfly. In 1937, the same author proposed the synonymy of *P. jordanica* with *P. orientalis* Chopra. This synonymy has been done in fact by Y. Palmoni (1897-1971), who was the founder and director of "Bet Gordon", the A.D. Gordon Agriculture and Nature Study Institute at kibbutz Deganya (LULAV, 1972). In 1939 specimens were sent to Dr. G. Ulmer for examination, and returned identified as *P. longicauda* (Olivier). Later on, other material was sent to Prof. V. Landa who determined them as *P. sublongicauda* Tshernova. This specific name has been used by SAMOCHA (1972) and remained until now. Thanks to the courtesy of S. Lulav, the actual director of Bet Gordon, we had the opportunity to study the collections of this institution. Among them, 19 Palingeniidae specimens are still available. They are all ♀♀. No nymphs nor ♂♂ are preserved. However, these specimens could be related to Chopra's species, especially on the basis of their peculiar forewing venation.

Palingenia orientalis Chopra, 1928

Palingenia jordanica BODENHEIMER, 1935 nomen nudum!

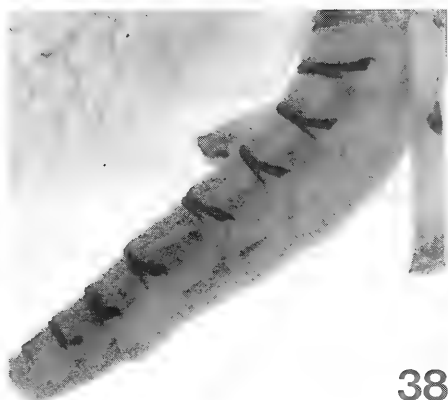
Palingenia orientalis BODENHEIMER, 1937

Palingenia sublongicauda SAMOCHA, 1972 nec Tshernova, 1949

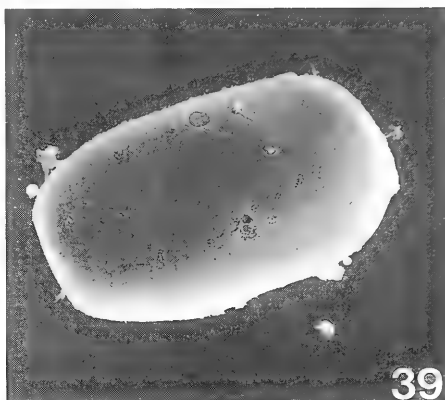
Material examined: 10 ♀♀: Israel, Lower Jordan River, Deganya (outlet of Lake Kinneret), -210 m below sea level, 7.IV.1944. Other specimens, all from the same place: 1 ♀ 29.III.1935, 7 ♀♀ 27.III.1944, 1 ♀ 29.III.1947 (coll. Y. Palmoni).

Description (dried specimens)

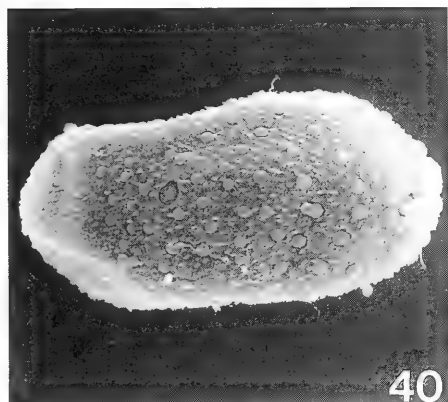
Size: body length (without cerci): 22-31 mm; forewing: 24-29 mm; cerci broken.



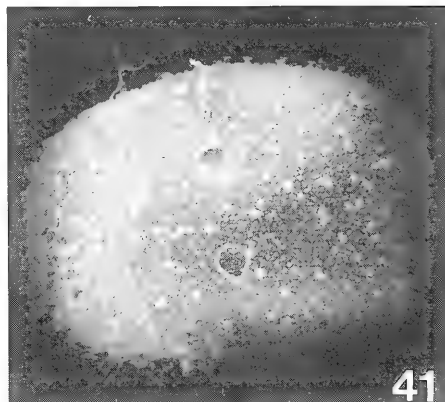
38



39



40



41

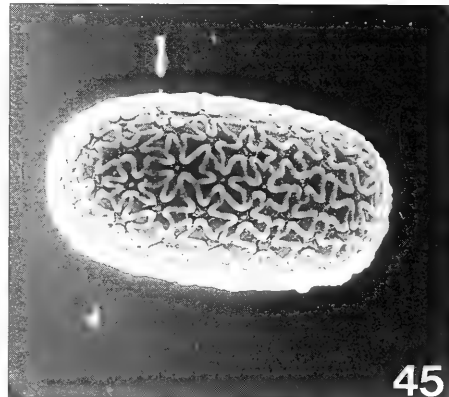
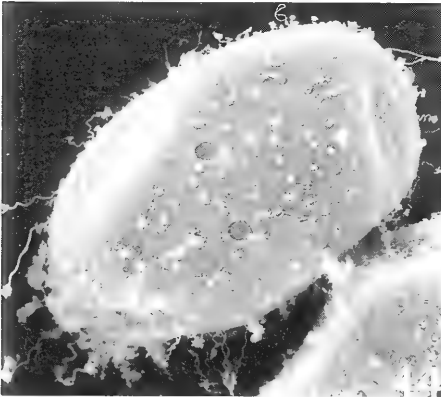
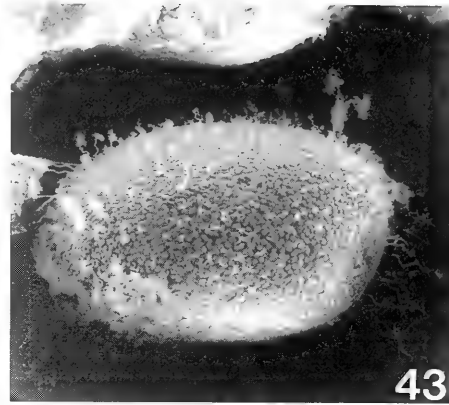
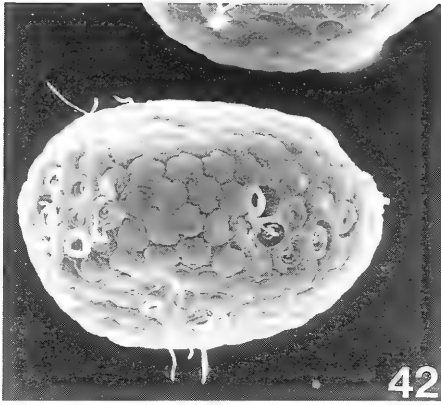
FIGS 38-41.

Female subimago (37) and eggs (38-41). 38-39: *E. zaitzevi*; 40: *Rh. znojkoii*; 41: *E. asiaeminoris*.

General coloration yellowish brown. Head yellowish; eyes black, as well as intra-cellular area. Thorax medium brown, legs yellowish. Wings uniformly milky, longitudinal veins (especially C, Sc, R and MA) tinted in yellow. Abdominal tergites I-VI yellowish brown, VII-X light brown, without specific patterns; sternites uniformly light yellow. Cerci light brown.

Forelegs short, twisted but not really atrophied. Middle and hindlegs normally built, the hind ones longer. On all tarsi, double claws, one hooked, the other obtuse. Inner border of the forewings regularly curved, without any winding. Vein MA forked over half of the distance from base to margin. 2 ICuA present. Vein CuA clearly bifid. CuA₁ long and regularly curved whereas CuA₂ short and reaching the border almost in a straight line (fig. 24).

In Palingeniidae, wing venation, especially in the forewing, gives good criteria even to distinguish the taxa at the specific level (DEMOULIN, 1965; Soldán, comm. pers.). The examined specimens present the same peculiar cubito-anal venation as mentioned by GRAVELY (1920) and CHOPRA (1928). Moreover, they belong without any doubt to the genus *Palingenia*: regularly curved forewing, head without cephalic processes, vein MA



FIGS 42-45.

Eggs. 42: *A. kugleri*; 43: *E. galileae*; 44: *H. samochai*; 45: *Ch. (Eu.) ortali*.

forked over half the distance from base to margin. Among the species belonging to that genus, *P. orientalis* can be easily separated from *P. longicauda* (Olivier), *P. fuliginosa* (Georgi), *P. sublongicauda* Tshernova and *P. apatris* Demoulin, in which vein CuA_2 is always much longer and not attached to CuA_1 as in *P. orientalis*. This peculiar branching of CuA is found for instance in most *Anagenesia* species (DEMOULIN, 1965). But in this genus, MA vein is always forked nearer the base than margin.

B i o n o m y . – The following information is based on the unpublished notes of Y. Palmoni. In Israel, *P. orientalis* was located in the Lower Jordan river, i.e. downstream to Lake Kinneret. One peculiarity of *P. orientalis* was to emerge and fly in the early morning (between 5 and 8 a.m.). In comparison, SOLDAN (1978) reports for *P. sublongicauda* early morning or evening emergences, whereas for *P. longicauda* and *P. fuliginosa*, only evening emergences have been reported (RUSSEV, 1987; SOLDAN & LANDA, 1986; pers. obs.). Most of the occurrences reported here come from the Jordan River near Deganya (outlet of Lake Kinneret). *P. orientalis* has been observed from 1935 to 1950. Emergence

and flight took place from end of March (earliest date: 27.III.1944) until the beginning of May (latest date: 5.V.1939). Specimens began to fly before 6 a.m. until 7.30 or 8 a.m. On the 27th of March 1944, Palmoni noted that at 9 a.m., about 10% were still alive. Since 1950 (4.V.1950), no more specimens have been collected, nor observed, in spite of a survey in the area for several years. According to ORTAL & POR (1978), as well as information communicated by R. Ortal (Jerusalem) the disappearance of *P. orientalis* is related to human impact along the Jordan watercourse, where the suitable habitats for the larvae have been destroyed by new buildings for irrigation or electric power stations.

P. orientalis was described from populations in Seistan (eastern Iran) and was never quoted since that time. The Jordan River population extends far to the west of the original distribution area of this species. No *Palingenia* species have been reported inbetween. The only Palingeniidae known from Middle East is *Mortogenesia mesopotamica* (Morton) from Iraq, but this species has few morphological affinities with representatives of the genus *Palingenia* (DEMOULIN, 1965).

P. orientalis has to be considered as having disappeared from Israel as well as Jordan. Evidence of remaining populations in the area or even elsewhere is not known.

BIOGEOGRAPHY OF THE STUDIED ELEMENTS

Although Israel belongs to the Palaearctic region, it is situated near the border of the Afrotropical region to which it is connected through the Rift Valley (see POR, 1975; TCHERNOV, 1988).

One species probably originated from Afrotropical region, the leptophlebiid *Ch. (Eu.) ortali*, found in the Dead Sea area. The subgenus *Euthraulus* is well represented by several species in Africa, as well as in the Oriental region (PETERS & EDMUNDS, 1970). This species is also the only one of the studied families to be present outside the northern part of the country.

The genus *Palingenia*, represented here by the species *P. orientalis*, is a west Palaearctic element.

All the other species are more or less restricted to the headwaters of the Jordan, the Hula Valley, and some streams in the Golan Heights, as for Israeli stoneflies species (BROMLEY, 1988). They are all Palaearctic elements although their origin is probably different. The two leptophlebiid species *Ch. (Ch.) picteti*, *P. submarginata* as well as the ephemereid *E. mesoleuca* probably have an European origin, and they reach their most south-eastern boundaries in the Levant. In contrast, none of the heptageniid species are known from Europe. They can be divided in two main categories. First, species endemic to the Levant, such as *E. galileae*, *E. asiaeminoris* and *A. kugleri*. If *E. asiaeminoris* probably has a west Asiatic origin, *E. galileae* could be a Pontic element, whereas an African origin for *A. kugleri* is probable. Secondly, Caucaso-Levantine species such as *E. zaitzevi*, *Rh. znojko* and *H. samochai*. These species are distributed from the foothills of the Caucasus, through Turkey, Syria, Lebanon and they reach their southern boundary in the headwaters of the Jordan.

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also to Prof. G. Lampel (Fribourg) for his russian translation of Kluge's description of *H. lutea*, and to Denise Studemann and Dr. Peter Landolt (Fribourg) for helpful discussion on the *Ephemerella* species. My gratitude to Dr. Tomas Soldán (Ceske Budejovice) for helpful advices, for allowing me comparison with other *Palingenia* species, and for his hospitality during my short visit in his laboratory. I am indebted to Dr. Heather J. Bromley (Jerusalem) for improving the English. The SEM photographs have been realized at the Electronic Microscopy Center of the Lausanne University.

My stays in Israel in May 1990 and 1991 were made possible through a grant of the Swiss Academy of Sciences (travel funds), as well as financial support by the Museum of Zoology in Lausanne. The stay and travelling in Israel were arranged by the Nature Reserves Authority wardens, especially by Dror Pevzner and Hillel Glassmann during my stay in the kibbouz Ortal (Golan), and by Gershon Goldstein and Avi Reuven during my stay in Tel Dan. Special thanks also to all the staff of the En Gedi Nature Reserve, especially to Ya'al Dolev for accomodation. I am also grateful to Avi Reuven (She'ar Yashuv) and Glassmann's family (Harashim) for their friendly hospitality. Last but not least, nothing could have been realized without help and licence for collecting material in the Reserves provided by Reuven Ortal (Jerusalem), as well as for all accomodation and help during my field trips in Israel.

RÉSUMÉ

Cet article constitue la première partie d'un travail consacré à l'étude des Epheméroptères d'Israël. Onze espèces sont citées. La famille la plus diversifiée est celle des Heptageniidae avec six genres renfermant chacun une seule espèce: *Rhithrogena znojkoï* (Tshernova), *Epeorus zaitzevi* Tshernova, *Ecdyonurus asiaeminoris* Demoulin, *Electrogena galileae* (Demoulin) (comb. nov.), *Afronurus kugleri* Demoulin et *Heptagenia samochai* (Demoulin) (comb. nov.). *E. zaitzevi* est nouveau pour la faune d'Israël. Le mâle de *H. samochai* est décrit pour la première fois, et la synonymie avec *H. lutea* Kluge (syn. nov.) est proposée. Les œufs des six espèces sont décrits et illustrés. Des clés de détermination pour les mâles et les larves sont incluses. Les Ephemerellidae sont représentés par une seule espèce, *Ephemerella mesoleuca* (Brauer). Les espèces de Leptophlebiidae sont: *Paraleptophlebia submarginata* (Stephens), *Choroterpes* (*Ch.*) *picteti* Eaton et *Choroterpes* (*Euthraululus*) *ortali* nov. sp. qui est décrite à tous les stades. De nouveaux critères pour distinguer les larves du sous-genre *Euthraululus* sont proposés. Une espèce de Palingeniidae a été découverte dans les collections du Bet Gordon Museum à Deganya: *Palingenia orientalis* Chopra dont la femelle est décrite pour la première fois. Cette espèce a disparu de la région concernée au début des années '50.

Des informations géographiques sont également données sur la distribution de ces espèces à l'intérieur et en dehors de l'aire d'étude, de même que certaines observations écologiques. Par exemple, l'émergence sous l'eau est signalée pour la première fois dans le genre *Afronurus*.

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Monographie der Scydmaenidae (Coleoptera) von Sabah (NO-Borneo)

von

Herbert FRANZ *

Mit 108 Abbildungen

ABSTRACT

Monography of the Scydmaenidae (Coleoptera) of Sabah (NE-Borneo). – Apart from 6 already known species, 109 new species are described and illustrated in the genera *Scydmaenus* (32 spp.), *Loeblites* (1 sp.), *Syndicus* (1 sp.), *Horiaeomorphus* (3 spp.), *Euconnus* (69 spp.) and *Protoscydmus* (1 sp.). Three new monotypic genera and each a new subgenus in the genera *Scydmaenus* and *Euconnus* respectively are erected.

VORWORT

In dieser Monographie sind die von Burckhardt, Löbl und Smetana in den Jahren 1987 und 1988 im Kinabalu-Nationalpark in Sabah gesammelten Scydmaeniden bearbeitet. Neben 6 schon bekannten Arten wurden 109 Arten als für die Wissenschaft neu beschrieben. Davon gehören 38 zur Gattung *Scydmaenus*, 1 Art zu *Loeblites*, und je eine zu *Syndicus*, *Syndicomorphus* und *Borneosabahia*, 3 zu *Horiaeomorphus*, 69 Arten zu *Euconnus* und eine zu *Protoscydmus*. Die von Reitter aus Borneo beschriebenen Arten aus den Genera *Euconnus* und *Scydmaenus* habe ich nicht gesehen, der Verbleib der Typen ist mir unbekannt. Die im Deutschen Entomologischen Institut in Eberswalde verwahrten Syntypen der von Schaufuss beschriebenen beiden *Agathelior*-Arten wurden mir in freundlicher Weise zugesandt, die eine hat sich zahlreich im Material des Genfer Museums wiedergefunden.

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Ich bin dem Muséum d'Histoire Naturelle de Genève und dort vor allem Herrn Dr. I. Löbl zu großen Dank dafür verpflichtet, daß mir das dort verwahrte Material aus Sabah zur Bearbeitung anvertraut worden ist. Es handelt sich um erheblich über 1000 Exemplare, wobei allerdings von einer Reihe von Arten große Serien, von anderen nur Einzel-exemplare vorliegen. Da von einigen Spezies offenbar nur ♀♀ gesammelt wurden, die eine Determination bis zur Art unmöglich machen und andererseits zahlreiche Arten in nur einem Exemplar vorhanden sind, liegt die Vermutung nahe, daß trotz des Umfanges der vorliegenden Ausbeute noch keineswegs der ganze Artenbestand des Untersuchungsgebietes erfaßt ist. Man muß demnach damit rechnen, daß der tatsächliche Artenbestand an Scydmaeniden des Nationalparks von Sabah die 115 dort derzeit nachgewiesenen Arten noch um einiges überschreitet.

Alle in der vorliegenden Arbeit behandelten Taxa sind am Ende der Monographie nach Gattungen geordnet aufgezählt. Alle Holotypen werden im Museum in Genf (cMG), eine Anzahl von Paratypen in meiner Sammlung (cF) verwahrt. Meine Sammlung wird nach meinem Ableben dem Naturhistorischen Museum in Wien übergeben.

Gattung *Scydmaenus* Latreille

Untergattung *Scydmaenus* Latr. s. str.

Scydmaenus novaehollandiae Lhoste

Orig. Diagn.: LHOSTE (1938), *Arb. morph. taxon. Ent.* 12, p. 113-114, fig. 2,6.

Die Art ist nach 2 Ex. aus Niederländisch-Indien, jetzt Indonesien ohne genauere Fundortangabe beschrieben. Mir liegen nun 36 Exemplare vor, die A. Smetana sowie Bruckhardt u. Löbl im Kinabalu-Nat. Park gesammelt haben. Von 2 ♂♂ von Poring Hot Springs, 495 m, 21.u.24.8.1988 wurden Penispräparate angefertigt, die mit den von Lhoste angefertigten Abbildungen übereinstimmen. Eines dieser beiden ♂♂ und 5 weitere Exemplare befinden sich in meiner Sammlung, alle anderen in der Sammlung des Mus. in Genf.

Scydmaenus vestitoides Reitter

Orig. Diagnose: REITTER (1913), *Ent. Mitt.* II (9), p. 268.

FRANZ (1985): *Mitt. Münch. ent. Ges.* 74, p. 110-111.

Von dieser Art befinden sich 41 Ex. in dem mir vorliegenden Material aus Sabah. Die Determination ist durch Anfertigung von Penispräparaten gesichert.

Scydmaenus minangkabauensis Blattny

Orig. Diagnose: BLATTNY (1926) *Suppl. Ent.* 14, p. 3 - 4, fig. 2.

FRANZ, H. (1984), Sber. Öst. Akad. Wiss., Math. nat. Kl. Abt. I, Bd. 193, p. 104.

Von dieser Art befinden sich in dem Material aus Sabah 12 Ex., die Determination ist durch Anfertigung von Penispräparaten gesichert.

Scydmaenus (s. str.) *kinabaluensis* nov. spec.

MATERIAL: Holotypus, ♂, Mount Kinabalu 1750 m (lg. Burckhardt u. Löbl, cMG); ebenda 1 Paratypus (cF); 4 Paratypen, Mt. Kinabalu, 2600 m (1 g. Burckhardt u. Löbl, 2600 m (cMG) und ebenda 1 Ex., (cF),

DIAGNOSE: Gekennzeichnet durch schlanke Fühler und Beine, gedrungene Gestalt, sowie fein punktierte, nach hinten gerichtet behaarte Flügeldecken.

BESCHREIBUNG: Long, 2,00 bis 2,20 mm, lat. 0,80 bis 0,90 mm, Rotbraun, gelblich behaart.

Kopf von oben betrachtet um ein Viertel breiter als lang, von den Augen zur Basis geradlinig verschmälert, die Schläfen doppelt so lang wie der Augendurchmesser. Die schlanken Fühler zurückgelegt die Halsschildbasis erreichend, beim ♀ alle Glieder länger als breit, beim ♂ 6 und 7 breiter als lang, das spitz-eiförmige Endglied fast so lang wie die beiden vorletzten zusammen.

Halsschild beim ♂ kaum merklich, beim ♀ deutlich gestreckt, ohne Basalgrübchen.

Flügeldecken zusammengenommen an der Basis nur wenig breiter als die Halsschildbasis, ohne Basalimpression und ohne Schulterbeule, fein und dicht punktiert, schräg nach hinten gerichtet behaart. Flügel verkümmert.

Beine schlank und lang, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb. 1) distal dorsalwärts gekrümmt, Ostium penis lang, dorsal gelegen, halb so lang wie der Peniskörper. Aus ihm ragt der Ductus ejaculatorius dorsalwärts heraus, er ist nach hinten gebogen und überragt den Hinterrand des Apex penis ein wenig. Der Apex ist am Hinterrand dreieckig ausgeschnitten.

***Scydmaenus (s. str.) pseudovestitoides* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und 6 Paratypen, Sabah, Poring Hot Springs, 9.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda, 6 Paratypen, (cF).

DIAGNOSE: Robust und stark gewölbt, fein punktiert und dicht behaart. Der Penis in Lateralansicht dem des *Sc. vestitoides* ähnlich.

BESCHREIBUNG: Long, 2,00 mm, lat. 0,80 bis 0,90 mm. Schwarz, die Extremitäten rotbraun gefärbt, gelblichgrau behaart.

Kopf von oben betrachtet gerundet-querrechteckig, die Schläfen schwach zur Basis konvergierend, Stirn und Scheitel äußerst fein punktiert und behaart. Fühler dick, zurückgelegt die Halsschildbasis nicht ganz erreichend, ihr Basalglied doppelt so lang wie breit, 3 bis 6 isodiametrisch bis leicht gestreckt, 7 und 8 breiter als lang. 9 doppelt so breit wie 8, wie auch 10 schwach quer, das spitz-eiförmige Endglied nicht ganz so lang wie die 2 vorletzten zusammen.

Halsschild kugelig gewölbt, isodiametrisch bis leicht gestreckt, vor der Mitte am breitesten, fein punktiert und dicht, abstehend behaart, mit 2 Basalgrübchen.

Flügeldecken zusammen an der Basis etwas breiter als die Halsschildbasis, stark gewölbt, ohne Schulterbeule und Basalimpression, fein und dicht punktiert, lang abstehend behaart, mit 2 Basalgrübchen. Flügel verkümmert.

Beine dick, Vorderschenkel dicker als die der Mittel- und Hinterbeine, Schienen gerade, Vordertarsen des ♂ schwach verdickt.

Penis (Abb. 2) wie bei *Sc. vestitoides* Reitt. annähernd in der Längsmittle im stumpfen Winkel nach oben geknickt, Apex penis breit abgestutzt, sein Hinterrand beiderseits mit einem feinen Stachel, die Seiten davor stumpfwinkelig erweitert. In der Mitte des Peniskörpers befindet sich dorsal ein ovales Fenster, in dem 2 durch eine Querverbindung aneinandergefügte kleine Drüsen liegen. Beide sind mit einem Ausführungsgang versehen, die beiden Ausführungsgänge sind distal ebenfalls miteinander verbunden.

***Scydmaenus (s. str.) trapeziceps* nov. spec.**

MATERIAL: Holotypus ♂, Sabah, Poring Hot Springs, 500 m, 8.8.1987 (lg. Burckhardt u. Löbl, cMG); Paratypus 1 Ex. Sabah, Mt. Kinabalu, 1580 m, 27.4.1987 (lg. Burckhardt u. Löbl, cF).

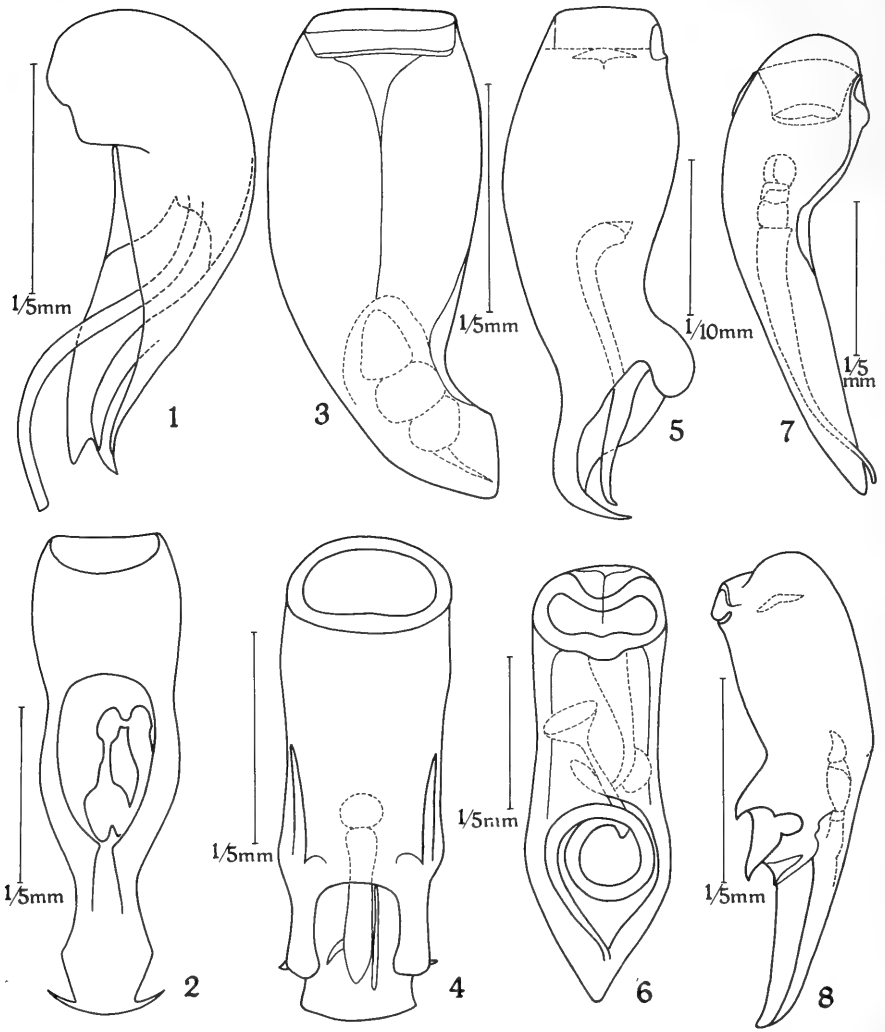


ABB. 1-8.

1: *Scydmaenus kinabaluensis* nov. spec., Penis in Lateralansicht. 2: *Scydmaenus pseudovestitoides* nov. spec., Penis in Dorsalansicht. 3: *Scydmaenus trapeziceps* nov. spec., Penis in Lateralansicht. 4: *Scydmaenus bukitulari* nov. spec., Penis in Dorsalansicht. 5: *Scydmaenus crockerensis* nov. spec., Penis in Lateralansicht. 6: *Scydmaenus borneoensis* nov. spec., Penis in Dorsalansicht. 7: *Scydmaenus borneoi* nov. spec. Penis in Lateralansicht. 8: *Scydmaenus fraternus* nov. spec., Penis in Lateralansicht.

DIAGNOSE: Sehr ausgezeichnet durch nahezu geradlinig trapezförmig von der Basis zum Vorderrand verschmälerten Kopf, ferner durch beim ♂ nicht verbreiterte Vordertarsen und medialwärts gekrümmte Mittel- und Hintertibien.

BESCHREIBUNG: Long. 2,30 bis 2,40 mm, lat. 0,90 mm. Dunkel rotbraun, graubraun behaart.

Kopf von oben betrachtet trapezförmig, Augen flach, nahe dem Vorderrand der Stirn gelegen, diese in der Mitte mit einem flachen Längskiel. Fühler am Vorderrand des Kopfes nahe beieinander eingefügt, zurückgelegt die Halsschildbasis knapp erreichend, ihr Basalglied doppelt so lang wie breit, breiter als die folgenden, 3 bis 5 eineinhalbmals so lang wie breit, 6 leicht gestreckt, 7 und 8 breiter als lang, 9 3 mal so breit wie 8, 10 noch etwas breiter als 9, schwach quer, das Endglied etwas asymmetrisch, um ein Viertel länger als breit.

Halsschild etwas länger als breit, vor seiner Längsmittle am breitesten und hier etwas breiter als der Kopf, mit 2 Basalgrübchen, abstehend behaart.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, mit Andeutung einer Basalimpression, lang, nach hinten gerichtet behaart.

Beine kurz, Vordertarsen des ♂ nicht verbreitert, Mittel- und Hintertibien mediodistal ausgerandet.

Penis (Abb. 3) füllhornförmig, distal ventralwärts gebogen, an der Basis ringförmig stärker sklerotisiert, dahinter mit einem pilzförmigen Druckregulierungsorgan. Von diesem zieht ein Muskelstrang distalwärts zum letzten Drittel des Penis. Dieses ist durch eine Membran gegenüber dem vorderen Teil des Peniskörpers abgegrenzt. Distal davon liegt eine Reihe von 3 Kammern, deren letzte mit einem Ausführungsgang in das Ostium penis mündet.

Scydmaenus (*s. str.*) *bukitulari* nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Mt. Kinabalu Nat. Park, Bukit Ular Trail, 1750 m, 29.4.1987 (lg. Smetana, cMG); Paratypus, Mt. Kinabalu, 2600 m, 2.5.1987 (lg. Burckhardt u. Löbl, cF); 2 Paratypen Mt. Kinabalu Nat. Park. Sumit Trail, 1850 m (lg. Smetana, cMG).

DIAGNOSE: Durch verhältnismäßig lange Fühler, 4 Basalgrübchen des Halsschildes und nicht verbreiterte Vordertarsen des ♂ gekennzeichnet.

BESCHREIBUNG: Long. 1,80 bis 1,90 mm, lat. 0,80 mm. Schwarzbraun, bräunlich behaart.

Kopf von oben betrachtet um ein Viertel länger als breit, mit schwach gerundeten Schläfen, diese doppelt so lang wie der Augendurchmesser. Fühler zurückgelegt die Halsschildbasis etwas überragend, ihre Basalglied doppelt, das 2. knapp doppelt so lang wie breit, 3, 4 und 5 um die Hälfte länger als breit, 6 isodiametrisch, 7 und 8 breiter als lang, die 3-gliedrige Keule schlank, Glied 9 und 10 etwas weniger als die Hälfte breiter als 7, beide um ein Drittel länger als breit, das spitz-eiförmige Endglied etwas kürzer als die beiden vorletzten zusammen.

Halsschild kugelig, annähernd so lang wie breit, etwas vor seiner Mitte am breitesten, mit 4 Basalgrübchen.

Flügeldecken zusammen schon an der Basis wesentlich breiter als die Halsschildbasis, ohne Basalimpression und ohne Schulterbeule glatt und anliegend behaart.

Beine verhältnismäßig schlank, Schenkel schwach verdickt, Schienen gerade, Vordertarsen des ♂ nicht verbreitert, Penis (Abb. 4) von oben betrachtet zylindrisch, seine Basalöffnung dorsobasal, das Ostium penis terminal gelegen. Seine Dorsalwand im letzten Fünftel medial ausgeschnitten, die beiden Seiten aber weit distalwärts vorspringend. In das Ostium penis ragt aus dem Penisinneren ein Sklerotinstab vor, an dessen Basis sich eine kleine runde Blase befindet. Neben dem dicken Stab verläuft von oben und hinten

betrachtet rechts ein dünner zweiter Stab, während links ein kurzer nach hinten gebogener Stachel vorragt. Die das Ostium seitlich begrenzenden Seitenteile der Peniswand sind außen an ihrem abgerundeten Ende mit einem kleinen Zahn bewehrt. Das Operculum ist rechteckig mit vorspringenden Hinterecken, es überragt die Seitenteile der Dorsalwand des Penis.

***Scydmanus (s. st.) crockerensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Crocker Range, 1350 m, km 60 Kinabalu. Tambunan, 17.5.1987 (Ig. Burckhardt u. Löbl, cMG).

DIAGNOSE: Durch breiten Kopf und annähernd gerundet- trapezförmigen Halsschild an *Armatoscydmanus* erinnernd, aber durch bei ♂ ungezähnte Hinterschenkel und anderen Penisbau davon verschieden.

BESCHREIBUNG: Long. 1,50 mm, lat. 0,60 mm, Rotbraun, gelblich behaart.

Kopf von oben betrachtet quer-fünfeckig mit parallelen Schläfen, diese doppelt so lang wie der Augendurchmesser. Fühler zurückgelegt die Halsschildbasis ein wenig überragend, ihr Basalglied eineinhalbmal so lang wie breit, die folgenden Glieder schmaler, 2 bis 6 deutlich gestreckt, 7 und 8 schwach quer, 9 eineinhalbmal, 10 doppelt so breit wie 8, das eiförmige Endglied fast so lang wie die beiden vorletzten zusammen.

Halsschild so lang wie breit, im vorderen Drittel seiner Länge am breitesten, von da gerade zur Basis verengt, flach gewölbt, mit 2 Basalgrübchen, ziemlich dicht behaart. Flügeldecken oval, schon an der Basis zusammen breiter als die Halsschildbasis, mit seichter Basalimpression, fein punktiert und nach hinten gerichtet behaart.

Beine mittellang, Schenkel mäßig verdickt, Hinterschenkel beim ♂ ohne Zahn, Schienen gerade.

Penis (Abb. 5) in der Anlage tonnenförmig, der Apex an der Basis verbreitert, dorsal wulstförmig vorgewölbt, seine Dorsalwand weit nach hinten vorgezogen und sichelförmig nach oben gebogen, das Ostium penis umfassend. In dieses ragt von vorne der Ductus ejaculatorius heraus, dessen Ende beinahe den Hinterrand des Penis erreicht. Er entspringt ungefähr in der Längsmittle des Peniskörpers in einer quergestellten, schwachen Erweiterung, eine Samenblase fehlt.

***Scydmanus (s. str.) borneoensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Crocker Range, 1550 bis 1650 m, 16.5.1987 (Ig. Burckhardt u. Löbl, cMG); 1 Paratypus ♀ Sabah, Poring Hot Springs, 500 m, 7.5.1987 (Ig. Burckhardt u. Löbl, cF).

DIAGNOSE: Gekennzeichnet durch stark queren Kopf, isodiametrischen Halsschild und kurze Beine.

BESCHREIBUNG: Long. 1,80 bis 2,00 mm, lat. 0,80 mm. Schwarz, Extremitäten rotbraun. Bräunlich behaart.

Kopf von oben betrachtet breiter als lang, Schläfen zur Basis leicht konvergierend, spärlich mit abstehenden Haaren bedeckt. Fühler zurückgelegt die Halsschildbasis erreichend, ihr Basalglied doppelt so lang wie breit, 2 bis 6 isodiametrisch, 7 und 8 breiter als lang, 9 doppelt so breit wie 8, 10 noch etwas breiter, beide breiter als lang, das Endglied spitz-kegelförmig, nicht ganz so lang wie die beiden vorletzten zusammen.

Halsschild isodiametrisch, vor der Mitte am breitesten, seitlich abstehend, auf der Scheibe schütter und anliegend behaart, mit 2 Basalgrübchen.

Flügeldecken kurzoval, schon an der Basis zusammen breiter als die Halsschildbasis, stark gewölbt, fein punktiert und abstehend behaart, Basalgrübchen und Schulterbeule fehlend.

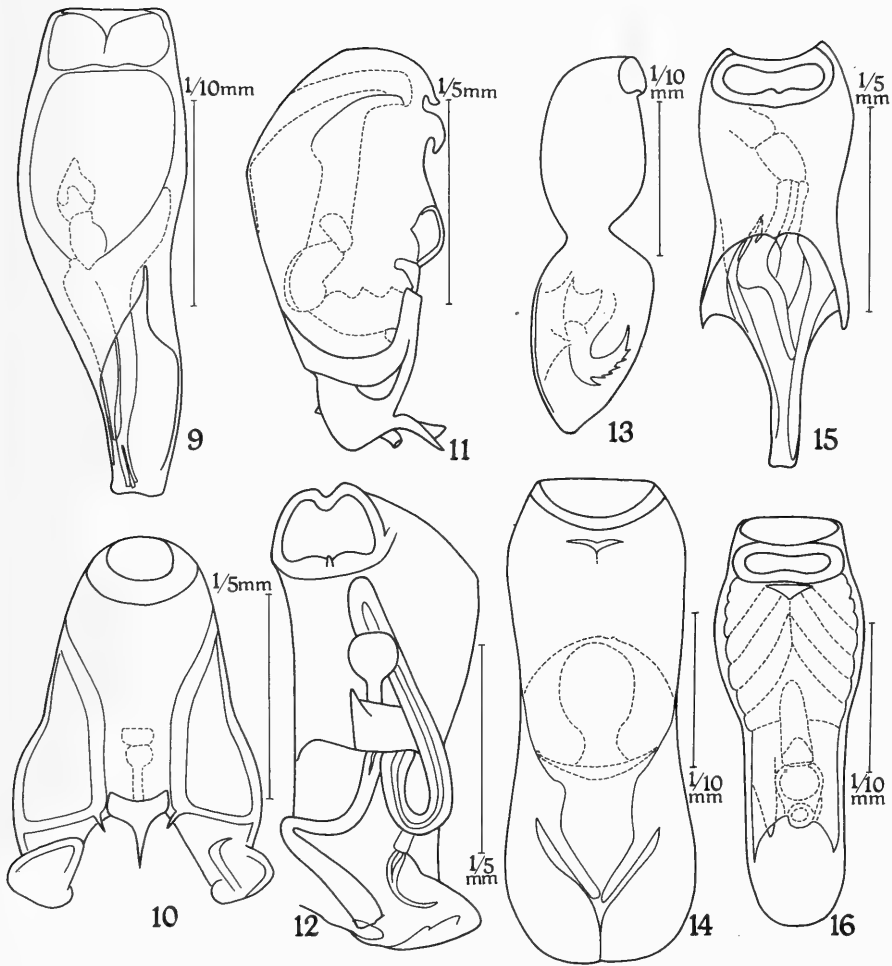


ABB. 9-16.

9: *Scydmaenus brevitarsis* (Schaufuss), Penis in Dorsalansicht. 10: *Scydmaenus densepunctatus* nov. spec., Penis in Dorsalansicht. 11: *Scydmaenus (Mimoscydmaenus) crockeri* nov. spec., Penis in Lateralansicht. 12: *Scydmaenus (Mimoscydmaenus) complexipenis* nov. spec., Penis in Dorso-lateralansicht. 13: *Scydmaenus (Mascarenisia) dissimilis* nov. spec., Penis in Lateralansicht. 14: *Scydmaenus (Eustemmoides) punctatus* nov. spec., Penis in Dorsalansicht. 15: *Scydmaenus (Eustemmoides) alessmetanai* nov. spec., Penis in Dorsalansicht. 16: *Scydmaenus (Eustemmoides) silvicola* nov. spec., Penis in Dorsalansicht.

Beine kurz und kräftig, Schenkel mäßig verdickt, Schienen gerade.

Penis (Abb. 6) von oben betrachtet zylindrisch, sein Apex spitzwinkelig -dreieckig, die Basalöffnung dorsobasal gelegen, mit stark sklerotisiertem Rahmen, Ostium penis terminal gelegen, bis ins distale Drittel der Penislänge nach vorne reichend. Im Ostium penis ist der spiralig aufgerollte Ductus ejaculatorius sichtbar. Er entspringt in einem Trichter im

vorderen Drittel der Penislänge, von wo ein gerades Rohr bis zum Ostium führt, wo dieses spitzwinkelig in den Ductus ejaculatorius mündet. Von der Basalöffnung des Penis zieht ein weites Rohr distalwärts und mündet hinter dem Trichter in den Ductus.

Scydmaenus borneoi nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Poring Hot Springs, 500 m, 8.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda, 1 Paratypus ♀, 8.5.1987 (lg. Burckhardt u. Löbl, cF).

DIAGNOSE: Gekennzeichnet durch von oben betrachtet runden Kopf, schlanke Fühlergeißel und länglichen Halsschild, ohne Basalgrübchen.

BESCHREIBUNG: Long. 1,80 mm, lat. 0,80 mm. Rotbraun, hellgrau behaart.

Kopf von oben betrachtet kreisrund, klein, anliegend behaart. Fühler zurückgelegt die Halsschildbasis erreichend, ihr Basalglied eineinhalbmals so lang wie breit, 2 bis 8 isodiametrisch bis leicht gestreckt, 7 und 8 nicht asymmetrisch, 9 um die Hälfte breiter als 8, 10 noch etwas breiter, beide schwach quer, das spitz-eiförmige Endglied so lang wie die beiden vorletzten zusammen.

Halsschild um ein Sechstel länger als breit, seitlich gleichmäßig gerundet, dicht, nach hinten gerichtet behaart, ohne Basalgrübchen.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, seitlich gleichmäßig gerundet, ohne Schulterhöcker und ohne Basalimpression, lang, nach hinten gerichtet behaart.

Beine kräftig, ziemlich kurz, Vordertarsen des ♂ nicht verbreitert. Penis (Abb. 7) langgestreckt, schwach dorsalwärts gekrümmt, in einer Spitze endend. Seine Basalöffnung dorsobasal gelegen, darunter befindet sich ein scheibenförmiges Druckregulierungsorgan. Dahinter befindet sich in der vorderen Hälfte des Peniskörpers eine Reihe von 3 Kammern, an die der bis an das Penisende heranreichende Ductus ejaculatorius anschließt. Sein Ende ragt ein wenig aus dem Ostium penis nach oben heraus.

Scydmaenus (s. str.) fraternus nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Crocker Range, 1270 m, 60 km von Kota Kinabalu nach Tambunan, 17.5.1987 (lg. Burckhardt u. Löbl cMG); Paratypus ♀ Sabah, Poring Hot Springs, 550 bis 600 m, 9.5.1987 (lg. Burckhardt u. Löbl, cF); ebenda, 31.8.1988 (lg. Smetana, cMG).

DIAGNOSE: Mit *S. tenuicornis* Schauf. und *allotenuicornis* m. sehr nahe verwandt, die Fühler aber kürzer und dicker, ihre Keule scharf abgesetzt. Penis abweichend gebaut, auch dem *Sc. paratenuicornis* sehr ähnlich, aber bedeutend größer als dieser. Die Stellung der Art innerhalb der Untergattung *Sydmaenus s. str.* ist als provisorisch anzusehen.

BESCHREIBUNG: Long. 1,20 bis 1,30 mm, lat. 0,50 bis 0,60 mm. Rotbraun, fein gelblich behaart.

Kopf von oben betrachtet rundlich, etwas breiter als lang, die Schläfen doppelt so lang wie der Augendurchmesser. Fühler schlank, zurückgelegt die Halsschildbasis um die beiden letzten Glieder überragend, ihr Basalglied zweieinhalbmals so lang wie breit, 2 und 5 eineinhalbmals so lang wie breit, 3, 4 und 6 leicht gestreckt, 7 und 8 schwach quer, 9 um ein Drittel breiter als 8, 10 noch ein wenig breiter, beide um ein Drittel länger als breit, das spitz-eiförmige Endglied nicht ganz so lang wie die beiden vorletzten zusammen.

Halsschild ein wenig länger als breit, seitlich gleichmäßig gerundet, nur so breit wie der Kopf, ziemlich dicht punktiert, ohne Basalgrübchen.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, stark gewölbt und seitlich stark gerundet, ohne Basalimpression und ohne Schulterbeule, seicht punktiert und nach hinten gerichtet behaart. Flügel verkümmert.

Beine lang und schlank, Schenkel sehr schwach verdickt, Schienen gerade.

Penis (Abb. 8) im Bau dem des *Sc. tenuicornis* und *allotenuicornis* sehr ähnlich, sein Apex gerade, kürzer und breiter als bei *Sc. allotenuicornis*, die aus dem Ostium penis herausragenden sklerotisierten Differenzierungen von der Vergleichsart abweichend gebaut.

Subgenus **Agathelor** Schaufuss

SCHAUFUSS (1884): *Annali. Mus. civ. Genova* (2) 1 XXI, p. 420-422.

FRANZ (1984): *Sber. Öst. Akad. Wiss., Math. nat. Kl. Abt. I*, 193, p. 133-135.

Schaufluss hat *Agathelor* als Gattung auf *A. deplanatum* Schauf. und *brevitarse* Schauf. begründet. Von beiden Arten befindet sich ein als Syntypus bezeichnetes Exemplar im Deutsch. Ent. Inst. in Eberwalde. Beide Ex. sind ♀♀ und tragen Patriazettel mit dem Text "Borneo Sarawak 1865 – 66 coll G. Doria", der mit der Fundortangabe in der Originaldiagnose übereinstimmt. Ob im Museum von Genua weiteres Typenmaterial verwahrt wird, ist mir unbekannt, Schaufuss gibt in der Beschreibung an "In Mus. Civ. Jan."

Ich habe (FRANZ 1984) nach den beiden in Eberswalde verwahrten Syntypen Neubeschreibungen angefertigt und festgestellt, daß beide in das Genus *Scydmaenus* gehören, konnte aber damals nur vermuten, da mir kein ♂ vorlag, daß beide in das Subgenus *Armatoscydmaenus* gehören.

Nunmehr habe ich in der großen Ausbeute aus Sabah von *Agathelor brevitarsis* auch ♂♂ auffinden können, die tatsächlich gezähnte Hinterschenkel besitzen, womit erwiesen ist, daß *A. brevitarsis* zu *Armatoscydmaenus* gehört. Dies gestattet es, für *A. brevitarsis* unter der Untergattung *Armatoscydmaenus* Schauf. eine Neubeschreibung zu geben.

Leider hat sich von *Agathelor deplanatum* Schaufuss in der Ausbeute von Sabah kein weiteres Material gefunden, sodaß von dieser Art nach wie vor nur der im Deutschen Ent. Inst. verwahrte Syntypus (♀) vorliegt. Dieses Tier weicht aber von den bekannten *Armatoscydmaenus*-Arten so weit ab, daß mit ziemlicher Sicherheit festgestellt werden kann, daß *Agathelor deplanatum* kein *Armatoscydmaenus* ist.

Ich habe daher das Genus *Agathelor* Schauf. für *A. deplanatus* Schaufuss als Typusart aufrechterhalten und begründe diese Entscheidung nachstehend.

Scydmaenus (Agathelor) deplanatus Schaufuss

SCHAUFUSS (1884): *Annali. Mus. civ. Genova* (2) 1 (XXI), p. 421

FRANZ (1984): *Sber. Öst. Akad. Wiss. Math. nat. Kl. Abt. I* 193, p. 134.

Die zitierte Neubeschreibung ist durch einige ergänzende Daten zu vervollständigen. Halsschild und Flügeldecken sind ziemlich dicht und lang behaart, die Haare sind aber beim Umpräparieren an der Körperoberfläche angeklebt und täuschen, da sie vorwiegend nach hinten gerichtet sind, eine längsrissige Skulptur vor. An einer Stelle sind die Haare aber abgeschabt, wodurch eine feine und schütterere Punktierung des Untergrundes sichtbar ist. An einer anderen Stelle sind die Haare quergestellt, was ebenfalls beweist, daß der Eindruck einer längsrissigen Struktur eine Täuschung ist.

Agathelor deplanatus ist, wie schon der Autor durch die Namensgebung zum Ausdruck gebracht hat, durch eine außerordentlich flache Körperform ausgezeichnet. Dieses Merkmal unterscheidet ihn von den Arten des Subgenus *Armatoscydmaenus*. Ein weiteres Unterscheidungsmerkmal ist der vor der Basis ausgeschweifte Halsschild, wodurch die Hinterecken des Halsschildes scharf gewinkelt sind. Weiters sind die Beine außerordentlich kurz, wodurch allein schon die Entwicklung eines Zahnes an den Hinterschenkeln unmöglich ist. Vor der Basis des Halsschildes stehen zwei sehr kleine, schwer

sichtbare Grübchen. Diese stehen nebeneinander vor dem Schildchen, nicht, wie bei den *Armatoscydmaenus*-Arten zur Seite gerückt. Alle diese Merkmale lassen erkennen, daß *A. deplanatus* nicht in das Subgenus *Armatoscydmaenus* gehört, sondern in ein eigenes Subgenus der Gattung *Scydmaenus* zu stellen ist.

Subgenus *Armatoscydmaenus* Franz

Scydmaenus (Armatoscydmaenus) brevitarsis (Schaufuss)

SCHAUFUSS (1884): *Annali. Mus. civ. Genova* (2) 1 (XXI) p. 421-423 (*Agathelora*)

FRANZ (1984): *Sber. Öst. Akad. Wiss., Math. nat. Kl. Abt. I*, 193, p. 134.

MATERIAL: Syntype ♀ Sarawak (Deutsches Ent. Inst.); Borneo, Sabah, 4♂ (Penispräparat) 1♀, Kinabalu Nat. Park, Poring Hot Springs, 485 m, (lg. Smetana, cMG); ebenda 2♂ 1♀ (Penispräparat, cF); Mount Kinabalu, 1500 m, 1790 m, 21.4.1987 (lg. Burckhardt u. Löbl, cMG), 3♂ 1♀ (CMG), 2♂, cF).

DIAGNOSE: Sehr ausgezeichnet durch dunkel rotbraune Färbung, beim ♂ gezähnte Hinterschenkel und stark einwärts gebogene, mediodistal abrupt verbreiterte Hinterschienen.

BESCHREIBUNG: Long. 1,60 bis 2,20 mm, lat. 0,70 bis 0,80 mm. Dunkel rotbraun, fein und dicht gelblich behaart.

Kopf von oben betrachtet gerundet-fünfeckig, breiter als lang, Augen groß, Schläfen ein wenig länger als der Augendurchmesser. Fühler zurückgelegt die Halsschildbasis erreichend, ihr Basalglied zweieinhalbmal so lang wie breit, 3 bis 6 isodiametrisch, 7 und 8 breiter als lang, nicht deutlich asymmetrisch, 9 doppelt so breit wie 8, 10 noch etwas breiter, das eiförmige Endglied kürzer als 9 und 10 zusammen.

Halsschild flach gewölbt, so lang wie breit, im vorderen Drittel seiner Länge am breitesten, von da zur Basis geradlinig verengt, sehr fein punktiert und aufgerichtet behaart, mit Andeutung einer Schulterbeule und Basalimpression.

Beine kurz, besonders die Tarsen sehr kurz, Hinterschenkel des ♂ scharf gezähnt, Hinterschienen des ♂ medialwärts gebogen und distal stark verbreitert.

Penis (Abb. 9) am apikalen Ende abgestutzt, nicht wie bei den bisher bekannten Arten des Subgenus *Armatoscydmaenus* zugespitzt und stark S-förmig gekrümmt. Im Inneren des Peniskörpers liegt vor dessen Längsmittle eine kapuzenförmige Blase, an die distal eine nierenförmige Blase anschließt. Diese mündet in den Ductus ejaculatorius, der an der Basis sehr stark erweitert ist. Der Ductus ejaculatorius reicht in der Ruhelage bis an das apikale Ende des Penis heran, ist dickwandig und sein Lumen überragt dünnwandig ein wenig den dickwandigen Teil. Neben dem Ductus liegt von oben und hinten betrachtet links ein großer Stachel, der das Penisende nicht erreicht. Das Ostium penis liegt dorsoapikal. Es reicht an den Seiten des Peniskörpers bis zu dessen distalem Viertel, weiter medial jedoch fast bis zur Längsmittle.

Scydmaenus (Armatoscydmaenus) trapezicollis Lhoste

LHOSTE (1938): *Arb. morph. taxon. Ent. Berlin Dahlem* 5, 124-125. fig. 18, 19.

FRANZ (1984): *Sber. Öst. Akad. Wiss. Math. nat. Kl. Abt. I*, 193, p. 135.

Ich habe *Sc. trapezicollis* (l.c.) als fragliches Synonym zu *Ag. deplanatum* gestellt, was nach dem nunmehrigen Stand des Wissens unrichtig ist. Nach Lhoste ist *A. trapezicollis* mit 1,50 mm Körperlänge größer als *Ag. deplanatum* mit nur 1,25 mm. Auch sind die Beine bei *Ag. deplanatum* noch kürzer als nach Lhostes Zeichnung bei *trapezicollis*. Die Halsschildseiten sind bei *trapezicollis* vor der Basis nicht ausgeschweift.

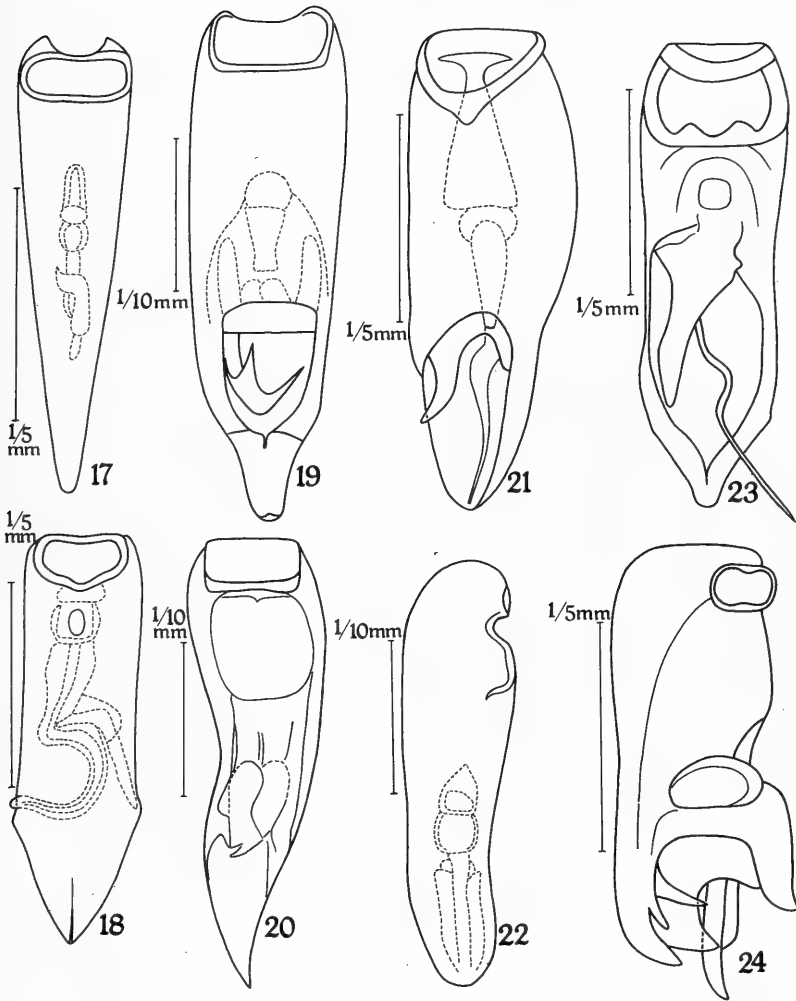


ABB. 17-24.

17: *Scydmaenus (Eustemmoides) cuneipenis* nov. spec., Penis in Dorsalansicht. 18: *Scydmaenus (Eustemmoides) thermarum* nov. spec., Penis in Dorsalansicht. 19: *Scydmaenus (Eustemmoides) furcatus* nov. spec., Penis in Dorsalansicht. 20: *Scydmaenus (Eustemmoides) burckhardtloebli* nov. spec., Penis in Dorsalansicht. 21: *Scydmaenus (Eustemmoides) sabahi* nov. spec., Penis in Dorsalansicht. 22: *Scydmaenus (Eustemmoides) allosabahensis* nov. spec., Penis in Lateralansicht. 23: *Scydmaenus (Eustemmoides) parasabahensis* nov. spec., Penis in Dorsalansicht. 24: *Scydmaenus (Eustemmoides) sabahensis* nov. spec., Penis in Dorsolateralansicht.

Der Penis ist bei der Lhoste-schen Art wie bei der *armatus-regularis*-Gruppe S-förmig gekrümmt, nicht wie bei *Sc. brevitarsis* und *latipes* nahezu gerade, wodurch *trapezicollis* der *armatus*-Gruppe näher steht als den auch noch durch die Verbreiterung der Hintertibien abweichenden Arten *brevitarsis* und *latipes*. Nach der von Lhoste gegebenen Abbildung ist zu erwarten, daß *Sc. trapezicollis* im männlichen Geschlecht gezähnte Hinterschlenkel besitzt und daß dies von Lhoste übersehen worden ist.

Scydmaenus (? Armatoscydmaenus) laticeps nov. spec.

MATERIAL: Nur Holotypus ♀, Sabah, Poring Hot Springs, 500 m, 8.5.1987 (lg. Burckhardt u. Löbl cMG).

DIAGNOSE: Ausgezeichnet durch den sehr breiten Kopf, sehr flachen Körper und die kurzen Fühler und Beine, die die Art in das Subgenus *Armatoscydmaenus* verweisen. Da jedoch kein ♂ vorliegt, ist unbekannt, ob dieses gezähnte Hinterschlenkel besitzt.

BESCHREIBUNG: Long. 1,80 mm, lat. 0,60 mm, Rotbraun, gelblich behaart.

Kopf von oben betrachtet gerundet-fünfeckig, um die Hälfte breiter als lang, die Schläfen 3 mal so lang wie der Durchmesser der kleinen Augen, Stirn und Scheitel flach gewölbt, fein aber dicht punktiert und behaart. Fühler zurückgelegt nur die Halsschildbasis erreichend, ihr Basalglied um die Hälfte länger als breit, 2 leicht gestreckt, 3 bis 8 breiter als lang, nur halb so lang wie die gesamten Fühler, 9 und 10 fast so lang wie breit und zusammen fast so lang wie das eiförmige Endglied.

Halsschild am Vorderrand am breitesten und hier nur wenig breiter als der Kopf, seitlich gerundet zur Basis verengt, fein, absteht behaart, sehr fein punktiert, mit 4 Basalgrübchen.

Flügeldecken oval, flach gewölbt, deutlich und dicht punktiert, absteht behaart, ohne Schulterbeule und Basalimpression, Schildchen erkennbar.

Beine kurz, Schenkel schwach verdickt, Schienen, besonders die der Vorder- und Hinterbeine distal verbreitert. Die Art unterscheidet sich von den übrigen bekannten *Ayatoscydmaenus*-Arten durch den ungewöhnlich breiten Kopf, die kurzen Fühler und die von oben betrachtet breiten Schienen.

Scydmaenus (Androscydmaenus) nov. subgen.

In der Ausbeute von Sabah liegt ein *Scydmaenus*-♂ vor, das durch den Bau des männlichen Kopulationsapparates von allen mir bekannten *Scydmaenus*-Arten so weit abweicht, daß es mit ihnen nicht in nähere verwandtschaftliche Beziehungen gebracht werden kann. In allen äußeren Merkmalen ist das Tier jedoch dem Genus *Scydmaenus* zugehörig. Es besitzt vor allem die für die Gattung *Scydmaenus* charakteristische Fühlerbildung, das distal ausgerandete 1. Fühlerglied, an dessen Basis die Fühler nach oben abgknickt werden können, und das kleine, asymmetrisch gebaute 7. und 8. Fühlerglied. Der Kopf ist gerundet quer-fünfeckig mit flachen, seitlich nicht vorstehenden Augen. Es besitzt einen seitlich gleichmäßig gerundeten Halsschild und seitlich gerundete Flügeldecken ohne deutliche Basalimpression und Schulterbeule.

Der männliche Kopulationsapparat weist jedoch nicht wie normal einen annähernd tonnenförmigen Peniskörper auf, sondern dieser teilt sich in der Mitte in 2 Äste, zwischen denen, weit vor dem Penisende, das Ostium penis liegt. Die beiden Seitenteile können nicht als Parameren gedeutet werden, da sie ihrer Anlage nach nie die Funktion von Tastorganen erfüllt haben können.

Scydmaenus (Androscydmaenus) densepunctatus nov. spec.

MATERIAL: Nur Holotypus ♂ (Penispräparat), Sabah, Kinabalu Nat. Park, HQ, Livagu River, 1500 m, 17.5.1987 (Ig. Smetana, cMG).

DIAGNOSE: Außer durch den Bau des männlichen Kopulationsapparates durch dichte Punktierung des Halsschildes und der Flügeldecken sowie durch schlanke Fühler und Beine gekennzeichnet.

BESCHREIBUNG: Long. 1,90 mm, lat. 0,70 mm, Rotbraun, hell bräunlich behaart.

Kopf von oben betrachtet in der Anlage querrechteckig, die Stirn aber zwischen den Fühlerwurzeln stumpfwinkelig vorspringend, ihr Mittelteil glatt und glänzend, die Seitenteile punktiert. Augen groß, schwach vorgewölbt, Schläfen nur wenig länger als der Augendurchmesser. Fühler schlank, zurückgelegt die Halsschildbasis um die beiden letzten Glieder überragend, das Basalglied doppelt so lang wie breit, an der Spitze ausgerandet, Glied 3, 4 und 5 schmaler als 2, ebenfalls doppelt so lang wie breit, die Länge des 6. Gliedes seine Breite um die Hälfte übertreffend, 7 und 8 klein, asymmetrisch, eben merklich breiter als lang, 9 um die Hälfte breiter als 8, 10 eineinhalbmal so breit wie 9, das Endglied nicht ganz so lang wie 9 und 10 zusammen. Drittes Glied der Maxillartaster ebenso lang wie der Augendurchmesser, das Endglied nicht deutlich erkennbar.

Halsschild um ein Fünftel länger als breit, seitlich gleichmäßig gerundet, dicht punktiert und anliegend behaart. Basalgrübchen von der Grundpunktur nicht unterscheidbar.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, ohne Schulterbeule und Basalimpression, seitlich gleichmäßig gerundet, dicht punktiert und anliegend behaart. Beine schlank, Schenkel keulenförmig verdickt, Schienen gerade, wie auch die Tarsen schlank.

Penis (Abb. 10) dreiteilig, der mittlere Teil kürzer als die beiden Seitenteile, nur die Spitze des Ductus ejaculatorius weiter nach hinten vorragend. Er setzt sich im Inneren des Penis ein kurzes Stück nach vorne fort und erweitert sich dann zu einer runden Blase, vor der eine breit becherförmige Blase steht. In der basalen Hälfte des Penis sind die beiden Seitenteile mit dem Mittelteil des Penis verschmolzen, die Basalöffnung liegt dorsobasal und ist von einem breiten Sklerotinrahmen umgeben, der die ganze Breite der Penisbasis einnimmt. Auch die Seitenteile des Penis sind von einem Sklerotinrahmen umgeben. Dieser trennt durch eine Querleiste einen vorderen Abschnitt der Seitenteile von einem kleineren distalen, der über das apikale Ende des Mittelteils hinausragt. Die Querleisten tragen medial einen scharfen schräg zur Mitte und nach hinten gerichteten Zahn.

Subgenus Mimoscydmaenus Franz

FRANZ (1986): *Revue suisse Zool.* 93, p. 967-970.

Das Subgenus *Mimoscydmaenus* wurde monotypisch auf *Scydmaenus (Mimoscydmaenus) Chiangmai* Franz errichtet, der in Thailand und auf der Halbinsel Malakka verbreitet ist. Das Auftreten zweier weiteren Arten in NO-Borneo ist einer von einer Reihe von Beweisen, daß zwischen der Fauna des äußersten Südostens des asiatischen Festlandes und dem Nordosten von Borneo enge faunistische Beziehungen bestehen.

Scydmaenus (Mimoscydmaenus) crockeri nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Crocker Range, 1350 m, 60 km von Kota Kinabalu Tambunan, 13.5.1987 (Ig. Burckhardt u. Löbl, cMG).

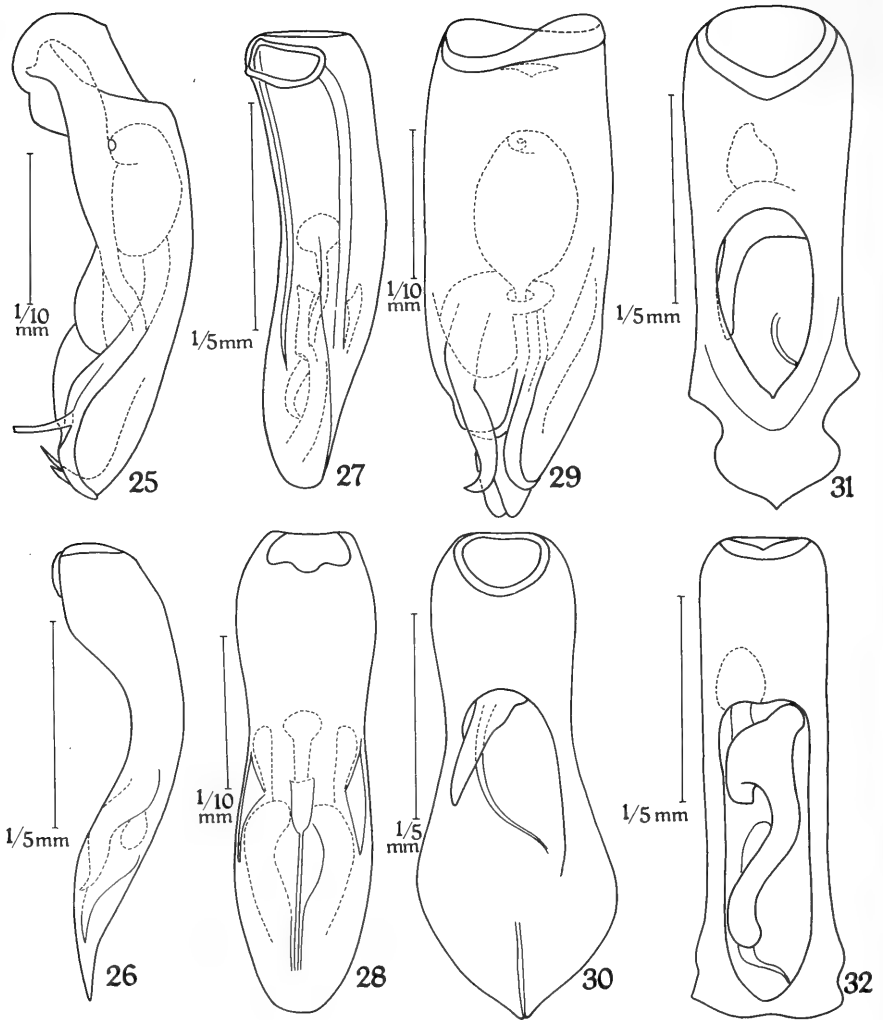


ABB. 25-32.

25: *Scydmaenus (Eustemmoides) sabahanus* nov. spec., Penis in Lateralansicht. 26: *Scydmaenus (Eustemmoides) filipenis* nov. spec., Penis in Lateralansicht. 27: *Scydmaenus (Eustemmoides) parafilipenis* nov. spec., Penis in Dorsolateralansicht. 28: *Scydmaenus (Eustemmoides) allofilipenis* nov. spec., Penis in Dorsalansicht. 29: *Scydmaenus (Eustemmoides) bidentipenis* nov. spec., Penis in Dorsalansicht. 30: *Scydmaenus (Eustemmoides) frater* nov. spec., Penis in Dorsalansicht. 31: *Scydmaenus (Eustemmoides) poringensis* nov. spec., Penis in Dorsalansicht. 32: *Scydmaenus (Eustemmoides) livagui* nov. spec., Penis in Dorsalansicht.

DIAGNOSE: Dem *Sc. chiangmai* äußerlich sehr ähnlich, im Bau des männlichen Kopulationsapparates aber stark abweichend.

BESCHREIBUNG: Long. 1,80 mm, lat. 0,80 mm. Graubraun, die Extremitäten gelbbraun, grau behaart.

Kopf von oben betrachtet fast kreisrund, stark gewölbt, in der Mitte mit einer Längsfurche, mit kleinen, weit nach vorne gerückten Augen, Schläfen 3 mal so lang wie der Augendurchmesser. Fühler körperlang, fadenförmig, alle Glieder sehr langgestreckt. Halsschild eineinhalbmal so lang wie breit, zum Vorderrand viel stärker verengt als zur Basis, kaum breiter als der Kopf, mit 2 sehr kleinen Basalgrübchen, sehr fein staubartig behaart.

Flügeldecken zusammengenommen schon an der Basis ein wenig breiter als der Halsschild, seitlich schwach gerundet, ohne Spur einer Basalimpression und ohne Schulterhöcker, äußerst fein punktiert und nach hinten gerichtet behaart. Flügel verkümmert.

Beine sehr lang, Schenkel keulenförmig verdickt, Schienen gerade, wie auch die Tarsen sehr dünn.

Penis (Abb. 11) gedrunken gebaut. Unter der Basalöffnung befindet sich ein Druckausgleichsorgan, das nicht wie meist bei den Vertretern der Gattung *Scydmaenus* pilzförmig sondern flach kappenförmig ist und schräg am dorsalen Ende eines dorsoventral verlaufenden Sklerotinbandes haftet. Von dem Druckregulierungsorgan zieht ein Bündel von Muskelsträngen, die sich annähernd in der Penismitte befinden, zu einer zweikammerigen Blase. Die basale dieser Blasen ist kleiner und schräggestellt, sie sitzt einer größeren nierenförmigen Blase auf, die ihrerseits in den nicht genau im Präparat erkennbaren Ductus ejaculatorius mündet. Das äußerste Ende des Ductus ejaculatorius ist am apikalen Rand des Penis sichtbar. Dorsal davon steht ein starker Stachel nach oben und hinten ab.

***Scydmaenus (Mimoscydmaenus) complexipenis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Poring Hot Springs, 500 m, 7.5.1987 (lg. Burckhardt u. Löbl, cMG); 1 Paratypus ebenda (cF); 1 Paratypus ♀ ebenda, 480 m, 29.8.1988 (lg. Smetana, cMG).

DIAGNOSE: Dem *Sc. crockeri* sehr ähnlich, aber der Körper etwas breiter, die Flügeldecken mit deutlicher Schulterbeule, die Beine kürzer, der Penis anders geformt.

BESCHREIBUNG: Long. 1,60 bis 1,70 mm, rotbraun, schütter gelblich behaart.

Kopf von oben betrachtet fast kreisrund, mit einem Längseindruck auf der Stirn, die Schläfen dreimal so lang wie die kleinen, weit vorne stehenden Augen. Fühler körperlang, fadenförmig, alle Glieder sehr lang und dünn.

Halsschild um ein Viertel länger als breit, nur wenig breiter als der Kopf, zum Vorderand stärker als zur Basis verengt, ohne Basalgrübchen.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis mit deutlicher Schulterbeule, deutlich punktiert und abstehend behaart. Flügel verkümmert.

Beine langgestreckt und schlank, aber etwas kürzer als bei *Sc. crockeri*, Schenkel keulenförmig verdickt, Schienen und Tarsen sehr schlank.

Penis (Abb. 12) asymmetrisch mit dorsolateral gelegener, von einem stark sklerotisierten Rahmen umfaßter Basalöffnung und dorsoapikalem Ostium penis. Im Penisinneren liegt knapp vor dessen Längsmittle die kugelige Samenblase, die distal einen weiten Ausführungsgang besitzt. Dieser ist durch einen stark sklerotisierten Querbalken fixiert, an dessen distalem Rand 2 dicke Schläuche entspringen. Von diesen ist der von oben und hinten besehene linke dünner und S-förmig gekrümmt. Er reicht bis nahe an das Penisende

heran und trägt terminal eine lange Geißel. Der rechte ist dicker und basalwärts umgebogen. An der Biegungsstelle entspringt ein kurzes Rohr, aus dem ein sichelförmig gekrümmter, blind endender Schlauch nach hinten abzweigt. An seinem Hinterende inseriert ein schwanzförmiger Fortsatz.

Subgenus **Mascarensia** Franz

Scydmaenus (Mascarensia) dissimilis nov. spec.

MATERIAL: Nur Holotypus ♂ Sabah, Poring Hot Springs, 500 bis 600 m, (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Dem *Sc. similis* Schauffuss ähnlich, aber etwas kleiner, die Fühler länger und schlanker, der Halsschild mit 2 Basalgrübchen, die Flügeldecken kürzer, der Penis abweichend gebaut.

BESCHREIBUNG: Long. 1,10 mm, lat. 0,50 mm, bräunlichgelb, sehr fein behaart. Kopf von oben betrachtet gerundet-fünfeckig, breiter als lang, die Schläfen nahezu parallel, fast doppelt so lang wie der Augendurchmesser. Stirn und Scheitel flach gewölbt, glatt und glänzend, kahl, Fühler zurückgelegt die Halsschildbasis ein wenig überragend, ihre beiden ersten Glieder knapp doppelt so lang wie breit, 3 bis 5 deutlich gestreckt, 6 klein, länger als breit, 7 und 8 asymmetrisch, schwach quer, 9 doppelt so breit wie 8, 10 noch etwas breiter, beide eben merklich gestreckt, das spitz-eiförmige Endglied so lang wie die beiden vorletzten zusammen.

Halsschild kaum merklich länger als breit, sehr wenig breiter als der Kopf, etwas vor seiner Längsmittle am breitesten, sehr fein punktiert (80-fache Vergrößerung), mit 2 Basalgrübchen.

Flügeldecken zusammen an der Basis nur wenig breiter als die Halsschildbasis, kurzoval, nur so lang wie der Kopf und Halsschild zusammen, fein punktiert, mit schwer erkennbarer Behaarung, ohne Basalimpression und ohne Schulterbeule. Flügel entwickelt.

Beine schlank, Hinterschenkel des ♂ mit einer Grube versehen.

Penis (Abb. 13) langgestreckt, in seiner Längsmittle stark eingeschnürt, hinter der Einschnürung liegt dorsal das große Ostium penis. In diesem befindet sich eine annähernd isodiametrische, an der Basis in ihrer ganzen Breite konkav ausgeschnittene Blase, an die distal ein breiter Gang anschließt, der nach kurzem Verlauf von oben und hinten betrachtet nach rechts biegt, sich dabei verschmälert und an der Außenseite der Biegung mit Zähnen besetzt ist.

Subgenus **Eustemmoides** Franz

FRANZ (1957); *Koleopt. Rdsch.* 35, p. 3-6.

Das Subgenus *Eustemmoides* habe ich auf *E. alluvialis* aus dem Tschadgebiet im subtropischen Afrika errichtet, es ist in der äthiopischen Region und darüber hinaus in den warmen Klimagebieten der Erde weiter verbreitet. Die Fauna von Sabah enthält, wie die Bearbeitung des mir von dort vorliegenden Materiales zeigt, eine ganz außerordentliche Vielfalt von Arten dieses Subgenus.

Scydmaenus (Eustemmoides) punctatus nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Poring Hot Springs, 600 m, bei Bat Cave, 10.5.1987 (lg. Burckhardt u. Löbl, cGM); Paratypus ♂ (Penispräparat), Sabah, Poring Hot Springs, 500 m, 10.5.1987 (lg-Burckhardt u. Löbl, cF); ebenda 500 m, 6.5.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch die deutliche Punktierung des Halsschildes und der Flügeldecken.

BESCHREIBUNG: Long. 1,20 bis 1,30 mm. lat 0,60 mm. Rotbraun, gelblich behaart.

Kopf von oben betrachtet gerundet-fünfeckig, breiter als lang, die Schläfen leicht zur Basis konvergierend, doppelt so lang wie der Augendurchmesser, Fühler zurückgelegt die Halsschildbasis knapp erreichend, doppelt so lang wie der Augendurchmesser; ihr Basalglied annähernd so lang wie breit, 3 bis 5 leicht gestreckt, 6 bis 8 breiter als lang, 9 und 10 quadratisch, 9 nicht ganz, 10 reichlich doppelt so breit wie 8, das spitz-eiförmige Endglied knapp so lang wie 9 und 10 zusammen.

Halsschild eben mehrlich länger als breit, etwas vor seiner Längsmittle am breitesten, an der Basis nicht ganz so breit wie die Flügeldecken zusammengenommen, mit 2 kleinen Basalgrübchen, zwischen der deutlichen Punktierung nur schwer sichtbar behaart. Flügeldecken schon an der Basis zusammen wesentlich breiter als die Halsschildbasis, ohne Schulterhöcker und nur mit Andeutung einer Basalimpression, deutlich und ziemlich dicht punktiert und ziemlich eng anliegend behaart. Flügel entwickelt.

Penis (Abb. 14) von oben betrachtet dreimal so lang wie breit, in der Längsmittle etwas schmaler als an den beiden Enden. Seine Basalöffnung dorsobasal gelegen, mit stärker sklerotierter Umrandung, dahinter mit pilzhutförmigem Druckregulierungsorgan. In der Längsmittle des Penis befindet sich ein von oben besehen kreisförmig abgegrenzter Raum, in dem eine große, distal mit einem Ausführungsgang versehene Blase gelegen ist. Es ist nicht erkennbar, ob der Ausführungsgang distal einen Ausgang besitzt. Der distale Teil des Penis ist zweiteilig. Er besteht aus 2 in der Sagittalebene zusammenstoßenden Lappen, die nur laterobasal mit dem Peniskörper verbunden sind. Jeder dieser Lappen ist durch einen tiefer Einschnitt in 2 Teile gespalten, deren vorderer medialwärts zu einem Sklerotinstab verschmälert ist. Die beiden Stäbe berühren einander in der Sagittalebene, vor der Berührungstelle der distalen Lappen. Sie scheinen bei der Kopula auseinandergepreßt werden zu können.

Scydmaeus (Eustemmaoides) alessmetanai nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Kinabalu Nat. Park. Poring Hot Springs, 485 m, 27.8.1988 (lg. Smetana, cMG).

DIAGNOSE: Gekennzeichnet durch stark gewölbten Körper, nahezu kahle Körperoberfläche und starken Glanz.

BESCHREIBUNG: Long. 1,50 mm, lat. 0,60 mm. Kastanienbraun, oberseits fast kahl.

Kopf klein, von oben betrachtet gerundet-rautenförmig, so lang wie breit, schütter abstechend behaart, Augen klein, flach. Fühler zurückgelegt die Halsschildbasis knapp erreichend, ihr Basalglied doppelt so lang wie breit, 3 bis 6 sehr wenig länger als breit, 7 und 8 breiter als lang, 9 um ein Drittel breiter als 8, um ein Fünftel länger als breit, 10 so lang wie 9, zur Spitze verbreitert und da doppelt so breit wie das vorhergehende, das spitz-eiförmige Endglied etwas kürzer als die beiden vorletzten zusammen.

Halsschild um die Hälfte länger als breit, etwas breiter als der Kopf mit den Augen, ungleichmäßig gerundet, schütter, anliegend behaart, ohne Basalgrübchen.

Flügeldecken an der Basis zusammen nur so breit wie die Halsschildbasis, stark gewölbt, aber seitlich nur schwach gerundet, sehr schütter und eng anliegend behaart, ohne Schulterbeule und ohne Basalimpression, Flügel entwickelt.

Beine ziemlich kurz, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb. 15) von oben betrachtet in der Anlage lang-rechteckig, mit scharf abgesetztem, schmalem Apex. Basalöffnung dorsobasal gelegen, sehr stark quer, mit

breitem, stark sklerotisiertem Rahmen. Ostium penis apikal in breitem Bogen aus der Dorsalwand des Penis ausgeschnitten, von dem langen schmalen Apex weit überragt. Der Hinterrand des Peniskörpers seitlich weit über die Basis des Apex nach hinten ragend. Die Hinterecken des Peniskörpers spitz. Hinter der Basalöffnung des Penis liegen hintereinander 2 Kammern, an die distal ein dickes Rohr anschließt. Dieses gabelt sich beim Austritt aus dem Ostium, der von oben und hinten besehen linke Ast setzt sich im Ostium leicht verdickt mit einem Knick zur Mitte fort und reicht in der Ruhelage bis zur Längsmittle des Apex penis. Der rechte Ast ist kürzer und ebenfalls beim Austritt in das Ostium verdickt. Ganz recht liegt ein langer Stachel, der von der Basis des Ostiums bis zum Ende des Apex reicht.

***Scydmaenus (Eustemmoides) silvicola* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Poring Hot Springs, nr Bat Cave, 10.5.1987 (lg. Burckhardt u. Löbl, cMG); Kinabalu Nat. Park, Poring Hot Springs, 485 m, 29.8.1988 (lg. Smetana) 1 Paratypus (cMG und 1 Paratypus (cF)).

DIAGNOSE: Durch geringe Größe, spärliche Behaarung und durch das im Verhältnis zum 10. bedeutend kleinere 9. Fühlrglied ausgezeichnet.

BESCHREIBUNG: Long. 1,10 mm, lat 0,50 mm, kastanienbraun, sehr fein hellbraun behaart.

Kopf von oben betrachtet gerundet-fünfeckig, wenig breiter als lang, die Schläfen parallel, eineinhalbmahl so lang wie der Durchmesser der flachen Augen. Fühler zurückgelegt die Halsschildbasis erreichend, ihr Basalglied knapp doppelt, das 2. eineinhalbmahl so lang wie breit, 3 bis 6 annähernd so lang wie breit, 7 und 8 quer, 9 um die Hälfte breiter als 8, 10 doppelt so breit, beide kugelig, nicht ganz so lang wie breit, das gerundet-kegelförmige Endglied nicht ganz so lang wie die beiden vorhergehenden zusammen.

Halsschild leicht gestreckt, seitlich gleichmäßig gerundet, stark gewölbt, glatt und glänzend, mit 2 Basalgrübchen.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, mit schwach angedeuteter Schulterbeule, sehr fein punktiert und fein anliegend behaart.

Beine kurz, Vorderschenkel stärker verdickt als die der beiden anderen Beinpaare.

Penis (Abb. 16) langgestreckt, seine basale Hälfte breiter als die distale. Die Basalöffnung ist sehr stark quer, dorsobasal gelegen, Ostium penis dorsoapikal. Hinter der Basalöffnung liegt im Penisinneren ein pilzförmiges Druckregulierungsorgan. Hinter der Längsmittle des Penis liegen im Penisinneren hintereinander 3 Blasen, von denen die vorderste gerundet-dreieckig ist und basalwärts eine langgestreckte "Haube" trägt. Die 2. Blase ist kugelförmig und starkwandig. Sie ist doppelt so breit wie die 3., die ebenfalls kugelig und starkwandig ist. Auf der von oben und hinten besehen linken Seite der 3 Blasen befindet sich ein breiter Stachel. Der Apex penis ist am Hinterende breit abgerundet.

***Scydmaenus (Eustemmoides) cuneipenis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Sabah, Mount Kinabalu HQ at Livagu River, 1500 m, 16.5.1987 (lg. Smetana, cMG).

DIAGNOSE: Durch schlanke Gestalt und lange Fühler einem *Mimoscydmaenus* ähnlich, von diesem Subgenus aber durch den Besitz einer zwar schlanken, aber deutlich abgesetzten Fühlerkeule und durch einfach keilförmig gebauten Penis verschieden.

BESCHREIBUNG: Long. 1,65 mm, lat. 0,65 mm. Rotbraun, gelblich behaart.

Kopf von oben betrachtet gerundet-fünfeckig, die fast parallelen Schläfen eineinhalbmahl so lang wie der Augendurchmesser. Fühler zurückgelegt die Mitte der Flügeldecken

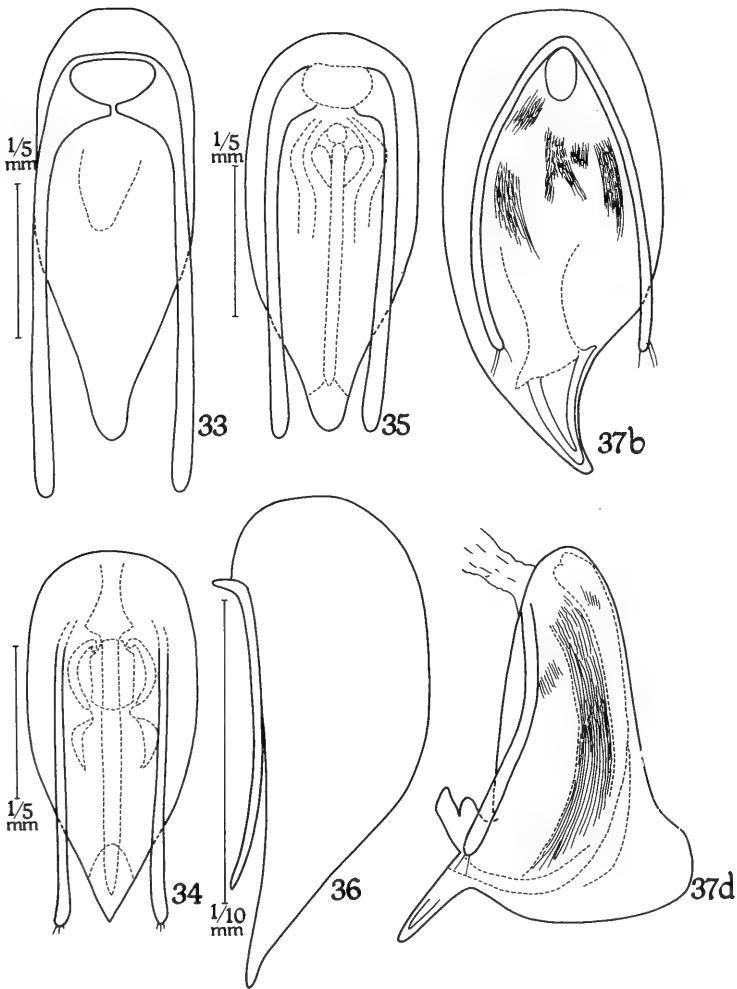


ABB. 33-37.

33: *Loeblites sabahensis* nov. spec., Penis in Dorsalansicht. 34: *Horaeomorphus loeblianus* nov. spec., Penis in Dorsalansicht. 35: *Syndicus kinabalui* nov. spec. Penis in Dorsalansicht. 36: *Syndicomorphus magnus*, nov. spec., Penis in Lateralansicht.

erreichend, alle Fühlerglieder mit Ausnahme des 7. und 8. gestreckt, diese so lang wie breit, 9 bis 11 die deutlich abgesetzte Keule bildend.

Halsschild um etwa ein Fünftel länger als breit, seitlich gleichmäßig gerundet, fein punktiert und behaart.

Flügeldecken zusammen breiter als die Halsschildbasis, ohne deutliche Schulterbeule und Basalimpression, fein punktiert und schräg abstehend behaart.

Penis (Abb. 17) lang keilförmig mit dorsolateral gelegener Basalöffnung. Im Penisinneren liegt in der Längsmittle eine Folge von 3 Blasen, an die distal ein Ausführungsgang anschließt, der im distalen Drittel des Penis endet. Der Ausführungsgang ist dreigliedert: auf ein kurzes basales Stück folgt ein verkehrt L-förmiger Abschnitt, zuletzt wieder ein gerades Stück, das aber schmaler ist als das basale. Der Winkel des L wird durch ein dünnes Rohr überbrückt.

Scydmaenus (Eustemmoides) thermarum nov. spec.

MATERIAL: Nur Holotypus ♂ (Penispräparat) Sabah, Poring Hot Springs, 500 m, 7.5.1987 (Ig Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch hell rotbraune Färbung, schlanke, aber hochgewölbte Gestalt, gestreckten Halsschild mit 2 kleinen Basalgrübchen und dicht punktierte Flügeldecken.

BESCHREIBUNG: Long. 1,80 mm, lat. 0,65 mm. Hell rotbraun, gelblich behaart.

Kopf von oben betrachtet nur wenig breiter als lang, die parallelen Schläfen nicht ganz doppelt so lang wie der Augendurchmesser.

Fühler zurückgelegt die Halsschildbasis knapp erreichend, ihr Basalglied zweieinhalbmal so lang wie breit, 2 leicht gestreckt, 3 bis 6 isodiametrisch, 7 und 8 breiter als lang, 9 um die Hälfte breiter als 8, wie auch 10 so lang wie breit. Das spitz-eiförmige Endglied kürzer als die beiden vorletzten zusammen.

Halsschild um knapp ein Fünftel länger als breit, nur wenig breiter als der Kopf, vor der Längsmittle am breitesten, fein, nach hinten gerichtet behaart, mit 2 seichten Basalgrübchen. Flügeldecken länglichoval, seitlich flach gerundet, zusammen nur wenig breiter als die Halsschildbasis, dicht punktiert, schräg nach hinten gerichtet behaart. Flügel verkümmert.

Beine mittellang, Schenkel schwach keulenförmig verdickt, Schienen gerade.

Penis (Abb. 18) in dem einzigen Präparat immatur, langgestreckt, der Apex spitzwinkelig-dreieckig. Hinter der dorsobasal gelegenen Basalöffnung liegt im Penisinneren eine kleine, stark sklerotisierte Blase in einem viereckigen Rahmen. An sie schließt distal der dicke S-förmig gekrümmte Ductus ejaculatorius an. Er verläuft zunächst sagittal, biegt dann in der Mitte des Penis im rechten Winkel, von hinten und oben betrachtet nach rechts und läuft dann in einem Zweidrittelkreis wieder nach links, wobei sich das Rohr allmählich verengt. In dem scharfen Winkel entspringt ein Sklerotinstachel, der zunächst nach rechts gerichtet ist, um dann im stumpfen Winkel nach hinten zu verlaufen.

Scydmaenus (Eustemmoides) furcatus nov. spec.

MATERIAL: Es liegen insgesamt 17 Exemplare der Art vor, wovon 11 einschließlich des Holotypus ♂ (Penispräparat) von Sabah, Kinabalu Nat. Park, Poring Hot Springs, 485 m, 28.8.1988 (Ig. Smetana) in cMG und 6 Exemplare vom selben Fundort (2 Penispräparate) in cF aufbewahrt werden.

DIAGNOSE: Dem an späterer Stelle beschriebenen *Sc. sabahensis* ähnlich, aber kleiner und schlanker, der Kopf fast so lang wie breit, der Halsschild länger als breit und der Penis ganz anders gebaut.

BESCHREIBUNG: Long. 1,20 mm, lat. 0,55 m. Dunkel rotbraun, gelblich behaart.

Kopf von oben betrachtet nur wenig breiter als lang, die Schläfen parallel, doppelt so lang wie der Augendurchmesser. Fühler zurückgelegt die Halsschildbasis knapp erreichend, mit sehr scharf abgesetzter Keule, ihr Basalglied doppelt so lang wie breit, 2 leicht gestreckt, 3 bis 6 annähernd quadratisch, 7 und 8 breiter als lang, 9 bis 11 die scharf abgesetzte Keule bildend, 9 und 10 etwas breiter als lang, das spitz-eiförmige Endglied fast so lang wie die beiden vorletzten zusammen.

Halsschild länger als breit, nicht breiter als der Kopf, an der Basis fast so breit wie die Basis der Flügeldecken gemeinsam, mit 2 kleinen Basalgrübchen, sehr fein punktiert und behaart. Flügel voll entwickelt.

Beine schlank, Vordertarsen des ♂ nicht verdickt, Schienen gerade.

Penis (Abb. 19) 3 mal so lang wie breit, sein Apex spitzwinkelig - dreieckig, seine Spitze schmal aufgebogen. Im Penisinneren befindet sich knapp vor der Penismitte eine Blase, die einem kurzen Rohrstutzen aufsitzt. Dahinter folgt beiderseits der Sagittalebene je ein Sklerotinstab, beide Stäbe sitzen distal einem sklerotisierten Querbalken auf. Hinter diesem Balken folgt das Ostium penis, in das von links ein Chitinstab hineinragt, der sich an der Spitze in eine zweispitzige Gabel verzweigt. Die beiden Spitzen sind nach vorne umgebogen.

Scydmaenus (Eustemmoides) burckhardtloebli nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Poring Hot Springs, 500 m, 7.5.1987 (Ig. Burckhardt u. Löbl, cMG); ebenda, 484 m, 2 Paratypen, 28.8.1988 (Ig. Smetama, cMG); 2 Paratypen ebenda, 20.8.1988 (Ig. Smetama, cF).

DIAGNOSE: Äußerlich dem später beschriebenen *Sc. allofilipenis* ähnlich, aber noch etwas schlanker, der Penis anders geformt.

BESCHREIBUNG: Long. 1,00 mm, lat. 0,35 bis 0,40 mm. Dunkel rotbraun, sehr fein gelblich behaart.

Kopf von oben betrachtet so lang wie breit, rundlich, Fühler zurückgelegt die Halsschildbasis knapp erreichend, ihr Basalglied nur um ein Viertel länger als breit, 2 doppelt so lang wie breit, 3 bis 6 isodiametrisch, klein, 7 und 8 stark quer, 9 um die Hälfte breiter als 8, breiter als lang, 10 viel größer, um die Hälfte breiter als 9, quadratisch, das spitz-eiförmige Endglied etwas länger als die beiden vorletzten zusammen.

Halsschild länger als breit, ein wenig breiter als der Kopf, schwach gleichmäßig gerundet, anliegend behaart, mit 2 Basalgrübchen. Flügeldecken sehr regelmäßig länglich-oval, an der Basis zusammen nur so breit wie die Halsschildbasis, glatt und glänzend, ohne Basalimpression und ohne Spur eines Humeralhöckers. Flügel verkümmert.

Beine ziemlich lang, Schenkel mäßig verdickt, Schienen gerade.

Penis (Abb. 20) langgestreckt, sein Apex sehr spitzwinkelig. Das Ostium penis bis zum apikalen Ende reichend. Die Basalöffnung dorsobasal gelegen, knapp dahinter liegt ein pilzförmiges Druckregulierungsorgan und dahinter in der Dorsalwand ein durchsichtiges gerundet-viereckiges Fenster. Distal der Penismitte liegen im Penisinneren zwei langgestreckte stark sklerotisierte Körper, deren einer am Hinterrand einen zur Seite gerichteten Zahn trägt.

Scydmaenus (Eustemmoides) sabahi nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Mount Kinabalu Nat. Park, HQ at Liwagu-River, 1500 m, 17.5.1987 (Ig. Smetana, cMG); 3 Paratypen Mount Kinabalu (Ig. Burckhardt u. Löbl, cMG); 2 Paratypen, Crocker Range, 1370-1500 m, (Ig. Burckhardt u. Löbl, cMG); Kinabalu, HQ

Bukit Ular Trail, 1700 m, 29.4.1987 (lg. Burckhardt u. Löbl, cMG); ebenda, 1 Paratypus (cF); 3 Paratypen, Kinabalu 1500 bis 1650 m und 2600 m (lg. Burckhardt u. Löbl, cF).

DIAGNOSE: Gekennzeichnet durch breiten Kopf, relativ lange Fühler und schlanke Beine sowie deutliche Punktierung von Halsschild und Flügeldecken.

BESCHREIBUNG: Long. 1,40 bis 1,80 mm, lat. 0,60 mm. Kastanienbraun, die Extremitäten heller, bräunlich behaart.

Kopf groß, um ein Viertel breiter als lang, fast so breit wie der Halsschild, mit schwach gerundeten, kurz und fein behaarten Schläfen. Fühler zurückgelegt die Halsschildbasis um das Endglied überragend, ihr Basalglied 3 mal so lang wie breit, 2,3 und 5 doppelt, 4 und 6 eineinhalbmals so lang wie breit, 7 und 8 breiter als lang, 9 und 10 leicht gestreckt, das spitz-eiförmige Endglied fast so lang wie die beiden vorletzten zusammen.

Halsschild seitlich stark gerundet, fast so breit wie lang, fein punktiert und anliegend behaart, ohne Basalgrübchen.

Flügeldecken schon an der Basis zusammen etwas breiter als die Halsschildbasis, stark gewölbt und seitlich gerundet, ohne Basalimpression und ohne Schulterbeule, kräftig punktiert, fein und anliegend behaart, ohne Basalgrübchen.

Beine lang, Schenkel keulenförmig verdickt, Schienen gerade, Vordertarsen des ♂ nicht verbreitert.

Penis (Abb. 21) ziemlich langgestreckt, sein Apex am Ende abgerundet-dreieckig, vom Peniskörper nur schwach abgesetzt. Die Basalöffnung dorsobasal gelegen, knapp dahinter liegt ein pilzförmiges Druckregulierungsorgan, von dem ein Bündel von Muskelsträngen zu zwei hintereinander liegenden Blasen zieht. Von diesen ist die basale quer kappenförmig, die distale lang eiförmig. Die letztere ragt in der Ruhelage ein wenig in das langovale Ostium hinein, das bis zum Penisende reicht. An seinem Vorderrand liegt ein quergestellter Sklerotinkomplex, der nach hinten und links außen einen starken Zahn entsendet. Rechts davon durchsetzt diesen Komplex der mit der langeiförmigen Blase kommunizierende Ductus ejaculatorius. Er verschmälert sich distalwärts zu einer engen Düse und reicht bis zur Penisspitze.

***Scydmaenus (Eustemmoides) allosabahensis* nov. spec.**

MATERIAL: Nur Holotypus ♂ (Penispräparat), Mount Kinabalu Nat. Park, Poring Hot Springs, 485 m, 28.8.1988 (lg. Smetana, cMG).

DIAGNOSE: Wesentlich kleiner und weniger robust als *Sc. sabahi*.

BESCHREIBUNG: Long. 1,20 mm, lat. 0,60 mm. Kastanienbraun, gelblich behaart.

Kopf von oben betrachtet etwas breiter als lang mit parallelen Schläfen, so breit wie der Halsschild. Fühler zurückgelegt die Halsschildbasis knapp überragend, ihr Basalglied zweieinhalbmals, das 2. doppelt so lang wie breit, 3, 4 und 6 leicht gestreckt, 5 um ein Viertel länger als breit, 7 und 8 breiter als lang, nicht asymmetrisch, 9 und 10 quer, eng an die vorhergehenden anschließend, das eiförmige Endglied fast so lang wie die beiden vorletzten zusammen.

Halsschild isodiametrisch, seitlich stark gerundet, vor seiner Längsmitte am breitesten, vor der Basis mit 2 großen Grübchen.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, mit seichter Basalimpression, sehr fein punktiert und fein, abstechend behaart. Flügel entwickelt.

Beine ziemlich lang, Schienen gerade, Vordertarsen des ♂ leicht verbreitert.

Penis (Abb. 22) langgestreckt, seine Basis bei seitlicher Betrachtung durch eine Einschnürung von der Dorsalseite hinter der Basalöffnung deutlich abgesetzt. In der distalen Hälfte des Peniskörpers befindet sich der Genitalapparat, bestehend aus 2 hintereinander liegenden Blasen und aus dem Ductus ejaculatorius. Die basale Blase ist gerundet-

kegelförmig und besitzt in der distalen Hälfte ein Lumen, das ventral weiter nach vorne reicht als dorsal. Die distale Blase ist so breit wie lang, in seitlicher Ansicht quadratisch und besitzt eine verdickte Wand. Der Ductus ejaculatorius ist von einer dicken Sklerotinhülle ummantelt, er reicht bis nahe an das abgerundete Penisende.

Scydmaenus (Eustemmoides) parasabahensis nov. spec.

MATERIAL: Holotypus (Penispräparat) und 3 Paratypen, Kinabalu Nat. Park, Poring Hot Springs, 500 bis 600 m, 9.5.1987 (lg. Smetana, cMG); ebenda 3 Paratypen, (♂ Penispräparat) (lg. Smetana, cF).

DIAGNOSE: Dem *Sc. sabahanus* nahe stehend, aber robuster, der Halsschild länger als breit, die Flügeldecken länger oval, die Beine kräftiger, der Penis ganz anders gebaut.

BESCHREIBUNG: Long. 1,65, lat. 0,65 mm. Dunkel rotbraun, gelblich behaart.

Kopf von oben betrachtet wenig breiter als lang mit parallelen Schläfen. Fühler zurückgelegt die Halsschildbasis erreichend, ihr Basalglied 3 mal, 3 bis 6 eineinhalbmal so lang wie breit, 7 und 8 etwas breiter als lang, 9 und 10 doppelt so breit wie 8, schwach quer, das eiförmige Endglied wenig kürzer als die beiden vorletzten zusammen.

Halsschild um ein Viertel länger als breit, wenig vor seiner Längsmittle am breitesten, zum Vorderrand nur wenig stärker verengt als zur Basis, mit 2 kleinen Basalgrübchen, anliegend behaart, fast glatt.

Flügeldecken schon an der Basis zusammen etwas breiter als die Halsschildbasis, seitlich gleichmäßig gerundet, fein punktiert, nur mit Andeutung einer Schulterbeule. Flügel verkümmert.

Beine kurz und kräftig, Schenkel mäßig verdickt, Schienen fast gerade.

Penis (Abb. 23) in den basalen 4 Fünfteln von oben betrachtet fast parallelseitig, im distalen Fünftel dreieckig zur Spitze verengt. Ostium penis die distale Hälfte der Dorsalseite des Penis einnehmend, ein mächtiger sklerotierter Zahn entspringt an seinem Basalrand und verbreitert sich hinter diesem auf 2 Drittel der Penisbreite. Er reicht bis über die Basis des Apex penis nach hinten. In seiner Längsmittle tritt auf seiner medialen Seite der dünne Ductus ejaculatorius aus. Er verläuft nach einer S-förmigen Krümmung gerade zur von oben und hinten betrachtet rechten Seite des Apex und überragt dessen Rand um ein bedeutendes Stück.

Scydmaenus (Eustemmoides) sabahensis nov. spec.

MATERIAL: 25 Ex., Sabah, Kinabalu Nat. Park, Holotypus ♂ (Penispräparat) Poring Hot Springs und Langanan River (lg. Burckhardt u. Löbl, sowie Smetana, cMG); Langanan River, 850 m (lg. Smetana, cMG); 18 Ex., Poring Hot Springs, cF).

BESCHREIBUNG: Long. 1,40, lat. 0,65. Dunkel rotbraun, gelblich behaart.

Kopf etwas breiter als lang, Schläfen wenig länger als der Augendurchmesser, zur Basis konvergierend, Fühler mit scharf abgesetzter Keule, ihr Basalglied dicker als die folgenden, um ein Drittel länger als breit, 2 bis 6 annähernd isodiametrisch, 7 und 8 breiter als lang, 9 mehr als doppelt so breit wie 8, isodiametrisch, 10 etwas breiter als 9, schwach quer, das eiförmige Endglied nicht ganz so lang wie die beiden vorletzten zusammen. Halsschild so lang wie breit, vor der Mitte am breitesten, zum Vorderrand viel stärker verengt als zur Basis, absteht behaart, ohne Basalgrübchen.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, fein punktiert und absteht behaart, ohne Basalimpression und ohne Schulterbeule.

Beine kräftig und mäßig lang.

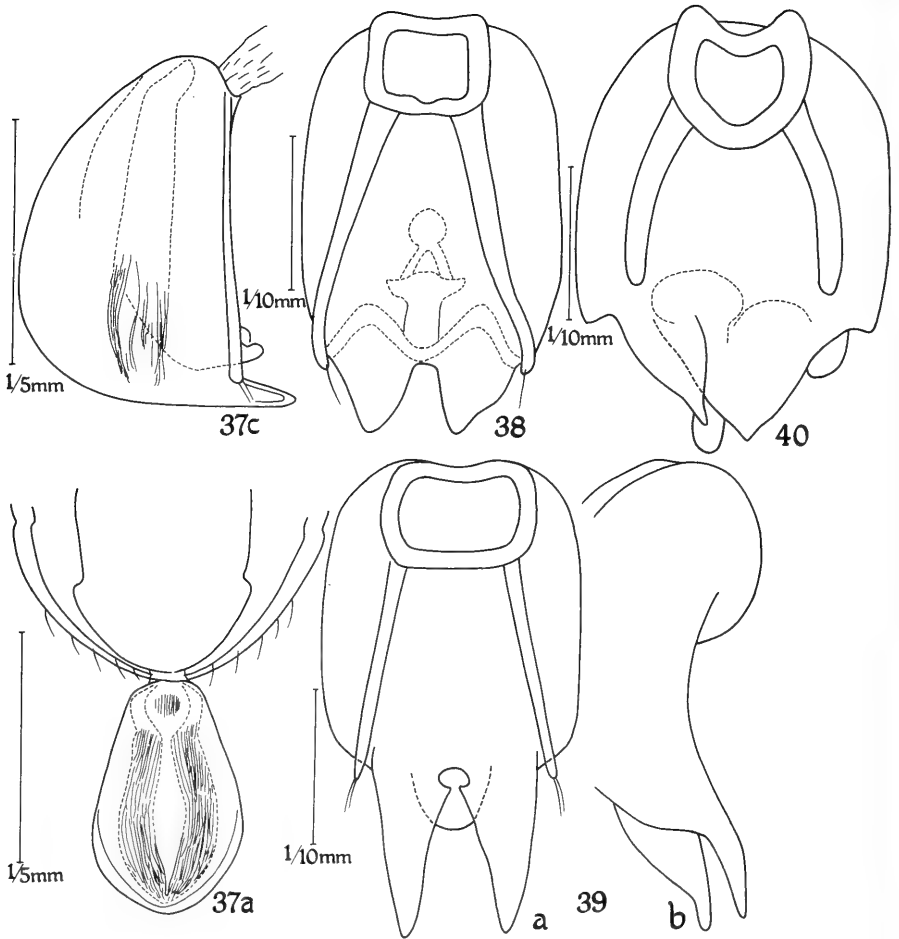


ABB. 37-40.

37: *Borneosabahia mirifica* nov. spec. a bis d Penis in verschiedenen Stellungen (Erläuterungen im Text). 38: *Euconnus* (s. str.) *pseudosukhotanus* nov. spec., Penis in Dorsalansicht. 39: *Euconnus* (s. str.) *allosukhotanus* nov. spec., Penis a) in Dorsal - b) in Lateralansicht. 40: *Euconnus* (s. str.) *kinabaluanus* nov. spec., Penis in Dorsalansicht.

Penis (Abb. 24) zweieinhalbmal so lang wie breit mit dorsoapikal gelegenen Ostium, an dessen Basis eine querovale, vom eigentlichen Ostium durch einen Querbalken getrennte Öffnung liegt. Von dem Querbalken zweigt an seinem von oben und hinten betrachtet rechten Ende ein dicker Zahn im rechten Winkel nach hinten ab. Vom linken Rand des Ostiums ragen 2 spitze Stachel in sein Inneres vor. Unter diesen ist das Operculum sichtbar, das vor der rechten Hinterecke tief kreisförmig ausgeschnitten ist. In diesem Ausschnitt ist ein sehr langer gerade nach hinten gerichteter Stachel sichtbar.

Scydmaenus (Eustemmoides) sabahanus nov. spec.

MATERIAL: Nur Holotypus ♂ (Penispräparat), Sabah, Mount Kinabalu, 1550 bis 1600 m, 24.4.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Äußerlich dem *Sc. sabahi* sehr ähnlich und von ihm nur durch den Bau des männlichen Genitalapparates sicher unterscheidbar.

BESCHREIBUNG: Hinsichtlich der äußeren Merkmale kann auf *Sc. sabahi* m. verwiesen werden.

Penis (Abb. 25) langgestreckt, sein Basalteil vom übrigen Peniskörper etwas abgesetzt. Dieser ist bei lateraler Betrachtung im flachen Bogen nach oben gekrümmt. In seinem Inneren liegt eine große, schwach sklerotisierte nierenförmige Blase, an die ein schwach S-förmig gekrümmter Ausführungsgang anschließt. Dieser ragt mit seinem Hinterende ein wenig über den Apex penis hinaus und entsendet kurz davor einen kurzen Schlauch dorsalwärts aus dem Ostium penis heraus. Dahinter stehen zwei kleine Stachel schräg nach vorne und oben. Von der Penisbasis zieht ein mächtiger Sklerotinbalken an der nierenförmigen Blase vorbei bis ins distale Drittel des Peniskörpers.

Scydmaenus (Eustemmoides) filipenis nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Crocker Range, 1200 m, km 60 Kota Kinabalu Tambunan, 4.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda 1 Paratypus (cF).

DIAGNOSE: Äußerlich dem *Sc. sabahensis* gleich, von ihm nur durch den Bau des männlichen Kopulationsapparates zu unterscheiden.

BESCHREIBUNG: Long. 1,50 mm, lat. 0,70 mm. Rotbraun, gelblich behaart. In den äußeren Merkmalen dem *E. sabahensis* gleich.

Penis (Abb. 26) sehr schlank und langgestreckt, flach dorsalwärts gebogen, in einer scharfen Spitze endend. Der basale Teil des Penis im einzigen Präparat undurchsichtig, distal der Längsmittle befindet sich ein S-förmig gebogener, mit der Spitze distalwärts orientierter Stachel, an dem ventral ein runder Sklerotinkörper hängt. Distal von dem beschriebenen Stachel liegt ein zweiter nur leicht gebogener, schwächer sklerotisierter Stachel. Beide ragen in der Ruhelage nicht aus dem Penisinneren heraus.

Scydmaenus (Eustemmoides) parafilipenis nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Kinabalu Nat. Park, Poring Hot Springs, area eastern Ridge, 850 m, 28.8.1988 (lg. Smetana, cMG); 3 Paratypen ebenda (cMG); 3 Paratypen (2 Penispräparate) (lg. Smetana, cF).

DIAGNOSE: Äußerlich dem *Sc. filipenis* sehr ähnlich, aber der Kopf größer, der Halsschild etwas länger, mit 2 Basalgrübchen, der Penis anders gebaut.

BESCHREIBUNG: Long. 1,40 mm, lat. 0,70 mm. Dunkel rotbraun, gelblich behaart.

Penis (Abb. 27) langgestreckt, schwach dorsalwärts gekrümmt, sein Apex abgerundet, an den beiden Seiten der Dorsalwand des Penis befindet sich, über die basalen drei Viertel

der Penislänge reichend, ein Sklerotinstreifen. Die Streifen erinnern an Parameren um so mehr, als sie an dem Rahmen der Basalöffnung wurzeln. In der Mitte des Peniskörpers liegt eine kugelige Blase, die distal in einen langen Ausführungsgang mündet, der bis ins Ostium penis reicht und dort mit einer düsenförmigen Verengung endet. Zu den beiden Seiten des Ausführungsganges liegt je ein langgestreckter schmaler Körper, der linke von ihnen mündet in ein dickes Rohr, das fast bis an das Hinterende des Ostiums heranreicht.

Scydmaenus (Eustemmoides) allofilipenis nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Poring Hot Springs, 600 m, nr. Bat Cave 10.5.1987 (lg. Burckhardt u. Löbl, cMG); Kinabalu Nat. Park, Poring Hot Springs, 485 m, 25.8.1988, lg. Smetana, 1 Paratypus (cMG) und 1 Paratypus (cF).

DIAGNOSE: Im Penisbau dem *Sc. parafilipenis* ähnlich, aber viel kleiner und schlanker als dieser.

BESCHREIBUNG: Long. 1,20 mm, lat. 0,40 mm. Dunkel rotbraun, bräunlich behaart. Kopf wenig breiter als lang, die Schläfen nur so lang wie der Durchmesser der großen Augen. Fühler zurückgelegt die Halsschildbasis erreichend, ihr Basalglied mehr als doppelt so lang wie breit, 2 leicht gestreckt, die folgenden Glieder klein, 9 nicht ganz doppelt so breit wie 8, 10 noch etwas breiter, das spitz-eiförmige Endglied kürzer als die beiden vorletzten zusammen.

Halsschild länger als breit, kaum breiter als der Kopf, seitlich gleichmäßig gerundet, glatt, sehr fein behaart, ohne Basalgrübchen.

Flügeldecken langoval, zusammen schon an der Basis ein wenig breiter als die Halsschildbasis, mit angedeutetem Schulterwinkel und einer Basalimpression. Flügel entwickelt.

Beine ziemlich lang und schlank.

Penis (Abb. 28) von oben betrachtet biskottenförmig, seine Basalöffnung dorsobasal gelegen, das Ostium penis apikal. In der Längsmittle des Penis liegt eine runde Blase, an deren distalem Ende ein Ausführungsgang entspringt, der zunächst durch eine lange, becherförmige Halterung hindurchtritt und danach bis an das Penisende reicht.

Zu den beiden Seiten der Blase liegt ein schmales lappenförmiges Sklerotingebilde, an das distal beiderseits der Sagittalebene ein bogeförmig zur Mitte gekrümmter großer Lappen anschließt. Die beiden großen Lappen umschließen den dünnen distalen Teil des Ductus ejaculatorius. Das Hinterende des Apex penis ist bogenförmig.

Scydmaenus (Eustemmoides) bidentipenis nov. spec.

MATERIAL: 25 Ex., davon 17 in cMG und 8 in cF, Kinabalu Nat. Park, 500 bis 1750 m. Holotypus ♂ (Penispräparat) 1500 m, 2.4.1987 (Burckhardt u. Löbl (cMG); ♂ u. andere Paratypen, 1750 m, 27.4.1987 (lg. Burckhardt u. Löbl (cF).

DIAGNOSE: Gekennzeichnet durch schlanke Fühler und Beine, sowie durch einen gestreckten Halsschild mit sehr kleinen Basalgrübchen.

BESCHREIBUNG: Long. 1,40 mm, lat. 0,70 mm, hell rotbraun, gelblich behaart. Kopf von oben betrachtet querrundlich, die Schläfen doppelt so lang wie die flachen Augen. Fühler schlank, zurückgelegt die Halsschildbasis um das lange Endglied überragend. Alle Glieder bis auf das 7. und 8. länger als breit, die beiden ersten zweieinhalbmal so lang wie breit, das 9. und 10. nicht ganz doppelt so breit wie lang, um ein Viertel länger als breit, das spitz-eiförmige Endglied so lang wie die beiden vorletzten zusammen.

Halsschild von oben betrachtet kurzoval, stark gewölbt, vor der Mitte am breitesten und hier wenig breiter als der Kopf mit den Augen, glatt und glänzend, fein und anliegend behaart, mit 2 kleinen Basalgrübchen.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, gleichmäßig gerundet und stark gewölbt, fein punktiert und anliegend behaart, ohne Basalimpression und ohne Schulterbeule. Flügel voll entwickelt.

Beine schlank, Schenkel schwach keulenförmig verdickt, Schienen gerade, Vordertarsen des ♂ nicht verbreitert.

Penis (Abb. 29) tonnenförmig, der Apex aber zur Spitze kegelförmig verschmälert. Die Basalöffnung basal, das Ostium penis dorsoapikal gelegen. Hinter der Basalöffnung liegt ein pilzförmiger Druckregulierungsapparat, dahinter in der basalen Hälfte des Penis eine sehr große langovale Blase mit apikalem dünnen Ausführungsgang. Dieser ist nahe seinem Ursprung in einer ringförmigen Halterung gefaßt, die Teil einer großen von oben und hinten betrachtet links liegenden Sklerotinplatte ist. Hinter der Halterung setzt sich der Ductus ejaculatorius als dickes Rohr apikalwärts fort und endet sichelförmig mit einer scharfen Spitze. Parallel dazu entspringt in der großen Sklerotinplatte ein dicker Sklerotinstrang, der ebenfalls vor der Penis Spitze sichelförmig endet. Zwischen den beiden sichelförmig endenden Strängen liegt ein dritter kürzerer und schmälere, der ebenfalls sichelförmig endet. Die Penis Spitze ist abgerundet zweispitzig.

***Scydmaenus (Eustemmoides) frater* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Kinabalu Nat. Park, Poring Hot Springs, 28.8.1988 (lg. Smetana, cMG); Ebends, Paratypus ♂ 21.6.1988 (lg. Smetana, cF).

DIAGNOSE: Gekennzeichnet durch relativ gestreckte Gestalt, vor allem aber durch den Bau des männlichen Kopulationsapparates, der verwandtschaftliche Beziehungen zu *Sc. poringensis* erkennen läßt, weshalb ich der Art den Namen *frater* gegeben habe.

BESCHREIBUNG: Kopf relativ schmal, fast so lang wie breit, Schläfen eineinhalbmals so lang wie der Augendurchmesser, parallel. Fühler zurückgelegt die Halsschildbasis knapp überragend, Glied 1 und 2 gestreckt, 3 bis 6 quadratisch, 7 und 8 breiter als lang, 9 und 10 mehr als doppelt so breit wie 8, schwach quer, das spitz eiförmige Endglied fast so lang wie die beiden vorletzten zusammen. Halsschild etwas länger als breit, vor seiner Längsmitte am breitesten und hier etwas breiter als der Kopf, fein behaart, ohne Basalgrübchen. Flügeldecken an der Basis zusammen nur wenig breiter als die Halsschildbasis, stark gewölbt, seitlich gleichmäßig gerundet, ohne Basalimpression und ohne Schulterbeule, fein punktiert und kurz behaart. Flügel voll entwickelt.

Beine kräftig, für die Verwandtschaftsgruppe relativ lang, Schenkel keulenförmig verdickt, Schienen gerade, Vordertarsen des ♂ verbreitert.

Penis (Abb. 30) nach oben gekrümmt, in der distalen Hälfte verbreitert, zum apikalen Ende gerundet zu einer Spitze verengt, die Basalöffnung dorso basal gelegen, Ostium penis dorsal im Bereich der Penismitte gelegen, sein Rahmen gegen den Apex verflachend. Aus dem Ostium ragt ein starker Stachel von oben und hinten besehen schräg nach links hinten. Der Ductus ejaculatorius entspringt unter dem Stachel und ist distal düsenförmig verengt.

***Scydmaenus (Eustommoides) poringensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Kinabalu Nat. Park, Poring Hot Springs, 475 m, 21.8.1988 (Lg. Smetana, cMG); Paratypus ♂ (Penispräparat), ebenda, 480 m, 26.8.1988 (lg. Smetana, cF).

DIAGNOSE: Durch kurze Beine mit dicken Schenkeln und durch die Penisform sehr gekennzeichnet.

BESCHREIBUNG: Kopf von oben betrachtet etwas breiter als lang, Schläfen leicht zur Basis konvergierend, eineinhalbmals so lang wie der Augendurchmesser. Fühler zurückgelegt die Halsschildbasis knapp erreichend, ihr Basalglied doppelt so lang wie breit, 2 leicht gestreckt, 3 bis 6 isodiametrisch, 7 und 8 breiter als lang, 9 doppelt so breit wie 8, 10 noch etwas breiter, beide so lang wie breit, das spitz-eiförmige Endglied nicht ganz so lang wie die beiden vorletzten zusammen.

Halsschild etwas länger als breit, vor seiner Längsmittle am breitesten, glatt und glänzend, mit 2 kleinen Basalgrübchen.

Flügeldecken zusammen nur wenig breiter als die Halsschildbasis, stark gewölbt, seitlich gleichmäßig gerundet, ohne Basalimpression und ohne Schulterbeule, sehr fein und seicht punktiert, nach hinten gerichtet behaart.

Beine kurz, Schenkel stark verdickt, Schienen gerade, Vordertarsen des ♂ verbreitert.

Penis (Abb. 31) leicht dorsalwärts gebogen, vor dem Apex stumpfwinkelig erweitert, dahinter beiderseite ausgebuchtet. Der Hinterrand des Apex mit einer sehr stumpfwinkligen Spitze. Die Basalöffnung dorsobasal gelegen, mit einem stark sklerotisierten Rahmen. Hinter der Basalöffnung liegt in der Sagittalebene eine kaputzenförmige Blase und dahinter ein etwa doppelt so breiter sklerotisierter Körper. Dieser liegt in der Ruhelage zum Teil vor, zum Teil hinter dem Basalrand des Ostium penis. Dieses ist langeiförmig und endet im Niveau der stumpfwinkligen Erweiterung der Penisseiten. Nahe hinter seiner Basis endet der breite sklerotisierte Körper und entsendet links nach hinten einen langen, stumpfen Zahn. Ein zweiter sehr schmaler Zahn liegt vor dem Hinterende des Ostiums, das distal breit umrahmt ist.

***Scydmaenus (Eustemmoides) livagui* nov. spec.**

MATERIAL: Nur Holotypus ♂ (Penispräparat) Kinabalu Nat. Park, HQ. at Livagu River, 1500 m, 16.5.1987 (lg. Smetana, cMG).

DIAGNOSE: In der Körperform und namentlich im Bau des männlichen Kopulationsapparates mit *Sc. poringensis* verwandt.

BESCHREIBUNG: Long. 1,60 mm, lat. 0,70 mm. Dunkel rotbraun, gelblich behaart.

Kopf von oben betrachtet sehr wenig breiter als lang, die zur Basis konvergierenden Schläfen nur wenig länger als der Durchmesser der großen, flach gewölbten Augen. Fühler zurückgelegt die Halsschildbasis erreichend, ihr Basalglied etwa doppelt so lang wie breit, 2 und 3 leicht gestreckt, 4 bis 6 isodiametrisch, 7 und 8 breiter als lang, 9 und 10 schwach quer, das spitz-eiförmige Endglied so lang wie die beiden vorletzten zusammen.

Halsschild etwas breiter als lang, mit 4 Basalgrübchen.

Flügeldecken zusammen etwas breiter als die Halsschildbasis, seitlich mäßig gerundet, fein punktiert und behaart.

Beine kräftig, Schenkel keulenförmig verdickt, Schienen gerade, Vordertarsen des ♂ kaum merklich verdickt.

Penis (Abb. 32) langgestreckt, von oben betrachtet bis zur Apikalpartie parallelseitig, zum Apex leicht erweitert, der Spitzenbereich schwach abgesetzt mit seitlich vortretenden Ecken, der Hinterrand breit abgestutzt. Ostium penis auf der Dorsalseite gelegen, zwei Drittel der Dorsalseite des Penis einnehmend. In seinem Inneren ist ein langer S-förmig gekrümmter Sklerotinstab vorhanden. Er wurzelt an der Basis des Ostiums mit einer stark verbreiterten Basis und endet mit dem schmaleren Ductus ejaculatorius düsenförmig verschmälert knapp vor dem Penisende. Vor der Basis des Ostiums befindet sich eine

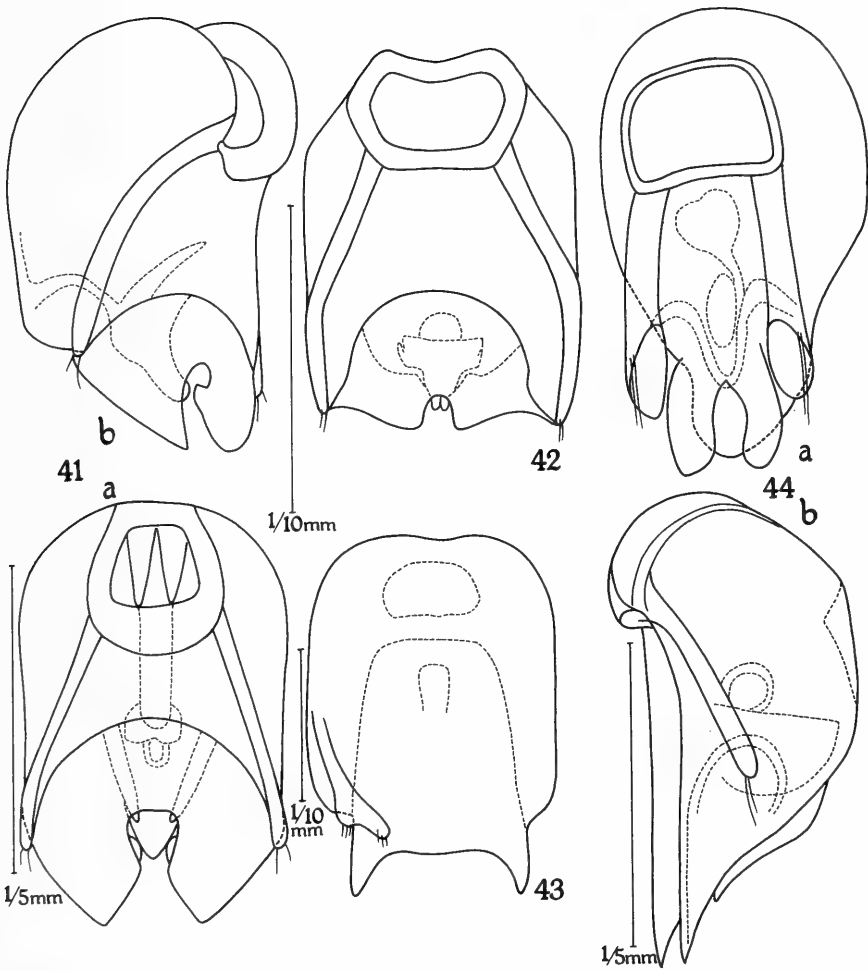


ABB. 41-44.

41: *Euconnus* (*s. str.*) *simillimus* nov. spec., Penis a) in Dorsal- b) in Dorsolateralansicht. 42: *Euconnus* (*s. str.*) *latus* nov. spec., Penis in Dorsalansicht. 43: *Euconnus* (*s. str.*) *paenetypticus* nov. spec., Penis in Dorsalansicht. 44: *Euconnus* (*s. str.*) *paeneglaber* nov. spec., Penis a) in Dorsal-, b) in Lateralansicht.

kurzovale Blase, die mit einem kurzen und dicken Ausführungsgang in die basale Erweiterung des dicken Sklerotinstabes mündet.

ANMERKUNG:

Da von mehreren der vorstehend beschriebenen *Eustemmoides*-Arten nur 1 ♂ vorliegt, ist die nachstehende Bestimmungstabelle unvollständig und es empfiehlt sich zur Sicherung der Determination Penispräparate anzufertigen.

BESTIMMUNGSTABELLE DER *Eustemmoides*-ARTEN VON SABAH

- | | | |
|----|--|---|
| 1 | Fühler fast halb-körperlang, alle Glieder bis auf das 7. und 8 viel länger als breit | <i>cuneipenis</i> n. sp. |
| – | Fühler kürzer und dicker | 2 |
| 2 | Flügeldecken dicht und kräftig punktiert | 3 |
| – | Flügeldecken höchstens schütter und unauffällig punktiert | 5 |
| 3 | Fühler kurz, zurückgelegt die Halsschildbasis nicht erreichend | 4 |
| – | Fühler lang, zurückgelegt die Halsschildbasis deutlich überragend | <i>sabahi</i> n. sp. und <i>sabahanus</i> n. sp. |
| 4 | Kleiner, long. 1,20 mm, Kopf fast so breit wie der Halsschild | <i>punctatus</i> n. sp. |
| – | Größer, long. 1,40 mm, Kopf deutlich schmaler als der Halsschild | <i>thermarum</i> n. sp. |
| 5 | 9. Fühlerglied nur halb so groß wie das 10 | <i>silvicola</i> n. sp. |
| – | 9. und 10. Fühlerglied in der Größe nur wenig verschieden | 6 |
| 6 | Körperoberfläche nahezu kahl, Kopf ein wenig länger als breit | <i>alesmetanai</i> n. sp. |
| – | Körperoberseite mindestens stellenweise deutlich behaart, Kopf nicht länger als breit | 7 |
| 7 | Körperlänge unter 1,20 mm | 8 |
| – | Körperlänge 1,20 mm und darüber | 10 |
| 8 | Fühler zurückgelegt die Halsschildbasis deutlich überragend, Körperlänge knapp 1,20 mm | <i>furcatus</i> n. sp. |
| – | Fühler zurückgelegt die Halsschildbasis knapp erreichend | 9 |
| 9 | 6. Fühlerglied länger als breit, Körperlänge um 1,20 mm | |
| – | 6. Fühlerglied annähernd isodiametrisch, Körperlänge um 1,00 mm | <i>burckhardtloebli</i> n. sp. |
| 10 | Körperlänge 1,50 bis 1,60 mm, Halschildbasis mit Punktgrübchen | 11 |
| – | Körperlänge unter 1,30 mm | 12 |
| 11 | Halsschild mit 4 Punktgrübchen | <i>livagui</i> n. sp. |
| – | Halsschild mit 2 Punktgrübchen | <i>poringensis</i> n. sp. |
| 12 | 7. und 8. Fühlerglied nicht asymmetrisch | 13 |
| – | 7. und 8. Fühlerglied asymmetrisch | 14 |
| 13 | 2. und 3. Fühlerglied mehr als eineinhalbmals so lang wie breit, Vordertarsen des ♂ nicht verbreitert | <i>bidentipenis</i> n. sp. |
| – | 2. und 3. Fühlerglied weniger als eineinhalbmals so lang wie breit, Vordertarsen des ♂ verbreitert | <i>frater</i> n. sp. |
| 14 | Dem <i>Armatoscydmaenus brevitarsis</i> durch gedrungenen Körperbau, trapezförmigen Halsschild und kurze Beine sehr ähnlich, aber die Hinterschenkel des ♂ ungezähnt und der Penis ganz anders geformt | <i>filipenis</i> n. sp. |
| – | Andere Merkmalskombinationen | <i>sabahensis</i> n. sp. und <i>allosabahensis</i> n. sp. |

Gattung **Loeblites** Franz

In Sabah kommt eine zweite Art der bisher monotypischen Gattung *Loeblites* vor.

Loeblites sabahensis nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat) und 4 Paratypen ♂, Poring Hot Springs, 500 m, 7.5.1987 (Burckhardt u. Löbl, cMG); 1 ♀ Paratypus, ebenda, 11.5.1987 (Burckhardt u. Löbl, cMG); 20 1 ♀ Paratypen, ebenda (lg. Burckhardt u. Löbl) 11.5.1987 (cF); 3 ♂ Paratypen, Kibongol V. 7 km N Tambunan, 700 m, 20.5.1987 (Burckhardt u. Löbl, cMG); 1 ♂ (Paratypus) Poring Hot Springs, 490 m, area Kipungit, 14.8.1988 (lg. Smetana, cF); 1 ♀ Crocker Range, 1270 m, 60 km NE Kota Kinabalu-Tambunan, 17.5.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Dem *L. mastigicornis* m. sehr ähnlich, aber rotbraun gefärbt, am Halsschild und namentlich auf den Flügeldecken viel länger behaart, der Halsschild viel kürzer und nur um etwa ein Viertel länger als breit, seine Basalgrübchen viel größer, die Flügeldecken mit deutlicher, lateral von einem Schulterhöcker begrenzter Basalimpression sowie mit einer großen Depression hinter dem Schildchen beiderseits der Naht.

BESCHREIBUNG: Long. 2,20 bis 2,40 mm, lat. 0,70 bis 0,90 mm. Dunkel rotbraun, stark glänzend, die Palpen und Tarsen heller gefärbt, braun behaart.

Kopf mit den stark vorgewölbten Augen fast so breit wie lang, mit deutlichen Supraantennalhockern. Fühler beim ♂ länger als beim ♀, beim ♂ fast körperlang, beim ♀ die Längsmittle der Flügeldecken erreichend, beim ♂ Glied 1 der Fühler etwas mehr als doppelt so lang wie breit, 3 und 4 mehr als 3 mal, 5 bis 8 fünfmal so lang wie breit, 9 etwas, 10 und 11 noch kürzer.

Halsschild im vorderen Viertel seiner Länge am breitesten, von da zur Basis leicht ausgeschwungen verengt, mit 4 großen Basalgrübchen, oberseits schütter, an den Seiten dicht und struppig abgehend behaart.

Flügeldecken schon an der Basis zusammen wesentlich breiter als die Halsschildbasis, deutlich punktiert und lang abgehend behaart, mit nach hinten verflachter Basalimpression und hinter dem Schildchen beiderseits der Naht mit großer, flacher Impression. Beine lang, Schenkel keulenförmig verdickt, Schienen gerade, Tarsen sehr schlank.

Penis (Abb. 33) in der Form dem des *L. mastigicornis* sehr ähnlich, schwach sklerotisiert. Parameren die Basalöffnung des Penis distal und lateral umfassend, das Penisende überragend, ohne Tastborsten. Im Penisinneren ist hinter der Basalöffnung ein zungenförmiger horizontal gelegener Sklerotinkörper erkennbar, bei einem Paratypus ist an seiner Stelle ein ungleich stark sklerotisierter, unregelmäßig geformter Körper vorhanden.

Gattung **Horaeomorphus** Schaufuss**Horaeomorphus loeblianus** nov. spec.

MATERIAL: Holotypus ♂ und ein Paratypus, Sabah, Mount Kinabalu Nat. Park, Poring Hot Springs, area Eastern Ridge Tr., 790 m, 17.8.1988 (lg. Smetana, cMG); 1 ♂ und 4 Ex. Paratypen, Poring Hot Springs, 550 bis 600 m, 9.5.1987 (lg. Burckhardt u. Löbl, cF); 5 Paratypen, ebenda, 480 bis 530 m, 8.-9.5.1987 (lg. Smetana, cMG); 2 ♂ (Penispräparat) Paratypen 7 km N Tambunan und Langanan Fall, 900-950 m, 13.5.1987 (lg. Burckhardt u. Löbl, cMG); 2 ♂ und 4 Ex. (Paratypen) ebenda, (cMG); Poring Hot Springs, Langanan River, 850 bis 950 m, 9.-20.5.1987 (cMG).

DIAGNOSE: Gekennzeichnet durch dicke, sehr kurze, zurückgelegt die Halsschildbasis nicht erreichende Fühler, zwischen den hoch aufgewölbten Supraantennalhockern tief eingesenkte Stirn und mediodistal ausgerandete, in der Ausrandung steif behaarte Mittelschienen.

BESCHREIBUNG: Long. 2,00 bis 2,10 mm, lat. 0,80 bis 1,00 mm. Dunkel rotbraun, rotgelb behaart.

Kopf von oben betrachtet in der Anlage lang-dreieckig, im Bereich der knapp vor der Kopfbasis stehenden Augen am breitesten, die Schläfen sehr kurz, abstehend beborstet, die Stirn zwischen den großen Supraantennalhöckern tief eingesenkt. Fühler dick, zurückgelegt die Halsschildbasis nicht erreichend, ihre 5 ersten Glieder annähernd isodiametrisch, 7 bis 10 breiter als lang, gegen das 10. an Breite zunehmend, das gerundet-kegelförmige Endglied so lang wie die beiden vorletzten zusammen, alle Glieder lang abstehend behaart.

Halsschild wenig länger als breit, im vorderen Drittel seiner Länge am breitesten und hier breiter als der Kopf mit den Augen, in der vorderen Hälfte kurz und steif aufgerichtet, hinter der Mitte noch dichter und lang, nach hinten gerichtet behaart, mit 4 Basalgrübchen, auf der Scheibe dicht punktiert. Flügeldecken länglichoval, stark gewölbt, an der Basis zusammen nur wenig breiter als die Halsschildbasis, mit runder, lateral von einer Humeralfalte begrenzter Basalimpression, fein punktiert, die Punktierung von der Mitte nach hinten gerichteten Behaarung weitgehend verdeckt. Flügel voll entwickelt. Beine mäßig lang, Schenkel keulenförmig verdickt, Vorderschienen mediobasal leicht ausgerandet, die Mittelschienen wesentlich stärker, in der Ausrandung mit steifen Borsten besetzt.

Penis (Abb. 34) etwa doppelt so lang wie von oben besehen breit, von der Längsmittle zur Spitze allmählich verengt, die Parameren lang und parallel, die Penis Spitze ein wenig überragend, mit einigen terminalen Tastborsten. Etwas vor der Längsmittle des Penis liegt sagittal ein stark sklerotisierter, annähernd isodiametrischer Komplex, der aus um eine zentrale Achse angeordneten Körpern besteht. Zu der Achse sind hintereinander 2 Paare von Schalen spiegelbildlich angeordnet. Die Achse ist offenbar der Ductus ejaculatorius, der in der Ruhelage bis knapp vor die Spitze des Penis reicht und dort zu einer Düse verengt ist.

***Horaeomorphus sabahensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat). Crocker Range, 1550-1650 m, 16.5.1987 (lg. Burckhardt u. Löbl, cMG); Paratypus ♂ (Penispräparat, ebenda (cF)); ♀ Paratypus, Mount Kinabalu Nat. Park, NO Silau-Silau Tr., 1540 m, 14.8 bis 1.9.1988 (lg. Smetana, cMG).

DIAGNOSE: Relativ groß und schlank, nur die Fühler kurz und dick. Halsschild und Flügeldecken ziemlich fein punktiert, aber dicht und lang behaart.

BESCHREIBUNG: Long. 2,60 bis 2,80 m, lat. 1,00 bis 1,20 mm, schwarz, die Beine dunkel rotbraun, bräunlich behaart.

Kopf von oben betrachtet gerundet-dreieckig mit großen Supraantennalhöckern, dazwischen eingesenkter Stirn und unter den Fühlerwurzeln stehenden Augen, Schläfen sehr kurz. Fühler sehr dick und zurückgelegt die Halsschildbasis wenig überragend, beim ♂ die ersten 6 Glieder annähernd quadratisch, die folgenden viel breiter als lang, und bis zum 10. Glied an Breite zunehmend, das Endglied kegelförmig, so lang wie breit. Beim ♀ alle Glieder bis auf das Endglied breiter als lang.

Halsschild etwas länger als breit, im vorderen Drittel seiner Länge am breitesten und hier breiter als der Kopf mit den Augen, vor der Basis ausgeschwungen, mit 4 in einer Querfurche stehenden Grübchen, besonders an den Seiten dicht und abstehend behaart.

Flügeldecken länglichoval, stark gewölbt und schon an der Basis zusammen viel breiter als die Halsschildbasis, mit strichförmig lateral von einem Schulterhöcker begrenzter Basalimpression, sehr fein punktiert und dicht, schräg abstehend behaart. Flügel entwickelt.

Beine beim ♂ etwas länger als beim ♀, Schenkel mäßig verdickt, Schienen gerade. Penis in dem einzigen vorhandenen Präparat stark geschrumpft, in den Umrissen dem des *H. loeblianus* ähnlich, etwas länger und schlanker, die Parameren zur Spitze verbreitert, mit zahlreichen terminalen Tastborsten versehen.

Horaeomorphus punctatissimus nov. spec.

MATERIAL: Holotypus ♂, Sabah, Kinabalu Nat. Park, HQ at Livagu Rv., 1500 m, 30.4.1987 (lg. Smetana, cMG); Paratypus ♀, Kinabalu N HQ. 1550 m, 2. bis 4.9.1988 lg. Bright, cMG); Sabah, Crocker Range, 1550 bis 1650 m, 16.5.1987 (lg. Burckhardt u. Löbl (cMW); Mount Kinabalu Nat. Park, HQ at Livagu Rv., 1500 m, 30.4.1987 (lg. Smetana, cF).

DIAGNOSE: Sehr ausgezeichnet durch flach gewölbte Gestalt, sehr dichte Punktierung der ganzen Oberseite sowie einen langen Sporn an den Trochanteren der Hinterbeine der ♂.

BESCHREIBUNG: Long. 2,40 bis 2,60 mm, lat. 0,80 bis 0,90 mm, rotbraun, bräunlich behaart.

Kopf von oben betrachtet annähernd gerundet-dreieckig, länger als breit, im basalen Viertel seiner Länge im Niveau der kleinen Augen am breitesten, die Augen an den Kopfseiten gelegen, wenig vorragend, die Schäfen nur halb so lang wie der Augendurchmesser, hinter den Fühlerwurzeln mit 2 Grübchen, schütter punktiert, nur die Schläfen spärlich behaart. Fühler ziemlich schlank, allmählich zur Spitze verdickt, die ersten 6 Glieder gestreckt, mit gegen das 6. abnehmender Länge, 7 isodiametrisch, 8 und 9 wenig, 10 stark quer, das Endglied kegelförmig, so lang wie breit.

Halsschild flach gewölbt, vor seiner Mitte am breitesten und hier wesentlich breiter als der Kopf mit den Augen, vor der Basis mit 2 Grübchen, dicht punktiert und abstehend behaart. Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, flach gewölbt, dicht punktiert und nach hinten gerichtet behaart, mit breiter Basalimpression und Andeutung einer Schulterbeule. Flügel voll entwickelt.

Beine mittellang, Hinterschenkel stark verdickt, Hinterschienen stark medialwärts gekrümmt, die Trochanteren der Hinterbeine beim ♂ mit einem langen, parallel zur Schenkelachse liegenden Dorn. Bei dem einzigen vorliegenden ♂ wurde bei der Präparation kein Aedeagus gefunden.

BESTIMMUNGSTABELLE DER *Horaeomorphus*-ARTEN BORNEOS

- 1 Tibien, besonders die der Hinterbeine stark medialwärts gekrümmt, die Trochanteren der Hinterbeine beim ♂ mit einem langen Sporn, Oberseite sehr dicht und grob punktiert, Körperlänge 2,40 mm und darüber *punctatissimus* nov. spec.
- Tibien höchstens schwach medialwärts gekrümmt, Trochanteren der Hinterbeine beim ♂ ohne Sporn 2
- 2 Sehr kleine Art (long 1,50 mm), mit dicht und kräftig punktierter Oberseite *sarawakensis* Franz
- Größere Arten mit weniger kräftiger oder ohne Punktierung der Oberseite 3
- 3 Große Art, Körperlänge 2,60 bis 2,80 mm. Schenkel mäßig verdickt, Schienen gerade *sabahensis* nov. spec.
- Kleinere Art, Körperlänge 2,00 bis 2,10 mm, Mittelteil des Kopfes mediodistal ausgerandet, in der Ausrandung grob punktiert (Sabah) *loeblianus* nov. spec.

Gattung *Syndicus* Motschulsky*Syndicus kinabalui* nov. spec.

MATERIAL: Holotypus ♂ und Paratypus ♂, Mount Kinabalu Nat. Park, Poring Hot Springs, 485 bis 490 m, 24. und 27.8.1988 (lg. Smetana, cMG); Paratypus ♂ ebenda. 27.8.1988 (lg. Smetana, cF).

DIAGNOSE: Durch die sehr stark verdickten Schenkel und sehr feine Punktierung von Kopf, Halsschild und Flügeldecken ausgezeichnet.

BESCHREIBUNG: Long. 2,50 bis 2,60 mm, lat. 0,80 bis 1,00 mm.

Kopf von oben betrachtet doppelt so breit wie lang, die Stirn gewölbt, ohne Spur von Supraantennalhöckern, Augen flach gewölbt, aus der Kopfwölbung kaum vorstehend, Oberseite des Kopfes sehr fein punktiert und kaum erkennbar behaart (80-fache Vergrößerung). Fühler zurückgelegt die Halsschildbasis nicht ganz erreichend, ihre ersten 4 Glieder leicht gestreckt, 5 isodiametrisch, 6 bis 9 breiter als lang, das 10. und 11. Glied zusammen gerundet-kegelförmig, das 11. dem 10., wie auch bei den anderen Arten der Gattung, wie eine Eichel dem Fruchtbecher aufsitzend.

Halsschild um ein Fünftel länger als breit, breiter als der Kopf mit den Augen, von der Mitte zur Basis sehr stark verengt, vor dieser mit 4 seichten Grübchen, die mittleren voneinander durch einen Längskiel getrennt, die Scheibe dicht und fein punktiert, kurz und steif abstehend behaart.

Flügeldecken schon an der Basis zusammen wesentlich breiter als die Halsschildbasis, mit einer runden, nach hinten offenen Basalimpression und Andeutung einer Schulterbeule, sehr fein punktiert, schräg nach hinten gerichtet behaart. Flügel entwickelt.

Beine kurz, Schenkel sehr stark keulenförmig verdickt, Schienen gerade, Tarsen kurz.

Penis (Abb. 35) langgestreckt, von oben besehen lang-eiförmig, das Penisende schmal abgerundet. Parameren das Penisende erreichend, ohne Tastborsten. Im Penisinneren liegt sagittal der Ductus ejaculatorius, der hinter der Basalöffnung in einem Komplex von 3 stark sklerotisierten Drüsen entspringt. Zu den beiden Seiten dieses Komplexes befinden sich sklerotisierte Falten der Präputialsackwand.

Gattung *Syndicomorphus* nov. gen.

In meiner Monographie der Gattung *Syndicus* (FRANZ 1971) habe ich nachgewiesen, daß die Vertreter der Gattung *Syndicus* eigentlich 11-gliedrige Fühler besitzen. Ich führte aus: "Untersucht man die Fühler der verschiedenen *Syndicus*-Arten genauer, so sieht man, daß diese eigentlich nicht 10- sondern 11-gliedrig sind. Das 11. Glied sitzt dem 10. wie eine Eichel ihrem Fruchtbecher (Cupula) auf, wobei es bei den einzelnen Arten zu einer mehr oder weniger weitgehenden Verschmelzung kommt". Das 10. und 11. Glied sind zusammen gerundet-konisch oder kurz-eiförmig.

Nun liegt mir aus Sabah neben dem schon beschriebenen *Syndicus kinabalui* eine durch bedeutendere Größe und lange und schlanke Fühler ausgezeichnete Art vor, bei der auch das 10. Glied sehr scharf begrenzt ist und keine Spur eines ihm aufsitzenden 11. Gliedes zeigt. Diese Art weicht von den *Syndicus*-Arten so weit ab, daß es gerechtfertigt ist, für sie ein eigenes Genus zu errichten.

Es erinnert im Habitus stark an *Mastigus* und auch an *Loeblites*, unterscheidet sich aber von dem letzteren durch robusteren Körperbau und kürzere Fühler, sowie von beiden Genera durch nur 10-gliedrige Fühler.

Typusart ist der nachfolgend beschriebene *Syndicomorphus magnus* nov. spec.

Syndicomorphus magnus nov. spec.

MATERIAL: Nur Holotypus ♂ (Penispräparat), Sabah Kinabalu Nat. Park, Bukit Utar Trail, 1700 m, 29.4.1987 (lg. Smetana, cMG).

DIAGNOSE: Auffällig groß, long. 3,20 mm, lat. 1,20 mm. Schwarz, schwarz-braun behaart.

BESCHREIBUNG: Durch die bedeutende Größe, die schwarze Farbe und 10-gliedrige Fühler sehr ausgezeichnet.

Kopf mit den vorgewölbten Augen um ein Drittel breiter als lang, die Stirn zwischen den Fühlerbasen flach eingedellt, schütter punktiert und behaart. Fühler fadenförmig, zurückgelegt die Längsmittle der Flügeldecken knapp erreichend, ihr Basalglied leicht gestreckt, 2 schmaler und kürzer als 1, 3 einhalbmahl, 4 knapp doppelt so lang wie breit, 5 bis ausschließlich 9 zweieinhalbmahl so lang wie breit, das Endglied ist spitz-oval und erreicht die Länge der 3-fachen Breite.

Halsschild im vorderen Drittel seiner Länge am breitesten und hier deutlich breiter als der Kopf mit den Augen, um ein Drittel breiter als lang, stark gewölbt, auf der Scheibe lang, schütter und anliegend behaart. Flügel verkümmert.

Beine lang und ziemlich schlank, Schenkel keulenförmig verdickt, Schienen gerade, Tarsen schlank.

Penis (Abb. 36) langgestreckt, von der Seite besehen doppelt so lang wie breit, in einer scharfen Spitze endend. Parameren schlank, die Penisspitze nicht erreichend, ohne Tastborsten. Das Penisinnere ist undurchsichtig.

Genus **Borneosabahia** nov. gen.

Mit *Euconnus* nahe verwandt, die Fühler allmählich zur Spitze verdickt, mit sehr großem keulenförmigen Endglied. Der Kopf gerundet-dreieckig, lang und nach hinten gerichtet behaart, die Augen in den stark nach hinten verlagerten Fühlerfurchen versenkt. Der Halschild halb so breit wie die Kopfbasis, Kiefertaster klein, das 4. Glied pfriemenförmig, schwer sichtbar. Halsschild konisch, kaum breiter als der Kopf, Hinterhüften breit getrennt, Mittelhüften durch einen hoch aufgewölbten Mesosternalkiel voneinander geschieden. Typusart: *Borneosabahia mirifica* nov. spec.

Borneosabahia mirifica nov. spec. (Abb. 37)

MATERIAL: Holotypus ♂ (Penispräparat, Crocker Range, 1500 m, Mount Kinabalu, 20.4.1987 (lg. Burckhardt u. Löbl, cMG); ebenda, 1000 bis 1500 m, 24 Ex. (Paratypen) lg. Burckhardt u. Löbl (cMG u. cF, mehrere Penispräparate).

DIAGNOSE: Sehr ausgezeichnet durch kurze, dicke Fühler mit auffallend großem, keulenförmigen Endglied, bei Betrachtung von oben gerundet-dreieckigen Kopf, mit lang nach hinten gerichtet behaartem Scheitel, durch kleinen gerundet-viereckigen Halsschild mit 4 untereinander durch eine Querfurchen verbundene Basalgrübchen, durch ovale ziemlich flach gewölbte Flügeldecken mit nach hinten verflachter Basalimpression und schlanken Beine.

BESCHREIBUNG: Long. 1,90 bis 2,20 mm, lat. 0,78 bis 0,90 mm, schwarzbraun bis dunkel rotbraun, braun behaart.

Kopf von oben betrachtet gerundet-dreieckig, am Scheitel lang, nach hinten gerichtet behaart, die Stirn wulstförmig emporgewölbt, mit tiefen, nach hinten allmählich verflachten Fühlergruben und in diesen an den Kopfseiten eingesenkten Augen. Fühler

kurz und dick, allmählich zur Spitze verbreitert, mit großem keulenförmigem Endglied, zurückgelegt die Halsschildmitte wenig überragend, ihr Basalglied um die Hälfte länger als breit, 2 leicht gestreckt, die folgenden bis zum 10. zunehmend breiter als lang und zunehmend breiter. Maxillarpalper schlank, ihr 4. Glied pfriemenförmig, sehr klein.

Halsschild konisch, so lang wie breit, an der Basis kaum breiter als der Kopf mit den Augen vor der Basis, mit 4 großen durch eine Querfurche verbundene Grübchen, abstehend, an den Seiten struppig behaart. Flügeldecken schon an der Basis zusammen viel breiter als die Halsschildbasis, flach gewölbt, dicht und schräg nach hinten abstehend behaart. Flügel voll entwickelt.

Beine schlank, Schenkel schwach verdickt, Schienen gerade, Hinterhüften breit getrennt, die Hinterbrust glatt und glänzend.

Penis (Abb. 37a-d) stark sklerotisiert, fast rechtwinkelig gekrümmt, in einem kleinen dreieckigen Apex endend. Dieser ist in seiner Lage zum Peniskörper verstellbar. In Abb. 37a ist der Penis ausgestülpt in Ventralansicht dargestellt, in Abb. 37b in Dorsalansicht, in Abb. 37c in Lateralansicht in Ruhestellung und in Abb. 37d in Erektion. Die Basalöffnung besitzt keinen sklerotisierten Rahmen, die Parameren sind an der Basis vor der Basalöffnung verbunden. Der Ductus ejaculatorius ist größtenteils dünnhäutig und in den Präparaten nicht sichtbar. Nur das verbreiterte Ende, das zum Teil auf der Dorsalseite des Penis aus dem Peniskörper herausragt, ist stärker sklerotisiert. Es deutet die Lage des Ostium penis an, die wie die Basalöffnung keinen sklerotisierten Rahmen besitzt. Dieser Mangel wie die geringe Differenzierung des ganzen Kopulationsapparates bezeugen eine niedrigere Entwicklungsstufe der Gattung.

Die geringe Formbeständigkeit des männlichen Kopulationsapparates verleitet dazu, morphologische Unterschiede zu vermuten. Das Vorhandensein einer sehr großen Zahl von Belegexemplaren hat es ermöglicht, zahlreiche Penispräparate anzufertigen und damit die Einheitlichkeit des Baues des Kopulationsapparates bei allen untersuchten Individuen sicherzustellen.

Gattung **Euconnus** Thomson

Untergattung **Euconnus** Thomson s. str.

Euconnus (*s.str.*) **pseudosukhotanus** nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Mount Kinabalu Nat. Park, HQ at Livagu, 1500 m, 15.5.1987 (lg. Smetana, cMG); Paratypus ♂ (Penispräparat), Mount Kinabalu, 1900 m, 28.4.1987 (lg. Burckhardt u. Löbl, cMG); ♂ Paratypus (Penispräparat), ebenda, 1500 m, 29.4.1987 (cF); Mount Kinabalu Nat. Park, HQ Silau-Silau, 1550 m, 4.9.1988 (lg. Smetana, cF); ebenda Paratypus ♂ (Penispräparat, cMG). Dazu zahlreiche weitere Ex. wahrscheinlich dieser Art (cMG).

DIAGNOSE: Dem *E. sukhotanus* aus Thailand ähnlich. Gekennzeichnet durch mit Ausnahme des Halsschildes kahle Körperoberseite, großen Kopf, lange Fühler mit lockerer 4 gliederiger Keule und stark keulenförmig verdickte Vorderschenkel.

BESCHREIBUNG: Long. 1,80 bis 2,20 mm, lat. 0,80 bis 0,95 mm, Rotbraun, glänzend, Halsschild braun behaart.

Kopf von oben betrachtet queroval, mit den großen, flach gewölbten Augen breiter als der Halsschild. Fühler zurückgelegt ungefähr die Halsschildbasis erreichend, mit langer, lockerer, 4 gliederiger Keule, ihre beiden ersten Glieder um ein Drittel länger als breit, 3 bis 7 leicht gestreckt, 8 bis 10 nicht ganz doppelt so breit wie 7, um ein Fünftel länger als breit, das Endglied eiförmig, etwas länger als das vorletzte.

Halsschild leicht gestreckt, glatt und glänzend, ohne Basalgrübchen, ziemlich gleichmäßig gerundet und struppig abstehend behaart. Flügeldecken stark gewölbt, schon an der Basis

zusammen breiter als die Halsschildbasis, glatt und glänzend, ohne Basalimpression und ohne Schulterbeule, die Naht hinter der Basis leicht eingetieft, Schildchen nicht erkennbar. Flügel voll entwickelt.

Beine ziemlich lang, Vorderschenkel des ♂ stark verdickt, Schienen vor der Längsmittlemediodistal ausgerandet.

Penis (Abb. 38) stark sklerotisiert, von oben betrachtet kurzoval, der Apex zweispitzig, die Basalöffnung groß, von einem stark sklerotisierten Rahmen umgeben. Bei seitlicher Betrachtung dem *E. paeneglaber* nov. spec. (Abb. 44b) ähnlich. Parameren das Penisende nicht erreichend. Im Penisinneren liegt sagittal hinter der Längsmittle eine kleine runde Blase, die distal mit 2 divergierenden Stützen mit einem ambossförmigen Sklerotinkörper verbunden ist. Dieser sitzt unmittelbar vor dem apikalen Penisende einem M-förmigen Sklerotinband auf.

***Euconnus* (s. str.) *allosukhotanus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Crocker Range, 1600 m, km 51 von Kota Kinabalu Tambunan, 18.5.1987 (lg. Burckhardt u. Löbl, cMG); Paratypus ♂ (Penispräparat) vom selben Fundort (lg. Burckhardt u. Löbl, cF); ♂ Paratypus (Penispräparat) vom selben Fundort (cMG).

DIAGNOSE: Äußerlich dem *E. pseudosukhotanus* fast vollständig gleich, im Penisbau jedoch von ihm sehr verschieden.

BESCHREIBUNG: Long. 2,20 mm, lat. 0,80 mm. Dunkel rotbraun, Palpen und Beine heller gefärbt, Halsschildseiten braun behaart.

Äußerlich unterscheidet sich die Art von *E. pseudosukhotanus* durch nur eineinhalbmals so langes wie breites 1. Fühlerglied und isodiametrische Glieder 3 bis 6, sowie durch außerordentlich stark keulenförmig verdickte Vorderschenkel des ♂.

Penis (Abb. 39a, b) ganz anders gebaut als bei der Vergleichsart. Peniskörper von oben betrachtet gerundet-rechteckig, um ein Fünftel länger als breit, mit sehr großer, gerundet-querrechteckiger, von einem stark sklerotisierten Rahmen umgebener Basalöffnung, Parameren gerade, dünn, nicht sklerotisiert, die Basis des Apex penis erreichend, mit je 2 terminalen Tastborsten. Apex aus 2 sehr spitzwinkelig-dreieckigen, an der Basis medial gemeinsam queroval ausgeschnittenen Teilen bestehend. Operculum den Peniskörper ein wenig überragend, sein Hinterrand bogenförmig, zwischen den beiden Teilen des Apex sichtbar. Im Penisinneren sind infolge von Luft einschüssen im Präparat keine sklerotisierten Gebilde erkennbar.

***Euconnus* (s. str.) *kinabaluensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Mount Kinabalu, 1500 m, 25.4.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Dem *E. pseudosukhotanus* äußerlich fast völlig gleich, des Penis aber ganz anders geformt.

BESCHREIBUNG: Long 2,00 mm, lat. 0,75 mm. Dunkel rotbraun, Fühlergeißel, Palpen und Beine heller gefärbt, Halsschild sehr kurz, wie geschoren braun behaart.

Stimmt in den äußeren Merkmalen so weit mit *E. pseudosukhotanus* überein, daß es genügt, die geringfügigen Unterschiede anzuführen: Zweites Fühlerglied nur um ein Viertel länger als breit, Halsschild ein wenig länger als breit, Mittelschienen des ♂ medialwärts gekrümmt.

Penis (Abb. 40) sehr gedrunken gebaut, von oben betrachtet in der Anlage sehr kurzoval, der Apex vom Peniskörper deutlich abgesetzt, dreieckig, von oben und hinten betrachtet

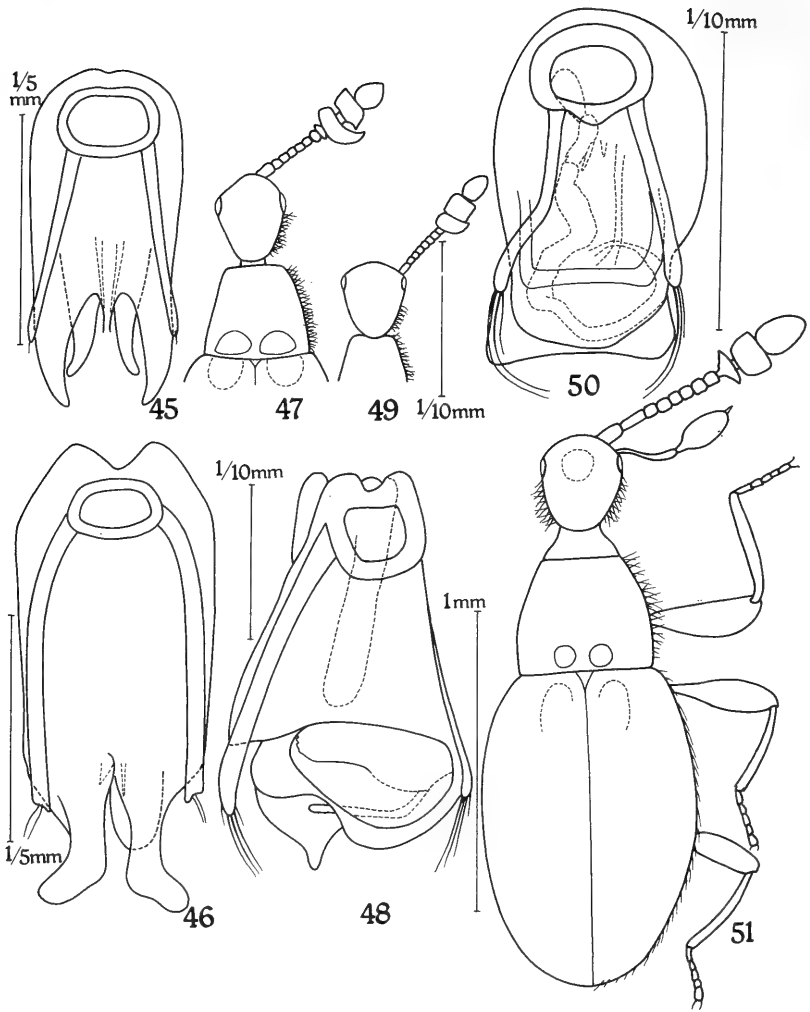


ABB. 45-51.

45: *Euconnus (s. str.) smetanaensis* nov. spec., Penis in Dorsalansicht. 46: *Euconnus (s. str.) apicefurcatus* nov. spec., Penis in Dorsalansicht. 47: *Euconnus (Borneoconnus) laticlava* nov. spec., Dorsalansicht des Vorderkörpers. 48: *Euconnus (Borneoconnus) laticlava* nov. spec. Penis in Dorsalansicht. 49: *Euconnus (Borneoconnus) sabahanus* nov. spec., Vorderkörper in Dorsalansicht. 50: *Euconnus (Borneoconnus) sabahanus* nov. spec., Penis in Dorsalansicht. 51: *Euconnus (Borneoconnus) eremita* nov. spec. Habitusbild.

links von einer sehr spitzwinkelig -dreieckigen, horizontalen Platte zum Teil überlagert. Basalöffnung groß, mit einem breiten, stark sklerotisierten Rahmen umgeben. Dieser Rahmen springt basal beiderseitig mit einer abgerundeten Ecke vor und ist distal breit abgerundet. Die Parameren entspringen hier, sie sind dünnhäutig, breit und erreichen die Basis des Apex nicht. Tastborsten sind an ihnen nicht erkennbar. Vor dem Ostium penis befindet sich im Penisinneren eine querovale, stark sklerotisierte Blase. Aus dem Ostium penis ragt nahe der Sagittalebene ein dicker Stab über den Apex penis vor, ein zweiter tritt von oben und hinten betrachtet nahe dem rechten Seitenrand nach hinten aus dem Peniskörper aus.

***Euconnus* (s. str.) *simillimus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Mount Kinabalu, 1550 m, 29.4.1987 (Burckhardt u. Löbl, cMG); ebenda, 13 Ex., wahrscheinlich dieser Art (cMG); ebenda 8 Ex., 1150 m 27.4.1987, ohne Penispräparat nicht als Paratypen bezeichnet, 27.4.1987 6 (cMG); ebenso 15 Ex. cMG und 6 Ex. (cF).

DIAGNOSE: Da sich von *E. kinabaluanus* keine äußeren Unterschiede feststellen lassen, erübrigt sich eine Wiederholung der für diese Art angeführten Merkmale.

BESCHREIBUNG: Die Penisform weicht von der Vergleichsart stark ab (vgl. Abb. 41). Penis von oben betrachtet gerundet-rechteckig, stark sklerotisiert, die Basalöffnung sehr groß, mit sehr breitem sklerotisiertem Rahmen. Die Dorsalwand ist apikal im Bogen über die ganze Penisbreite tief ausgeschnitten, im Ausschnitt ist eine horizontale Sklerotinplatte sichtbar, die medial von hinten tief eingeschnitten ist und beiderseits des Einschnittes breit dreieckig nach hinten vorspringt. In dem Einschnitt liegt eine spitzwinkelig-dreieckige Platte, die der Lage nach dem Operculum entspricht. Die Parameren erreichen das Hinterende des Penis nicht, sie tragen je 2 terminale Tastborsten. Bei dorsolateraler Betrachtung (Abb. 42 b) sieht man, daß die unter dem bogenförmigen Ausschnitt der Dorsalwand sichtbare mediale Platte tiefer liegt als die Dorsalwand und dem Operculum homolog ist. Noch tiefer liegt der sagittal angeordnete Ductus ejaculatorius, der hinter der Penismitte in eine kleine, stark umwandete Blase mündet und seitlich beiderseits von einem schräg nach hinten und zur Mitte gerichteten Sklerotinstab begleitet ist.

***Euconnus* (s. str.) *latus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Mount Kinabalu, 1550 bis 1750 m, 29.4.1987 (Ig. Burckhardt u. Löbl, cMG); ebenda, 6 Ex. Determination fraglich, (cMG und cF).

DIAGNOSE: Dem *E. simillimus* n. sp. weitgehend gleich, der Körper etwas breiter, die Fühler etwas länger, der Penis anders gebaut.

BESCHREIBUNG. Mit Rücksicht auf die fast völlige Übereinstimmung in den äußeren Merkmalen mit *E. simillimus* genügt es, eine Penisbeschreibung zu geben.

Penis (Abb. 42) gedrunken gebaut, von oben betrachtet in der Anlage kurz rechteckig, mit sehr großer, mit einem sehr breiten Sklerotinrahmen versehener Basalöffnung. Die Parameren an deren distalem Rand inserierend, das Penisende erreichend, mit je 2 terminalen Tastborsten versehen. Apex penis nicht abgesetzt, sein Hinterrand in breitem Bogen ausgeschnitten. In dem Ausschnitt ist das Operculum sichtbar, dessen Hinterrand mit dem Hinterende der Penisseite mündet, zwischen ihnen nahezu gerade verläuft, in der Sagittalebene aber schmal ausgerandet ist. In der Ausrandung sind die Enden von 2 Skerotinstäben sichtbar. Vor der Ausrandung steht im Penisinneren ein becherförmiges Sklerotingebilde, aus dessen basalem Rande eine kugelförmige Blase nach vore ragt.

***Euconnus (s. str.) paenetypticus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und 5 Paratypen, Poring Hot Springs, 25. bis 29.8.1988 (Ig. Smetana, cMG); ebenda 2 Paratypen (Ig. Smetana, cF).

DIAGNOSE: Weitgehend in den äußeren Merkmalen mit den aus dem Raum von Sabah beschriebenen Arten aus dem Subgenus *Euconnus* s. str. übereinstimmend, von diesen jedoch durch behaarte Schläfen und durch mit einer Querfurche verbundene Basalgrübchen des Halsschildes, sowie durch viel geringere Größe verschieden.

BESCHREIBUNG: Long. 1,20 bis 1.40 mm. lat. 0,50 bis 0,55 mm. Rotbraun, Schläfen und Halsschildseiten braun behaart.

Kopf von oben betrachtet queroval, flach gewölbt, die Schläfen etwas länger als der Augendurchmesser, dicht und steif abstehend behaart. Fühler zurückgelegt die Halsschildbasis um das Endglied überragend, mit breiter, 4 gliederiger Keule, ihr 2. Glied um die Hälfte länger als breit, 3 bis 7 isodiametrisch, 8 bis 10 nicht ganz doppelt so breit wie 7, leicht gestreckt, das Endglied eiförmig, kürzer als die beiden vorletzten zusammen. Halsschild so lang wie breit, stark gewölbt, zum Vorderrand etwas stärker als zur Basis verengt, auf der Scheibe glatt und glänzend, an den Seiten struppig abstehend behaart, vor der Basis mit 2 großen und tiefen Grübchen, die bisweilen durch eine seichte Querfurche verbunden sind.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, glatt und glänzend, kahl, mit tiefer, lateral durch eine Humeralfalte begrenzter Basalimpression in einer im Halbkreis weit über sie hinaus auf die Flügeldecken reichenden Verflachung gelegen.

Beine schlank, Vorderschenkel stärker verdickt als die der beiden anderen Beinpaare. Penis (Abb. 43) in dem einzigen vorliegenden Präparat bei der Entfernung von Luftpneumose stark beschädigt und ein Teil der Parameren und des Penisinneren zerstört. Der Hinterrand des Penis ist gerade, die beiden Seiten springen aber spitzwinklig vor. Von den beiden Parameren ist nur eine zum Teil erhalten, ihr distales Ende ist fußförmig verbreitert und im Spitzenbereich mit einer Anzahl von Borsten besetzt. Im Penisinneren befindet sich ein großer, von oben betrachtet etwa trapezförmiger Komplex, von dem hinter der Penisbasis ein trichterförmiges Gebilde stark sklerotisiert erhalten ist.

***Euconnus (s. str.) paeneglaber* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und 2 Paratypen, Kinabalu Nat. Park, Poring Hot Springs, 486 bis 495 m, 25.8.1988 (Ig. Smetana, cMG) ebenda 2 Paratypen (Ig. Smetana, cF).

DIAGNOSE: Gekennzeichnet durch bis auf die Halsschildseiten kahlen Körper, lange, schlanke Fühler mit langer, 4-gliederiger Keule und schlanke Beine mit schwach verdickten Schenkeln.

BESCHREIBUNG: Long. 1,50 mm, lat. 0,60 mm. Rotbraun, glatt und glänzend, Halsschildseiten bräunlich behaart.

Kopf von oben betrachtet annähernd kreisrund mit flachen Augen. Fühler zurückgelegt die Körpermitte erreichend, ihre 4-gliedrige Keule fast so lang wie die Geißel, das Basalglied dicker als die folgenden, 2 um die Hälfte länger als breit, 3 bis 6 isodiametrisch, 7 breiter als lang, die Keule doppelt breiter als die Geißel, 8 bis 10 annähernd so lang wie breit, das eiförmige Endglied kürzer als die beiden vorletzten zusammen.

Halsschild so lang wie breit, ungefähr so breit wie der Kopf, zum Vorderrand stärker als zur Basis verengt, stark gewölbt, vor der Basis ohne Grübchen, die Seiten abstehend behaart.

Flügeldecken schon an der Basis zusammen beträchtlich breiter als der Halsschild, stark gewölbt, nur mit sehr kleiner Basalimpression, ohne Schulterbeule.

Beine schlank, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb. 45 a, b) stark sklerotisiert, oberseits flach, ventral stark gewölbt, sein Apex in der Längsmittle tief eingeschnitten, das Operculum zungenförmig. Basalöffnung sehr groß, gerundet-querrechteckig, Parameren von oben betrachtet sehr breit, das Penisende nicht erreichend, mit 2 langen terminalen Tastborsten. Im Penisinneren liegt hinter der Basalöffnung eine stark sklerotisierte herzförmige Blase mit einem ins Ostium penis führenden Ausführungsgang. Lateral an diesem befindet sich eine langovale Drüse. Vor dem Ostium liegt quer zur Sagittalebene ein doppelt wellenförmig gebogenes Sklerotinband. Der Apex penis besteht aus zwei breiten nach außen gebogenen Teilen, die durch einen basal spitzwinkelig zusammenlaufenden Spalt getrennt sind.

***Euconnus* (*s. str.*) *smetanaensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Kinabalu Nat. Park Poring Hot Springs, 490 m, 20.8.1988 (lg. Smetana, cMG); ebenda 3 Ex. 20-21.8.1988 (cMG); ebenda, 1 Ex. 21. u. 25.8.1988 (lg. Smetana, cF).

DIAGNOSE: Viel kleiner als die anderen Arten des Subgenus aus Sabah. Penisbau von den anderen Arten stark abweichend.

BESCHREIBUNG: Long. 1,30 mm, lat. 0,60 mm. Braunschwarz, Tibien und Tarsen rotbraun, Palpen hellgelb. Stark glänzend, Halsschild braun behaart.

Kopf von oben betrachtet mit den großen Augen queroval, so breit wie der Halsschild. Fühler zurückgelegt die Halsschildbasis erreichend, mit lockerer, 4 gliederige Keule, das Basalglied dicker als die folgenden, 2 gestreckt, 3 bis 7 kugelig, 8 knapp doppelt so breit wie 7, wie auch 9 und 10 nicht ganz so lang wie breit, das eiförmige Endglied nicht ganz so lang wie die beiden vorletzten zusammen.

Halsschild so lang wie breit, zum Vorderrand stark, zur Basis nur wenig verengt, seitlich abstehend behaart, vor der Basis ohne Grübchen.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, glatt und glänzend, mit kleiner, lateral von einer Humeralfalte begrenzter Basalimpression.

Beine schlank, Vorderschenkel aber beim ♂ sehr stark keulenförmig verdickt, Schienen gerade.

Penis (Abb. 45) von oben betrachtet mehr als doppelt so lang wie breit, mit sehr großer Basalöffnung, sein Apex aus 2 am Ende gegeneinander gekrümmten Spitzen bestehend. Zwischen der Basis derselben ragt der Ductus ejaculatorius ins Freie. Auch das Operculum ist zweiteilig, jeder Teil endet in einer stumpfen Spitze, die lateralwärts gedreht ist. Die Parameren sind gerade und tragen je eine terminale Tastborste. Sie erreichen nur die Längsmittle des Apex penis.

***Euconnus* (*s. str.*) *apicefurcatus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und 2 Paratypen (davon 1 ♂ Penispräparat), Crocker Range, 1550 bis 1650 m, 16.5.1987 (lg. Bruckhardt u. Löbl, cMG); ebenda 2 ♂ ♂ (Penispräparate, cF); Kinabalu Nat. Park, area Langanan 485 m, 28.8.1988 (lg. Smetana, cMG); Poring Hot Springs, 480 m, 27.8.1988 (lg. Smetana, cMG); Mont Kinabalu, 1450 bis 1550 m, 23.5.1987 (lg. Bruckhardt u. Löbl, cF).

DIAGNOSE: Kleiner als *E. pseudosukhotanus*, Fühler viel kürzer, Penis ganz anders gebaut.

BESCHREIBUNG: Long. 1,70 bis 1,80 m. Kastanienbraun, die Beine hell rotbraun, Halsschild bräunlich behaart.

Kopf von oben betrachtet rund, etwas breiter als lang, flach gewölbt, Augen flach, Fühler zurückgelegt die Halsschildbasis nicht erreichend, mit lockerer viergliederiger Keule, ihr 2. und 7. Glied um etwa ein Drittel länger als breit, 3 bis 6 isodiametrisch, 8 bis 10 doppelt so breit wie 7, so lang wie breit, das eiförmige Endglied wesentlich kürzer als die beiden vorletzten zusammen. Halsschild kaum merklich länger als breit, kugelig, kurz und abstehend behaart, ohne Basalgrübchen, so breit wie der Kopf mit den Augen.

Flügeldecken sehr stark gewölbt, schon an der Basis zusammen wesentlich breiter als die Halsschildbasis, sehr fein punktiert, glänzend. Flügel verkümmert.

Beine ziemlich kurz, Vorderschenkel des ♂ stark verdickt, Schienen dünn, die der Mittelbeine mediiodistal leicht ausgeschnitten.

Penis (Abb. 46) von oben betrachtet mehr als doppelt so lang wie breit, der Peniskörper nahezu parallelseitig, die Basalöffnung nicht ungewöhnlich groß, die Parameren die Basis des Apex penis erreichend, mit je 2 terminalen Tastborsten. Apex penis aus zwei fußförmig endenden Teilen bestehend, Operculum zungenförmig, nur die Längsmittte des Apex erreichend. Vor dem Ostium penis stehen im Penisinneren 2 kleine in der Ruhelage distalwärts gerichtete Stachel.

BESTIMMUNGSTABELLE DER IN SABAH VORKOMMENDEN ARTEN AUS DEM SUBGENUS *Euconus* s. str.

1	Klein, Körperlänge 1,20 bis 1,40 mm	2
–	Größer, Körperlänge über 1,50 mm	3
2	Schläfen unbehaart, Halsschild ohne Basalgrübchen	<i>smetanaensis</i> n. sp.
–	Schläfen behaart, Halsschild mit 4 durch eine Querfurche verbundenen Grübchen.....
	<i>paenetypticus</i> n. sp.
3	Körperlänge 1,50 bis 1,80 mm, robust gebaut	4
–	Körperlänge mindestens 1,80 mm (meist über 2,20 mm)	5
4	Körperlänge 1,50 mm, Fühler zurückgelegt die Körpermitte erreichend
	<i>paenaglaber</i> n. sp.
–	Körperlänge 1,70 bis 1,80 mm, Fühler zurückgelegt die Halsschildbasis nicht erreichend	<i>apicefurcatus</i> n. sp.
5	Mittelschienen des ♂ sehr stark medialwärts gekrümmt (hierher 3 nur durch den Penisbau unterscheidbare Arten <i>simillimus</i> n. sp., <i>latus</i> n. sp. und <i>kinabaluanus</i> n. sp.) ...	
–	Mittelschienen ganz gerade	6
6	Vorderschenkel des ♂ sehr stark keulenförmig verdickt, halb so breit wie der Kopf lang, mittlere Fühlergeißelglieder isodiametrisch	<i>allosukhotanus</i> n. sp.
–	Vorderschenkel des ♂ weniger stark verdickt, mittlere Glieder der Fühlergeißel leicht gestreckt	<i>pseudosukhotanus</i> n. sp.

Untergattung **Borneoconnus** nov. subgen.

Die Arten der neuen Untergattung der Gattung *Euconus* Thomson sind durch beim ♂ monströses 9. Fühlerglied der 3 gliederigen Fühlerkeule, durch langgestreckten Kopf mit kleinen Augen und langen, bärtig behaarten Schläfen, durch konischen Halsschild mit großen Basalgrübchen und durch den Bau des männlichen Kopulationsapparates gekennzeichnet. Dem Aedeagus fehlt eine deutlich abgegrenzte Apikalpartie.

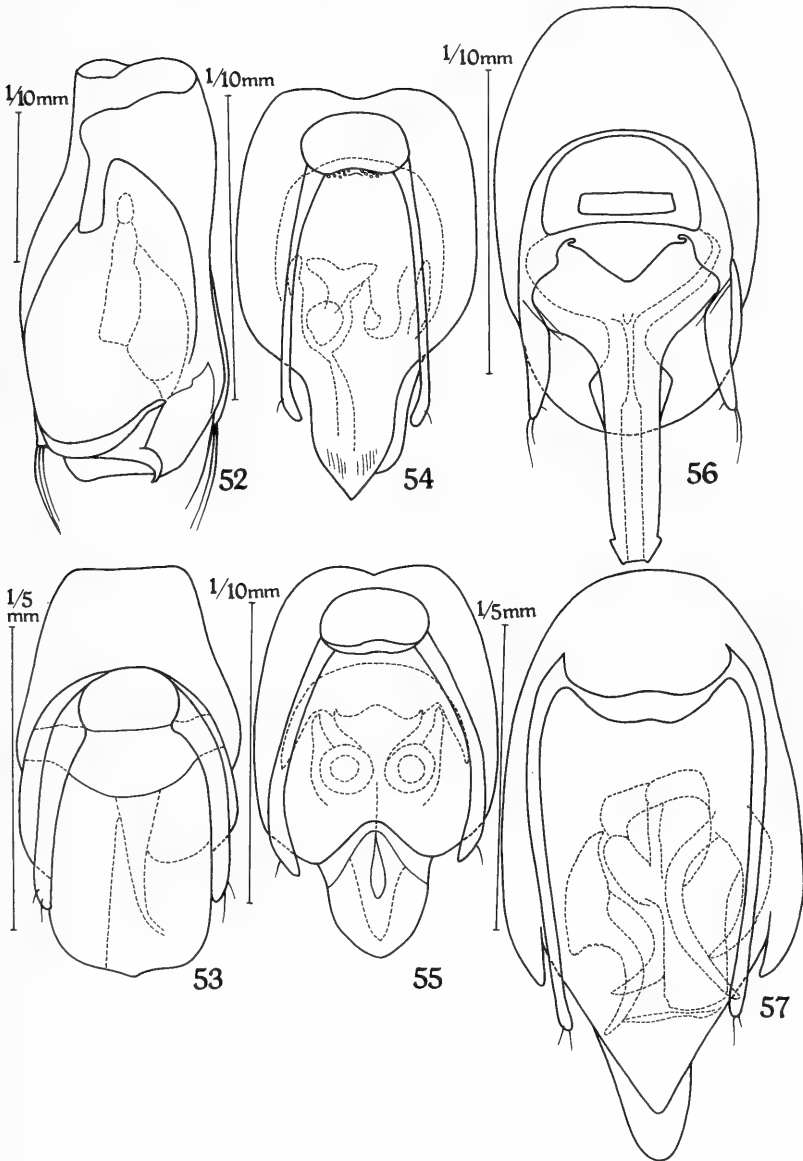


ABB. 52-57.

52: *Euconnus (Borneoconnus) eremita* nov. spec., Penis in Ventralansicht. 53: *Euconnus (Napochus) kinabalui* nov. spec., Penis in Dorsalansicht. 54: *Euconnus (Napochus) mirus* nov. spec., Penis in Dorsalansicht. 55: *Euconnus (Napochus) paramirus* nov. spec., Penis in Dorsalansicht. 56: *Euconnus (Napochus) allomirus* nov. spec., Penis in Dorsalansicht. 57: *Euconnus (Napochus) layangensis* nov. spec., Penis in Dorsalansicht.

Zur Typusart bestimme ich die nachfolgend an erster Stelle beschriebene *Euconnus* (*Borneoconnus*) *laticlava*.

***Euconnus* (*Borneoconnus*) *laticlava* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und 2 Paratypen (1 ♂ Penispräparat), Crocker Range, 1550 bis 1650 m, 16.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda ♂ (Penispräparat) (cF); Kinabalu Nat. Park, area Langanan, 485 m, 22.8.1988 (lg. Smetana, cMG); Poring Hot Springs, 480 m, 27.8.1988 (lg. Smetana, cMG); Mount Kinabalu, 1450 bis 1550 m, 23.5.1987 (lg. Burckhardt u. Löbl, cF).

DIAGNOSE: Gekennzeichnet durch von oben betrachtet rautenförmigen Kopf, der so lang ist wie der Halsschild und durch den Fühlerbau beim ♂ (Abb. 47).

BESCHREIBUNG: Long. 1,70 bis 1,80 mm, lat. 0,55 bis 0,60 mm. Hell rotbraun bis dunkelbraun, gelblich behaart.

Kopf um ein Drittel länger als mit den flachen Augen breit, mit diesen so breit wie der Halsschild in seiner Längsmittle, an den Seiten steif abstehend behaart, die Schläfen zweieinhalbmal so lang wie der Augendurchmesser, Fühler zurückgelegt nur die Halsschildmitte erreichend, das Basalglied doppelt so lang wie breit, das 2. Glied schwach, die folgenden stärker quer, das 8. sehr kurz, das 9. beim ♂ so breit wie das 3. bis 8. Glied lang, mehr als doppelt so breit wie lang, nach außen stärker erweitert als nach innen, distalwärts gebogen und in einer Spitze endend, das 10. mit schrägen Seiten, das Endglied gerundet-kegelförmig, halb so breit wie das 10.

Halsschild schmal konisch, so lang wie an der Basis breit, die Seiten steif abstehend behaart, mit 2 großen, in die Quere gezogenen Basalgrübchen.

Flügeldecken langoval, schon an der Basis zusammen wesentlich breiter als der Halsschild, mit tiefer, scharf begrenzter Basalimpression, fein und ziemlich dicht punktiert, anliegend behaart. Flügel verkümmert.

Beine kurz, Schenkel etwas verdickt, Schienen fast gerade.

Penis (Abb. 48) von oben betrachtet glockenförmig mit dorsobasal gelegener, mit einem breiten Sklerotinrahmen versehener Basalöffnung und dorsoapikal gelegener Ostium penis. Parameren gerade, den Penisseiten eng anliegend, das Penisende nicht ganz erreichend, im Spitzenbereich mit mehreren langen Tastborsten. Ein Apex penis ist nicht vorhanden, vielmehr schließt die Dorsalwand des Penis geradlinig ab. Eine ventral nach hinten vorragende Spitze ist wohl als Operculum zu deuten. An Stelle normaler Genitalorgane ist im Inneren des Penis nur ein von der Basis bis ins distale Drittel des Penis reichender dicker Balken zu erkennen. Im Bereich des Ostiums sind übereinander 4 horizontale Ebenen erkennbar: zuunterst das "Operculum", darüber eine horizontale Platte, die nur wenig über die Dorsalwand des Penis vorragt und von deren von oben und hinten betrachtet rechter Seite ein schmaler Sklerotinstab querüber nach links gerichtet ist. In der 3. Ebene liegt ein Sklerotinrahmen, der rechts schmal und links breit ist und eine große querovale Öffnung umfaßt, die vielleicht das Ostium penis ist. Die oberste Ebene wird durch die Dorsalwand des Penis gebildet.

***Euconnus* (*Boreoconnus*) *sabahanus* nov. spec.**

MATERIAL: Holotypus ♂ und 25 ♂ Paratypen (Penispräparat) sowie 14 ♀ Paratypen, Crocker Range, 1550 bis 1650 m, 16.5.1987 (lg. Burckhardt u. Löbl cMG); ebenda 9 ♂ 6 ♀ Paratypen (cF); ebenda, ca. 1000 m, 2 ♂ 5 ♀ Paratypen, cMG (lg. Smetana, cMG); ebenda, ♂ 3 ♀ (Paratypen), 27.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda, ♂ 4 ♀ Paratypen, Livago Ricer, 1490 bis 1500 m (lg. Burckhardt u. Löbl, cMG); Poring Hot Springs, 9 ♂ 7 ♀ Paratypen (lg. Burckhardt u. Löbl (cF); Mount Kinabalu, 2000 m, 2 ♀ Paratypen (cMG); Crocker Range, 7 km N Tambunan, 700 m, 20.5.1987 (cMG).

DIAGNOSE: Fühler mit scharf abgesetzter, 3 gliederiger Keule, das 9. Glied beim ♂ asymmetrisch, außenseitig erweitert, das 10. groß, regelmäßig rechteckig. Halsschild konisch mit 2 großen Basalgrübchen (Abb. 49).

BESCHREIBUNG: Long. 1,15 bis 1,30 mm. Kastanienbraun, die Beine heller, braun behaart.

Kopf von oben betrachtet länglich-eiförmig, im Niveau der kleinen, flachen Augen am breitesten, von da zur Basis in flachem Bogen verengt, die Schläfen dreimal so lang wie der Augendurchmesser, schräg abstehend steif und kurz, nach hinten gerichtet behaart. Fühler zurückgelegt die Halsschildbasis nicht erreichend, mit sehr scharf abgesetzter, 3 gliederiger Keule, ihr Basalglied und das 2. etwas länger als breit, 3 bis 8 klein, breiter als lang, das 9. Glied sehr breit, beim ♂ asymmetrisch, rechts viel stärker erweitert als links, aber viel weniger stark als bei *E. laticlava*, 10 rechteckig, fast so lang wie breit, das eiförmige Endglied ist nur so lang wie das 10. und viel schmaler als dieses. Hals nur ein Drittel so breit wie die Halsschildbasis. Halsschild konisch, länger als breit, mit 2 sehr großen und tiefen Basalgruben, seitlich abstehend behaart.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, mit runder Basalimpression, ohne Schulterbeule, nach hinten gerichtet behaart. Flügel verkümmert.

Penis (Abb. 50) im Bau dem des *E. laticlava* ähnlich, von oben betrachtet 3 übereinander gelegene Ebenen erkennen lassend, zu oberst eine rechteckig begrenzte, am wenigsten weit distalwärts reichende, die von einem sklerotisierten Rahmen umgeben ist. Über ihr liegen die Parameren. Darunter folgt eine zweite distal im flachen Bogen begrenzte mittlere Platte, unter der das Ostium penis liegt und unter der sich der Ductus ejaculatorius befindet. Er entspringt in einer länglichovalen Blase unter der Basalöffnung des Penis und verläuft zunächst S-förmig gekrümmt bis nahe an das Penisende, biegt dann von oben und hinten betrachtet im flachen Bogen nach rechts und weiter in einem weiten Bogen über die rechte Penisseite wie der nach vorne und zurück zur Penismitte. Dabei verschmälert er sich zu einem dünnen Rohr. Unter ihm folgt auf der dritten Ebene das Operculum, dessen Hinterrand gerundet-rechteckig ist und nur wenig über die mittlere Platte nach hinten vorragt. Die Basalöffnung liegt dorsobasal und besitzt einen breiten Sklerotinrahmen, von dessen distaler Seite entspringen die Parameren, die am distalen Ende 3 lange Tastborsten tragen. Je 2 von diesen sind sehr lang und am Ende zur Sagittalebene gebogen. Sie überragen das Penisende.

***Euconus (Borneoconus) eremita* nov. spec.**

MATERIAL: Nur Holotypus ♂ (Penispräparat), Mount Kinabalu, 2995 m, Paka Cave, 5.2.1987 (lg. Smetana, cMG).

DIAGNOSE: Größer und vor allem breiter als *E. laticlava*, die Fühler länger, die Geißelglieder von einander wenig verschieden, die Schläfen stark gerundet, auch die Flügeldecken stärker gerundet als bei den Vergleichsarten, nur wenig länger als Kopf und Halsschild zusammen (Abb. 51).

BESCHREIBUNG: Long. 1,90 mm, lat. 0,60 mm. Hell rotbraun, gelblich behaart.

Kopf gerundet-rautenförmig, nicht ganz so lang wie der Halsschild, der Hals weniger als halb so breit wie der Vorderand des Halsschildes, die Schläfen zu ihm gerundet verengt, seitlich abstehend behaart, die Stirn unter der Fühlern flach, leicht eingetieft. Fühler zurückgelegt beinahe die Halsschildbasis erreichend, ihre Geißel deutlich länger als die Keule, die beiden ersten Fühlerglieder um die Hälfte länger als breit, das 3. bis 6. Glied fast so lang wie breit, 7 und 8 etwas breiter und deutlich quer, die Keule fast 4 mal so breit wie sie. Glied 9 und 10 fast symmetrisch, 9 nach außen distal auf das Dreifache verbreitert, 10 trapezförmig noch etwas breiter als 9 und distal schwach verbreitert, das eiförmige Endglied etwas schmaler als das vorhergehende.

Halsschild an der Basis nur wenig breiter als am Vorderrand, abstehend, an den Seiten dichter als auf der Scheibe behaart, vor der Basis mit 2 mäßig großen Grübchen. Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, seitlich gleichmäßig gerundet, mit kleiner, mäßig tiefer Basalimpression, abstehend behaart. Flügel verkümmert.

Beine verhältnismässig länger als bei den beiden anderen Arten der Untergattung, Schenkel schwach verdickt, Mittel- und Hinterschienen schwach medialwärts gebogen. Penis (Abb. 52) von oben betrachtet annähernd zylindrisch mit basal gelegener Basalöffnung und terminal gelegenen Ostium penis. Parameren das Penisende nicht ganz erreichend, mit je 3 langen terminalen Tastborsten. Im Penisinneren befindet sich vor der Penismitte eine kleine länglichovale Blase mit breitem, nur bis zum distalen Drittel des Penis reichendem Ausführungsgang. An diesen schließt von oben und hinten betrachtet rechts ein breites sklerotisiertes Feld an, an dem keine weiteren Differenzierungen erkennbar sind. Der Hinterand der Dorsalwand des Penis ist bandförmig stärker sklerotisiert. Unter ihm ragt eine weitere sklerotisierte Fläche vor, die am Hinterrand einen eiförmig gekrümmten Stachel nach rechts entsendet. Darunter findet sich in einer dritten Ebene eine dritte Sklerotinplatte, die vielleicht das Operculum repräsentiert. Ein Apex penis ist auch bei dieser Art nicht entwickelt.

Untergattung **Napochus** Reitter

Euconnus (Napochus) kinabalu nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat) Poring Hot Springs, 550 bis 600 m, 9.5.1987 (Ig. Burckhardt u. Löbl, cMG); 2 Paratypen Mount Kinabalu, 2600 m, 1.5.1987 (Ig. Burckhardt u. Löbl (cF); ebenda. 2 Paratypen (cMG); 2 Ex. Paratypen, Mount Kinabalu, 1500 m, 21. u. 15.5.1987 (Ig. Burckhardt u. Löbl, cMG); ebenda 2 Paratypen, 25.5.1987 (cF); 1 Paratypus, ebenda, 1750 m, 24.4.1987 (cMG); Mont Kinabalu, Sumit Tr. Podok, 2300 bis 2499 m, 29.4.1987 (Ig. Smetana, cMG); 1 Paratypus, Crocker Range, Kota Kinabalu, Tambunan, 18.5.1987 (Ig. Burckhardt u. Löbl, cMG).

DIAGNOSE: Klein, hell rotbraun, Kopf isodiametrisch, Fühler zurückgelegt die Halsschildbasis um die letzten 2 Glieder überragend, Halsschild isodiametrisch, Flügeldecken mit langer Humeralfalte.

BESCHREIBUNG: Long. 1,00 bis 1,20 mm, lat. 0,45 bis 0,50 mm, hell gelbbraun, gelblich behaart.

Kopf isodiametrisch-rund mit stark vorgewölbten Augen und steif abstehend behaarten Schläfen. Fühler mit lockerer, 4 gliederiger Keule, zurückgelegt die Halsschildbasis um die beiden letzten Glieder überragend, die beiden ersten Glieder leicht gestreckt, 3 bis 7 klein, schwach quer, 8 bis 10 rundlich, nicht ganz so breit wie lang, das Endglied rundlich, nicht ganz so lang wie breit.

Halsschild konisch, isodiametrisch mit 2 Basalgrübchen, ohne basale Querfurche, abstehend, an den Seiten dichter und struppig behaart. Flügeldecken schon an der Basis zusammen etwas breiter als die Halsschildbasis, seitlich stark gerundet, um ein Viertel länger als Kopf und Halsschild zusammen, fein punktiert, schräg abstehend behaart, mit tiefer, von einer schrägen Humeralfalte scharf begrenzter Basalimpression. Flügel entwickelt.

Beine mit schwach verdickten Schenkeln und geraden Schienen.

Penis (Abb. 53) von oben betrachtet etwas mehr als doppelt so lang wie breit, seine Basalöffnung weit auf die Dorsalseite gerückt, die Parameren an ihr mit der ganzen Breite ansetzend, das Penisende nicht annähernd erreichend, im Spitzenbereich mit je 2 Tastborsten. Am Hinterrand der Basalöffnung zieht ein breites Sklerotinband quer über die

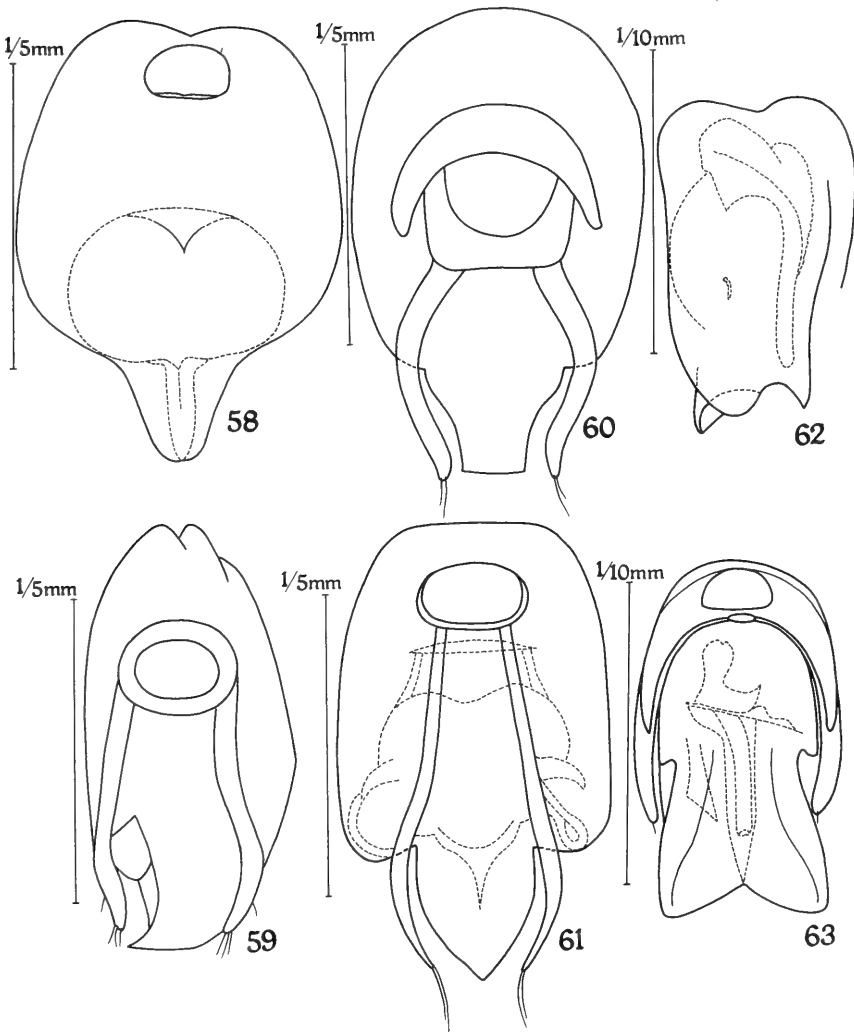


ABB. 58-63.

58: *Euconnus (Napochus) valdeobscurus* nov. spec., Penis in Dorsalansicht. 59: *Euconnus (Napochus) parakinabalui* nov. spec., Penis in Dorsalansicht. 60: *Euconnus (Napochus) fuscus* nov. spec., Penis in Dorsalansicht. 61: *Euconnus (Napochus) funestus* nov. spec., Penis in Dorsalansicht. 62: *Euconnus ? (Napochus) sabahinanus* nov. spec., Penis in Dorsalansicht. 63: *Euconnus (Napochus) borneoi* nov. spec., Penis in Dorsalansicht.

ganze Dorsalwand des Penis. Hinter diesem Querband ist der Penis größtenteils durchsichtig, so daß der Ductus ejaculatorius von außen zu sehen ist. Er ist lang trichterförmig und am distalen Ende zu einem sehr dünnen Rohr verengt, das zur Seite gebogen ist. Der Apex penis ist vom Peniskörper nur schwach abgesetzt, distalwärts fast nicht verschmälert, sein Hinterrand gerundet, in der Mitte aber in einer kleinen Spitze vorspringend.

***Euconnus (Napochus) mirus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Mount Kinabalu Nat. Park, Poring Hot Springs area below Langanan Fall, 800 m, 12.5.1987 (lg. Smetana cMG); 2 Paratypen, Crocker Range, 1550 bis 1650 m, 16.5.1987 (lg. Burckhardt u. Löbl, cMG und cF); Mont Kinabalu, 2600 m, April 1987 (lg. Burckhardt u. Löbl, cF); 5 Paratypen, Mount Kinabalu, 1500 bis 1600 m, 25.4.1987 (lg. Burckhardt u. Löbl, cMG); Poring Hot Springs, 550 bis 600 m, 9.6.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch geringe Größe, tiefe Basalfurche des Halsschildes und eine große, beide Flügeldecken umfassende Verflachung hinter der Basalimpression.

BESCHREIBUNG: Long. 0,95 mm bis 1,00 mm, lat. 0,50 mm. Schwarzbraun mit heller brauner Extremitäten, lang schwarzbraun behaart.

Kopf von oben betrachtet queroval, mit großen, flach gewölbten Augen und langer absteher Behaarung der Schläfen. Fühler zurückgelegt die Halsschildbasis erreichend, mit lockerer 4 gliederiger Keule eine schlanker Geißel, ihre beiden ersten Glieder gestreckt, 3 bis 7 sehr klein, etwas breiter als lang, 8 bis 10 im distalen Drittel ihrer Länge am breitesten, von da zur Spitze abrupt verengt, das Endglied leicht gestreckt, sein Spitzenteil wie eine Eichel der Cupula aufsitzend.

Halsschild konisch, so lang wie breit, an der Basis kaum breiter als der Kopf mit den Augen, struppig absteher behaart, mit tiefer basaler Querfurche, in dieser mit 4 Grübchen.

Flügeldecken kurzoval, an der Basis zusammen so breit wie die Halsschildbasis, distal aber stark verbreitert, mit breiter, lateral von einer langen Humeralfalte begrenzter Basalimpression, bis zur Mitte verflacht, fein punktiert und behaart. Flügel voll entwickelt.

Beine kurz und schlank.

Penis (Abb. 54) gedrungen gebaut, aus einem von oben besehen gerundet-kurzrechteckigen Peniskörper und einem dünnhäutigen, zungenförmigen Apex bestehend. Parameren die Basis des Apex penis etwas überragend, mit je einer lateral vor der Spitze stehenden Tastborste. Basalöffnung ohne stark sklerotisierten Rahmen, nur sein Hinterrand durch Sklerotinkörnchen markiert. Im Penisinneren ist ein dessen größten Teil erfüllender Sklerotinkomplex vorhanden, der in halbkreisförmiger Begrenzung vom Hinterrand der Basalöffnung bis in den Bereich des Apex penis reicht. Dieser ist spitz-zungenförmig, das Operculum etwas kürzer und abgerundet-zungenförmig. Innerhalb des Sklerotinkomplexes im Penisinneren fallen zwei annähernd kugelige, etwa in der Längsmittle des Penis, spiegelbildlich zur Sagittalebene liegende Zysten auf. Die von oben und hinten besehen linke entsendet basalwärts ein annähernd dreiblättriges Gebilde, das rechte ein breites Sklerotinband. Lateral von den beiden Zysten steht auf beiden Penisseiten ein langgestreckter Sklerotinkörper.

***Euconnus (Napochus) paramirus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Crocker Range, 1550 bis 1650 m, 16.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda, 1 Paratypus (cF); 2 Paratypen, Mount Kinabalu, 2600 m, April 1987 (lg. Burckhardt u. Löbl, cF); 1 Paratypus, Mount Kinabalu Nat. Park, HQ at Livago River, 1500 m, 1.9.1988 (lg. Smetana, cMG).

DIAGNOSE: Dem *E. (Napochus) mirus* sehr ähnlich, aber die Fühler länger, zurückgelegt die Halsschildbasis überragend, ihre Keule länger als die Geißel, die Flügeldecken länger als Kopf und Halsschild zusammen, der Apex penis (Abb. 55) etwas kürzer, die im Penisinneren liegenden Zysten exakter kugelförmig mit einem opaken Kern, zwischen ihnen steht in der Sagittalebene an Stelle des dreiblättrigen Gebildes ein Sklerotintrichter, dessen Hals den Apex penis nicht erreicht.

***Euconus (Napochus) allomirus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat). Sabah, Mount Kinabalu, 1500 m, 25.4.1987 (lg. Bruckhardt u. Löbl, cMG); Paratypus ♀, Kinabalu 1550 m, 28.4.1987 (lg. Bruckhardt u. Löbl, cF).

DIAGNOSE: Äußerlich dem *Euconus mirus* ähnlich, aber wesentlich größer, die Fühlerkeule länger als die Geißel, der Halsschild mit sehr tiefer basaler Querfurche, die Flügeldecken ohne deutliche Punktierung, der Penis ganz anders geformt.

BESCHREIBUNG: Long. 1,20 mm, lat. 0,50 mm. Dunkel rotbraun, gelbbraun behaart. Kopf von oben betrachtet gerundet-rautenförmig mit großen, stark vorgewölbten Augen und bärtig behaarten Schläfen. Fühler zurückgelegt die Halsschildbasis erreichend, mit lockerer, 4 gliederiger Keule, diese länger als die Geißel, ihre beiden ersten Glieder so lang wie breit, 3 bis 7 sehr klein, 8 bis 10 reichlich doppelt so breit wie die vorhergehenden, breiter als lang, mit dem für die Untergattung *Napochus* typischen Bau, das Endglied länger als die beiden vorletzten, sein distaler Teil schmaler als der basale, dem er eine Eichel ihrer Cupula aufsitzt.

Halsschild konisch, etwas breiter als lang, an der Basis breiter als der Kopf mit den Augen, seitlich struppig abstehend behaart, mit auffällig tiefer Basalfurche.

Flügeldecken schon an der Basis zusammen etwas breiter als die Halsschildbasis, fein behaart, ohne deutlich erkennbare Punktierung. Flügel voll entwickelt.

Beine schlank, Vorderschenkel etwas stärker verdickt als die der beiden anderen Beinpaare. Penis (Abb. 56) sehr eigenartig gebaut. Peniskörper von oben betrachtet oval mit einem langen, schmalen Apex und einem großen halbkreisförmig begrenzten Operculum. Basalöffnung sehr groß mit stark sklerotisiertem Rahmen, der an der Basis zu einem großen dreieckigen Lappen verarbeitet ist. Mit der Basalöffnung sind die Parameren fest verwachsen, sie schließen an den dreieckigen Lappen mit einer Öse an, sind an der Basis breit, dann tief ausgebuchtet, zu letzt außer gerade, der Innenrand aber schwach gebogen, so daß die Parameren zur Spitze verschmälert sind. Sie tragen in der postbasalen Ausbuchtung 2 steife, schräg nach innen und hinten gerichtete Borsten. Im Spitzenbeich stehen terminal 2 lange Borsten und davor medial eine sehr kurze. Der Apex wurzelt unmittelbar am Hinterrand der Basalöffnung, die vom Vorderrand des Penis fast bis in dessen Längsmittle verschoben ist. Nach der trichterförmigen Basis ist der Apex sehr stark eingeschnürt und verläuft dann parallelseitig bis zur Spitze, vor der beiderseits eine kleine Ecke vorspringt. Innerhalb des Apex verläuft der Ductus ejaculatorius, an der Einschnürungsstelle als enges, dahinter als weites Rohr.

***Euconus (Napochus) layangensis* nov. spec.**

MATERIAL: Holotypus ♂, Kinabalu Nat. Park, Layang Layang, 2600 m, 2. bis 8.5.1987, in Falle (lg. Smetana, cMG).

DIAGNOSE: im Rahmen des Subgenus *Napochus* etwas abweichend, weil das Endglied der Fühler nicht deutlich in einen breiteren basalen und einen schmälere distalen Teil gegliedert ist, sonst aber durchaus den Merkmalen des Subgenus *Napochus* entsprechend.

BESCHREIBUNG: Long. 1,60 mm, lat. 0,70 mm. Hell rotbraun, gelblich behaart.

Kopf von oben betrachtet queroval, mit den großen vorgewölbten Augen so breit wie die Halsschildbasis, flach gewölbt, an den Schläfen und am Hinterkopf fein und abstehend behaart, Fühler mit lockerer, 4 gliederiger Keule, zurückgelegt die Halsschildbasis knapp erreichend, ihr Basalglied und das 2. doppelt so lang wie breit, 3 bis 7 klein, annähernd isodiametrisch, 8 doppelt so breit wie 7, 9 und 10 noch ein wenig breiter, alle 3 schwach quer, das gerundet-kegelförmige Endglied etwas länger als die beiden vorletzten zusammen.

Halsschild kurz, etwas breiter als lang, konisch, mit 2 Basalgrübchen, fein punktiert und dicht, steif aufgerichtet behaart.

Flügeldecken zusammen schon an der Basis etwas breiter als die Halsschildbasis, dicht und steif abstehend behaart. Flügel entwickelt.

Beine schlank, Schenkel schwach verdickt.

Penis (Abb. 57) mit von oben betrachtet langovalem Peniskörper, spitzwinkelig-dreieckigem Apex und den Apex überragendem Operculum. Parameren die Mitte des Apex kaum erreichend, schlank, mit je 2 terminalen Tastborsten. Basalöffnung des Penis breit, nur ihr Basalrand stark sklerotisiert. Im Inneren des Peniskörpers befindet sich ein ausgedehnter sklerotisierter Komplex, in dem von einem zentralen kompakten Bereich 4 große sichelförmig gekrümmte Stachel distalwärts ausgehen. Von oben betrachtet links befinden sich neben einander 2 nach links außen gekrümmte Stachel und rechts der Sagittalebene ein nach rechts und daneben außen ein nach links gekrümmter Stachel. Der Komplex wird distalwärts durch eine Querleiste begrenzt.

***Euconus (Napochus) quinquearticulatus* nov. spec.**

MATERIAL: Holotypus ♀, Mount Kinabalu Nat. Park, 1550 bis 1650 m, HQ, 24.4.1987 (Ig. Smetana, cMG); Paratypus ♀, Pondok Lowii, 2300 bis 2400 m, 28.8.1988 (Ig. Smetana, cF).

BESCHREIBUNG: Long. 2,10 mm, lat. 1,10 mm. Schwarz, Palpen, erste Fühlerglieder und Beine dunkel-rotbraun, braun behaart.

Kopf von oben betrachtet gerundet-rautenförmig, mit sehr großen, seitlich vorgewölbten Augen, so breit wie lang, am Scheitel schütter, weißlich, nach hinten, an den Schläfen seitlich abstehend behaart. Fühler mit scharf abgesetzter 5 gliederiger Keule, die Geißelglieder leicht gestreckt, das Basalglied und das 2. etwas dicker als die folgenden, 7 doppelt so breit wie 6, 8 bis 10 noch etwas breiter, fast so breit wie lang, das Endglied um ein Drittel länger als das vorletzte, sein distaler Teil eichelartig vom basalen abgeschnürt.

Halsschild konisch, an der Basis doppelt so breit wie am Vorderrand und hier breiter als lang, mit basaler Querfurche, in dieser mit 3 seitlichen Grübchen, auf der Scheibe schütter, an den Seiten dichter, abstehend behaart.

Flügeldecken kurzoval, sehr breit, schon am Vorderrand zusammen um die Hälfte breiter als die Halsschildbasis, mit einer lateral von einer Schulterbeule begrenzten Basalimpression, lang und abstehend behaart. Flügel voll entwickelt.

Beine schlank, Schenkel sehr schwach verdickt.

***Euconus (Napochus) ventricosus* nov. spec.**

MATERIAL: Nur Holotypus ♀, Mount Kinabalu, 1550 bis 1650 mm, 24.4.1987 (Ig. Burckhardt u. Löbl, cMG).

DIAGNOSE: Wie die vorhergehende Art durch 5 gliederige Fühlerkeule ausgezeichnet, alle Keulenglieder deutlich gestreckt, das letzte, wie für das Subgenus kennzeichnend, 2-

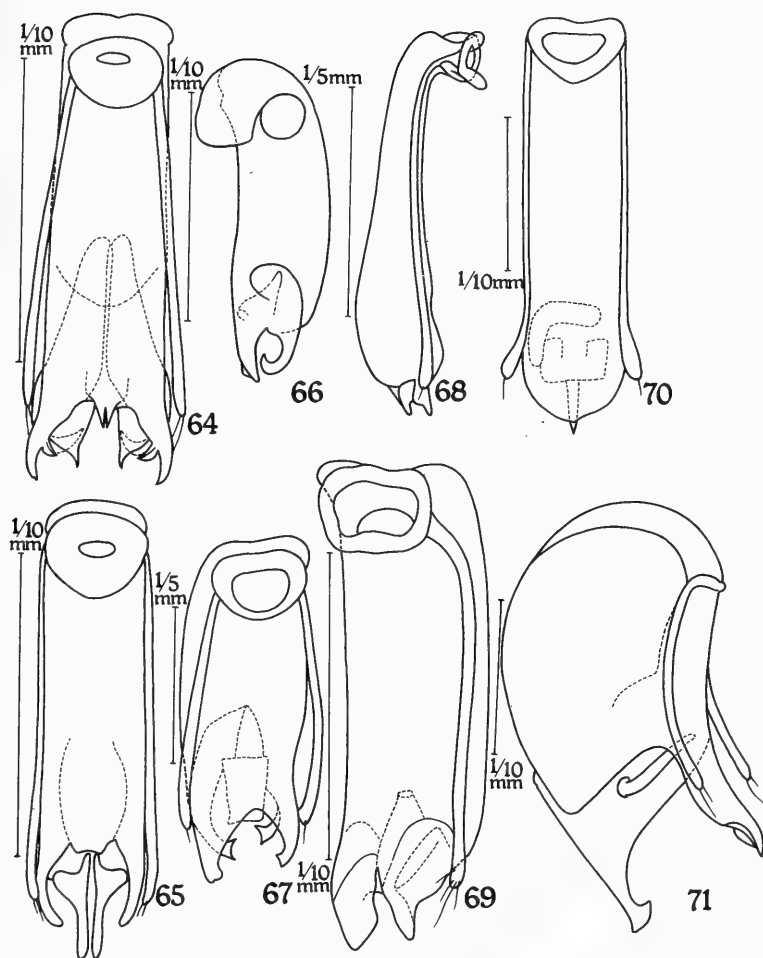


ABB. 64-71.

- 64: *Euconnus (Napoconnus) cephalotes* nov. spec., Penis in Dorsalansicht. 65: *Euconnus (Napoconnus) parallelipenis* nov. spec., Penis in Dorsalansicht. 66: *Euconnus (Napoconnus) valdepullus* nov. spec., Penis in Dorsolateralansicht. 67: *Euconnus (Napoconnus) langananensis* nov. spec., Penis in Dorsalansicht. 68: *Euconnus (Napoconnus) elongatior* nov. spec., Penis in Lateralansicht. 69: *Euconnus (Napoconnus) tambunanus* nov. spec., Penis in Dorsolateralansicht. 70: *Euconnus (Napoconnus) proceripenis* nov. spec., Penis in Dorsalansicht. 71: *Euconnus globicollis* nov. spec. Penis in Lateralansicht.

teilig, mit schmalerem distalem Teil, mit schmalerem Kopf, der Hinterkopf beulenförmig über den Hals vorgewölbt, die Flügeldecken sehr stark bauchig verbreitert.

BESCHREIBUNG: Long. 1,90 mm, lat. 1,0 mm. Schwarzbraun, Palpen, Fühler und Beine hellbraun (? immatur). Kopf von oben betrachtet gerundet-rautenförmig, mit wenig vorragendem Apex, Scheitel, Hinterkopf und Schläfen dicht und abstehend behaart, der Scheitel als Beule ziemlich spitz über den Hinterkopf basalwärts vorragend. Halsschild breiter als lang, sein Basalrand aber nur um ein Drittel breiter als der Vorderrand, die Seiten steif abstehend behaart, vor der Basis mit 3 großen Grübchen. Flügeldecken sehr stark bauchig erweitert, zusammen schon an der Basis wesentlich breiter als die Halsschildbasis, mit seichter, lateral von einer Humeralfalte begrenzter Basalimpression, sehr fein punktiert und schütter behaart. Flügel voll entwickelt. Beine schlank, Schenkel kaum verdickt.

***Euconus (Napochus) burckhardtianus* nov. spec.**

MATERIAL: Nur Holotypus ♂ und Paratypus ♀, Sabah, Poring Hot Springs, 500 m, 7.5.1987 (lg. Burckhardt u. Löbl, cMG); und 10.5.1987, (cF).

DIAGNOSE: Eine durch ihre Größe und die relativ langen Fühler auffallende Art, die im Bau des männlichen Kopulationsapparates den Arten mit nach oben gebogenem Apex penis zuzuordnen ist. Einen ähnlich gebauten Penis besitzt von den *Napochus*-Arten aus Sabah vor allem *N. parakinabalui*, der aber wesentlich kleiner ist und kürzere Fühler besitzt, darüber hinaus auch mit *E. (Napochus) fricatoris* Schauf. aus Singapore und seinen Verwandten, die aber wesentlich größer sind und bei denen das 8. bis 10. Fühlerglied nur wenig breiter als lang ist.

BESCHREIBUNG: Long. 1,60 mm, lat. 0,80 mm, braungrau, braun behaart.

Kopf von oben betrachtet rundlich, etwas breiter als lang, die großen Augen seitlich stark vorgewölbt, die Oberseite lang und abstehend, die Schläfen sehr dicht und seitlich steif abstehend behaart. Fühler dick, zurückgelegt die Halsschildbasis nicht ganz um das Endglied überragend, ihr 2. Glied quadratisch, 3 bis 7 breiter als lang, 8 und 9 doppelt so breit wie 7, so lang wie breit, 10 sehr schwach quer, das Endglied etwas länger als breit, sein distaler Teil schwach stufenförmig abgesetzt und etwas schmaler als der basale.

Halsschild konisch, etwas breiter als lang, an der Basis ein wenig breiter als der Kopf mit den Augen, dicht, an den Seiten sehr dicht und struppig abstehend behaart, vor der Basis mit einer beiderseits von einem Grübchen begrenzten Querfurche.

Flügeldecken zusammen schon an der Basis viel breiter als die Halsschildbasis, sehr lang und abstehend behaart, mit tiefer, länglicher Basalimpression. Flügel voll entwickelt.

Schenkel schwach verdickt, Schienen schlank.

Penis im einzigen vorliegenden Präparat sehr stark geschrumpft und deshalb nicht abbildbar, mit großer, von einem sklerotisierten Rahmen umgebener, dorsal nahe der Penisbasis gelegener Basalöffnung. Parameren am Präparat nicht erhalten, Apex wie bei *E. parakinabalui* aufgebogen, breit zungenförmig, Operculum flach, annähernd so lang wie der Apex, sein Hinterrand spitzbogenförmig.

***Euconus (Napochus) valdeobscurus* nov. spec.**

MATERIAL: Holotypus ♂, Mount Kinabalu, 1550 bis 1650 m, 24.4.1957 (lg. Burckhardt u. Löbl, cMG); 1 Paratypus, Mount Kinabalu, Nat. Park, Poring Hot Springs, 450 bis 500 m, 30.5.1988 (lg. Smetana, cF).

DIAGNOSE: Ausgezeichnet durch tief schwarze Körperfarbe und dichte, schwarzbraune Behaarung.

BESCHREIBUNG: Long. 1,50 mm, lat. 0,70 mm. Schwarz glänzend, die Beine dunkel rotbraun.

Kopf von oben betrachtet rundlich, mit den flach gewölbten Augen ein wenig breiter als lang, dicht und lang schwarzbraun behaart, Fühler zurückgelegt die Halsschildbasis knapp erreichend, die breite Keule scharf abgesetzt, die beiden ersten Glieder um ein Viertel länger als breit, 3 bis 7 klein, schwach quer, 8 bis 10 dreimal so breit wie 7, beim ♂ stark beim ♀ schwach quer, das Endglied an der Spitze abgerundet, so lang wie breit, in der Längsmittle stufig auf die halbe Breite verschmälert.

Halsschild breiter als lang, an seiner Basis deutlich breiter als der Kopf mit den Augen, dicht und absteht behaart, beim ♂ mit 3 in einer seichten Querfurche stehenden Grübchen, beim ♀ ohne solche.

Flügeldecken schon an der Basis zusammen wesentlich breiter als die Halsschildbasis, stark gewölbt und seitlich stark gerundet, mit tiefer, lateral von einer langen Humeralfalte scharf begrenzter Basalimpression, fein und seicht, aber dicht punktiert, schräg absteht behaart.

Beine sehr schlank, Schenkel kaum verdickt, Schienen im distalen Drittel leicht verbreitert, Tarsen sehr zart.

Penis (Abb. 58) von oben betrachtet breit, der Peniskörper gerundet-trapezförmig, der Apex spitzwinkelig-dreieckig, an seiner Basis nur ein Drittel so breit wie der Peniskörper, die Basalöffnung dorsobasal gelegen, das Ostium penis offenbar terminal, der Ductus ejaculatorius scheint bis zur Penis Spitze zu reichen, er entspringt am distalen Ende des Peniskörpers aus einem stark sklerotisierten Komplex, der von einer durchsichtigen Cuticula umhüllt ist. Parameren sind an dem einzigen vorliegenden Präparat nicht vorhanden, sie sind vermutlich bei der Präparation verloren gegangen.

***Euconnus (Napochus) parakinabalu* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und 3 Paratypen, Mount Kinabalu, 2600 m, April 1987 (Ig. Burckhardt u. Löbl cMG); ebenda 2 ♂ (Penispräparat und 8 Paratypen (cF); 1 Paratypus Mount Kinabalu 1450 bis 1500 m (cMG); 2 Paratypen Crocker Range, 1559 bis 1650 m, 16.5.1987 (cMG); 2 Paratypen, Mount Kinabalu, Layang Layang, 2590 m, 1. bis 2.5.1987 (Ig. Smetana, cMG); 1 Ex. Crocker Range, ca. 1000 m, 5.9.1988 (Ig. Smetana, cMG); 1 Ex. Mount Kinabalu, Livagu River, 1.9.1988 (Ig. Smetana, cMG); 2 Ex. Poring Hot Springs, 500 bis 600 m. 5-5. u. 7-6.1987 (Ig. Burckhardt, cMG).

DIAGNOSE: Dunkel rotbraun, die 4 gliederige Fühlerkeule länger als die Geißel, scharf abgesetzt, Halsschild mit basaler Querfurche.

BESCHREIBUNG: Long. 1,10 bis 1,20 mm, lat. 0,60 mm. Dunkel rotbraun, bräunlich behaart.

Kopf von oben betrachtet isodiametrisch rund mit vorgewölbten Augen, die Schläfen eineinhalbmal so lang wie der Augendurchmesser, absteht behaart. Fühler zurückgelegt die Halsschildbasis nicht ganz erreichend, ihre Geißel etwas kürzer als die 4 gliederige Keule, die beiden ersten Glieder so lang wie breit, 3 bis 7 sehr klein, breiter als lang, 8 3-mal so breit wie 7, schwach, 9 und 10 etwas stärker quer, das Endglied gerundet-kegelförmig, nur wenig länger als breit.

Halsschild konisch, an seiner Basis wenig breiter als der Kopf mit den Augen, seine Seiten struppig absteht behaart, vor der Basis mit 2 großen Grübchen.

Flügeldecken zusammen an der Basis etwas breiter als die Halsschildbasis, oval, wenig länger als Kopf und Halsschild zusammen, fein punktiert und schräg absteht behaart, mit langer, von einer schrägen Humeralfalte begrenzten Basalimpression. Flügel verkümmert.

Beine schlank und mäßig lang, Schenkel sehr schwach verdickt, Schienen gerade.

Penis (Abb. 59) von oben betrachtet annähernd doppelt so lang wie breit, mit nach oben gebogenem, am Ende breit abgestutztem Apex. Basalöffnung dorsal gelegen mit breitem sklerotisierten Rahmen, Parameren leicht S-förmig gebogen, das Penisende fast erreichend, mit je 2 terminalen Tastborsten.

Euconnus (Napochus) fuscus nov. spec.

MATERIAL: Holotypus ♂, Kinabalu Nat. Park, Poring Hot Springs, 475 m, 23.8.1988 (Ig. Smetana, cMG); 1 Paratypus, ebenda 11.5.1987 (Ig. Burckhardt u. Löbl, cF); Mount Kinabalu Nat. Park, Livagu River, 490 m, 18.5.1987 (Ig. Smetana, cMG).

DIAGNOSE: rotbraun stark glänzend, Halsschild mit basaler Querfurche und darin mit 4 Grübchen, Flügeldecken mit langer, lateral von einer langen Humeralfalte begrenzter Basalimpression.

BESCHREIBUNG: Long. 1,30 mm, lat. 0,65 mm. Dunkel rotbraun, die Extremitäten heller gefärbt.

Kopf von oben betrachtet queroval mit seitlich stark vorgewölbten Augen und bärtig behaarten Schläfen. Halsschild konisch, an der Basis nur wenig breiter als der Kopf mit den Augen, mit breiter basaler Querfurche und darin mit 4 Grübchen, die Seiten absteht behaart.

Flügeldecken stark gewölbt und seitlich stark gerundet, glatt und glänzend, schütter, nach hinten gerichtet behaart, mit tiefer, lateral von einer Humeralfalte begrenzter Basalimpression.

Beine kurz, Schenkel schwach verdickt, Schienen distalwärts etwas verbreitert.

Penis (Abb. 60) von oben betrachtet kurzoval, mit annähernd trapezförmigem, scharf abgesetzten Apex. Seine Basalöffnung auf der Dorsalseite nahe zur Penismitte verschoben, von einem sehr breiten Sklerotinrahmen umgeben, Parameren an dessen distalem Rand inserierend, stark nach außen und dann wieder zur Mitte gebogen, das Penisende erreichend, mit je 2 terminalen Tastborsten.

Euconnus (Napochus) funestus nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat) und 4 Paratypen, Poring Hot Springs, 500 bis 550 m, 6. u. 12.5.1987 (Ig. Burckhardt u. Löbl, cMG); ebenda 3 Paratypen (cF); 2 Paratypen, ebenda (Ig. Smetana, cMG); 1 Paratypus, ebenda, 23.8.1988 (Ig. Smetana, cMG); 1 Paratypus, Mount Kinabalu, Summit Pondok Ubah, 2050 m, 26.4.1987 (Ig. Smetana, cMG).

DIAGNOSE: Gekennzeichnet durch schwarze Körperfärbung, sehr lange Fühlerkeule und gedrungenen Fühlerbau.

BESCHREIBUNG: Long. 1,50 bis 1,60 mm, lat. 0,65 mm, Schwarz, die Extremitäten hellbraun, weißlich behaart.

Kopf von oben betrachtet gerundet-rautenförmig, mit den stark vorgewölbten Augen breiter als lang, oberseits flach, Schläfen und Hinterkopf dicht und absteht behaart. Fühler zurückgelegt die Halsschildbasis erreichend, mit 4 gliederiger Keule, das 7. Glied aber schon breiter als das 6., die beiden ersten Glieder nicht ganz so lang wie breit, 3 bis 7 klein, 8 bis 10 doppelt breiter als 7, schwach quer, das 11. Glied querüber abgeschnürt, der distale Teil schmaler als der basale.

Halsschild konisch, an der Basis kaum breiter als der Kopf mit den Augen, mit bisweilen undeutlicher basaler Querfurche, seitlich absteht behaart.

Flügeldecken kurzoval, kaum länger als Kopf und Halsschild zusammen, gemeinsam breiter als die Halsschildbasis, seitlich sehr stark gerundet, lang und schräg nach hinten

gerichtet behaart, mit tiefer, von einer schrägen Humeralfalte scharf begrenzter Basalimpression. Flügel entwickelt.

Beine kurz, Schenkel schwach verdickt.

Penis (Abb. 61) wie für die Untergattung *Napochus* typisch gebaut. Peniskörper von oben betrachtet gerundet-viereckig, doppelt so breit wie die davon scharf abgesetzte Apikalpartie, Basalöffnung dorsobasal gelegen mit schmalem sklerotisierten Rahmen, Parameren am distalen Rand der Basalöffnung angesetzt, schmal und dünnhäutig, distal der Mitte S-förmig gekrümmt, das Penisende erreichend, mit je 2 terminalen Tastborsten. Im Penisinneren liegt ein umfangreicher sklerotisierter Komplex, vor dessen Basis knapp hinter der Basalöffnung eine schmale Querleiste liegt. Von den beiden Enden dieser Querleiste ziehen Muskelstränge zu dem Sklerotinkomplex, von dem beiderseits ein sichelförmig nach hinten gekrümmter Zahn absteht. Hinter den Zähnen steht am apikalen Ende des Sklerotinkomplexes auf beiden Seiten eine schmale Sklerotinschleife ab. Apikal ragt am Ende des Sklerotinkomplexes eine Spitze unter dem zungeförmigen Apex penis nach hinten vor.

***Euconus* ? (*Napochus*) *sabahianus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Mount Kinabalu Nat. Park, Poring Hot Springs area Eastern Ridge Tr., 1000 m, 28.6.1988 (lg. Smetana, cMG); 1 Paratypus Poring Hot Springs, 500 bis 600 m, 9.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda 2 Paratypen, 1030 m, (lg. Smetana, cF); 1 Paratypus, Mount Kinabalu at Livagu, 1803 m, 2.9.1988 (lg. Smetana, cMG); Crocker Range, 9-9-1988 (lg. Smetana cMG).

DIAGNOSE: Sehr klein, schwarz, Extremitäten rotbraun, gedrungen gebaut, Kopf klein, so lang wie breit, Halsschild isodiametrisch, Flügeldecken kurzoval.

BESCHREIBUNG: Long, 1,00 bis 1,10 mm, Schwarz, Extremitäten rotbraun.

Kopf von oben betrachtet rundlich, mit stark vorstehenden Augen und bärtig behaarten Schläfen. Fühler mit lockerer 4 gliederiger Keule, zurückgelegt die Halsschildbasis erreichend, ihre beiden ersten Glieder leicht gestreckt, 3 bis 7 stark quer, 8 3-mal so breit wie 7, 9 und 10 noch etwas breiter, alle 3 viel breiter als lang, das Endglied fast so lang wie die beiden vorletzten zusammen, sein distaler Teil schmaler als der proximale, wie für *Napochus* kennzeichnend. Auch die vorletzten Glieder wie für *Napochus* typisch gebaut.

Halsschild annähernd konisch, breiter als lang, mit 2 in einer Querfurche stehenden Basalgrübchen, dicht und struppig absteht behaart.

Flügeldecken kurzoval, schon an der Basis zusammen breiter als die Halsschildbasis, mit tiefer, lateral durch eine lange Humeralfalte begrenzter Basalimpression, lang, nach hinten gerichtet behaart.

Beine kurz und schlank, Schenkel nur schwach verdickt.

Penis (Abb. 62) im einzigen vorliegenden Präparat nur unvollständig erhalten. Die Apikalpartie zweispitzig, die Basalöffnung und eine Paramere verloren. Die erhaltene rechte Paramere ist leicht S-förmig gekrümmt und hat keine Tastborsten.

***Euconus* (*Napochus*) *borneoi* nov. spec.**

MATERIAL: Holotypus ♂, (Penispräparat), Sabah, Poring Hot Springs, 500 m, (lg. Burckhardt u. Löbl, cMG); ebenda, 1 Paratypus (Penispräparat) 9.5.1987 (Burckhardt u. Löbl, cF); 1 Paratypus, Mount Kinabalu, 2600 m, 23.5.1987 (lg. Burckhardt u. Löbl, cMG); 1 Paratypus, Kinabalu Nat. Park, HQ Liangu River, ca. 1000 m, 5.9.1987 (lg. Smetana, cMG); Paratypus ♀ Crocker Range, ca. 1000 m, 5.12.1988 (lg. Smetana, cMG).

DIAGNOSE: Nur im weiteren Sinn in das Subgenus *Napochus* gehörig. Durch rundlichen Kopf mit großen vorgewölbten Augen, kurze Fühler mit breiter 4 gliederiger Keule

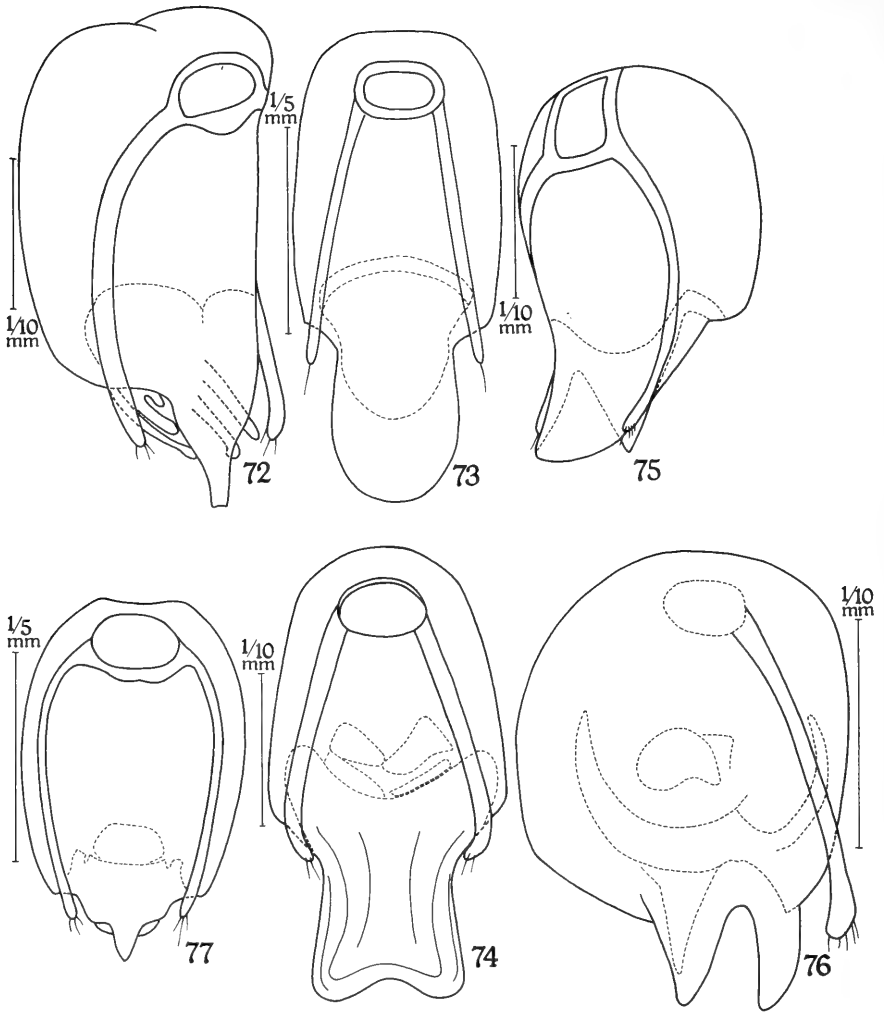


ABB. 72-77.

72: *Euconnus fraudulentus* nov. spec., Penis in Dorsolateralansicht. 73: *Euconnus kinabalumontanus* nov. spec., Penis in Dorsalansicht. 74: *Euconnus parakinabalumontanus* nov. spec., Penis in Dorsalansicht. 75: *Euconnus minutipenis* nov. spec. Penis in Dorsolateralansicht. 76: *Euconnus glandulipenis* nov. spec., Penis in Dorsalansicht. 77: *Euconnus robusticeps* nov. spec. Penis in Dorsalansicht.

sowie konischen Halsschild mit 2 Basalgrübchen, jedoch ohne basale Querfurche gekennzeichnet.

BESCHREIBUNG: Long. 1,15 bis 1,20 mm, lat. 0.,55 mm. Rotbraun, gelblich behaart.

Kopf von oben betrachtet isodiametrisch-rundlich mit großen vorgewölbten Augen und dicht behaarten Schläfen. Fühler zurückgelegt die Halsschildbasis erreichend, mit breiter 4 gliederiger Keule, diese reichlich so lang wie die Geißel, das Basalglied gestreckt, 2 bis 7 klein, Glied 8 bis 10 3mal so lang wie 7, breiter als lang, das Endglied sehr kurz eiförmig.

Halsschild so lang wie breit, konisch, an der Basis so breit wie der Kopf mit den Augen, mit 2 großem Basalgrübchen und steif abstehend behaarten Seiten.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, etwas länger als Kopf und Halsschild zusammen, mit kleiner, von einer hoch emporgewölbten Humeralfalte begrenzter Basalimpression, fein punktiert und schräg abstehend behaart. Flügel entwickelt.

Beine schlank, Schienen in der Längsmitte etwas verdickt.

Penis (Abb. 63) von oben betrachtet an einen Hutpilz erinnernd, Peniskörper und Apex nicht scharf getrennt, ihm sitzt basal haubenförmig eine "Schale" auf, die den Peniskörper fast bis zur Längsmitte einhüllt und in der dorsobasal die Basalöffnung liegt. Diese besitzt keinen sklerotisierten Rahmen. Diese "Schale" steht über einem kleinen querovalen Sklerotinkörper, der hinter der Basalöffnung liegt, und über die dünnhäutigen Parameren mit dem Peniskörper in Verbindung. Dieser ist etwa in seiner Längsmitte von beiden Seiten eingeschnürt und erweitert sich dahinter wieder zu einem schwalbenschwanzförmigen Endteil. Im Inneren des Peniskörpers liegt nahe der Basis eine keulenförmige Blase, die sich distal schiffchenförmig erweitert. An sie schließt der Ductus ejaculatorius, ein dickes Rohr, das in einem weiten Kanal nicht ganz bis zur Penisspitze reicht. Von oben und hinten betrachtet links befindet sich ein breiter und flacher, schräg nach hinten und zur Mitte gerichteter Zahn. Die Parameren sind breit, erreichen das distale Drittel der Penislänge und liegen dem Peniskörper seitlich eng an. Jede trägt eine terminale Tastborste.

BESTIMMUNGSABELLE DER *Napochus*-ARTEN AUS SABAH.

- | | | |
|---|---|----------------------------------|
| 1 | Arten mit 5-gliederiger Fühlerkeule | 2 |
| – | Arten mit 4-gliederiger Fühlerkeule | 3 |
| 2 | Etwas größer, das 7. bis 10. Fühlerglied nur leicht gestreckt, Kopf mit den stark vorgewölbten Augen so breit wie die Halsschildbasis | <i>quinquearticulatus</i> n. sp. |
| – | Etwas kleiner, das 7. bis 10. Fühlerglied wesentlich länger als breit, Kopf mit den wenig vorgewölbten Augen nicht so breit wie die Halsschildbasis | <i>ventriculosus</i> n. sp. |
| 3 | Relativ groß (long. 1,60 mm) | 4 |
| – | Körperlänge 1,50 mm und darunter | 5 |
| 4 | 11. Fühlerglied im distalen Teil abrupt verschmälert, Fühler zurückgelegt die Halsschildbasis überragend | <i>burckhardtianus</i> n. sp. |
| – | Distaler Teil des 11. Fühlergliedes nicht eingeschnürt und distal abrupt verschmälert, Fühler zurückgelegt die Halsschildbasis knapp erreichend | <i>layangensis</i> n. sp. |
| 5 | Körperlänge um 1,50 mm | 6 |
| – | Körperlänge 1,30 mm und darunter | 7 |
| 6 | 8. bis 10. Fühlerglied 3 mal so breit wie lang. | <i>valdeobscurus</i> n. sp. |
| – | 8. bis 10. Fühlerglied höchstens doppelt so breit wie lang | <i>funestus</i> n. sp. |
| 7 | Körperlänge 1,30 mm, Penis Abb. 61 | <i>fuscus</i> n. sp. |
| – | Körperlänge 1,20 mm und darunter, Penis anders gebaut | 8 |

- 8 Halsschild ohne basale Querfurche, nur mit Basalgübchen 9
 – Halsschild mit basaler Querfurche 10
 9 Kopf schmaler als der Halsschild *kinabalui* n. sp.
 – Kopf so breit wie der Halsschild *borneoi* n. sp.
 10 Körperfarbe schwarz *sabahinanus* n. sp.
 – Körperfarbe rotbraun hierher 4 Arten die nur im männlichen
 Geschlecht aufgrund des Baues des männlichen Kopulationsapparates sicher unter-
 schieden werden können
 *mirus* n. sp., *paramirus* n. sp., *allomirus* n. sp. und *parakinabalui* n. sp.

Untergattung *Napoconnus* Franz

Euconnus (Napoconnus) cephalotes nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat) Mount Kinabalu Nat. Park, HG at Livagu River, 1600 m, 25.4.1987 (Ig. Smetana, cMG); ebenda, 1500 m, 2.9.1988 (Ig. Smetana, cMG); 2♂ Paratypen, Mount Kinabalu, 1450 bis 1550 m, 21. u. 23.5.1987 (Ig. Burckhardt u. Löbl, cF); ebenda, 3 Paratypen (Ig. Burckhardt u. Löbl 1987, cMG); 1 Paratypus ebenda, 1450 bis 1530 m (Ig. Burckhardt u. Löbl, cMG).

DIAGNOSE: Kopf besonders beim ♂ groß, Schläfen und Hinterkopf außerordentlich dicht, pelzig behaart, Fühler sehr kurz, Körper auffällig gedrungen gebaut.

BESCHREIBUNG: Long. 1,60 bis 1,80 mm, lat. 0,60 bis 0,70 mm. Rotbraun, bräunlich behaart.

Kopf von oben betrachtet annähernd isodiametrisch-rundlich, sehr flach gewölbt, beim ♂ mit den Augen nahezu so breit wie die Halsschildbasis, beim ♀ wesentlich schmaler, die Stirn in beiden Geschlechtern spitz nach vorne vorspringend. Fühler zurückgelegt knapp die Halsschildmitte erreichend, zwischen dem 1. und 2. Glied deutlich abknickbar, das Basalglied zweimal, das 2. eineinhalbmal so lang wie breit, 3 bis 8 klein, distalwärts zunehmend quer, 9 und 10 mehr als doppelt so breit wie lang, 10 länger als 9, das gerundet-kegelförmige Endglied nicht ganz so lang wie die beiden vorletzten zusammen. Halsschild konisch, so lang wie an der Basis breit, ohne Basalgübchen, kurz und dicht, abstehend behaart.

Flügeldecken schon an der Basis zusammen deutlich breiter als die Halsschildbasis, seitlich stark gerundet erweitert, wenig länger als Kopf und Halsschild zusammen, ohne Basalimpression und ohne Schulterbeule. Flügel voll entwickelt.

Beine ziemlich kurz, Schenkel mäßig verdickt, Schienen gerade.

Penis (Abb. 65) langgestreckt, von oben betrachtet zum apikalen Ende leicht verbreitert, der Apex tief gespalten, zu beiden Seiten mit je 2 Zähnen endend. Am Grunde des Ausschnittes zwischen diesen tritt ein in 2 Spitzen gespalteener Vorsprung zutage. Unter und zwischen den Zähnen steht eine horizontale, stark sklerotisierte Platte hervor, die mediodistal in einem spitzen Zahn endet. Noch ventraler als diese Platte befinden sich zwei sichelförmig zur Mitte gebogene Zähne.

Die Basalöffnung des Penis liegt dorsobasal, sie hat ein kleines Lumen und ist von einem sehr breiten Sklerotinrahmen umfaßt. An diesem entspringen die dünnen geraden Parameren, die das Penisende nicht erreichen. Jede trägt terminal 2 lange Tastborsten.

Euconnus (Napoconnus) parallelipenis nov. spec.

MATERIAL: Nur Holotypus ♂ (Penispräparat), Mount Kinabalu Nat. Park, Poring Hot Springs, 530 m, 30.8.1988 (Ig. Smetana, cMG).

DIAGNOSE: Gekennzeichnet durch das Fehlen von Basalgrübchen am Halsschild, durch glatte, schwach behaarte Flügeldecken mit runder Basalimpression ohne Humeralfalte und stark verdickte Vorderschenkel sowie durch die Penisform.

BESCHREIBUNG: Long. 1,40 mm, lat. 0,60 mm. Kastanienbraun, bräunlich behaart.

Kopf etwas länger als mit den kleinen Augen breit, flach gewölbt, an den Schläfen und am Hinterkopf schütter behaart. Fühler zurückgelegt die Halsschildmitte knapp erreichend, ihre beiden ersten Glieder doppelt so lang wie breit, 3 bis 8 klein, 9 und 10 dreimal so breit wie 8, das Endglied um die Hälfte länger als breit.

Halsschild so lang wie breit, ein wenig breiter als der Kopf mit den Augen, schütter behaart, ohne Basalgrübchen.

Flügeldecken sehr fein punktiert, spärlich behaart, mit kleiner, runder Basalimpression.

Vorderschenkel stärker verdickt als die der Mittel- und Hinterbeine, Schienen schlank und gerade.

Penis (Abb. 65) sehr langgestreckt, parallelseitig, seine Basalöffnung mit sehr breitem, stark sklerotisierten Rahmen, mit sehr dünnen, fast penislangen Parameren mit je 2 terminalen Tastborsten, mit aus stark sklerotisierten, zangenförmigen Teilen bestehenden Apex und mit 2 aus dem terminal gelegenen Ostium herausragenden, basal verbreiterten, distal schmalen und parallelen Stäben.

***Euconnus (Napoconnus) valdepullus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Mount Kinabalu, 1550 bis 1650 m 24.4.1987 (Ig. Burckhardt u. Löbl, cMG); 1 Paratypus, ebenda (cF).

DIAGNOSE: Für die Untergattung ungewöhnlich klein.

BESCHREIBUNG: Long 0,90 mm, lat. 0,35 mm. Schwarzbraun, Beine und Palpen bräunlich gelb, hellgrau behaart.

Kopf von oben betrachtet länglich-rautenförmig, im Niveau der vor seiner Längsmitte stehenden Augen am breitesten und hier so breit wie der Vorderrand des Halsschildes, nach hinten gerichtet, lang behaart. Fühler zurückgelegt die Halsschildmitte erreichend, ihr Basalglied doppelt, das 2. eineinhalbmal so lang wie breit, 3 bis 8 sehr klein, 9 3 mal, 10 4-mal so breit wie 8, das Endglied gerundet-kegelförmig, so lang wie breit.

Halsschild ein wenig länger als an der Basis breit, mit 2 Basalgrübchen, besonders an den Seiten dicht behaart.

Flügeldecken stark gewölbt, an der Basis zusammen wenig breiter als die Halsschildbasis, mit runder und tiefer Basalimpression, fein behaart. Flügel voll entwickelt.

Beine schlank und kurz.

Penis (Abb. 66) leicht dorsalwärts gekrümmt, seine Basis lappenförmig dorsalwärts gebogen, Apex penis spitzwinkelig-dreieckig distalwärts vorspringend, Operculum hakenförmig nach oben gebogen. Vor dem Ostium penis liegt im Penisinneren ein kapuzenförmiges Sklerotiegebilde.

***Euconnus (Napoconnus) langananensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat). Poring Hot Springs, 850 m, 14.8.1987 (Ig. Burckhardt u. Löbl, cMG); 1 Paratypus ♂ (Penispräparat), ebenda 30.4.1987 (Ig. Burckhardt u. Löbl (cMG); 1 Paratypus (♂), Mount Kinabalu, 1500 m, 21.4.1987 (Ig. Burckhardt u. Löbl, cF); 1 Paratypus ♂ (Penispräparat) Mount Kinabalu, 1500 m, 21.7.1987 (Ig. Burckhardt u. Löbl, cF); 1 Paratypus ♂ (Penispräparat), Crocker Range, 1650 m, 16.5.1987 cMG und 2 Paratypen, ebenda (cF).

DIAGNOSE: Gekennzeichnet durch großen Kopf, dieser mit den Augen so breit wie die Halsschildbasis, so lang wie breit.

BESCHREIBUNG: Long. 1,30 bis 1,40 mm, lat. 0,70 mm. Rotbraun, gelblich behaart. Kopf so lang wie breit, Schläfen und Hinterkopf sehr dicht, nach hinten gerichtet behaart. Fühler zurückgelegt die Halsschildbasis knapp erreichend, ihr Basalglied und das 2. doppelt so lang wie breit, 3 bis 8 sehr klein, 9 3 mal so breit wie 8, 10 noch etwas breiter, beide stark quer, das Endglied so lang wie breit. Halsschild knapp so lang wie an der Basis breit, mit 2 Basalgrübchen, dicht, nach hinten gerichtet behaart. Flügeldecken schon an der Basis zusammen etwas breiter als die Halsschildbasis, feiner und schütterer als der Halsschild behaart, mit wenig hervortretender, lateral von einer kurzen Humeralfalte begrenzter Basalimpression. Flügel entwickelt. Beine kurz, Vorderschenkel stärker verdickt als die der beiden anderen Beinpaare. Penis (Abb. 67) weniger langgesteckt als bei den meisten anderen Arten der Untergattung, nach oben gebogen, der Apex 2-spitzig, Operculum ebenfalls in Form von 2 Doppelspitzen nach hinten vorspringend. Parameren das Penisende nicht erreichend, mit je einer terminalen Tastborste versehen.

***Euconnus (Napoconnus) elongatior* nov. spec.**

MATERIAL: Holotypus ♂ und Paratypus ♂ (Penispräparate), Crocker Range, 1350 m, km 60 Kota Kinabalu, Tambunan, 17.5.1987 (lg. Burckhardt u. Löbl, cMG); 4 Paratypen, Crocker Range, 1550 bis 1650 m, 16.5.1987 lg. Burckhardt u. Löbl, cF); 5 Paratypen, Crocker Range, 17.5.1987 route Kota Kinabalu, Tambunan (lg. Burckhardt u. Löbl, cMG); 2 Paratypen, ebenda, 1550 bis 1650 m 16. bis 18.5.1987 (cMG); 2 Paratypen, Poring Hot Springs, 7. bis 12.5.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Dem nachstehend beschriebenen *E. proceripenis* sehr ähnlich, weicht von diesem vor allem durch schlankere Fühlerkeule, den Besitz von 4 Basalgrübchen des Halsschildes und durch anders geformten Penis ab.

BESCHREIBUNG: Long. 1,30 mm, lat. 0,60 mm, dunkel rotbraun, bräunlichgrau behaart.

Kopf von oben betrachtet gerundet-rautenförmig, im Niveau der stark vorgewölbten Augen am breitesten und mit den Augen breiter als lang, Hinterkopf und Schläfen abstehend behaart. Fühler zurückgelegt die Halsschildbasis fast erreichend, ihr Endglied spitz-eiförmig, so lang wie die beiden vorletzten zusammen.

Halsschild an der Basis so breit wie lang, mit 4 Basalgrübchen.

Flügeldecken sehr fein punktiert und behaart, vor der Basis mit kleiner Basalimpression.

Flügel voll entwickelt.

Beine schlank, Vorderschenkel kaum stärker verdickt als die der beiden anderen Beinpaare.

Penis (Abb. 68) sehr langgestreckt, distalwärts verbreitert, seine Basalöffnung im rechten Winkel nach oben gebogen. Parameren dem Peniskörper eng anliegend, das Penisende fast erreichend, mit 2 terminalen Tastborsten. Apex penis zweispitzig.

***Euconnus (Napoconnus) tambunanus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Crocker Range, 1000 m, (lg. Burckhardt u. Löbl, cMG); 4 Paratypen, Poring Hot Springs (lg. Burckhardt u. Löbl, cF); ebenda 6 Paratypen (cMG); 1 Paratypus, Mount Kinabalu, 1534 m, 29.5.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Fühlerkeule schlanker als bei *E. proceripenis*, Halsschild mit 2 Basalgrübchen, Flügeldecken abstehend behaart, Vorder- und Mittelschenkel keulenförmig verdickt.

BESCHREIBUNG: Long. 1,20 bis 1,30 mm, lat. 0,60 mm, Rotbraun, weißlich behaart. Kopf von oben betrachtet so lang wie mit den großen, vorgewölbten Augen breit, lang, nach hinten gerichtet behaart. Fühler zurückgelegt fast die Halsschildbasis erreichend, das 1. Glied fast 3 mal so lang wie breit, das 11. Glied in einer scharfen Spitze endend, so lang wie die beiden vorletzten zusammen. Halsschild leicht gewölbt, seine Basis nur so breit wie der Kopf mit den Augen, vor der Basis mit 2 Grübchen. Flügeldecken zusammen nicht viel breiter als die Halsschildbasis, abstehend behaart, an der Basis mit einer länglichen, wenig tiefen Basalimpression. Penis (Abb. 69) dem des *E. langananensis* ähnlich, wie dieser in flachem Bogen dorsalwärts gekrümmt. Basalöffnung dorsobasal gelegen, mit nur mäßig breitem Sklerotinrahmen umgeben. Parameren dünn, dem Peniskörper eng anliegend, das Penisende nicht ganz erreichend, im Spitzebereich mit 4 Tastborsten verschiedener Länge. Apex mit zwei stumpfen Spitzen, zwischen diesen mäßig tief ausgeschnitten. Unmittelbar vor dem apikal gelegenen Ostium penis liegt ein wenig differenzierter Sklerotikokomplex.

***Euconnus (Napoconnus) proceripenis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und Paratypus ♀, Crocker Range, 1600 m, 18.5.1987 (lg. Burckhardt u. Löbl, cMG); 1 Paratypus ♂ Penispräparat, Mount Kinabalu, 1500 m, 21.5.1987 (lg. Burckhardt u. Löbl cF); Crocker Range, 1530 bis 1650 m und 1200 m, 63 km route Kota Kinabalu, 16.5.1987 (lg. Burckhardt u. Löbl cMG); 1 Paratypus, Poring Hot Springs, 900 bis 950 m, 12.5.1987 (lg Burckhardt u. Löbl, cMG) und ebenda 1 Paratypus ♂, 11.5.1987 (cF).

DIAGNOSE: Gekennzeichnet durch breite Fühlerkeule, deren letztes Glied breiter als das vorletzte, am distalen Ende abgerundet, Halsschild mit 2 Basalgrübchen.

BESCHREIBUNG: Long. 1,30 mm, lat. 0,60 mm. Dunkel rotbraun, bräunlichgrau behaart.

Kopf von oben betrachtet gerundet-rautenförmig, im Niveau der stark vorgewölbten Augen am breitesten, mit den Augen breiter als lang, Hinterkopf und Schläfen abstehend behaart. Fühler zurückgelegt die Halsschildbasis erreichend, ihr Endglied spitz-eiförmig, so lang wie die beiden vorletzten zusammen.

Halsschild an der Basis so breit wie lang, mit 4 Basalgrübchen.

Flügeldecken sehr fein punktiert und behaart, an der Basis mit kleiner Basalimpression. Flügel voll entwickelt.

Beine schlank, Schenkel in der Dicke wenig verschieden.

Penis (Abb. 70) sehr langgestreckt distalwärts schwach verbreitert, seine Basalöffnung im rechten Winkel nach oben gebogen, Parameren dem Peniskörper eng anliegend, das Penisende fast erreichend, mit terminaler Tastborste. Apex penis 2-spitzig.

BESTIMMUNGSTABELLE DER *Napoconnus*-ARTEN AUS SABAH

- | | | |
|---|---|---------------------------|
| 1 | Sehr klein, Körperlänge 0,90 mm | <i>valdepullus</i> n. sp. |
| – | Größer, Körperlänge 1,20 mm und darüber | 2 |
| 2 | Kopf breit, mit den Augen beim ♂ annähernd so breit wie die Halsschildbasis, Fühler zurückgelegt die Halsschildmitte nicht erreichend, Körper sehr gedrungen gebaut | 3 |
| – | Kopf schmaler, Fühler zurückgelegt die Halsschildmitte überragend | 4 |
| 3 | Schläfen und Scheitel sehr dicht pelzig behaart, Halsschild ohne Basalgrübchen | <i>cephalotes</i> n. sp. |

- Schläfen und Hinterkopf dicht, aber nicht pelzig behaart, Halsschild mit 2 Basalgrübchen *langananensis* n. sp.
- 4 Halsschild ohne Basalgrübchen, 8. Fühlerglied breiter als das 7 *paralleleipenis* n. sp.
- Halsschild mit Basalgrübchen 5
- 5 Halsschild mit 2 Basalgrübchen, Vorderschenkel mäßig verdickt *tambunanus* n. sp.
- Halsschild mit 4 Basalgrübchen, Vorderschenkel stark verdickt. Hierher die 2 nur durch Unterschiede im Penisbau sicher unterscheidbaren Arten *proceripenis* n. sp. und *elongatior* n. sp.

Euconnus-species incertae sedis

Euconnus globicollis nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Poring Hot Springs, 6.5.1987 (lg. Burckhardt u. Löbl, cMG); 2 Paratypen ebenda, (cMG), und 1 Paratypus (cF).

DIAGNOSE: Gekennzeichnet durch länglich-rautenförmigen Kopf, undeutlich abgesetzte 5-gliedrige Fühlerkeule, schlanken konischen Halsschild mit 2 Basalgrübchen und kräftige Beine mit mäßig verdickten Schenkeln und gekrümmten Vorder- und Mittelschienen.

BESCHREIBUNG: Long. 1,80 mm, lat. 0,70 bis 0,80 mm. Rotbraun, die Beine heller gefärbt, gelblich behaart.

Kopf von oben betrachtet gerundet-rautenförmig und wenig länger als mit den großen, stark gewölbten Augen breit, die Schläfen doppelt so lang wie der Augendurchmesser, lang abstehend behaart. Fühler allmählich zur Spitze verdickt, mit undeutlich abgesetzter 5-gliedriger Keule, zurückgelegt die Halsschildbasis knapp erreichend, ihre beiden ersten Glieder leicht gestreckt, die folgenden isodiametrisch, vom 7. an gegen die Spitze zunehmend verdickt, das spitz-eiförmige Endglied so lang wie die beiden vorhergehenden zusammen. Halsschild so lang wie breit, fast konisch, seitlich abstehend behaart, mit 2 Basalgrübchen. Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, stark gewölbt und seitlich stark erweitert, nur mit Andeutung einer Basalimpression, ohne Humeralfalte, lang abstehend behaart.

Beine kräftig, Vorderschenkel stärker verdickt als die der Mittel- und Hinterbeine, Vorder- und Mittelschienen leicht medialwärts gekrümmt.

Penis (Abb. 71) sehr eigenartig gebaut, Apex penis stark nach oben gekrümmt, ebenso auch die Parameren, Operculum dagegen in der Ebene der Ventralwand des Penis gelegen, in einer stark verschmälerten am Ende spatelförmigen Spitze endend. Aus dem Ostium penis ragt rechtsseits ein starker Stachel nach oben: Die Parameren erreichen das Penisende nicht, sie tragen je 2 terminale Tastborsten.

Euconnus fraudulentus nov. spec.

MATERIAL: Nur Holotypus ♂ (Penispräparat), Mount Kinabalu, 1500 m, 25.4.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Dem *E. parakinabalumontanus* sehr ähnlich, von ihm aber durch nur 3-gliedrige Fühlerkeule und ganz andere Penisform verschieden. Gekennzeichnet außerdem durch kleinen, raufenförmigen Kopf, kurze Fühler und kurze Beine mit medialwärts gekrümmten Schienen.

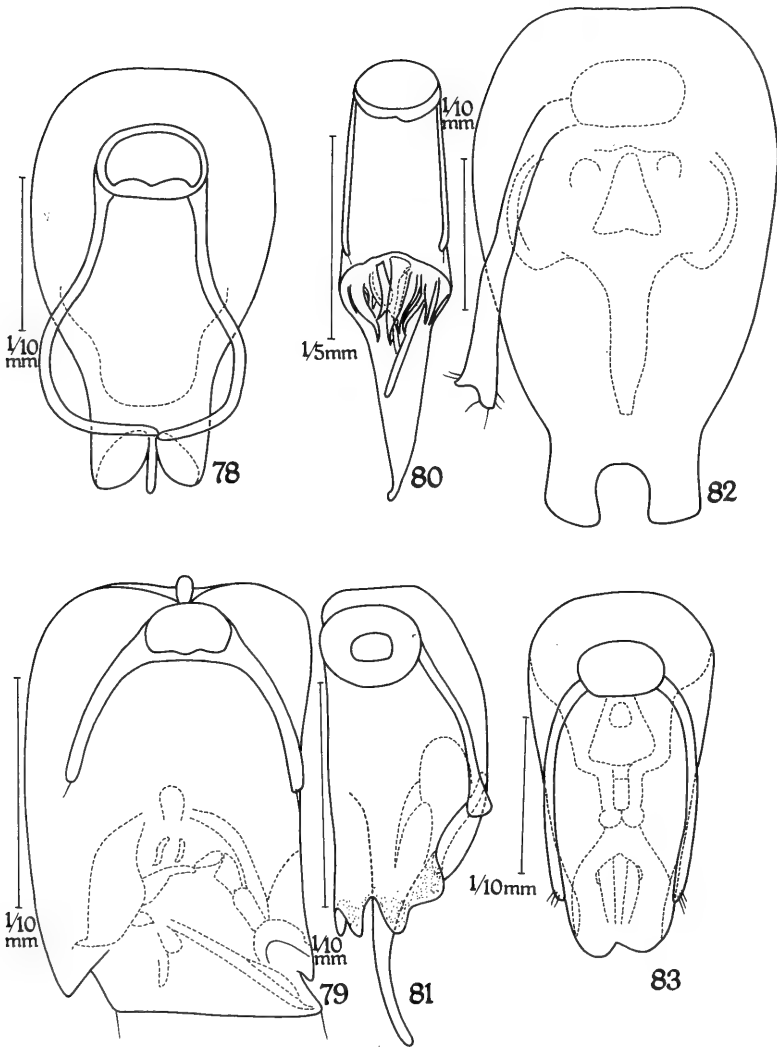


ABB. 78-83.

78: *Euconnus paramerorum* nov. spec., Penis in Dorsalansicht. 79: *Euconnus circumlatus* nov. spec., Penis in Dorsalansicht. 80: *Euconnus filipenis* nov. spec., Penis in Dorsalansicht. 81: *Euconnus stylifer* nov. spec., Penis in Dorsalansicht. 82: *Euconnus paraglobicollis* nov. spec., Penis in Dorsalansicht. 83: *Euconnus pondoki* nov. spec., Penis in Dorsalansicht.

BESCHREIBUNG: Long. 2,00 mm, lat. 1,00 mm. Schwarz, Beine rotbraun, dicht bräunlichgrau behaart.

Kopf von oben betrachtet rautenförmig mit stark vorgewölbten Augen, so breit wie lang, oberseits nach hinten gerichtet, an den Schläfen seitlich abstehend, dicht behaart. Fühler kurz, zurückgelegt nicht einmal die Halsschildmitte erreichend, alle Glieder mit Ausnahme des ersten und letzten breiter als lang, das 2. breiter als das 7., 3 mal so breit wie lang, halb so breit wie das 9., dieses fast, das 10. exakt doppelt so breit wie lang, das eiförmige Endglied so lang wie die beiden vorletzten zusammen. Halsschild so lang wie breit zum Vorderrand viel stärker als zur Basis verengt, sehr dicht und kurz, aufgerichtet behaart, mit 2 Basalrübchen.

Flügeldecken zusammen schon an der Basis viel breiter als die Halsschildbasis, mit sehr kleiner, lateral von einer wenig vortretenden Humeralfalte begrenzter Basalimpression, dicht punktiert und dicht abstehend behaart. Flügel entwickelt.

Beine kurz, Schenkel keulenförmig verdickt, Schienen medialwärts gekrümmt.

Penis (Abb. 72) wie bei vielen anderen *Euconnus*-Arten geformt, mit oberseits flachem, ventral vorgewölbtem Peniskörper und von diesem scharf abgesetztem, dreieckigem Apex. Die Basalöffnung mit stark sklerotisiertem Rahmen und das Penisende nicht ganz erreichenden Parameren. Diese mit je 3 terminalen Tastborsten, leicht gebogen. Seiten des Apex penis schwach ausgeschweift. Aus dem Ostium penis ragen mehrere Sklerotinstäbe heraus, von denen 2 von oben und hinten besehen rechts liegende mit Widerhaken versehen sind.

***Euconnus kinabalumontanus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Crocker Range, 1600 m, 18.8.1987 (lg. Burckhardt u. Löbl, cMG; 1 Paratypus, Mount Kinabalu, 1500 m, 21.5.1987 (lg. Burckhardt u. Löbl, cF).

DIAGNOSE: Gekennzeichnet durch gestreckten, gerundet-rautenförmigen Kopf mit kleinen Augen, steif abstehend behaarten, isodiametrischen Halsschild mit 4 Basalrübchen und stark medialwärts gekrümmte Vorderschienen.

BESCHREIBUNG: Long. 1,90 mm, lat. 0,88 bis 1,00 mm, schwarz, die Beine rötlichbraun, braun behaart.

Kopf von oben betrachtet lang-rautenförmig, die kleinen Augen an den Kopfseiten weit nach vorne gerückt, lang und dicht abstehend behaart. Fühler mit scharf abgesetzter, 4-gliedriger Keule, zurückgelegt die Halsschildmitte erreichend, ihre beiden ersten Glieder eineinhalbmal so lang wie breit, 3 bis 7 klein, isodiametrisch, 8 3-mal so breit wie 7, 9 und 10 noch etwas breiter, alle 3 stark quer, das Endglied sehr kurz eiförmig, fast so lang wie 9 und 10 zusammen.

Halsschild breiter als der Kopf, so lang wie breit, beinahe konisch, mit 4 Basalrübchen, dicht und abstehend behaart.

Flügeldecken zusammen an der Basis so breit wie die Halsschildbasis, mit von einer langen Humeralfalte begrenzter Basalimpression, fein punktiert und abstehend behaart.

Beine ziemlich lang und schlank, Schenkel schwach verdickt, Mittelschienen medio-distalwärts gebogen.

Penis (Abb. 73) mit einem von oben betrachtet eineinhalbmal so langen wie breiten, parallelseitigen Peniskörper und einem von diesem scharf abgesetzten zungenförmigen Apex. Basalöffnung dorsal gelegen, mit sklerotisiertem Rahmen, Parameren gerade, die Basis des Apex penis etwas überragend, mit je einer terminalen Tastborste. Operculum weniger als halb so lang wie der Apex, sein Hinterrand halbkreisförmig, seine Basis flach bogenförmig begrenzt, stark sklerotisiert.

***Euconus parakinabalumontanus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Mount Kinabalu, 1450 bis 1550 m, 23.5.1987 (Burckhardt u. Löbl, cMG); 1 Paratypus ♀, 1450 m, HQ Liwago River, 7.8.1988 (lg. Smetana, cF).

DIAGNOSE: Gekennzeichnet durch lange Behaarung der Oberseite, kurze Fühler mit 4-gliederiger Keule, Penis sehr ähnlich dem von *E. kinabalumontanus*.

BESCHREIBUNG: Long. 1,90 bis 2,10 mm, lat. 0,80 mm. Dunkel rotbraun, graubraun behaart.

Kopf von oben betrachtet länglich-rund mit kleinen vor seiner Längsmittle stehenden Augen, Hinterkopf und Schläfen sehr lang und dicht behaart. Fühler mit 4 gliederiger Keule, zurückgelegt nur die Halsschildmitte erreichend, ihr Basalglied und das 2. um ein Drittel länger als breit, 3 bis 7 klein, isodiametrisch, 8 mehr als doppelt so breit wie 7, wie auch 9 und 10 mehr als doppelt so breit wie lang, das gerundet-kegelförmige Endglied nicht ganz so lang wie 9 und 10 zusammen.

Halsschild isodiametrisch, seitlich mäßig gerundet, zum Vorderrand nur wenig mehr als zur Basis verengt, sehr dicht, und abstechend behaart. Flügel voll entwickelt.

Beine kurz, Schenkel mäßig verdickt.

Penis (Abb. 74) von oben betrachtet aus einem distal verbreiterten Peniskörper und einem davon abgeschnürten, gerundet rechteckigen Apex bestehend. Parameren nur die Basis des Apex penis erreichend, am distalen Ende mediodistal gekrümmt, mit je 2 terminalen Tastborsten. Apex penis gerundet-viereckig, seine Umrandung stärker sklerotisiert. Im Penisinneren liegen vor der Basis des Apex, spiegelbildlich zur Sagittalebene, 4 Sklerotinkörper.

***Euconus minutipenis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Kinabalu Nat. Park, Sumit Trail, Pondok Lowii, 2300 bis 2400 m, 28.4.1987 (lg. Smetana, cMG); 2 Paratypen, Crocker Range, 1550 bis 1659 m, 18.5.1987 (lg. Burckhardt u. Löbl, cMG); 2 Paratypen, Poring Hot Springs, 550 bis 950 m, 9. bis 12.5.1987 (lg. Burckhardt u. Löbl, cF); ebenda, 1 Paratypus, 485 m, 20.8.1987 (lg. Smetana cMG); 2 Paratypen, Mount Kinabalu, 1550 bis 1700 m, 24. bis 27.5.1987 (lg. Burckhardt u. Löbl, cF); 1 Paratypus, Kinabalu Nat. Park, Mempasi Trail, 1600 m, 22.5.1987 (lg. Smetana, cMG); 1 Paratypus, Kinabalu Nat. Park, Sumit Trail, Pondok-Utah, 2050 m, 26.4.1987 (lg. Smetana, cMG); Crocker Range, ca. 1000 m, 5.9.1988 (lg. Smetana, cMG).

DIAGNOSE: Äußerlich dem *E. globicollis* ähnlich, aber heller rotbraun, schütterer behaart, Vorderschienen kaum merklich medialwärts gebogen, Flügeldecken zusammen schon an der Basis wesentlich breiter als die Halsschildbasis, Fühler mit deutlich abgesetzter 4 gliederiger Keule, Penis ganz anders geformt.

BESCHREIBUNG: Long. 1,70 bis 1,80 mm, lat. 0,60 bis 0,70 mm. Rotbraun, Palpen und Beine heller gefärbt, bräunlichgelb behaart.

Kopf von oben betrachtet gerundet-rautenförmig, die Augen beim ♂ größer und stärker vorgewölbt als beim ♀, Hinterkopf beulenförmig über den Hals vorragend, Schläfen dicht, seitlich abstechend behaart. Fühler dick, beim ♀ zurückgelegt die Halsschildbasis etwas, beim ♂ um die beiden letzten Glieder überragend, ihr Basalglied dicker als die folgenden, das 2. beim ♂ reichlich, beim ♀ knapp doppelt so lang wie breit, die folgenden Glieder bis zum 7. kugelig, 8 bis 10 isodiametrisch, doppelt so breit wie 7, das kegelförmige Endglied nicht ganz so lang wie die beiden vorletzten zusammen.

Halsschild beim ♂ leicht gestreckt, beim ♀ so breit wie lang, mit 2 großen medialen und 2 kleinen lateralen Basalgrübchen, auf der Scheibe schütter, an den Seiten sehr dicht, abstechend behaart, zum Vorderrand sehr stark, zur Basis fast nicht verengt.

Flügeldecken zusammen schon an der Basis breiter als die Halsschildbasis, beim ♂ gestreckter als beim ♀, mit flacher, aber lateral von einer Humeralfalte scharf begrenzter Basalimpression, fein punktiert und schräg abstehend behaart.

Schenkel beim ♂ stärker als beim ♀ keulenförmig verdickt, Schienen mediodistal flach ausgerandet und mit Haarfilz bedeckt, beim ♂ stärker als beim ♀ mediodistal gekrümmt, Tarsen sehr zart.

Penis (Abb. 75) sehr klein dorsalwärts gekrümmt, der Apex nicht vom Peniskörper abgesetzt, dreieckig, aber vor der Spitze breit abgerundet. Basalöffnung dorsobasal gelegen, mit einem sklerotisierten Rahmen umgeben, Parameren das Penisende nicht ganz erreichend und jede mit 4 terminalen Tastborsten versehen. Das spitzwinkelig-dreieckig ausgeschnittene Operculum erreicht den Hinterrand des Apex, es ist stärker sklerotisiert als der Peniskörper.

***Euconnus glandulipenis* nov. spec.**

MATERIAL: Nur Holotypus ♂, Poring Hot Springs, 500 m, 6.5.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch schokoladebraune Färbung, lange, 4- bis 5-gliedrige Fühlerkeule, gerundet-rautenförmigen Kopf mit stark vorgewölbten Augen und nahezu konischen Halsschild. Im Habitus täuschend an *Napoconnus* erinnernd, aber durch die lange 4- bis 5-gliedrige Fühlerkeule und durch den Penisbau als einer ganz anderen Verwandtschaftsgruppe zugehörig erwiesen.

BESCHREIBUNG: Long. 1,50 mm, lat. 0,76 mm. Dunkel schokoladebraun, hellgrau behaart.

Kopf von oben betrachtet gerundet-rautenförmig, mit großen, stark vorgewölbten Augen und beulenförmig gegen den Hals vortretendem Hinterkopf, lang grau behaart.

Fühler zurückgelegt die Halsschildbasis überragend, ihre 4- bis 5-gliedrige Keule länger als die Geißel, das Basalglied sehr kurz, das 2. zweieinhalbmal länger als breit, 3 bis 5 annähernd isodiametrisch, 6 und 7 klein, breiter als lang, 8 bis 10 so lang wie breit, das eiförmige Endglied fast so lang wie 9 und 10 zusammen.

Halsschild etwas länger als breit, nahezu konisch, an der Basis nur wenig breiter als der Kopf mit dem Augen, stark gewölbt, mit 2 Basalgrübchen, schütter, anliegend behaart.

Flügeldecken sehr kurz oval, hoch gewölbt, schon an der Basis zusammen viel breiter als die Halsschildbasis, mit lateral von einer Humeralfalte begrenzter Basalimpression, mit langer, fast anliegender Behaarung.

Beine kurz. Schenkel schwach verdickt.

Penis (Abb. 76) sehr gedrungen gebaut, der Peniskörper von oben betrachtet fast kreisrund, der Apex aus 2 spitzwinkelig-dreieckigen Teilen bestehend. Basalöffnung ohne sklerotisierten Rahmen, von den Parameren ist am einzigen Präparat nur eine erhalten, die nur die Basis des Apex penis erreicht. Sie ist an der Spitze verbreitert und mit mehreren Tastborsten besetzt. In der Mitte des Peniskörpers liegt ein rundlicher sklerotisierter Körper und distal davon ein doppelt- halbmondförmiges Sklerotinband.

***Euconnus robusticeps* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und Paratypus, Mount Kinabalu Nat. Park, area Langanan Crk., 885 m, 22.8.1988 (lg. Smetana, cMG); 1 Paratypus, Poring Hot Springs, 500 m, 3.5.1987 (lg. Burckhardt u. Löbl, cMG) und 1 Paratypus ebenda, 13.5.1987 (lg. Burckhardt u. Löbl, cF); 1 Paratypus, Crocker Range, km. 6 NE Kota Kinabalu Tambunan, 19.5.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Sehr ausgezeichnet durch gedrungenen Körperbau, großen runden Kopf und kugelig gewölbten Halsschild, sowie kurze Fühler und Beine.

BESCHREIBUNG: Long. 1,80 bis 2,00 mm, lat. 0,60 mm. Schwarz, Beine rotbraun, Palpen bräunlichgelb, braun behaart.

Kopf von oben betrachtet nahezu kreisrund, flach gewölbt, fast so lang und breit wie der Halsschild, an den Schläfen dicht und steif abstehend behaart, Augen klein, weit nach vorne gerückt. Fühler dick, zurückgelegt nur das vorderste Viertel der Halsschildlänge erreichend, die Geißelglieder kurz und gedrängt aneinanderschließend, die 4-gliedrige Keule fast so lang wie die Geißel, Glied 8 um die Hälfte breiter als 7, 9 um mehr als die Hälfte breiter als 8, wie auch 10 stark quer. Das gerundet kegelförmige Endglied so lang wie die beiden vorletzten zusammen.

Halsschild kugelig, gleichmäßig vom Vorderrand bis zur Basis gerundet, sehr dicht abstehend behaart, mit 2 großen medianen und 2 kleinen lateralen Basalgrübchen.

Flügeldecken an der Basis zusammen kaum breiter als die Halsschildbasis, stark gewölbt und seitlich gleichmäßig gerundet, mit ziemlich tiefer Basalimpression, fein punktiert und nach hinten gerichtet behaart. Flügel entwickelt.

Beine sehr kurz und dick, alle Schenkel stark verdickt, die Schienen in der Längsmittle breiter als an den beiden Enden, leicht medialwärts gekrümmt.

Penis (Abb. 77) von oben betrachtet oval, der Apex zweistufig zur Spitze verschmälert, in einer scharfen Spitze endend. Basalöffnung groß, nur die distale Hälfte ihrer Umrahmung stark sklerotisiert. Parameren die Längsmittle des Apex erreichend, mit je 3 terminalen Tastborsten. Im distalen Viertel der Penislänge befindet sich ein stark sklerotisierter Komplex, der die ganze Penisbreite einnimmt.

***Euconnus paramerorum* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Mount Kinabalu, 1750 m, 27.4.1987 (lg. Burckhardt u. Löbl, cMG); ebenda Paratypus ♂ (Penispräparat) (lg. Burckhardt u. Löbl, cF); Paratypus, Poring Hot Springs, 550 bis 600 m, 9.5.1987 (lg. Burckhardt u. Löbl, cMG) und Paratypus above Poring Hot Springs, 570 m, 15, 8, 1988 (lg. Smetana, cMG).

DIAGNOSE: Sehr ausgezeichnet durch annähernd kugelförmigen Kopf, unscharf abgesetzte, 5-gliedrige Fühlerkeule, beim ♂ sehr stark verdickte Vorderschenkel und durch den Penisbau.

BESCHREIBUNG: Long. 1,60 m, lat. 0,60 mm. Schwarz, Beine rotbraun, Palpen hell gelbbraun.

Kopf von oben betrachtet ungefähr kugelig, Scheitel beulenförmig emporgewölbt, Augen groß, aber wenig gewölbt, allseits abstehend behaart. Fühler beim ♂ mit undeutlich abgegrenzter 5-gliedriger, beim ♀ mit 4-gliedriger Keule, zurückgelegt die Halsschildbasis knapp erreichend, ihre beiden ersten Glieder leicht gestreckt, 3 bis 6 kugelig, 7 beim ♂ um die Hälfte breiter als 6, beim ♀ kaum größer als das vorhergehende, 8 bis 11 doppelt so breit wie 6, 8 kaum, 9 und 10 zunehmend breiter als lang, das gerundet-kegelförmige Endglied fast so lang wie die beiden vorletzten zusammen.

Halsschild kugelig gewölbt, zum Vorderrand stärker als zur Basis verengt, so lang wie breit, mit 2 Basalgrübchen, abstehend behaart.

Flügeldecken schon an der Basis zusammen etwas breiter als die Halsschildbasis, kaum länger als Kopf und Halsschild zusammen; sehr fein punktiert und mäßig dicht, nach hinten gerichtet behaart. Basalimpression seicht, lateral von einer Humeralfalte begrenzt.

Beine mittellang, Vorderschenkel etwas stärker verdickt als die der beiden anderen Beinpaare, Schienen schwach gebogen.

Penis (Abb. 78) von oben betrachtet birnförmig, mit großer, von einem skerotisierten Rahmen umgebener Bassöffnung. Apex nicht abgesetzt, Ostium penis terminal gelegen, Parameren sehr lang, distal der Mitte in weitem Bogen zur Sagittalebene gebogen.

***Euconnus circumlatus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Kinabalu Nat. Park, Poring Hot Springs, 520 m, 15.8.1988 (lg. Smetana, cMG); 1 Paratypus, ebenda 9.5.1987 (lg. Smetana, cMG); 6 Paratypen, ebenda 500 bis 600, 7. bis 13.5.1987 (lg. Burckhardt u. Löbl, cMG); 4 Paratypen, Kinabalu Nat. Park, Sumit Trail Pondok Ubah, 2000 bis 2400 m, 26.4.1987 (lg. Smetana, cMG); HQ Liwagu River, 1500 bis 1550 m, 27.4.1987 (lg. Smetana, cMG); Mount Kinabalu, 1750 m 27.4.1987 (lg. Burckhardt u. Löbl, cMG); 4 Paratypen, ebenda, Mount Kinabalu, 2600 m, 2.5.1987 (lg. Burckhardt, u. Löbl, cF) und 3 Paratypen ebenda (cMG); 4 Paratypen, ebenda, 1550 m, (cMG).

DIAGNOSE: Sehr ausgezeichnet durch von oben betrachtet fast kreisrunden Kopf, sehr scharf abgesetzte, 4-gliedrige Fühlerkeule und durch den Penisbau.

BESCHREIBUNG: Long. 1,50 bis 1,80 mm, lat. 0,60 bis 0,80 mm. Kastanienbraun, die Beine rotbraun, bräunlich behaart.

Kopf von oben betrachtet fast kreisrund, mit großen, flach gewölbten Augen und bärtig abstehend behaarten Schläfen, Fühler zurückgelegt die Halsschildmitte wenig überragend, ihre beiden ersten Glieder um ein Viertel länger als breit, breiter als die folgenden, 3 bis 7 annähernd so lang wie breit, 8 3mal so breit wie 7, sehr schwach quer, 9 und 10 noch etwas breiter als das Endglied, dieses gerundet- kegelförmig, wenig länger als breit.

Halsschild konisch, nicht breiter als der Kopf, dicht, abstehend behaart, mit 2 weit an die Seiten gerückten Basalgrübchen, Flügeldecken an der Basis zusammen nur wenig breiter als die Halsschildbasis, mit kleiner furchenförmig vertiefter Basalimpression, sehr fein punktiert und abstehend behaart. Flügel entwickelt.

Beine lang, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb. 79) gedrungen gebaut, schwach sklerotisiert, von oben betrachtet gerundet-rechteckig, leicht nach oben gebogen, Umrahmung der Basalöffnung distal stark sklerotisiert, von ihrem Basalrand ragt ein Sklerotinzapfen nach vorne. Parameren sehr kurz, nicht einmal die Längsmittle des Penis erreichend, mit einer terminalen Tastborste. Apex vom Peniskörper abgesetzt, eine breite und kurze, nach oben gerichtete Platte darstellend. In ihren Hinerecken steht beiderseits eine lange, nach hinten gerichtete Tastborste. Im Penisinneren steht sagittal eine tropfenförmige Apophyse, von der beiderseits ein Sklerotinbogen zur Seite und nach hinten zieht. Zwischen den beiden Bögen befinden sich in unregelmäßiger Anordnung kleine Sklerotinkörper. Im Apikalbereich zieht von oben und hinten betrachtet nach hinten rechts ein langer Sklerotinstab, an dessen linker Seite basal weitere kleine Sklerotinkörper angeordnet sind.

***Euconnus filipenis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Mount Kinabalu, 1500 m, 25.4.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch geringe Größe, querovalen Kopf mit stark vorge-wölbten, großen Augen und schlanken Fühlern mit 4-gliedriger Keule, isodiametrischem Halsschild mit 2 durch eine Querfurchen verbundenen Basalgrübchen. Penis sehr schlank.

BESCHREIBUNG: Long. 1,20 mm, lat. 0,50 mm, hell rotbraun, wenig dicht hellbraun behaart.

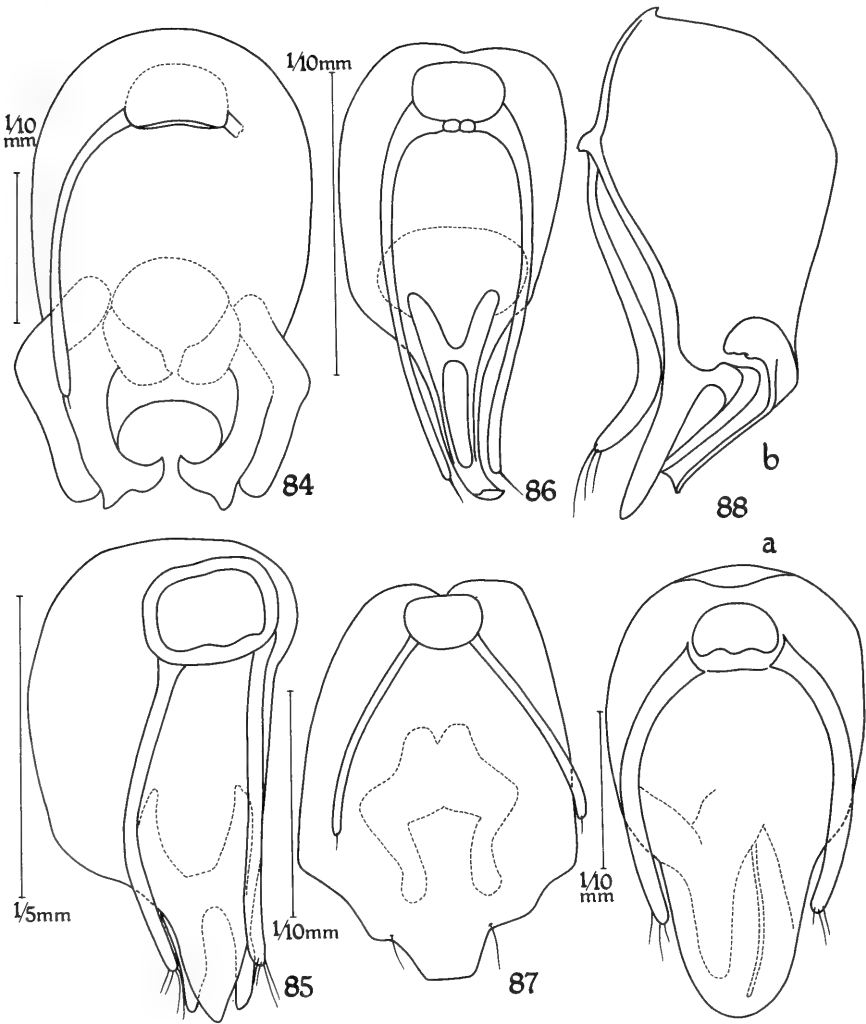


ABB. 84-88.

84: *Euconnus crockeranus* nov. spec. Penis in Dorsalansicht. 85: *Euconnus valdepilosus* nov. spec., Penis in Dorsolateralansicht. 86: *Euconnus tortricornis* nov. spec., Penis in Dorsalansicht. 87: *Euconnus borneoensis* nov. spec. Penis in Dorsalansicht. 88: *Euconnus crockeri* nov. spec., Penis a) in Dorsal-, b) in Lateralansicht.

Kopf mit den großen, vorgewölbten Augen quereval. Die Fühler mit lockerer, 4-gliedriger Keule, zurückgelegt die Halsschildbasis erreichend, ihr Basalglied und das 2. um die Hälfte länger als breit, 3 bis 7 annähernd isodiametrisch, 8 bis 10 mehr als doppelt so breit wie 7, und breiter als lang, das Endglied gerundet-kegelförmig, kürzer als 9 und 10 zusammen.

Halsschild so lang wie breit, kaum breiter als der Kopf mit den Augen, seitlich gleichmäßig gerundet, vor der Basis mit 2 durch eine Querfurche verbundenen Grübchen, seitlich abstehend behaart.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, mit lateral durch eine Humeralfalte begrenzter Basalimpression, schütter behaart.

Beine schlank, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb. 80) sehr schmal und langgestreckt, schwach sklerotisiert, seine Dorsalwand in der Längsmittle im Bogen begrenzt, distal von der Begrenzung ragen aus dem Penisinneren zahlreiche Stachel nach hinten. Das Operculum ist nahezu so lang wie der Peniskörper, sehr spitzwinkelig-dreieckig, seine äußerste Spitze aufgebogen.

Euconnus stylifer nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Poring Hot Springs, 500 m, 8.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda 2 Paratypen (cF); 1 Paratypus ♀ Kinabalu Nat. Park, HQ Sillar, 1540 m, 14.8. bis 1.9.1988 (lg. Smetana, cMG).

DIAGNOSE: Gekennzeichnet durch kastanienbraune Färbung, unscharf abgesetzte 5-gliedrige Fühlerkeule, kugelig gewölbten Halsschild mit sehr dichter, senkrecht abstehegender Behaarung und lang-strichförmig in einer Eindellung verlaufende Basalimpression.

BESCHREIBUNG: Long. 1,50 bis 1,60 mm, lat. 0,70 bis 0,75 mm. Kastanienbraun, braungrau behaart.

Kopf von oben betrachtet gerundet-rautenförmig, Schläfen sehr dicht, abstehend behaart, Augen klein, seitlich vorgewölbt.

Fühler zurückgelegt die Halsschildbasis knapp erreichend, mit unscharf abgesetzter 5-gliedriger Keule, ihre beiden ersten Glieder gestreckt, 3 bis 6 klein, isodiametrisch, 7 um die Hälfte breiter als 6, 8 bis 10 gleichbreit, doppelt so breit wie 7, alle 3 stark quer, das eiförmige Endglied kürzer als 9 und 10 zusammen. Halsschild fast so lang wie breit, sehr dicht und steif aufgerichtet behaart, mit 4 tiefen Basalgrübchen.

Flügeldecken schon an der Basis zusammen viel breiter als die Halsschildbasis, fein punktiert und abstehend behaart, mit tiefer Basalimpression und schräger, hoch emporgewölbter Humeralfalte. Flügel voll entwickelt.

Beine mittellang, Vorderschenkel stärker verdickt als die der beiden anderen Beinpaare, Mittelschienen medialwärts gekrümmt. Flügel voll entwickelt.

Penis (Abb. 81) langgestreckt, Peniskörper von oben betrachtet doppelt so lang wie breit, die Basalöffnung von einem breiten sklerotisierten Rahmen umgeben, die Parameren die Mitte des Peniskörpers wenig überragend, zur Spitze verbreitert, ohne Tastborsten. Aus dem Ostium penis ragt ein langer, ventralwärts gebogener Sklerotinstab nach hinten heraus. Er wurzelt hinter der Längsmittle des Peniskörpers und ist an der Basis verhältnismäßig breit. Er verschmälert sich distalwärts trichterförmig. Auf seiner von hinten und oben betrachtet rechten Seite liegen hintereinander 2 große ovale Sklerotinkörper und unter diesen ein schmales stark sklerotisiertes Operculum. Die Dorsalwand des Penis ist über das Operculum hinaus distalwärts verlängert und wellenförmig begrenzt, sie ist in

dem Bereich vor dem Hinterrand mit zahlreichen Poren besetzt. Eine Abgrenzung der apikalen Partie gegen den Peniskörper ist nicht vorhanden.

***Euconnus paraglobicollis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Crocker Range, 1550 bis 1650 m, 16.6.1987 (lg. Burckhardt u. Löbl, cMG); 3 Paratypen, Poring Hot Springs, 500 m, (lg. Burckhardt u. Löbl, cMG); 1 ♂ (Penispräparat) ebenda (cF).

DIAGNOSE: Äußerlich dem *E. globicollis* sehr ähnlich, von ihm durch scharf abgesetzte 4-gliedrige Fühlerkeule und abweichenden Penisbau verschieden und mit ihm deshalb nicht nahe verwandt.

BESCHREIBUNG: Long. 1,60 bis 1,65 mm, lat. 0,60 bis 0,70 mm. Rotbraun, bräunlich behaart.

Kopf von oben betrachtet gerundet-rautenförmig, länger als breit, stark gewölbt, die kleinen Augen seitlich etwas vorragend. Schläfen steif abstehend behaart. Fühler zurückgelegt die Halsschildbasis etwas überragend, die 4-gliedrige Keule etwas kürzer als die Geißel, die beiden ersten Glieder etwas länger als breit, 3 bis 7 isodiametrisch, 8 nicht ganz, 9 und 10 reichlich doppelt so breit wie 7, das eiförmige Endglied etwas kürzer als die beiden vorletzten zusammen.

Halsschild schwach gerundet, fast konisch, an der Basis kaum merklich breiter als der Kopf mit den Augen, mit kleinen Basalgrübchen, an den Seiten abstehend behaart. Flügel voll entwickelt.

Beine kräftig, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb. 82) von oben betrachtet eiförmig, der Apex schwach abgesetzt. Basalöffnung des Penis im einzigen vorhandenen Präparat bei Präparation zerstört, Parameren abgebrochen. Die von oben und hinten betrachtet linke in der vermutlich richtigen Position in der Abbildung dargestellt, distal leicht verbreitert, an der Spitze mit 2 längeren Tastborsten, davor auf beiden Seiten mit je 2 kleinen Börstchen. Im Penisinneren entspringt der Präputialsack distal aus einem breiten, lateral durch sklerotisierte Leisten begrenzten Raum. Er verengt sich trichterförmig zu einem Rohr, das bis zur Basis des Apex penis reicht und dessen distales Ende düsenförmig verengt ist. In dem breiten basalen Teil befindet sich sagittal ein sklerotisierter dreieckiger Körper, an dessen beiden Seiten 2 kleinere, rundliche angedeutet sind. Der Apex penis ist zweiteilig, die beiden Teile sind durch einen bogenförmigen Ausschnitt getrennt.

***Euconnus pondoki* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Kinabalu Nat. Park, Sumit Trail Pondok Ubah, 2050 m, 26.4.1987 (lg. Smetana, cMG); Paratypus ♂ (Penispräparat), Poring Hot Springs, 350 bis 600 m, 9.5.1987 (lg. Burckhardt u. Löbl, cF).

DIAGNOSE: Zu den Arten mit raute-förmigem Kopf und konischem Halsschild gehörig. Unter diesen verhältnismäßig klein.

BESCHREIBUNG: Long. 1,40 mm, lat. 0,60 mm. Rotbraun, bräunlich behaart.

Kopf von oben betrachtet gerundet-rautenförmig, im Niveau der etwas vor seiner Längsmittle stehenden Augen am breitesten, leicht gestreckt, die Schläfen und der Hinterkopf abstehend behaart.

Fühler mit 4-gliedriger Keule, zurückgelegt die Halsschildbasis knapp erreichend, ihre beiden ersten Glieder leicht gestreckt, 3 bis 7 klein, breiter als lang, 8 doppelt so breit wie 7, isodiametrisch, 9 und 10 breiter als lang, das eiförmige Endglied kürzer als die beiden vorletzten zusammen.

Halsschild konisch, etwas länger als breit, mit 2 Basalgrübchen, an den Seiten dicht behaart.

Flügeldecken schon an der Basis zusammen etwas breiter als die Halsschildbasis, fein punktiert und behaart, mit einer lateral von einer Humerafalte begrenzten Basalimpression. Flügel voll entwickelt.

Beine mäßig lang, Schenkel keulenförmig verdickt, Schienen gerade.

Penis (Abb. 83) von oben betrachtet eiförmig, distal verschmälert, der Apex nicht abgesetzt, sein Hinterrand in der Mitte eingekerbt. Basalöffnung ohne sklerotisierte Umrahmung. Parameren das Hinterende des Penis nicht erreichend, vor der Spitze mit je 3 lateralen Tastborsten. Hinter der Basalöffnung befindet sich im Penisinneren ein U-förmiger Sklerotinkörper. Zwischen den basalwärts gerichteten Armen des U befindet sich ein kleiner, tropfenförmiger Sklerotinkörper. Distal schließen an das U 2 parallel zur Sagittalebene liegende Sklerotinstäbe an, die distal kugelig erweitert sind. Die Seiten des Penis sind zwischen der Basalöffnung und der Apikalregion stärker sklerotisiert als der Basal- und Apikalbereich. Vor dem Hinterrand des Penis stehen spiegelbildlich zur Sagittalebene 2 parallele Sklerotinstäbe.

***Euconnus crockeranus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Crocker Range, 1200 m km 63 NE Kota Kinabalu Tambunan, 11.5.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch sehr kurze Fühler mit gedrungener 4-gliedriger Keule, schwarze Körperfärbung und rotbraune Extremitäten.

BESCHREIBUNG: Long. 1,40 mm, lat. 0,60 mm. Schwarz, die Extremitäten rotbraun, bräunlich behaart.

Kopf von oben betrachtet gerundet-rautenförmig, länger als breit, die Schläfen doppelt so lang wie der Augendurchmesser, abstehend behaart. Fühler zurückgelegt nicht einmal die Halsschildmitte erreichend, Glied 1 sehr kurz, 2 dick, isodiametrisch, 3 bis 7 sehr klein, breiter als lang, 8 3-mal so breit wie 7, 9 und 10 noch etwas breiter, alle 3 stark quer, das Endglied knapp so lang wie breit. Halsschild gleichmäßig zum Vorderrand und zur Basis verengt, so lang wie breit, seitlich dicht und struppig behaart, mit 2 Basalgrübchen.

Flügeldecken kurzoval, schon an der Basis etwas breiter als die Halsschildbasis, nur mit Andeutung einer Basalimpression, fein punktiert und abstehend behaart.

Beine kurz, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb. 84) von oben betrachtet oval, der Peniskörper in den basalen 2 Dritteln schwach sklerotisiert und auch die Basalöffnung nur am distalen Rand stärker versteift. Parameren schlank, das Penisende nicht erreichend, mit einer terminalen Tastborste. Das distale Drittel des Penis stark sklerotisiert, in der Längsmittle am Hinterrand im Bogen ausgeschnitten. In das distale Ende des Ausschnittes ragen von den Seiten 2 spiegelbildlich zu einander stehende Sklerotinhaken vor. An sie schließt basal auf beiden Seiten der Rand des Apex penis an, der im Winkel an den Peniskörper grenzt. Hier liegt in der Sagittalebene ein dünnhäutiges Fenster der Peniswand, das laterodistal auf beiden Seiten von einem stark sklerotisierten, annähernd halbmondförmigen Gebilde begrenzt wird.

***Euconnus valdepilosus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Crocker Range, 1550 bis 1650 m, 16.5.1987 (lg. Burckhardt u. Löbl, cMG); 1 Paratypus ebenda (cF) und 1 Paratypus (cMG).

DIAGNOSE: Gekennzeichnet durch robuste Körperform, dichte und steif aufgerichtete Behaarung der ganzen Oberseite und schwach abgesetzte 4-bis 5-gliedrige Fühlerkeule.

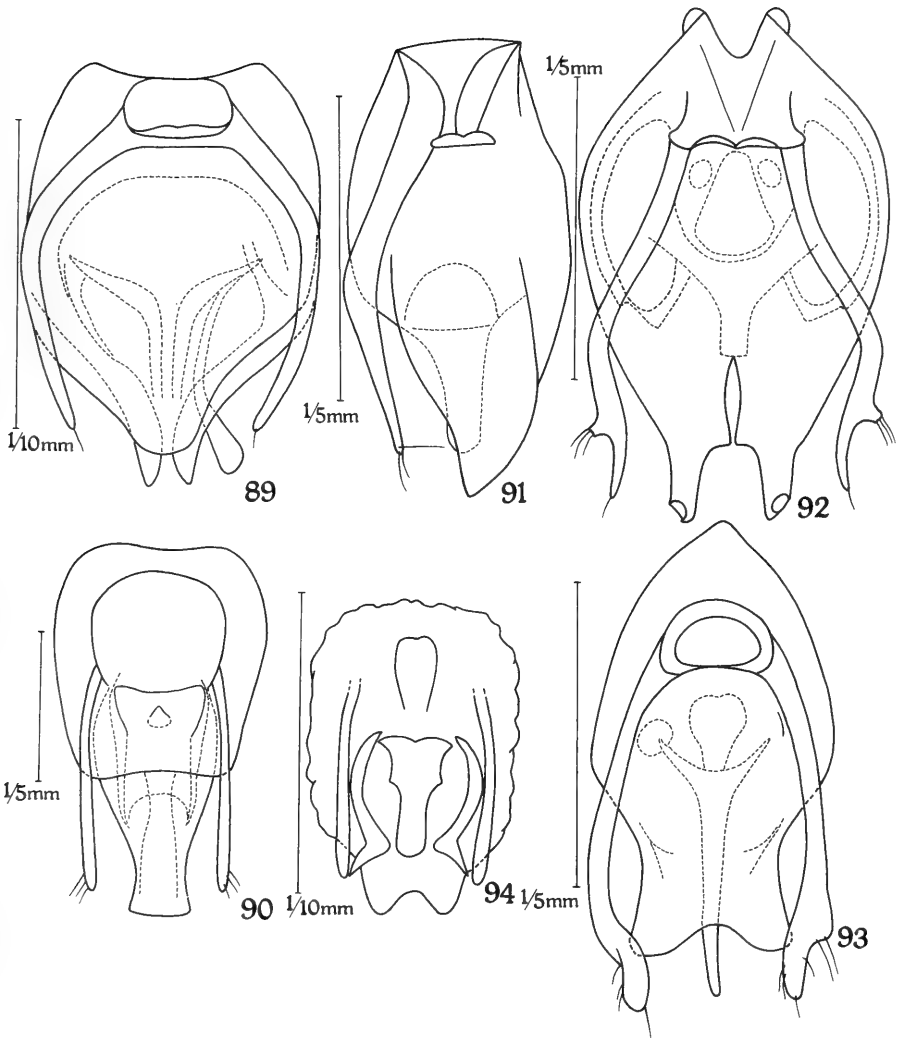


ABB. 89-94.

89: *Euconnus sabahi* nov. spec., Penis in Dorsalansicht. 90: *Euconnus protectus* nov. spec., Penis in Dorsalansicht. 91: *Euconnus crockericola* nov. spec., Penis in Dorsalansicht. 92: *Euconnus excelsipenis* nov. spec., Penis in Dorsalansicht. 93: *Euconnus longitubus* nov. spec., Penis in Dorsalansicht. 94: *Euconnus indecorus* nov. spec. Penis in Dorsalansicht.

BESCHREIBUNG: Long. 2,30 bis 2,50 mm, lat. 0,30 bis 1,00 mm. Braunschwarz.

Beine dunkel-rotbraun, Palpen heller, Behaarung schwarzbraun.

Kopf von oben betrachtet rund, stark gewölbt, fast kugelig, allseits dicht und steif abgehend behaart, mit kleinen, hinter den Fühlerwurzeln stehenden Augen. Fühler zurückgelegt die Halsschildbasis knapp erreichend, mit scharf abgesetzter, 4-bis 5-gliedriger Keule, diese sehr unscharf abgesetzt, das 2. Glied um ein Drittel länger als breit, 3 bis 7 leicht gestreckt, 8 bis 10 beim ♂ nicht ganz doppelt so breit wie lang, beim ♀ etwas schmaler, das eiförmige Endglied fast so lang wie die beiden vorletzten zusammen.

Halsschild stark gewölbt, etwas breiter als lang, kaum breiter und länger als der Kopf, allseits dicht und abgehend behaart, mit von der Behaarung stark verdeckten Basalgrübchen.

Flügeldecken stark gewölbt, schon an der Basis zusammen viel breiter als die Halsschildbasis, mit von einer sehr kurzen Humeralfalte begrenzter Basalimpression, fein punktiert und lang, nach hinten gerichtet behaart. Flügel entwickelt.

Beine mit stark verdickten Schenkeln und schwach gebogenen Schienen.

Penis (Abb. 86) aus einem kurzovalen Peniskörper, einem spitzwinkelig-dreieckigen Apex und einem diesem an Länge gleichen Operculum bestehend. Das Operculum ist stark sklerotisiert und besitzt die Form eines H, wobei dessen basale Teile der Verankerung im Peniskörper dienen, während die distalen unter dem Apex nach hinten ragen. Basalöffnung des Penis groß, dorsobasal gelegen. Parameren am distalen Rand der Basalöffnung wurzelnd, das Penisende fast erreichend, terminal mit je 2 langen und 2 kürzeren Borsten versehen.

***Euconnus tortricornis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Crocker Range, 1550 bis 1650 m (lg. Burckhardt u. Löbl, cMG); Paratypus ♂ Crocker Range, 1270 m, km 60 route Kota Kinabalu-Tambunan, 17.5.1987 (lg Burckhardt u. Löbl, cF); ebenda ♂ Paratypus, ebenda (cMG).

DIAGNOSE: ♂ gekennzeichnet durch die Fühlerbildung, mittlere Fühlerglieder exzentrisch.

BESCHREIBUNG: Long. 2,00 mm, lat. 0,90 mm. Schwarz, Palpen und Beine rotbraun, braun behaart.

Kopf von oben betrachtet gerundet-rautenförmig isodiametrisch, die Augen in der Längsmittlinie des Kopfes stehend, stark vorgewölbt, die Schläfen eineinhalbmal so lang wie der Augendurchmesser, seitlich abgehend, der Hinterkopf nach hinten gerichtet behaart. Fühler zurückgelegt die Halsschildbasis erreichend, beim ♂ die 3 ersten Glieder normal geformt, 1 und 2 gestreckt, 3 so lang wie breit, 4 dem 3. exzentrisch aufsteigend, ebenso 5 und 6, die Fühler dadurch in ihrem Bereich nach außen gedreht, 7 wieder in die Achse zurückgedreht, 8 bis 11 die normale Keule bildend, 8 bis 10 stark quer, das eiförmige Endglied so lang wie die beiden vorletzten zusammen. Beim ♀ sind die Fühler normal gebildet.

Halsschild so lang wie breit, zum Vorderrand stärker verengt als zur Basis, dicht, an den Seiten struppig abgehend behaart, mit 2 Basalgrübchen.

Flügeldecken sehr kurzoval, schon an der Basis zusammen viel breiter als die Halsschildbasis, fein punktiert und lang, abgehend behaart, mit breiter, lateral von einer Humeralfalte begrenzter Basalimpression.

Beine kurz, Schenkel mäßig verdickt, Schienen medialwärts gekrümmt.

Penis (Abb. 86) aus einem von oben betrachtet ovalen Peniskörper und einem langgestreckten schmalen Apex bestehend. Dieser ist dorsalwärts gebogen, die Spitze schmal

abgestutzt. Parameren das Penisende fast erreichend, mit einer sehr kräftigen terminalen Borste versehen. Der Apex ist durch ein H-förmiges Sklerotingerüst versteift. Dieses ist in der basalen Hälfte breiter, distalverschmälert. Zwischen und vor den basalen Ästen des H befindet sich ein großes querovales, dünnhäutiges Fenster.

***Euconnus borneoensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Mount Kinabalu, 1750 m, 27.4.1987 (Ig. Burckhardt u. Löbl, cMG); 1 Paratypus, ebenda (cF); 1 Paratypus, Poring Hot Springs, 550 bis 600 m, 9.5.1987 (Ig. Burckhardt u. Löbl, cMG); 1 Paratypus, Poring Hot Springs, area Eastern Ridge Trail; 1000 m, 29.9.1988 (Ig. Smetana, cMG).

DIAGNOSE: Gekennzeichnet durch großen runden Kopf, kurze Fühler mit 4-gliedriger Keule, konischen Halsschild sowie geringe Größe.

BESCHREIBUNG: Long. 1,40 mm, lat. 0,60 mm. Rotbraun, gelblich behaart.

Kopf von oben betrachtet kreisrund, flach gewölbt, mit bärtig behaarten Schläfen. Fühler zurückgelegt die Halsschildbasis nicht erreichend, mit scharf abgesetzter, 4-gliedriger Keule, die beiden ersten Glieder gestreckt, 3 bis 7 sehr klein, 8 bis 10 sehr stark quer, mehr als 3-mal so breit wie 7, das Endglied gerundet-kegelförmig, nicht ganz so lang wie breit.

Halsschild annähernd konisch, nicht breiter als der Kopf mit den Augen, seitlich struppig behaart, mit 2 großen Basalgrübchen.

Flügeldecken kurzoval, schon an der Basis zusammen breiter als die Halsschildbasis, mit lateral von einer kurzen Humeralfalte begrenzter Basalimpression, fein und wenig auffällig, jedoch aufgerichtet behaart.

Beine kurz und schlank.

Penis (Abb. 87) von oben betrachter wenig länger als breit, in den basalen drei Vierteln distalwärts verbreitert, dann stufenförmig verschmälert, der Apex kurz, zum Hinterrand abgestuft. Zu beiden Seiten der am weitesten distal stehenden Stufe steht eine kärtige Borste. Basalöffnung ohne sklerotisierten Rahmen, Parameren dünn, nur das distale Drittel der Penislänge erreichend, mit einer terminalen Tastborste. Im Penisinneren befindet sich ein in der Anlage 5-eckiger Sklerotinkörper, der wie ein vekehrtes U distalwärts offen ist.

***Euconnus crockeri* nov. spec.**

MATERIAL: Holotypus ♂ und Paratypus ♂ (Penispräparate), Crocker Range, 1550 bis 1650 m, 16.5.1987 (Ig. Burckhardt u. Löbl, cMG); Paratypus 1 ♂ (Penispräparat) Crocker Range, 1200 m, km 63 Kota Kinabalu-Tambunan, 19.5.1987, (cMG); ebenda, 1 Paratypus (cF).

DIAGNOSE: Gekennzeichnet durch unscharf abgesetzte 5-gliedrige Keule der nur 10-gliedrigeren Fühler, gerundet-rautenförmigen Kopf, konischen Halsschild und bedeutende Größe.

BESCHREIBUNG: Long. 2,20 bis 2,40 mm, lat. 0,80 bis 0,90 mm. Dunkel rotbraun, bräunlich behaart.

Kopf von oben betrachtet annähernd kreisrund, der Augendurchmesser nur so groß wie der des 1. Fühlergliedes, Schläfen absteht behaart.

Fühler nur 10-gliedrig, das Endglied aber distal leicht abgeschnürt, ähnlich wie bei *Napochus*, zurückgelegt die Halsschildbasis erreichend, mit unscharf abgesetzter 5-gliedriger Keule, das Basalglied etwas dicker als 2, dieses um ein Viertel länger als breit, 3 bis 5 sehr klein, 6 etwas größer, 7 um ein Drittel breiter als 6, 8 bis 10 noch breiter als 7, deutlich breiter als lang, das gerundet-kegelförmige Endglied fast so lang wie 9 und 10 zusammen.

Halsschild so breit wie lang, fast konisch, mit 2 großen Basalgrübchen, seitlich struppig abstehend behaart.

Flügeldecken langoval, an der Basis zusammen nur wenig breiter als die Halsschildbasis, mit breiter, lateral von einer schrägen Humeralfalte begrenzter Basalimpression, schräg abstehend behaart.

Beine kräftig und ziemlich lang, Vorderschenkel stärker verdickt als die der beiden anderen Beinpaare, Vorder- und Mittelschienen leicht medialwärts gekrümmt.

Penis (Abb. 88 a, b) von oben betrachtet eiförmig, mit schwach abgesetztem Apex, bei seitlicher Betrachtung nach oben gekrümmt. Unter dem Apex liegt noch stärker gekrümmt als dieser und in der Ruhelage mit der Spitze diesem genähert, von oben und hinten betrachtet links der schmale Ductus ejaculatorius, der nur in Lateralsicht als stark sklerotisiertes Rohr erkennbar ist. Die Basalöffnung des Penis besitzt nur distal einen stark sklerotisierten Rahmen, an dem die S-förmig gekrümmten Parameren inserieren. Sie sind mit je 3 terminalen Tastborsten bewehrt.

***Euconnus sabahi* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Mount Kinabalu, 1580 m 27.4.1987 (Ig. Burckhardt u. Löbl, cMG); 1 Paratypus ♀, Poring Hot Springs, 6.5.1987 (Ig. Burckhardt u. Löbl, cF); ebenda 1 Paratypus, 500 m, 11.5.1987 (Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch gerundet-rautenförmigen Kopf, scharf abgesetzte 4-gliedrige Fühlerkeule, konischen Halsschild mit 2 Basalgrübchen und durch die Penisform.

BESCHREIBUNG: Long. 1,30 mm, lat. 0,65 mm, rotbraun, lang gelblich behaart.

Kopf von oben betrachtet gerundet-rautenförmig, mit den Augen nicht ganz so breit wie lang, die Schläfen eineinhalbmal so lang wie der Augendurchmesser, dicht abstehend behaart. Fühler zurückgelegt die Halsschildbasis knapp erreichend, ihre beiden ersten Glieder gestreckt, 3 bis 7 klein, isodiametrisch, 8 bis 10 3-mal so breit wie 7, viel breiter als lang, das Endglied gerundet-kegelförmig, so lang wie breit.

Halsschild länger als breit, fast konisch, mit 2 Basalgrübchen, nach hinten gerichtet behaart.

Flügeldecken zusammen schon an der Basis breiter als der Halsschild, mit kurzer, lateral von einer kurzen Humeralfalten begrenzter Basalimpression, lang, nach hinten gerichtet behaart. Flügel voll entwickelt.

Beine schlank, Vorderschienen schwach medialwärts gekrümmt.

Penis (Abb. 89) sehr gedrungen gebaut, der Apex gerundet-dreieckig, vom Peniskörper nicht scharf gesondert. Operculum ein wenig länger als der Apex, aus 2 schmalen Sklerotinkörpern bestehend, nach vorne lateralwärts gebogen. Basalöffnung des Penis unmittelbar hinter dem Basalrand des Penis gelegen, nur am distalen Rand stark sklerotisiert, Parameren hier lateral wurzelnd, mit einer terminalen Tastborste versehen. Im Penisinneren liegt distal der Mitte ein großer sklerotisierter Trichter, dessen Mündung in den Spalt zwischen den beiden Teilen des Operculums führt. Von dem von oben und hinten betrachtet rechten Rand des Trichters entspringt ein langer distalwärts verbreiteter und nach rechts ausbiegender Sklerotinstab, der über den Rand des Operculums hinausragt.

***Euconnus protectus* nov. spec.**

MATERIAL: Holotypus ♂ Kinabalu-Nat. Park, HQ, Silau-Silau Trail, 1540 m, 14.8. bis 1.9.1988 (Ig. Smetana, cMG); 2 Paratypen, ♀ ♀ Mount Kinabalu, 1450 bis 1550 m, 25.4. und 23.5.1987 (Ig. Burckhardt u. Löbl, cMG); ebenda, 1 Ex. (cF); Poring Hot Springs, 500 m, 7.4.1987, 12.5.1987; (Burckhardt u. Löbl, cF).

DIAGNOSE: Gekennzeichnet durch verhältnismäßig schlanke Fühler mit lockerer 4-gliedriger Keule und rotbraune Färbung.

BESCHREIBUNG: Long. 1,40 mm, lat. 0,60 mm. Rotbraun, gelblich behaart.

Kopf gerundet-rautenförmig, die Schläfen doppelt so lang wie der Augendurchmesser. Fühler zurückgelegt die Halsschildbasis erreichend, mit lockerer 4-gliedriger Keule, das 7. Glied intermediär zwischen Geißel und Keule, Glied 2 gestreckt, 3 bis 6 klein, isodiametrisch, 8 bis 10 breiter als lang, das Endglied spitz eiförmig, länger als breit.

Halsschild konisch, länger als breit, an der Basis etwas breiter als der Kopf mit den Augen, an den Seiten abstehend behaart, vor der Basis mit 2 Grübchen.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, ohne deutliche Basalimpression, schräg nach hinten abstehend behaart. Flügel entwickelt.

Beine ohne besondere Merkmale.

Penis (Abb. 90) von oben betrachtet aus einem gerundet- viereckigen Peniskörper und einem davon abgesetzten Apex bestehend. Dieser ist distalwärts verschmälert, zum Ende aber wieder etwas verbreitert. Vor ihm liegt zum Teil im Inneren des Peniskörpers ein länglicher Sklerotinkörper, der zur Basis verbreitert ist und distal im Bereich des Apex penis einen über die ganze Breite reichenden Bogenausschnitt besitzt. Die Parameren erreichen das Penisende fast und tragen im Spitzenbereich lateral je 3 Tastborsten.

***Euconnus crockericola* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und 4 Paratypen, Crocker Range, 1200 m, 63 km Kota Kinabalu-Tambunan, 19.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda, 2 Paratypen (cF).

DIAGNOSE: Gekennzeichnet durch relativ bedeutende Größe, gerundet-rautenförmigen Kopf, kräftige Fühler mit unscharf abgesetzter, 4-bis 5-gliedriger Keule, kugeligen, relativ kleinen Halsschild, und sehr stark bauchig erweiterte Flügeldecken.

BESCHREIBUNG: Long. 2,20 bis 2,40 mm, lat. 0,90 bis 1,00 mm. Dunkel rotbraun, dicht und aufgerichtet bräunlichgelb behaart.

Kopf von oben betrachtet gerundet-rautenförmig, stark, der Scheitel und Hinterkopf beulenförmig gewölbt. Länge der Schläfen gleich dem Zweieinhalbfachen des Augendurchmessers, allenthalben an den Schläfen besonders grob und steif behaart. Fühler zurückgelegt die Halsschildbasis erreichend, das 2. Glied um die Hälfte länger als breit, 3 leicht gestreckt, 4 bis 7 kugelig, 8 und die folgenden doppelt so breit wie 6, alle 3 schwach quer, das eiförmige Endglied fast so lang wie die beiden vorletzten zusammen.

Halsschild kugelig, kaum breiter als der Kopf, so breit oder etwas breiter als lang, dicht und abstehend behaart, mit 4 Basalgrübchen.

Flügeldecken schon an der Basis zusammen viel breiter als die Halsschildbasis, mit tiefer, lateral von einer langen Humeralfalte begrenzter Basalimpression, sehr lang und dicht, abstehend behaart.

Beine sehr kräftig, Schenkel keulenförmig verdickt, Schienen medialwärts gekrümmt.

Penis (Abb. 91) in dem einzigen vorliegenden Präparat sehr stark geschrumpft, aus einem ziemlich kurzovalen Peniskörper und einem langen spitzwinkelig-dreieckigen, leicht nach oben gebogenen Apex bestehend. Unter diesem liegt ein schmal-zungenförmiges Operculum, das stärker sklerotisiert ist als der Apex. Von den beiden Parameren ist im Präparat nur eine erhalten. Sie ist in der basalen zwei Dritteln sehr breit, zur Spitze stark verschmälert und an dieser mit einer sehr starken und steif medialwärts gesichtenen und 2 weiteren terminalen Borsten versehen.

Euconnus excelsipenis nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat) Crocker Range, 1550 bis 1650 m, 16.5.1987 (lg. Burckhardt u. Löbl, cMG); 1 Paratypus vom selben Fundort (cF).

DIAGNOSE: Gekennzeichnet durch scharf abgesetzte 4-gliedrige Fühlerkeule, gerundet-rautenförmigen Kopf, namentlich aber durch den außerordentlich komplizierten Bau des männlichen Kopulationsapparates.

BESCHREIBUNG: Long. 1,70 mm, lat. 0,60 mm. Schwarz, die Extremitäten rotbraun, gelblichbraun behaart.

Kopf von oben betrachtet gerundet-rautenförmig, der Hinterkopf beulenförmig empor-gewölbt. Fühler mit scharf abgesetzter 4-gliedriger Keule, zurückgelegt die Halsschildbasis erreichend, ihr Basalglied kurz, das 2. leicht gestreckt, 3 bis 7 klein, breiter als lang, 8 doppelt so breit wie 7, wie auch 9 und 10 breiter als lang, das Endglied gerundet-kegelförmig, etwas länger als breit.

Halsschild rund, etwas breiter als lang, zum Vorderrand stärker als zur Basis verengt, viel breiter als der Kopf, dicht und abstehend behaart, mit 4 Basalgrüben.

Flügeldecken schon an der Basis zusammen etwas breiter als die Halsschildbasis, sehr fein punktiert, stark glänzend, schwach behaart. Flügel voll entwickelt.

Beine kurz. Schenkel keulenförmig verdickt.

Penis (Abb. 92) reich differenziert und sehr eigenartig gebaut, von oben betrachtet kurzoval, seine Basis mit 2 Höckern versehen, zwischen diesen mit einem spitzbogenförmigen Ausschnitt. Apex ebenfalls mit 2 dicken, an der Spitze distal ausgerandeten Sklerotinstäben. Deren Basis ist medial rechtwinklig erweitert, aber nicht verbunden, sondern durch einen tiefen sagittalen Spalt getrennt. Am basalen Ende des Spaltes mündet ein kurzes, dickes Rohr, das in einem weiten Trichter in der Penismitte entspringt. In diesen Trichter ragt von vorne ein großer tropfenförmiger Sklerotinkörper, zu dessen beiden Seiten sich basal zwei kleine weitere Sklerotinkörper befinden. Unmittelbar vor ihnen liegt die Basalöffnung des Penis, die nur am Hinterrand einen schwach sklerotisierten Rahmen besitzt. An diesem entspringen die beiden Parameren, die S-förmig gekrümmt bis an das apikale Ende des Penis reichen. Vor ihrer Spitze sind sie gegabelt. Sie entsenden lateral einen sehr kurzen Ast, der gerade abgeschnitten ist und dort 3 Tastborsten trägt. Der Hauptast ist ab der Stelle der Gabelung verschmälert und trägt eine terminale Tastborste. Im Penisinneren befindet sich beiderseits des beschriebenen Trichters eine flügelartige, an ihrem lateralen Rand schmal sklerotisierte Fläche.

Euconnus longitubus nov. spec.

MATERIAL: Holotypus ♂ (Penispräparat), Mount Kinabalu, 1750 m, 27.4.1953 (lg. Burckhardt u. Löbl, cMG); ebenda 3 Paratypen, 1550 bis 1600 m, 16. u. 18.4.1987 (cMG); 3 Paratypen (1 Penispräparat) Crocker Range, 63 km Kinabalu-Tambunan, 17.-18.5.1987 (lg. Burckhardt u. Löbl, cF); ebenda, 1 ♂ Paratypus, ca. 1000 m, 5.9.1988 (lg. Smetana, cMG); 1 ♀ Paratypus, Mount Kinabalu, 2600 m, 1.5.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch verhältnismäßig bedeutende Körpergröße, kleinen konischen Halsschild, und breite, stark gewölbte Flügeldecken.

BESCHREIBUNG: Long. 1,60 mm, lat. 0,70 mm. Dunkel rotbraun, bräunlich behaart.

Kopf beim ♂ von oben betrachtet gerundet-rautenförmig, die Schläfen nicht ganz doppelt so lang wie der Augendurchmesser, steif abstehend behaart, beim ♀ größer, von oben betrachtet rund, Fühler zurückgelegt die Halsschildbasis mit dem Endglied überragend, ihr 3. bis 7. Glied isodiametrisch, ebenso 8 bis 10, diese aber doppelt so breit wie 7, das Englied eiförmig, fast so lang wie die beiden vorletzten zusammen.

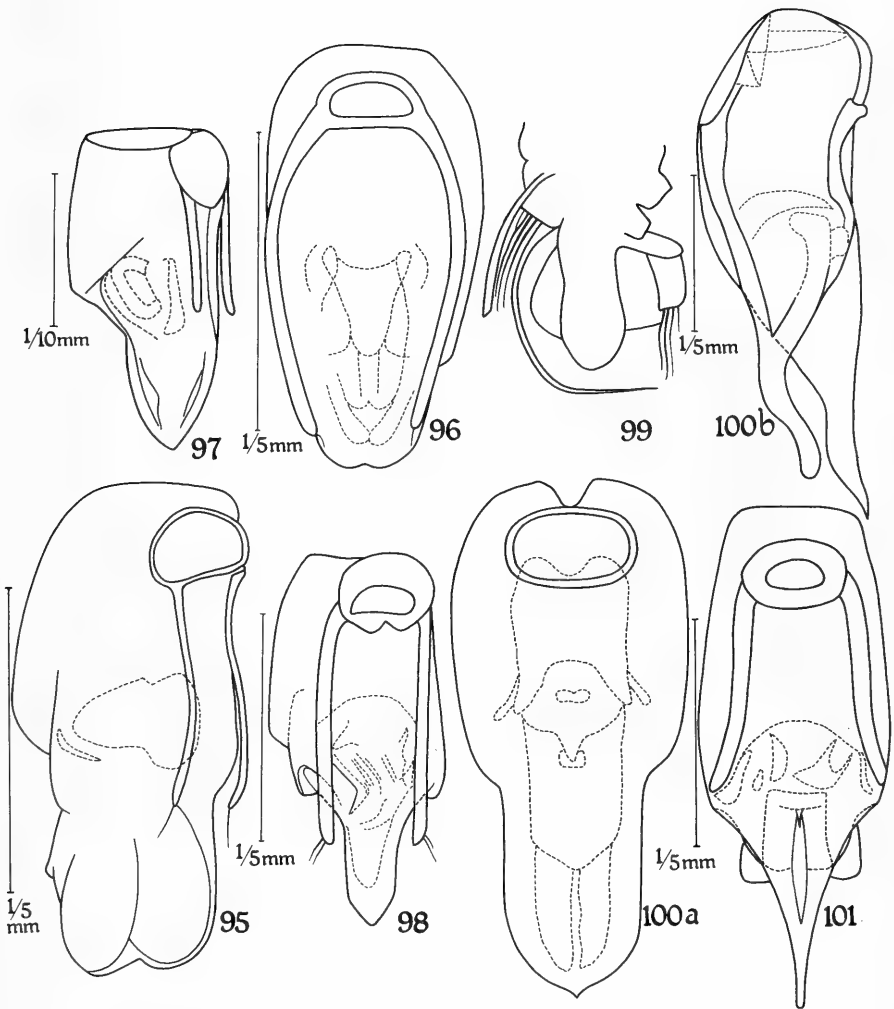


ABB. 95-101.

95: *Euconnus pilosiceps* nov. spec., Penis in Dorsolateralansicht. 96: *Euconnus smetanai* nov. spec., Penis in Dorsalansicht. 97: *Euconnus silauensis* nov. spec., Penis in Lateralansicht. 98: *Euconnus acuticornis* nov. spec., Penis in Dorsolateralansicht. 99: *Euconnus livagoensis* nov. spec. Apikalpartie des Penis in Lateralansicht. 100: *Euconnus poringensis* nov. spec., Penis a) in Dorsal- b) in Lateralansicht. 101: *Euconnus longeacuminatus* nov. spec., Penis in Dorsalansicht.

Halsschild klein, so lang wie breit, konisch, an der Basis etwas breiter als der Kopf, mit 4 Basalgrübchen, seitlich absteht behaart.

Flügeldecken zusammen schon an der Basis wesentlich breiter als die Halsschildbasis, mit breiter, lateral von einer Humeralfalte begrenzter Basalimpression, schräg absteht behaart.

Beine kräftig, Schenkel mäßig verdickt, Schienen mäßig medialwärts gekrümmt.

Penis (Abb. 99) im Bauplan an *E. excelsipenis* erinnernd, der Ductus ejaculatorius über den Apex weit hinausragend, dessen Hinterrand in der Mitte nicht tief eingeschnitten sondern nur im flachen Bogen breit ausgerandet. Basalöffnung des Penis groß, mit breitem Sklerotinrahmen. Parameren das Penisende so weit überragend wie der Ductus ejaculatorius, vor der Spitze lateral breit ausgerandet, lateral und medial beiderseits mit je 3 Tastborsten. Der Ductus ejaculatorius ist basal trichterförmig erweitert, in dem Trichter ruht eine lang-herzförmige Blase neben der von oben und hinten betrachtet links am Trichterrand ein runder Sklerotinkörper steht.

***Euconnus indecorus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Poring Hot Springs, Langanan River, 850 m, 14.5.1987 (lg. Burckhardt u. Löbl, cMG); 3 Paratypen, Mount Kinabalu, 1430 bis 1520 m, 25.4.1987 (lg. Burckhardt u. Löbl, cMG); ebenda 2 Paratypen (cF).

DIAGNOSE: Gekennzeichnet durch geringe Größe, braunschwarze Färbung, kompakte, 4-gliedrige Fühlerkeule und gedrungene Gestalt.

BESCHREIBUNG: Long. 1,15 bis 1,25 mm, lat. 0,45 bis 0,50 mm. Braunschwarz, braungrau behaart.

Kopf von oben betrachtet rund, flach gewölbt, die Schläfen absteht behaart, Fühler zurückgelegt die Halsschildbasis knapp erreichend, mit scharf abgesetzter, 4-gliedriger Keule, ihre beiden ersten Glieder leicht gestreckt, die folgenden klein, nur ein Drittel so breit wie 8 und die folgenden.

Halsschild konisch, so lang wie breit, an der Basis etwas breiter als der Kopf mit den Augen, mit 2 Basalgrübchen, seitlich absteht behaart.

Flügeldecken kurzoval, schon an der Basis zusammen breiter als die Halsschildbasis, mit breiter, lateral von einer langen Humeralfalte begrenzter Basalimpression, nach hinten gerichtet behaart.

Beine kurz, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb 94) sehr klein, sein Apex 2-spitzig, dünnhäutig, im Inneren des Peniskörpers jedoch mit stark sklerotisierten Differenzierungen. Im basalen Penisteil steht ein lang-tropfenförmiges Gebilde, hinter dem ein langgestreckter Sklerotinkörper folgt, der sich distal verjüngt und an beiden Seiten von einer sklerotisierten Schale umfaßt ist, die distal im rechten Winkel umbiegt und im Bereich des Apex penis seitlich mit einer scharfen Spitze ins Freie tritt. Sie tritt dort mit dem distalen Ende der Parameren in Verbindung, deren Basis ebenso wie die Basalöffnung des Penis im Präparat nicht erhalten ist. Der Apex endet in 2 abgerundeten Spitzen, zwischen denen der Hinterrand im Bogen ausgeschnitten ist.

***Euconnus pilosiceps* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Mount Kinabalu, 1450 bis 1550 m, 23.5.1987 (lg. Burckhardt u. Löbl, cMG); 1 ♀ wahrscheinlich dieser Art unter Layang Layang, 2595 m, 2.5.1987 (lg. Smetana, cF).

DIAGNOSE: Sehr ausgezeichnet durch sehr dicht aufgerichtet behaarten, von oben betrachtet runden Kopf und kurze Fühler mit 4-gliedriger Keule.

BESCHREIBUNG: Long. 1,90 mm, lat. 0,80 mm. Braunschwarz, die Beine rotbraun, braunschwarz behaart.

Kopf von oben betrachtet rund, der Hinterkopf schwach beulenförmig vorgewölbt, sehr dicht aufgerichtet behaart, mit kleinen, an den Kopfseiten stehenden Augen. Fühler zurückgelegt die Halschildbasis nicht erreichend, mit scharf abgesetzter, 4-gliedriger Keule, die beiden ersten Glieder gestreckt, 3 bis 7 sehr klein, breiter als lang, 8 bis 10 stark quer, 3-mal so breit wie 7, das Endglied gerundet-kegelförmig, so lang wie 9 und 10 zusammen. Bei dem vermutlich zugehörigen ♀ die Fühler länger mit lockerer 4-gliedriger Keule, sonst aber der Kopf genau so geformt und behaart.

Halsschild so lang wie breit, seitlich schwach gerundet, verhältnismäßig klein, allseits sehr dicht behaart, unter der Behaarung glänzend, ohne Basalgrübchen.

Flügeldecken kurzoval, stark gewölbt, schon an der Basis zusammen viel breiter als die Halsschildbasis, mit breiter, von einer langen Humeralfalte begrenzter Basalimpression, dicht und aufgerichtet behaart, fein punktiert. Flügel voll entwickelt.

Beine kurz, Schienen leicht medialwärts gekrümmt, beim vermutlich zugehörigen ♀ die Mittelschienen mediobasal mit einem feinen Dorn.

Penis (Abb. 95) mehr als doppelt so lang wie breit, schwach sklerotisiert, mit unscharf abgesetzter Apikalpartie, diese zweilappig, die Lappen unvollständig getrennt. Basalöffnung groß, mit sehr schmalem, sklerotisierten Rahmen, Paramere dünn, nur die Basis des Apex penis erreichend, mit je einer terminalen Tastborste. Im Peniskörper ist vor dessen distalem Ende ein unregelmäßig geformter Sklerotinkörper vorhanden.

Anmerkung: In Papua habe ich 2 *Euconnus*-♀ gefunden, das eine bei der Karawari-Lodge, das andere in der Bismarck-Ränge, die dem *E. pilosiceps* äußerlich außerordentlich ähnlich sind. Der Kopf ist bei ihnen allerdings deutlich länger als breit.

Euconnus smetanai nov. spec.

MATERIAL: Kinabalu Nat. Park, Poring Hot Springs, area Eastern Ridge Tr. 790 m, 17.8.1988 (lg. Smetana, cMG); 1 Paratypus ebenda, 510 m, 30.8.1988 (lg. Smetana, cMG); ebenda 3 Paratypen, 1450 in 1550 m, 29.4. bis 22.5.1987 (lg. Burckhardt u. Löbl, cF).

DIAGNOSE: Gekennzeichnet durch nur 3-gliedrige Fühlerkeule, gerundet-rautenförmigen, länglichen Kopf und konischen Halsschild.

BESCHREIBUNG: Long. 1,20 mm, lat. 0,50 mm. Dunkel rotbraun, braun behaart.

Kopf von oben betrachtet gerundet-rautenförmig, die Schläfen doppelt so lang wie der Augendurchmesser, abstehend braun behaart. Fühler mit 3-gliedriger Keule, sehr breit, fast so lang wie die Geißel, ihre beiden ersten Glieder gestreckt, 3 bis 8 sehr klein, 9 dreimal, 10 und 11 4-mal so breit wie 8, 9 und 10 sehr stark quer, das Endglied kegelförmig, so lang wie breit.

Halsschild konisch, so lang wie breit, an der Basis breiter als der Kopf mit den Augen, seitlich abstehend behaart.

Flügeldecken zusammen schon an der Basis breiter als die Halsschildbasis, mit kleiner Basalimpression und langer, abstehegender Behaarung.

Beine kurz.

Penis (Abb. 96) oval, sein Apex vom Peniskörper nicht deutlich abgesetzt, Parameren das Penisende fast erreichend, mit einer terminalen Tastborste. Im Penisinneren befindet sich hinter der Mitte des Peniskörpers ein sklerotisierter Komplex, dessen vorderer Teil nach hinten gerichtet spitzwinkelig-dreieckig ist und abgerundete Ecken besitzt, während der

distale Teil zungenförmig ist und am Hinterrand in der Mitte leicht eingekerbt ist. Vor der Penis Spitze befinden sich 2 zwei zueinander und nach hinten konvergierende Stäbe.

***Euconnus silauensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Mount Kinabalu Nat. Park, HQ Silau-Silau. Tr. 1550 m, 14.8.1988 (lg. Smetana, cMG); ebenda 2♀ (? diese Art) Mount Kinabalu, 1500 m, 29.4.1987 (lg. Burckhardt cMG); ebenda 2♀ (? diese Art), 21. bis 25.4.1987 (lg. Burckhardt u. Löbl, cF); Mount Kinabalu, 1500 bis 1550 m, 23-28.4.1987 (lg. Burckhardt u. Löbl, cMG, ? diese Art).

DIAGNOSE: Kleine Art mit kurzen Fühlern und mit gedrungen gebauter 4-gliederiger Keule.

BESCHREIBUNG: Long. 1,20 bis 1,30 mm, lat. 0,50 bis 0,55 mm. Dunkel rotbraun, bräunlich behaart.

Kopf, von oben betrachtet gerundet-rautenförmig, mit großen Augen und bärtig behaarten Schläfen. Fühler zurückgelegt die Halsschildbasis knapp erreichend, mit kompakter 4-gliederiger Keule und dünner Geißel, ihre beiden ersten Glieder kaum gestreckt, die folgenden klein, breiter als lang, 8 bis 10 3-mal so breit wie 7 das Endglied kurz, schmaler als die vorhergehenden.

Halsschild konisch, so lang wie breit, an der Basis etwas breiter als der Kopf mit den Augen, seitlich struppig behaart, mit 2 Basalgrübchen.

Flügeldecken kurzoval, schon an der Basis zusammen breiter als die Halsschildbasis, fein punktiert und ziemlich lang behaart, mit unscheinbarer Basalimpression. Flügel voll entwickelt.

Beine kurz, ohne besondere Merkmale.

Penis (Abb. 97) aus einem annähernd isodiametrischen Peniskörper und einer wenig kürzeren zungenförmigen Apikalpartie bestehend. Parameren nur von halber Penislänge. Vor der Basis des Apex penis liegen im Penisinneren Sklerotindifferenzierungen.

***Euconnus acuticornis* spec. nov.**

MATERIAL: Holotypus ♂ (Penispräparat) Crocker Range 1200 m, km 63 NE Kota Kinabalu-Tambunan, 19.7.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch querovalen Kopf, dieser in seiner Länge fast derjenigen der 3 vorletzten Fühlerglieder gleich. Das Endglied der Fühler sehr spitz und lang, Halsschild klein, mit 2 sehr großen Basalgrübchen.

BESCHREIBUNG: Long. 1,40 mm, lat. 0,70 mm. Rotbraun, gelblich behaart. Kopf von oben betrachtet queroval, Augen stark vorgewölbt, Schläfen doppelt so lang wie der Augendurchmesser, ohne steif abstehende Behaarung, Fühler zurückgelegt die Halsschildbasis etwas überragend, ihre beiden ersten Glieder doppelt so lang wie breit, 3 sehr klein, 4 bis 6 zunehmend größer, 7 kugelig um die Hälfte breiter als 6, 8 nicht ganz doppelt so breit wie 7, 9 und 10 noch etwas breiter als 8, zunehmend breiter als lang, das in einer scharfen Spitze endende Engglied fast so lang wie 8 bis 10 zusammen.

Halsschild isodiametrisch, nicht breiter als der Kopf mit den Augen, mit 2 großen Basalgrübchen, an den Seiten steif abstehend behaart.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, mit von einer Humeralfalte scharf begrenzter Basalimpression, fein punktiert und lang, abstehend behaart. Flügel entwickelt.

Beine mittellang, Vorderschenkel etwas stärker verdickt als die der beiden anderen Beinpaare.

Penis (Abb. 98) aus einem von oben betrachtet gerundet- länglich rechteckigen Penis-körper und einer nur wenig kürzeren Apikalpartie bestehend. Basalöffnung des Penis von einem breiten, stark sklerotisierten Rahmen umgeben. Parameren die Basis des Apex penis etwas überragend mit je 2 terminalen Tastborsten. Apex langgestreckt im basalen Viertel verengt, das 2. und 3. Viertel parallelseitig, das letzte dreieckig verschmälert. Operculum zungenförmig, kürzer und schmaler als der Apex, aber stärker sklerotisiert. Im Inneren des Peniskörpers befinden sich parallele sklerotisierte Falten der Peniswand, unter denen ein von oben und hinten betrachtet links stehender winkelig gebogener Stachel auffällt. Vor ihm steht ein spitzwinkelig dreieckiger nach links außen gerichteter Zahn.

***Euconnus livagoensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Kinabalu Nat. Park, HQ at Livago, 1505 m 2.9.1988 (Ig. Smetana, cMG); ebenda 1 Paratypus (Ig. Smetana, cMG); 1 Paratypus, Mount Kinabalu (cF).

DIAGNOSE: Eine gedrungen gebaute Art mit gerundet-rautenförmigem Kopf mit abstehend behaarten Schläfen, konischem Halsschild und kurzovalen Flügeldecken.

BESCHREIBUNG: Long. 1,10 mm, lat. 0,50 mm. Rotbraun, die Extremitäten hell gelbbraun, braun behaart.

Kopf von oben betrachtet gerundet-rautenförmig, die dicht und steif abstehend behaarten Schläfen eineinhalbmal so lang wie der Augendurchmesser. Fühler zurückgelegt die Halsschildbasis erreichend, mit breiter, 4-gliedriger Keule, ihre beiden ersten Glieder dicker als die folgenden, 2 leicht gestreckt, 3 bis 7 klein, 8 mehr als 3-mal so breit wie 7, 9 und 10 noch etwas breiter, alle stark quer, das Endglied halbkugelig, ebenfalls breiter als lang.

Halsschild konisch, so lang wie breit, an den Seiten struppig behaart, mit 2 Basalgrübchen. Flügeldecken zusammen wesentlich breiter als die Halsschildbasis, nur so lang wie Kopf und Halsschild zusammen, mit nach hinten verflachter Basalimpression, fein punktiert und nach hinten gerichtet behaart.

Beine kurz und schlank, Schenkel nur schwach verdickt.

Penis (Abb. 99) ganz immatur, so daß nur einige morphologische Details des apikalen Teiles desselben erkennbar sind. Der Apex ist zungenförmig, zu seinen beiden Seiten sind die Ende den Parameren erkennbar. Sie tragen eine Mehrzahl langer, wellig gebogener Tasthaare. Ein sehr langes biegt zunächst nach hinten und dann hinter der Spitze des Apex penis von oben und hinten besehen nach rechts. Es endet in einer sehr feinen Spitze in der Nähe der Borsten der rechten Paramere. Die angeführten Merkmale werden ausreichen, um die Art im männlichen Geschlecht wiedererkennen zu können, da sie bei keiner anderen *Euconnus*-Art aus Sabah bisher in einer annähernd ähnlichen Weise bekannt sind.

***Euconnus poringensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) und 1 Paratypus, Poring Hot Springs 8.5.1987 (Ig. Burckhardt u. Löbl, cMG); ebenda 1 ♂ Paratypus (Penispräparat) (cF).

DIAGNOSE: Kopf relativ klein, gerundet-rautenförmig mit dicht abstehend behaarten Schläfen. Fühler zurückgelegt die Halsschildbasis knapp erreichend, mit scharf abgesetzter 4-gliedriger Keule, ihre beiden ersten Glieder gestreckt, 3 bis 7 kleinkugelig, 8 eineinhalbmal, 9 und 10 doppelt so breit wie 7, isodiametrisch, das Endglied spitz eiförmig, ein wenig kürzer als 9 und 10 zusammen.

Halsschild konisch, kaum merklich länger als breit, an der Basis nur wenig breiter als der Kopf mit den Augen, seitlich struppig, abstehend behaart, mit 2 großen Basalgrübchen.

Flügeldecken zusammen schon an der Basis wesentlich breiter als die Halsschildbasis, dicht punktiert, lang und wenig dicht behaart.

Beine ziemlich kurz und schlank, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb. 100 a, b) von oben betrachtet aus einem ovalen Peniskörper und einem davon abgesetzten, zungenförmigen Apex bestehend. Basalöffnung groß, Parameren an dem einzigen vorhandenen Penispräparat nicht erkennbar. Hinter der Basalöffnung befindet sich im Penisinneren eine gerundet-langrechteckige Platte, die bis in den Apikalbereich zurückreicht und an der Basis schwach, am Hinterrand aber tief im Bogen ausgeschnitten ist. Hinter ihn befindet sich bis weit in die apikale Region hineinreichend eine zweite, etwas längere Platte, die an der Basis klammerartig ausgeschnitten und am distalen Ende stumpfwinkelig-dreieckig begrenzt ist.

Daran schliesst sich unter dem Apex penis ein aus 2 parallelen Stäben bestehendes Operculum an, das nicht ganz bis zum Penisende reicht. In dem Raum zwischen den beiden Platten sieht man bei Betrachtung von oben einen kleinen annähernd quereovalen Sklerotinkörper. Dieser erweist sich bei lateraler Betrachtung als die Spitze eines großen Zahnes, der von der Ventralwand des Penis nach oben ragt. Die distale Platte biegt bei seitlicher Betrachtung ventralwärts zur Ventralwand des Penis und findet in den beiden Stäben des Operculums ihre Forsetzung.

***Euconnus longeacuminatus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Mount Kinabalu, 1500 m, 25.4.1987 (Ig. Burckhardt u. Löbl, cMG); Paratypus ♂ (Penispräparat) Crocker Range 1200 m, km 63 von Kota Kinabalu nach Tambunan, 19.5.1987 (Ig. Burckhardt u. Löbl, cF); ebenda, 6 Parytypus, Penispräparat (cMG).

DIAGNOSE: Äußerlich dem *E. kinabalu* ähnlich, aber wesentlich weniger robust, im Bau des männlichen Kopulationsapparates sehr von ihm verschieden.

BESCHREIBUNG: Long. 1,90 mm, lat. 0,80 mm. Schwarzbraun, Beine und Palpen rotbraun, braun behaart.

Kopf von oben betrachtet rautenförmig, mit stark vorgewölbten Augen, die Schläfen 3-mal so lang wie der Augendurchmesser, dicht und steif, auch die Kopfoberseite lang und steif nach hinten gerichtet behaart. Fühler zurückgelegt die Halsschildbasis erreichend, mit unscharf abgesetzter, 5-gliederiger Keule, ihr 2. Glied um ein Viertel länger als breit, 3 und 4 leicht gestreckt, 5 und 6 kugelig, 7 ebenso aber etwas größer, 8 größer als 7, 9 und 10 schwach quer, das spitz-eiförmige Endglied etwas kürzer als die beiden vorletzten zusammen.

Halsschild gestreckt etwas breiter als der Kopf mit den Augen, zum Vorderrand stärker als zur Basis verengt, dicht und abstechend behaart, mit 4 Basalgrübchen.

Flügeldecken an der Basis zusammen etwas breiter als die Halsschildbasis, mit breiter, lateral von einer Humeralfalte scharf begrenzter Basalimpression, sehr fein rugos skulptiert (80-fache Vergrößerung), lang, nach hinten gerichtet behaart. Flügel voll entwickelt.

Beine ziemlich schlank, Schenkel mäßig verdickt, Mittelschienen des ♂ medioterminal mit einem feinen Dorn.

Penis (Abb. 101) sehr langgestreckt, mit einem langen, in einer scharfen Spitze endenden Apex. Operculum breit und viel kürzer als der Apex. Basalöffnung des Penis mit einem breiten sklerotisierten Rahmen. Parameren breit, nur die Basis des Apex penis erreichend, ohne Tastborsten. Apex penis basal mit einem langen sagittalen Dorn, zu beiden Seiten desselben stark sklerotisiert. Davor stehen im Penisinneren mehrere unregelmäßig geformte Sklerotinkörper.

***Euconnus cuneipenis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Crocker Range, 1550 bis 1650 m, 16.5.1987 (Ig. Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch länglichen, gerundet-rautenförmigen Kopf, kleinen, konischen Halsschild mit 4 Basalgrübchen und sehr kurzovale Flügeldecken.

BESCHREIBUNG: Long. 1,80 mm, lat. 0,90 mm. Rotbraun, bräunlichgelb behaart.

Kopf von oben betrachtet länglich gerundet-rautenförmig, mit langen, steif abstehend behaarten Schläfen und kleinen, vorgewölbten Augen.

Fühler zurückgelegt die Halsschildbasis erreichend, mit unscharf abgesetzter 4-gliedriger Keule, ihr Basalglied dicker als die folgenden, das 2. leicht gestreckt, 3 bis 7 kugelig, 7 schon etwas größer als 6, 8 um die Hälfte größer als 7, 9 und 10 mehr als doppelt so breit wie 8, stark quer, das kegelförmige Endglied nicht ganz so lang wie die beiden vorletzten zusammen.

Die Fühler erweisen sich bei genauer Betrachtung als schwach asymmetrisch. Die Glieder vom 7. bis 9. sind medial länger als lateral. Die Glieder 8, 9 und 10 sind überdies seitlich erweitert und auf der Erweiterung mit einem Büschel dickerer Borsten versehen. Medial spingt der distale Rand des 8. und namentlich des 9. und 10. Gliedes mit einer scharfen Spitze über die Basis des nächstfolgenden Gliedes vor.

Halsschild fast konisch, an seiner Basis nur wenig breiter als der Kopf mit den Augen, stark gewölbt, seitlich abstehend behaart, mit 6 Basalgrübchen.

Flügeldecken sehr kurzoval, schon an der Basis zusammen viel breiter als die Halsschildbasis, mit tiefer, lateral von einer Humeralfalte begrenzter Basalimpression. An der Naht hinter dem Schildchen über beide Flügeldecken mit einer flachen, länglichen Eintiefung, sehr deutlich punktiert, stark glänzend, ziemlich schütter behaart.

Beine kräftig, Vorderschenkel etwas stärker verdickt als die der beiden anderen Beinpaare, Schienen leicht medialwärts gekrümmt.

Penis (Abb. 102) von oben betrachtet keilförmig, mit kleiner, runder Basalöffnung ohne stärker sklerotisierten Rahmen und fast die Penisspitze erreichenden Parameren mit je 2 terminalen Tastborsten. Ductus ejaculatorius gerade, sagittal verlaufend. Er entspringt in einer kleinen Kugel, die seine Basis trichterförmig umfaßt. Seine ganze Basalregion ist von einer Membran kugelförmig umfaßt. Diese Membran ist basal von einem geraden Rohr durchbrochen, das basal in die Kugel mündet und hinter der Basalöffnung in einem fast die ganze Penisbreite einnehmenden Sklerotinbogen entspringt. Die Spitze des Ductus ejaculatorius überragt in der Ruhelage die Spitze des Apex ein wenig.

***Euconnus ubahanus* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Kinabalu Nat. Park, Sumit Trail Pondok, Ubah, 2050 m, 26.4.1989 (Ig. Smetana, cMG).

DIAGNOSE: Eine der vielen Arten des Gebietes, die durch einen raute-förmigen Kopf, durch einen kleinen annähernd konischen Halsschild und kurzovale Flügeldecken ausgezeichnet sind. Sehr ausgezeichnet durch den Bau des männlichen Kopulationsapparates, der von oben betrachtet fast genau gerundet-quadratisch ist und dem ein Apex und ein Operculum fehlen.

BESCHREIBUNG: Long. 1,40 mm, lat. 0,70 mm. Dunkel rotbraun, braun behaart.

Kopf gerundet-rautenförmig, so lang wie mit den Augen breit, die Schläfen 3-mal so lang wie der Augendurchmesser, steif abstehend behaart. Fühler mit scharf abgesetzter 4-

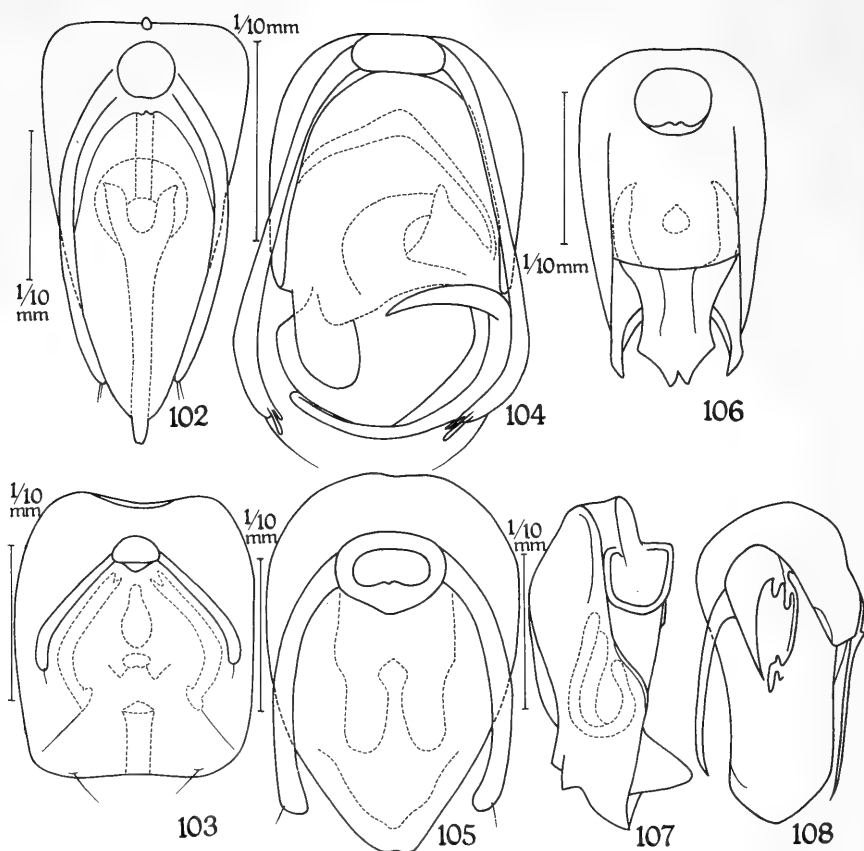


ABB. 102-108.

102: *Euconnus cuneipenis* nov. spec., Penis in Dorsalansicht. 103: *Euconnus ubahanus* nov. spec., Penis in Dorsalansicht. 104: *Euconnus masculinus* nov. spec., Penis in Dorsalansicht. 105: *Euconnus ovulipenis* nov. spec., Penis in Dorsalansicht. 106: *Euconnus bicornipenis* nov. spec., Penis in Dorsalansicht. 107: *Euconnus fontium* nov. spec., Penis in Dorsolateralansicht. 108: *Protoscydmus sabahensis* nov. spec., Penis in Dorsalansicht.

gliederiger Keule, zurückgelegt die Halsschildbasis nicht ganz erreichend, ihr Basalglied dicker als die folgenden, doppelt so lang wie breit, 2 leicht gestreckt, 3 bis 7 isodiametrisch, klein, 8 3-mal so breit wie 7, 9 und 10 noch etwas breiter, alle 3 sehr stark quer, das Endglied gerundet-kegelförmig, breiter als lang.

Halsschild annähernd konisch, an der Basis etwas breiter als der Kopf mit den Augen, seitlich dicht abstehend behaart, vor der Basis mit 2 nahe an den Seitenrand gerückten Grübchen.

Flügeldecken kurzoval, schon an der Basis zusammen viel breiter als der Halsschild, mit tiefer, grubchenförmiger Basalimpression, fein punktiert und lang abstechend behaart. Flügel verkümmert. Beine ziemlich kurz, Schenkel schwach verdickt.

Penis (Abb. 103) von oben betrachtet gerundet-viereckig, wenig länger als breit, ohne Apex und Operculum, mit kleiner Basalöffnung mit nur am Hinterrand sklerotisiertem Rahmen. Parameren dünnhäutig, nur halb so lang wie der Penis, mit je einer terminalen Tastborste. Hinter der Basalöffnung befindet sich im Penisinneren ein lang tropfenförmiger Sklerotinkörper, der auf beiden Seiten von einem Sklerotinbogen umfaßt ist. Distal von dem tropfenförmigen Körper befindet sich ein viel kleinerer querovaler und dahinter ein sagittal verlaufendes Rohr, das am Hinterrand des Penis endet, ohne daß dort ein geräumiger Ostium penis vorhanden wäre. Am Hinterrand des Penis befindet sich auf jeder Seite eine Borste. Die Borsten sind einander zugewendet.

***Euconnus masculinus* nov. spec.**

Material: Nur Holotypus ♂ (Penispräparat), Kinabalu Nat. Park, HQ 1500 m, 25. bis 30.4.1987 (Ig. Smetana, cMG).

DIAGNOSE: Kopf rautenförmig, Halsschild konisch, Fühlerkeule locker 4-gliederig, Fühler zurückgelegt die Halsschildbasis erreichend.

BESCHREIBUNG: Long. 1,00 mm, lat. 0,50 mm. Rotbraun, dicht grau behaart.

Kopf von oben betrachtet gerundet-rautenförmig, mit den großen, vorgewölbten Augen etwas breiter als lang, sehr flach gewölbt. Fühler mit scharf abgesetzter, lockerer, 4-gliederiger Keule, ihre beiden ersten Glieder eineinhalbmal so lang wie breit, 3 bis 7 etwas breiter als lang, 8 bis 10 sehr schwach quer, das eiförmige Endglied fast so lang wie die beiden vorhergehenden zusammen.

Halsschild konisch, etwas länger als breit, an der Basis breiter als der Kopf mit den Augen, ohne Basalgrübchen, an den Seiten dichter behaart als auf der Scheibe.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, wenig länger als zusammen breit, mit kleiner, von einer kurzen Humeralfalte begrenzter Basalimpression, fein punktiert und anliegend behaart.

Beine kurz, Schenkel schwach verdickt, Schienen gerade.

Penis (Abb. 104) aussergewöhnlich gebaut, sodaß daran zu denken ist, die Art einem eigenen Subgenus zuzuordnen. Peniskörper von oben betrachtet sehr kurzoval, am Hinterrand in seiner ganzen Breite abgestutzt, an ihn schließt der gerundet stumpfwinkelig-dreieckige Apex an, der nicht ganz so breit ist wie der Peniskörper. Aus diesem tritt an der von oben und hinten besehen rechten Seite der Ductus ejaculatorius nach hinten aus. Er entspringt im Inneren des Penis schmal trichterförmig, zieht außerhalb des Apexrandes nach hinten um den Hinterrand des Apex herum bis zu dessen linkem Rand, wobei er sich allmählich verschmälert. Bei seinem Austritt aus dem Peniskörper steht von ihm ein großer sichelförmiger Zahn ab, der zur Mitte des Penis gerichtet ist. Die Basalöffnung des Penis liegt dorsobasal und besitzt keinen stärker sklerotisierten Rahmen. Von ihren Seiten entspringen die ebenfalls nur schwach sklerotisierten Parameren, die das Penisende erreichen. Sie tragen vor ihrer Spitze lateral eine lange Borste und terminal 2 klöppelförmige Forsätze. Die Basalöffnung des Penis befindet sich in einer Art "Haube", die den Peniskörper von 3 Seiten umhüllt. Im Penisinneren befindet sich vor dem Ursprung des Ductus ejaculatorius ein sklerotisierter Komplex, der links aus dem Ostium penis einen breiten Lappen nach hinten entsendet.

***Euconnus ovulipenis* nov. spec.**

MATERIAL: Nur Holotypus ♂ (Penispräparat) Crocker Range, 1200 m, 63 km Straße Kota Kinabalu-Tambunan, 19.5.1987 (Ig. Burckhardt u. Löbl, cMG).

DIAGNOSE: Sehr ausgezeichnet durch die sehr lange Fühlerkeule, annähernd konischen Halsschild, sowie durch die Penisform.

BESCHREIBUNG: Long. 1,20 mm, lat. 0,70 mm. Dunkel rotbraun, gelblich behaart.

Kopf von oben betrachtet rundlich, flach gewölbt, mit den flach gewölbten Augen nur wenig breiter als lang, die gerundet zur Basis konvergierenden Schläfen knapp doppelt so lang wie der Augendurchmesser, wenig auffallend abstehend behaart, die Behaarung der Kopfoberseite lang, nach hinten gerichtet, wenig dicht. Fühler zurückgelegt die Halsschildbasis knapp überragend, ihr Basalglied und das 2. etwas gestreckt, 3 bis 7 sehr stark quer, 8 doppelt so breit wie 7, auch 9 und 10 leicht gestreckt, 10 breiter als 9, das eiförmige Endglied um die Hälfte länger als 10, die Keule mehr als doppelt so lang wie die Geißel.

Halsschild nahezu konisch, zur Basis aber schwach verengt, diese mit 2 durch eine Querfurche verbundenen Grübchen, oberseits schütter, seitlich struppig abstehend behaart.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis mit breiter, lateral von einer langen Humeralfalte begrenzter Basalimpression, fein punktiert und schräg abstehend behaart. Flügel voll entwickelt.

Beine kurz, ohne besondere Merkmale.

Penis (Abb. 105) von oben betrachtet kurz eiförmig, der Apex vom Peniskörper nicht abgesetzt. Die Basalöffnung mit breitem, stark sklerotisiertem Rahmen, Parameren breit, die Penisspitze nicht ganz erreichend. Operculum spitzwinkelig-dreieckig, das Penisende nicht erreichend. Im Penisinneren liegen distal der Basalöffnung 2 an der Basis miteinander verbundene sagittal parallel zueinander apikalwärts verlaufende Sklerotinzapfen, die im distalen Viertel der Penislänge enden.

***Euconnus bicornipenis* nov. spec.**

MATERIAL: Nur Holotypus ♂ (Penispräparat) Sabah, Mount Kinabalu, 1750 m, 27.4.1987 (lg. Burckhardt u. Löbl, cMG).

DIAGNOSE: Gekennzeichnet durch zurückgelegt die Halsschildbasis erreichende Fühler mit 4-gliedriger Keule, sehr stark querem 8. bis 10. Fühlerglied und sehr großem Endglied, dessen distaler Teil schwach vom basalen abgesetzt und verschmälert ist. Das einzige vorliegende Exemplar ist stark beschädigt, es fehlen ihm u. a. beide Flügeldecken. Penis sehr eigenartig gebaut, sodaß die Erkennung der Art durch die Penismerkmale allein schon ausreichend gesichert ist.

BESCHREIBUNG: Long. ca. 1,20 mm, lat. ca. 0,70 mm. Dunkel rotbraun.

Kopf von oben betrachtet gerundet-rautenförmig, die Schläfen doppelt so lang wie der Augendurchmesser. Fühler zurückgelegt die Halsschildbasis überragend, ihre beiden ersten Glieder leicht gestreckt, 3 bis 7 isodiametrisch bis schwach quer, 7 schon etwas breiter als 6, 8 mehr als doppelt so breit wie 7, stark, 9 und 10 noch stärker quer, das Endglied so breit wie 10, nur sehr wenig kürzer als 9 und 10 zusammen, sein distaler Teil etwas schmaler als der basale, seine Spitze breit abgerundet.

Halsschild konisch, so breit wie lang, an der Basis breiter als der Kopf mit den Augen, so weit erkennbar nur mit 2 Basalgrübchen.

Flügeldecken verloren gegangen, Flügel voll entwickelt.

Beine ziemlich kurz, Schienen schwach medialwärts gekrümmt.

Penis (Abb. 106) von oben betrachtet annähernd doppelt so lang wie breit, distalwärts etwas verschmälert, der Apex nicht scharf abgesetzt. Die Basalöffnung nur an ihrem distalen Rand mit sklerotisierter Umrahmung, Parameren am einzigen Präparat nicht vorhanden. Ostium penis dorsoapikal gelegen, aus ihm ragt distalwärts eine stark sklerotisierte, horizontale Platte heraus. Diese ist vor ihrem apikalen Ende spatelförmig verbreitert

und dahinter wieder eckig verschmälert. Der Hinterrand ist 2-spitzig. Die Platte ist auf ihren beiden Seiten im Penisinneren mit einem langen Sklerotinstab verankert, die beiden Stäbe sehen von oben betrachtet wie 2 Stierhörner aus. Die Penisseiten reichen seitlich der horizontalen Platte stachelförmig verschmälert bis zur Penisspitze.

***Euconnus fontium* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat), Sabah, Poring Hot Springs, 500-600 m, 9.5.1987 (lg. Burckhardt u. Löbl, cMG); ebenda, 2 Paratypen, 500 bis 620 m, 16.5.1987 (cF); ebenda 3 Paratypen (cMG); 1 Paratypus, Crocker Range, 1000 m, 5.9.1988 (lg. Smetana, cMG).

DIAGNOSE: Sehr klein, sehr gedungen gebaut, Fühler sehr kurz.

BESCHREIBUNG: Long. 0,90 mm, lat. 0,60 mm. Schwarz, Beine größtenteils rotbraun, dunkel behaart.

Kopf von oben betrachtet nahezu kreisrund, dicht und abstehend behaart. Fühler zurückgelegt die Halsschildbasis nicht erreichend, ihre Keule sehr scharf abgesetzt, die Geißel dünn, ohne das Basalglied so lang wie die Keule, das 2. Glied um die Hälfte länger als breit, wie auch das erste viel dicker als die folgenden, Glied 8 doppelt, 9 und 10 3-mal so breit wie lang.

Halsschild konisch, an der Basis so breit wie der Kopf, auch an den Seiten nur schütter behaart, stark glänzend, vor der Basis mit 2 großen Grübchen.

Flügeldecken sehr kurz oval, nur so lang wie Kopf und Halsschild zusammen, schon an der Basis zusammen viel breiter als die Halsschildbasis, ohne Basalimpression und ohne Humeralfalte, schütter, abstehend behaart. Flügel verkümmert.

Beine sehr kurz.

Penis (Abb. 107) dünnhäutig, nur die Umrahmung der Basalöffnung, der Apex und 2 nahe beieinander liegende Schleifen im Penisinneren stärker sklerotisiert. Basalöffnung gerundet-viereckig, Apex dreieckig, Ostium terminal gelegen.

BESTIMMUNGSTABELLE DER *Euconnus*-ARTEN INCERTAE SEDIS VON-SABAH

- | | | |
|---|---|----------------------------|
| 1 | ♂ mit asymmetrischen Fühlergliedern | 2 |
| – | ♂ mit normalen Fühlern | 4 |
| 2 | Mittlere Fühlerglieder exzentrisch, Körpergröße 2,0 mm, schwarzbraun, dicht und abstehend behaart | <i>tortricornis</i> n. sp. |
| – | Glieder der Fühlerkeule beim ♂ schwach asymmetrisch | 3 |
| 3 | 8., 9. und 10. Fühlerglied des ♂ medial erweitert und mit einem Borstenbündel versehen | |
| – | Fühlerkeule 4-gliedrig. | <i>cuneipenis</i> n. sp. |
| – | Fühlerkeule 3-gliedrig, ihre Glieder medial beim ♂ erweitert | <i>smetanai</i> n. sp. |
| 4 | Fühler scheinbar 10-gliedrig, Glied 3 sehr klein, schwer sichtbar, Keule 5-gliedrig | <i>crockeri</i> n. sp. |
| – | Fühler deutlich 11-gliedrig | 5 |
| 5 | Die ganze Körperoberseite lang abstehend dunkel behaart, Körperlänge 1,70 mm und darüber | 6 |
| – | Körper meist ohne lang abstehende dunkle Behaarung, Größe unter 1,60 mm | 9 |
| 6 | Fühler kurz, zurückgelegt die Halsschildbasis nicht erreichend | 7 |
| – | Fühler lang, zurückgelegt die Halsschildbasis überragend | 9 |
| 7 | Kopf, Halsschild und Flügeldecken annähernd gleich breit, 8. und 11. Fühlerglied schmaler als das 9. und 10 | <i>rotundiceps</i> n. sp. |

- Kopf und Halsschild deutlich schmaler als die Flügeldecken 8
 - 8 Körper schütter behaart, der Untergrund unter der Behaarung allenthalben sichtbar *circumlatus* n. sp.
 - Körper sehr dicht, emporgerichtet behaart, Untergrund unter der Behaarung nur an begrenzten Stellen sichtbar *pilosiceps* n. sp.
 - 9 Körperlänge über 1,60 mm 10
 - Körperlänge unter 1,60 mm 14
 - 10 Körperlänge über 1,90 mm *crockericola* n. sp.
 - Körperlänge unter 1,80 mm 11
 - 11 Halsschild konisch 12
 - Halsschild seitlich gerundet, Fühler zurückgelegt die Halsschildbasis erreichend 13
 - 12 Fühler mit scharf abgesetzter 4-gliedriger Keule *minutipenis* n. sp.
 - Fühler mit 5-gliedriger Keule *globoicollis* n. sp.
 - 13 8. Fühlerglied deutlich kleiner und schmaler als die folgenden, Kopf stärker gewölbt und dichter behaart *fraudentus* n. sp.
 - 8. Fühlerglied kaum kleiner als die folgenden, Kopf flacher und weniger dicht behaart *parakinabalui montanus* n. sp.
 - 14 Körperlänge 1,40 bis 1,60 mm 22
 - Körperlänge unter 1,40 mm 15
 - 15 Kleine Arten vom 0,90 bis 1,00 mm Körperlänge 16
 - Etwas größere Arten von 1,20 bis 1,40 mm Körperlänge 17
 - 16 Fühler zurückgelegt die Halsschildbasis erreichend, die 4-gliedrige Keule locker, die Glieder 8 bis 10 nur schwach quer, Körperfarbe rotbraun *masculinus* n. sp.
 - Fühler zurückgelegt die Halsschildbasis nicht erreichend, die 4-gliedrige Keule sehr kompakt, die Glieder 9 und 10 mehr als 3-mal so breit wie lang, Körperfarbe schwarz *fontium* n. sp.
 - 17 Körperlänge um 1,20 mm 18
 - Körperlänge 1,30 bis 1,40 mm 19
 - 18 Körper schlank, hellbraun gefärbt, Fühler schlank *filipenis* n. sp.
 - Körper robuster, schwarzbraun, Fühler dicker *livagoensis* n. sp.
 - 19 Fühlerkeule fast doppelt so lang wie die Geißel, die Keulenglieder alle gestreckt *ovulipenis* n. sp.
 - Fühlerkeule nicht oder nur wenig länger als die Keule, ihre Glieder nicht stark gestreckt 20
 - 20 Fühlerkeule 5-gliedrige, die Fühler zurückgelegt die Halsschildbasis erreichend *protectus* n. sp.
 - Fühlerkeule 4-gliedrig, Fühler meist kürzer 21
 - 21 9. und 10. Fühlerglied 3-mal so breit wie lang *indecorus* n. sp.
 - 9. und 10. Fühlerglied höchstens schwach quer 22
 - *silauensis* n. sp.
 - 22 Kopf stark quer, letztes Fühlerglied sehr spitz eiförmig länger als die beiden vorletzten zusammen *scuticornis* n. sp.
 - andere Merkmalskombinationen
- Hierher alle anderen Arten, die nur aufgrund der Genitalmerkmale sicher bestimmt werden können.

Gattung **Protoscydmus** nov. gen.

Die Gattung gehört zu den Scydmaeniden mit dem primitivsten Bau des männlichen Kopulationsapparates. Der Penis besitzt keine scharf begrenzte Basalöffnung. Die Para-

meren haften am Peniskörper ohne Verbindung mit sklerotisierten Ansatzstellen, im Penisinneren fehlen irgendwelche sklerotisierte Organe, der Apex penis ist nicht vom Peniskörper abgesetzt, ein Operculum fehlt ebenso wie ein scharf umgrenztes Ostium. Das neue Genus gehört in die Verwandtschaft der ebenfalls primitiven Genera *Alloraphes*, *Stenichnaphes* und *Parastenichnaphes*, der Genitalapparat ist aber noch weniger entwickelt.

Die Gattung ist auf die einzige bisher bekannte Art *Protoscydmus sabahensis* nov. spec. begründet.

Als Merkmale von generischem Rang sind zu bewerten: Die sehr geringe Größe und die angegebenen Merkmale des männlichen Genitalapparates.

***Protoscydmus sabahensis* nov. spec.**

MATERIAL: Holotypus ♂ (Penispräparat) Kinabalu Nat. Park, Poring Hot Springs area below Langanan Fall, 800 m, 12.5.1987 (lg. Smetana, cMG); 2 Paratypen ebenda, 520 m 13.5.1987 (lg. Smetana, cF); 1 Paratypus, Eastern Ridge Tr. 790 m, 17.8.1988 (lg. Smetana, cMG); 1 Paratypus, Kinabalu Nat. Park, 1100, 24.5.1897 (lg. Smetana, cMG).

DIAGNOSE: Gekennzeichnet durch sehr geringe Größe, konischen Halsschild und 4-gliedrige Fühlerkeule.

BESCHREIBUNG: Long. 0,80 bis 0,90 mm, lat. 0,40 bis 0,42 mm. Braunschwarz, Fühlergeißel, Beine und Palpen rotbraun, gelblich behaart.

Kopf rundlich, der Hinterkopf etwas beulenförmig emporgewölbt, Schläfen fein behaart, Fühler zurückgelegt nur die Halsschildmitte erreichend, mit scharf abgesetzter, 4-gliedriger Keule, ihr 2. Glied eineinhalbmal so lang wie breit, 3 bis 7 sehr klein, 8 bis 10 3-mal so breit wie 7, breiter als lang, 11 schmaler als 10.

Halsschild konisch, isodiametrisch bis leicht gestreckt, mit 2 Basalgrübchen, an den Seiten schütter, abstehend behaart.

Flügeldecken schon an der Basis zusammen breiter als die Halsschildbasis, mit kleiner Basalimpression, abstehend behaart. Flügel entwickelt. Beine kurz, ohne besondere Merkmale.

Penis (Abb. 108) mit schlanken Parameren ohne Tastborsten. Die übrigen Merkmale wurden schon in der Gattungsdiaagnose aufgezählt.

KATALOG DER BESPROCHENEN ARTEN

Gattung *Scydmaenus* Latreille

Untergattung *Scydmaenus* s. str.

- novaeollandiae* Lhoste
- minangkabauensis* Blatny
- pseudovestitoides* nov. spec.
- vestitoides* Reitter
- kinabaluensis* nov. spec.
- trapeziceps* nov. spec.
- bukitulari* nov. spec.
- crockerensis* nov. spec.
- borneoensis* nov. spec.
- borneoi* nov. spec.
- fraternus* nov. spec.

Untergattung *Agatheloor* Schaufuss

- deplanatus* Schaufuss

Untergattung *Armatoscydmaenus* Franz
brevitarsis Schaufuss
trapezicollis Lhoste
laticeps nov. spec.

Untergattung *Androscydmaenus* nov. subg.
densepunctatus nov. spec.

Untergattung *Mimoscydmaenus* Franz
crockeri nov. spec.
complexipenis nov. spec.

Untergattung *Mascarensia* Franz
dissimilis nov. spec.

Untergattung *Eustemmoides* Franz
punctatus nov. spec.
alessmetanai nov. spec.
silvicola nov. spec.
cuneipenis nov. spec.
thermarum nov. spec.
furcatus nov. spec.
burckhardtloebli nov. spec.
filipenis nov. spec.
parafilipenis nov. spec.
allofilipenis nov. spec.
bidentipenis nov. spec.
frater nov. spec.
poringensis nov. spec.
livagui nov. spec.
sabahensis nov. spec.
sabahi nov. spec.
allosabahensis nov. spec.
parasabahensis nov. spec.
sabahanus nov. spec.

Gattung *Loeblites* Franz
sabahensis nov. spec.

Gattung *Horaeomorphus* Schaufuss
loeblianus nov. spec.
sabahensis nov. spec.
punctatissimus nov. spec.

Gattung *Syndicus* Motschulsky
kinabalui nov. spec.

Gattung *Syndicomorphus* nov. gen.
magnus nov. spec.

Gattung *Borneosabahia* nov. gen.
mirifica nov. spec.

Gattung *Euconnus* Thomson
 Untergattung *Euconnus* s. str.
pseudosukhotanus nov. spec.
allosukhotanus nov. spec.
kinabaluanus nov. spec.
simillimus nov. spec.
latus nov. spec.

paenetypticus nov. spec.

paeneglaber nov. spec.

smetanaensis nov. spec.

apicefurcatus nov. spec.

Untergattung *Borneoconnus* nov. sub.

laticlava nov. spec.

sabahanus nov. spec.

eremita nov. spec.

Untergattung *Napochus* Reitter

kinabalui nov. spec.

mirus nov. spec.

allomirus nov. spec.

layangensis nov. spec.

quinquearticulatus nov. spec.

ventriculosus nov. spec.

burckhardtianus nov. spec.

valdeobscurus nov. spec.

parakinabalui nov. spec.

fuscus nov. spec.

funestus nov. spec.

sabahinanus nov. spec.

borneoi nov. spec.

paramirus nov. spec.

Untergattung *Napoconnus* Franz

cephalotes nov. spec.

parallelipenis nov. spec.

valdepullus nov. spec.

langananensis nov. spec.

elongatior nov. spec.

tambunanus nov. spec.

proceripenis nov. spec.

Euconnus spec. incertae sedis

globicollis nov. spec.

fraudulentus nov. spec.

kinabalumontanus nov. spec.

parakinabalumontanus nov. spec.

minutipenis nov. spec.

glandulipenis nov. spec.

robusticeps nov. spec.

paramerorum nov. spec.

circumlatus nov. spec.

filipenis nov. spec.

stylifer nov. spec.

paraglobicollis nov. spec.

pondoki nov. spec.

crockeranus nov. spec.

valdepilosus nov. spec.

tortricornis nov. spec.

borneoensis nov. spec.

crockeri nov. spec.

sabahi nov. spec.
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longeacuminatus nov. spec.
cuneipenis nov. spec.
ubahanus nov. spec.
masculinus nov. spec.
ovulipenis nov. spec.
bicornipenis nov. spec.
fontium nov. spec.

Gattung *Protoscydmus* nov. gen.

sabahensis nov. spec.

PHYLOGENETISCH- BIOGEOGRAPHISCHE ERGEBNISSE

Die Bearbeitung der Scydmaenidenfauna von Sabah hat zur Abrundung meiner seit 20 Jahren schrittweise durchgeführten Studien der Scydmaenidenfauna Südasiens geführt. Sie hat gezeigt, dass der Raum des Nat. Parks des Mount Kinabalu als eines der Entwicklungszentren der Bodenfauna von SO-Asien anzusprechen ist, einer Fauna, die von Borneo über Indonesien bis Thailand reicht. Im Raum des Kinabalu-Nat. parks sind nun 114 Scydmaeniden-Arten nachgewiesen, ausserordentlich viele, wenn man vergleichsweise berücksichtigt, dass Burckhardt und Löbl im Zuge ihrer Aufsammlungen in Thailand, in einer etwa 1000 Exemplare umfassenden Scydmaenidenausbeute nur 47 Arten von Scydmaeniden gefunden haben (FRANZ 1987, 1989a). Die Verwandtschaft der Scydmaenidenfauna von Thailand zu der von Sabah hat sich allerdings als sehr eng erwiesen, was aus dem Umstand hervorgeht, dass die Gattung *Loeblites* Franz und die Untergattung *Mimoscydmaenus* Franz der Gattung *Scydmaenus* diesen beiden Gebieten als Endemismen gemeinsam sind. In die gleiche Richtung weist auch die nahe Verwandtschaft der *Euconnus*-Fauna von Thailand und Sabah, vor allem der Arten der Untergattung *Euconnus* s.str.

Aufschlussreich ist auch ein Vergleich der Scydmaenidenfauna von Sabah mit derjenigen von Malaysia, Singapur und Sumatra (SCHAUFUSS 1884, BLATTNY 1926, 1935, FRANZ 1970, 1984 und 1989b), der ergibt dass auch diese Gebiete dem südostasiatischen Faunenbereich angehören. Dagegen gehört die Fauna von Sri Lanka, von wo 198 Scydmaenidenarten bekannt sind (BESUCHET 1971, FRANZ 1971, 1981) einem anderen Faunenbereich an, dem südindischen (vgl. FRANZ im Druck) und letzten Endes der Fauna des alten Gondwana-Kontinentes mit naher Verwandtschaft zu Madagaskar (FRANZ 1981). Die Fauna von Papua (FRANZ in Druck) ist australisch und somit einem ganz anderen Faunenbereich angehörig.

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