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GENÈVE
IMPRIMERIE SITO
MARS 1992

ISSN 0035-418X

REVUE SUISSE DE ZOOLOGIE

TOME 99 — FASCICULE 1

Publication subventionnée par la Société helvétique des Sciences naturelles
et la Société suisse de Zoologie

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Directeur du Muséum d'Histoire naturelle de Genève

FRANÇOIS BAUD
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Revue suisse Zool.	Tome 99	Fasc. 1	p. 3-9	Genève, mars 1992

A new species and the first males of *Suffasia* with a redilimation of the subfamilies of the Zodariidae (Araneae)

by

Rudy JOCQUÉ*

With 11 figures

ABSTRACT

A new species of *Suffasia* Jocqué, so far only known from females, is decribed on males and females from Nepal. *S. tumegaster* n. sp. combines autopomorphies of the subfamilies Zodariinae and Storeninae which implies that the subfamilies are to be merged in one assemblage. This had been predicted by an earlier cladistic analysis. The position of the new species and the generic relationships in the large subfamily Zodariinae are discussed.

INTRODUCTION

The genus *Suffasia* was erected by JOCQUÉ (1991) for two species originally described in *Suffucia* Simon, which is now considered a synonym of *Asceua*. Both the species were only known from females. At the time of Jocqué's revision, this was unfortunate considering the critical position *Suffasia* takes in the taxonomy of the Zodariidae. Jocqué considered the Zodariinae and Storeninae as two different monophyletic subfamilies based on the following autapomorphies: the presence of a femoral organ in the Zodariinae and the presence of chisel-shaped metatarsal tuft hairs in the Storeninae. However, according to the cladogram presented in JOCQUÉ (1991), the Storeninae are a paraphyletic grouping. The cladogram indicates that these subfamilies should have been considered as belonging to one monophyletic group. The author was aware of this but argued that the autapomorphies warranted the separation of these two subfamilies. The characters of *Suffasia*, which is the sister-group of all other Zodariinae, are evidently crucial in this argument but the scarcity of the material and the absence of males hampered the interpretation of *Suffasia*'s position.

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* Koninklijk Museum voor Midden-Afrika B-3080 Tervuren

A collection of spiders from Nepal made by Y. Löbl, contains a new species of *Suffasia* represented by an important number of specimens, males as well as females. It appears that it has important consequences for the taxonomy of the Zodariidae.

The format and description follows that of JOCQUÉ (1991). All measurements are in mm.

I am indebted to B. Hauser and Y. Löbl (MHNG: Musée d'Histoire naturelle, Genève) for the loan of material and to K. Wouters (KBIN: Koninklijk Belgisch Instituut voor Natuurwetenschappen) for help with the scanning electron micrographs.

Suffasia tumegaster new species
(figures 1–10)

Material: Holotype male: NEPAL, Kathmandu, Phulcoki, 2500 m, 10.V.1981, litter in oak forest near crest, Y. Löbl & A. Smetana (MHNG).

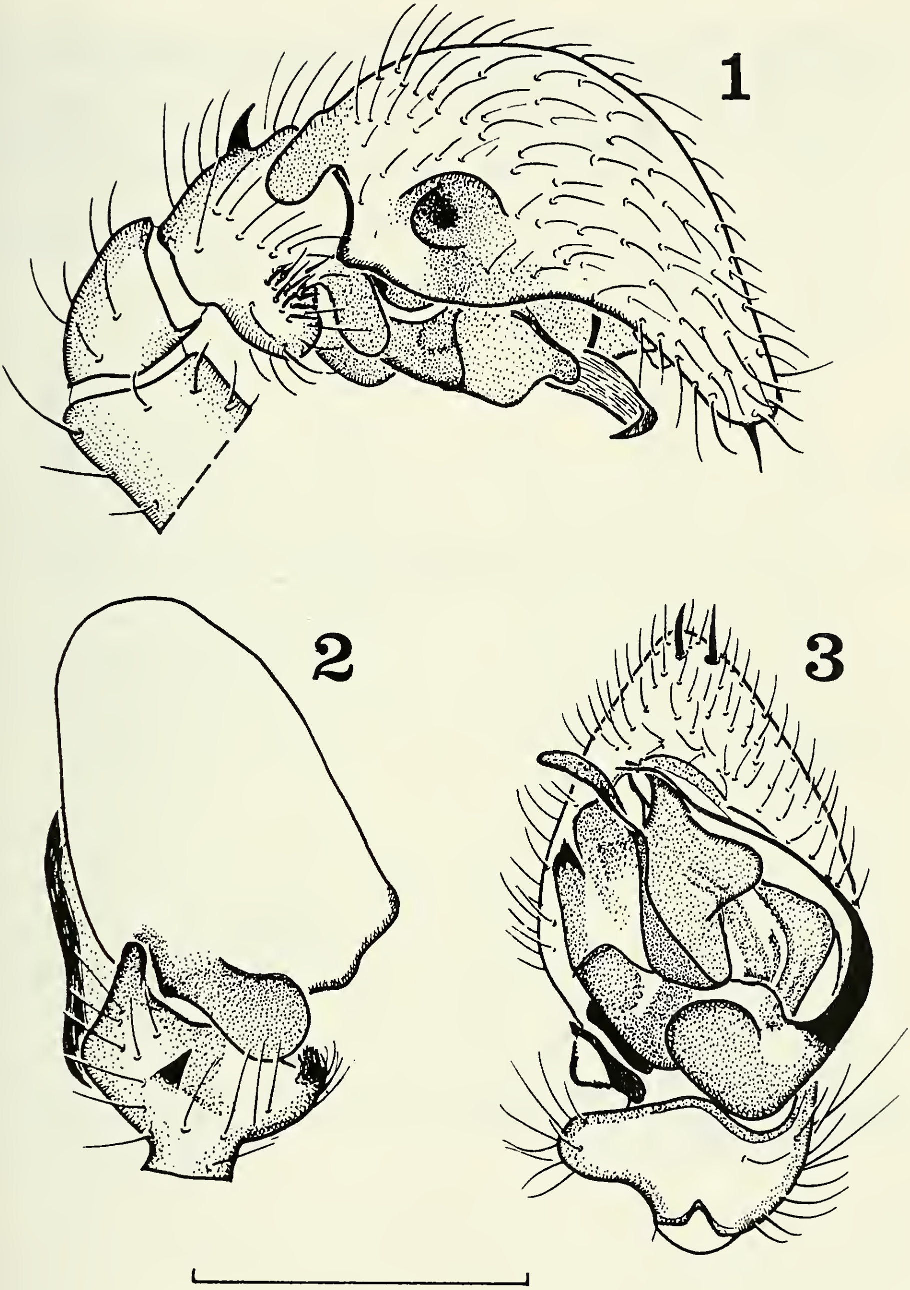
Paratypes: NEPAL (all material collected by Y. Löbl & A. Smetana): 1♀: together with holotype; 3♂ 2♀ 4 juv.: Kathmandu, Phulcoki, 2500 m, 10.V.1981, litter in oak forest near crest (KBIN); 1♂: northern slope, further as previous; 3♂ 3♀ 2 juv.: Malemchi, 2800 m, 14.IV.1981, litter at base of wall (MHNG); 6♂ 6♀ 4 juv.: Chaubas, 2500 m, 4-5.IV.1981, litter in rhododendron forest (MHNG); 4♂ 5♀ 11 juv.: Gul Bhanjyang, 2600 m, 6.IV.1981, litter in oak forest (MHNG); 1♀, 1 juv.: Barahbise, Dobate Ridge, 3000 m, 7.V.1981, pine litter (MHNG); 2♂ 3 juv.: Phulcoki, 2600-2700 m, 15.X.1983, dry forest, litter (MHNG); 3♀: Phulcoki, 2550-2650 m, 14-17.X.1983, dry forest, litter (MHNG, 1♀ in KBIN); 5♂ 1♀ 5 juv.: Phulcoki, 2500 m, northern slope, 28-29.IV.1984, litter at rock base (MHNG); 1♀: Phulcoki, 2600 m, northern slope, 16.X.1983, litter at rock base (MHNG); 1♂ 1♀ 1 juv.: Induwa Kola valley, 2100 m, 17.IV.1984, forest edge, litter (KBIN); 1♂ 2♀: 2000 m, mosses and litter in swampy area, further as previous; 1♂ 1♀ 3 juv.: Mangmaya, northern slope of hill to NW, 2300 m, 6.IV.1984, dry forest, litter, (MHNG); 1♀: Num, Arun valley, near main bridge, 1050 m, 20.IV.1984, secondary dry forest (MHNG); 8♂ 3♀ 4 juv.: Mangsingma, forest to S, 2200 m, 11.IV.1984, litter in ravine (MHNG); 1♂ 1 juv.: Mangsingma, crest to S, 2800 m, 7.IV.1984, rhododendron-bambou litter (MHNG); 2♂ 1♀ 4 juv.: Godawari, forest above botanical garden, 1600 m, 31.III.1984, litter, (MHNG); 4♂ 2♀ 2 juv.: Kuwapani, forest to NW, 2350 m, 5.IV.1984, humid litter (MHNG); 1♀: Kuwapani, forest to NW, 2250 m, 24.IV.1984, litter on fallen trunk (MHNG).

Diagnosis: the male is easily recognized by the dorsal cymbial flange overlying the palpal tibia, the cymbial lateral pit and the swollen venter of the abdomen. The female is characterized by the epigyne with frontal entrance openings and the course of the copulatory ducts. The small AME are an additional diagnostic character for both sexes.

Etymology: *Tumegaster* is a contraction of the Latin words *tumidus* (swollen) and *gaster* (abdomen); this noun in apposition obviously refers to the swollen ventral side of the male abdomen.

Description: Male holotype (range of paratypes in brackets): total length 3.15 (2.79-3.35); carapace 1.43 (1.30-1.58) long, 1.05 (1.02-1.21) wide.

Colour: carapace orange brown with network of dark lines dominated by large U-shaped pattern in front of fovea and darker area on lower half of clypeus; chelicerae pale brown; sternum yellowish brown with faint darker pattern; legs yellow; abdomen: dorsum dark sepia with narrow brown scutum in anterior half, followed by two pairs of pale spots and three pale bars; posterior one in front of the spinnerets on either side with triangular extension; venter pale except for swollen area which is pale brown and followed by two dark patches touching spinneret area; epiandrum pale yellow.



FIGS 1-3.

Suffasia tumegaster n. sp., male palp: 1. lateral view; 2. dorsal view; 3. ventral view. (scale line = 0.5 mm).

Carapace smooth. Chilum single, triangular, higher than wide; difficult to see because underlain by dark, wide, membranous triangle. Anterior margin of chelicerae with two teeth of which the distal one is the largest.

Eyes: AME: 0.07; ALE: 0.08; PME: 0.08; PLE: 0.09; AME-AME: 0.02; AME-ALE: 0.05; PLE-PLE: 0.07; PME-PLE: 0.11.

MOQ: AW = 0.69 PW; AW = 0.55 L. Clypeus 0.31; high or 3.9 times the diameter of an ALE.

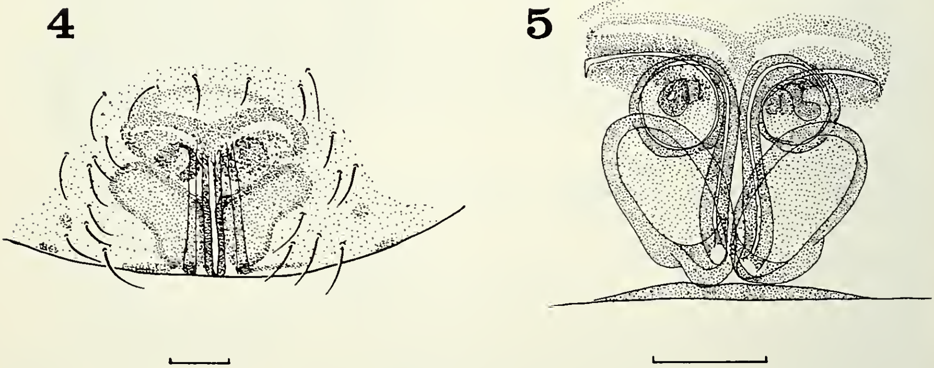
Legs: Spination poorly developed: all femora with two dorsal spines. Tibiae and metatarsi with flattend incised hairs. Metatarsi II, III and IV with distoventral tuft of chisel-shaped hairs (fig. 6). Femoral organ on all legs, with two smooth hairs (fig. 7).

Measurements

	F	P	T	Mt	t	Tot
I	1.15	0.40	1.01	1.05	0.55	4.16
II	1.07	0.40	0.81	0.91	0.48	3.67
III	1.01	0.42	0.75	1.01	0.42	3.61
IV	1.25	0.42	1.13	1.51	0.61	4.92

Abdomen ventrally with a wide, slightly sclerotized, transverse swelling halfway between the epigastric fold and the spinnerets (fig. 8). Epiandrum poorly sclerotized. Dorsal frontal scutum very narrow, poorly sclerotized.

Male palp (fig. 1-3, 9, 10): tibia with short dorsal spiniform apophysis and lateral haired boss. Cymbium with proximal dorsal flange overlying anterior dorsal margin of tibia (fig. 2, 9) and deep proximal lateral hole (fig. 1, 10). Embolus relatively long, strongly tapering towards extremity; base of embolus separated from rest of tegulum; tegular apophysis well developed, twisted, pointing outward; conductor a distal transverse ridge of tegulum.



Figs 4-5.

Suffasia tumegaster n. sp., epigyne: 4. ventral view; 5. dorsal view, cleared. (scale line = 0.1 mm).

Female paratype from type locality (range of paratypes in brackets): total length 3.96 (3.11-4.51); carapace 1.71 (1.39-2.18) long, 1.30 (0.98-1.58) wide.

Colour as in male, but dark marking in front of fovea more V-shaped. Abdomen generally as in male but scutum absent; chevrons instead of transverse pale bars; posterior pale triangles separated. Eyes, chilum and chelicerae as in male.

Legs: spination, femoral organs and ornamentation as in males.

Measurements

	F	P	T	Mt	t	Tot
I	1.02	0.45	1.02	1.08	0.61	4.18
II	0.98	0.45	0.80	0.96	0.57	3.76
III	1.29	0.45	0.80	1.08	0.51	4.13
IV	1.31	0.51	1.08	1.57	0.63	5.10

Female palp with long conical tarsus (fig. 11).

Epigyne (fig. 4-5): entrance openings on anterio-lateral side of epigyne; thin-walled copulatory ducts run inward describing loop in anterior part, thence they run backward along central longitudinal axis and enter large, oval spermathecae near posterior margin.

Other material examined: none.

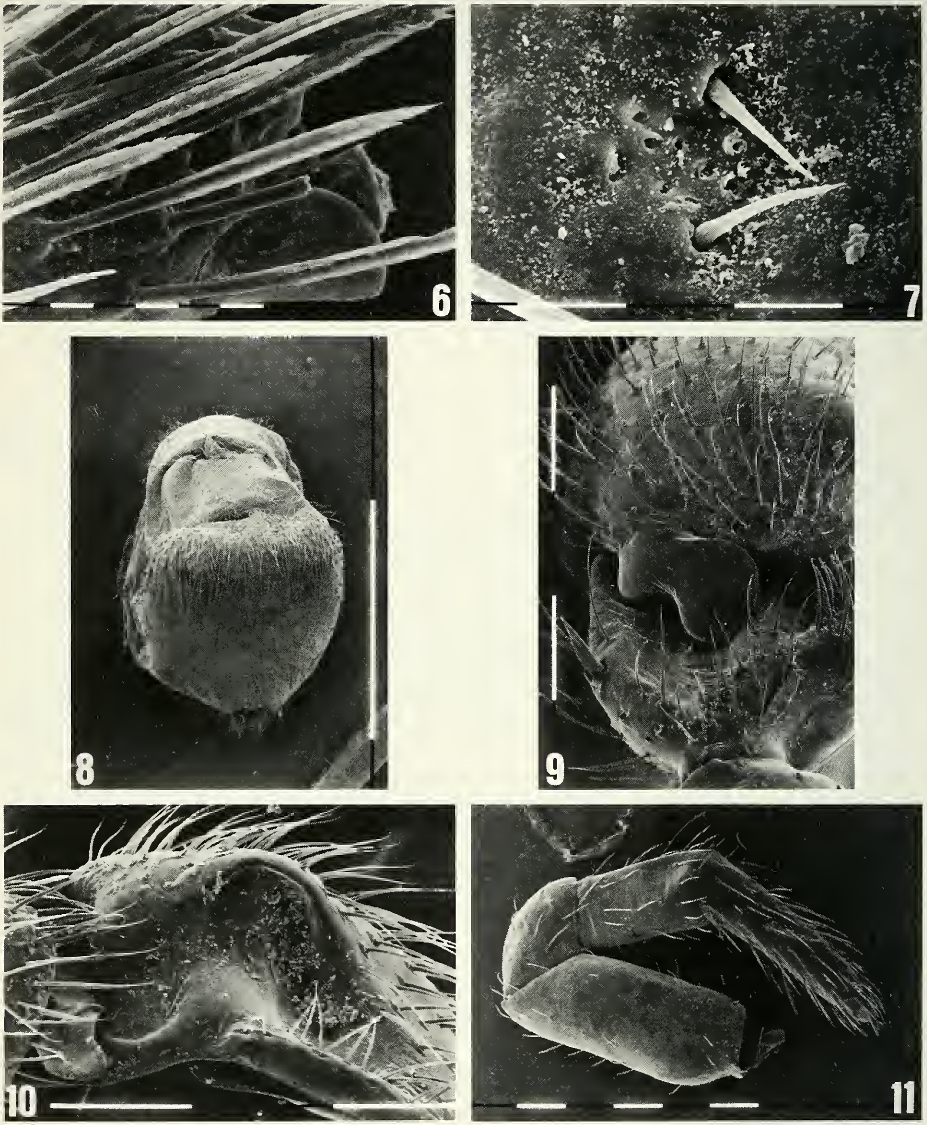
Distribution: central and eastern Nepal, 1050 to 3000 m.

DISCUSSION

The attribution to *Suffasia* of the species here described, is not entirely sure. So far the genus was only known from a few females from South India (Kodaikanal in the Palni Mts.) and since many zodariid genera are mainly diagnosed on characters of the male palp an unambiguous definition of *Suffasia* has to wait the description of the male of its type species. Diagnostic characters of *Suffasia* are the female palp with a long conical tarsus, the dark network pattern on the carapace (not mentioned in JOCQUÉ, 1991) and the presence of a femoral organ and flattened incised hairs on the legs in combination with a chilum and cheliceral teeth, which is unique in the Zodariinae. *S. tumegaster* shares all these characters with the type species of the genus, *Suffasia tigrina*. However, that species lacks metatarsal hair tufts and chisel-shaped hairs, the autapomorphy of the Storeninae. On the other hand it has a well developed leg spination and a peculiar epigyne with frontal thick-walled spermathecae, and sclerotized copulatory ducts running forward. *S. tumegaster* is different in all these respects: it has chisel-shaped hairs in metatarsal tufts, poorly developed leg spination and a differently organized epigyne in which the spermathecae are near the posterior margin and the thin-walled copulatory ducts run backward.

It might therefore well be that the present species should be placed in a new genus but as long as the males of the type species are not known this cannot be decided. In any case, the species is strongly related to *Suffasia* although it has some remarkable characters in the male palp which remind of *Forsterella* Jocqué from New Zealand (isolated base of the embolus) and of *Asceua* Thorell and *Mallinella* Strand (well developed conductor), two Palaeotropical genera.

The most remarkable statement is that of the combination of chisel-shaped hairs in the metatarsal tufts, cheliceral teeth and a chilum, all characters of the Storeninae, with the



FIGS 6-11.

Suffasia tumegaster n. sp. 6. metatarsal tuft, chisel-shaped hairs; 7. femoral organ on femur II; 8. male abdomen ventral view; 9. male palp, proximal part of cymbium, dorsal view; 10. cymbium, lateral view; 11. female palp, lateral view (scale line = 0.01 mm for 6 and 7, 1 mm for 8, 0.1 mm for 9, 10 and 11).

presence of a femoral organ and flattened incised hairs on the legs, autapomorphies of the Zodariinae. From this combination it is clear that the autapomorphies used by JOCQUÉ (1991) to separate the mentioned subfamilies do not hold. The cladistic analysis in that paper indeed suggested that the Zodariinae and Storeninae are one large monophyletic group. This implies that the Storeninae have to be deleted and that the Zodariidae only contain 5 subfamilies. 32 out of 47 genera now belong in the Zodariinae.

This monophyletic assemblage is largely composed of genera which are endemic to particular continents. It is very surprising that the genera which are found in Africa are apparently more closely related to the Australian Zodariinae than to the genera found in South America. The five Neotropical genera are indeed near the root of the zodariine branch whereas the Australian ones are situated in between the Neotropical and the other Palaeotropical-Palaearctic ones. This statement is at least puzzling: it is in contrast with the timing of major plate tectonic events that caused the breakdown of Gondwanaland, as deduced from geological data. If more global revisions of old invertebrate groups become available, the picture of the Gondwanaland breakdown chronology might perhaps change altogether.

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Revue suisse Zool.	Tome 99	Fasc. 1	p. 11-30	Genève, mars 1992

Multivariate morphometrics of geographic variation of *Gerris costae* (Heteroptera: Gerridae) in Europe

by

Christian Peter KLINGENBERG *

With 7 figures

ABSTRACT

The waterstrider species *Gerris costae* (Herrich-Schaeffer) has a large and disjunct distribution in the southern part of the palearctic region. Multivariate morphometric techniques were used to assess the geographic variation in the European part of its range, where three subspecies are currently recognized: *G. c. costae* (Herrich-Schaeffer), *G. c. fieberi* Stichel, and *G. c. poissoni* Wagner and Zimmermann. Twelve variables were selected from a larger set (56 or 57 variables for males and females, respectively) by stepwise discriminant analysis, and were found to represent the main patterns of morphometric variation in the full character set. Principal component analysis revealed that both 'size' and 'shape' contribute to geographic differentiation. Canonical variate analysis with two different criteria for the definition of *a priori* groups showed that the subspecies are coherent units separate from each other, and that the segregation into the three subspecies indeed reflects the main pattern of geographic variation in Europe. Comparisons of field samples with offspring reared in the laboratory under standardized conditions demonstrated that geographic differentiation is genetically determined for the most part. The study therefore supports the segregation of *Gerris costae* into three subsepcies in the area considered. Linear discriminant functions are given to allocate additional material to the subspecies.

INTRODUCTION

Intraspecific variation is of major interest for the study of evolutionary processes such as speciation (ENDLER, 1977), and, in conjunction with biogeographic evidence, to infer the distributional history of taxa (JANSSON, 1980; THORPE, 1984). Moreover,

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* Department of Population Biology, Zoological Institute of the University of Bern, Baltzerstrasse 3, CH-3012 Bern, Switzerland.

Present address: Department of Entomology, University of Alberta, Edmonton, Alberta T6G 2E3, Canada.

geographic variation is of taxonomic importance in the context of the subspecies concept (Blackwelder, 1967; Barrowclough, 1982; Mayr, 1982; Smith and Patton, 1988). Morphometric methods can be used to analyze various aspects of variation (Pimentel, 1979; Thorpe, 1983), and have therefore been widely utilized in recent investigations. Examples of morphometric studies on geographic variation in insects include Zimmerman and Ludwig (1974), Bryant (1977), Bryant and Turner (1978), Foottit and Mackauer (1980), and Ruttner (1988).

To be of evolutionary or taxonomic importance, geographic variation has to be genetically determined, at least to a large extent (Atchley, 1983). Variation in the quality of habitats can generate environmental variation in morphometric traits (e.g., Smith and Patton, 1988) which may be confounded with genetic variation. Laboratory rearings under standardized conditions can be used to control for environmental effects in studies of the genetic determination of morphometric differentiation (Bryant, 1977; Bryant and Turner, 1978; Sorensen and Sawyer, 1989).

The waterstrider *Gerris costae* (Herrich-Schaeffer) has a wide and rather disjunct distribution in the southern palearctic region, and exhibits considerable geographic variation in morphological traits. Several subspecies have been proposed in the European part of its range (Fig. 1). *G. c. costae* (Herrich-Schaeffer), *G. c. fieberi* Stichel, and *G. c. poissoni* Wagner and Zimmermann have been described in detail by Wagner and Zimmermann (1955) using genital morphology and coloration as main characters, and were included by Nieser (1978) in his compilation of European semiaquatic and aquatic bugs. Nieser (1978) did not, however, recognize *G. c. arvernensis* from the French Massif Central (distinguished by male genital morphology, Poisson, 1957) or *G. c. avernensis* from the Pyrenees (a name proposed without any further details or description by Richard, 1967), as subspecies. Another subspecies, *G. c. sahlbergi* Distant, occurs in Central Asia (Kanyukova, 1982).

The nominate subspecies *G. c. costae* was reported from the Alps (Wagner and Zimmermann, 1955; Nieser, 1978), and from various parts of Italy (Servadei, 1967; Nieser, 1978; Tamanini, 1979). It is confined to high altitudes (in Switzerland mainly above 1200 m; in Tyrol mainly above 800 m, lowest record 550 m, Heiss, 1969), where it is found mostly on small pools and ponds in meadows and bogs. *G. c. fieberi* is distributed in Italy (Wagner and Zimmermann, 1955; Servadei, 1967; Tamanini, 1979) and in south-eastern Europe (Balkans, Carpathian Mountains, eastwards to the north-western coast of the Black Sea; Wagner and Zimmermann, 1955; Nieser, 1978), and its range extends throughout Asia Minor to Lebanon, Israel, Syria and Iraq (Hoberlandt, 1948; Wagner and Zimmermann, 1955; Nieser and Moubayed, 1985). It occurs in very diverse habitats on stagnant as well as flowing water (Hoberlandt, 1948; Zimmermann, 1982; pers. obs.), and is not restricted to high elevations, but can also be very abundant in river basins at low altitudes (pers. obs.). *G. c. poissoni* is found on small bodies of stagnant water in mountainous areas of France and the Iberian peninsula, and in Great Britain and Ireland (Wagner and Zimmermann, 1955; Poisson, 1957; Nieser, 1978), where it also occurs at low altitudes under harsh climatic conditions. The subspecific status of *Gerris costae* in large parts of the western Soviet Union is unclear (e.g., records of the nominate subspecies reported by Kanyukova, 1982).

Genital morphology and coloration, the main characters in previous taxonomic studies, exhibit considerable variability within samples from single localities. Individuals differ seasonally in certain characters, such as the bright patch on the pronotum that often is visible to its full extent only after overwintering. Bächler (1985) found no correspondence between enzyme electrophoretic similarities and described subspecies, mainly

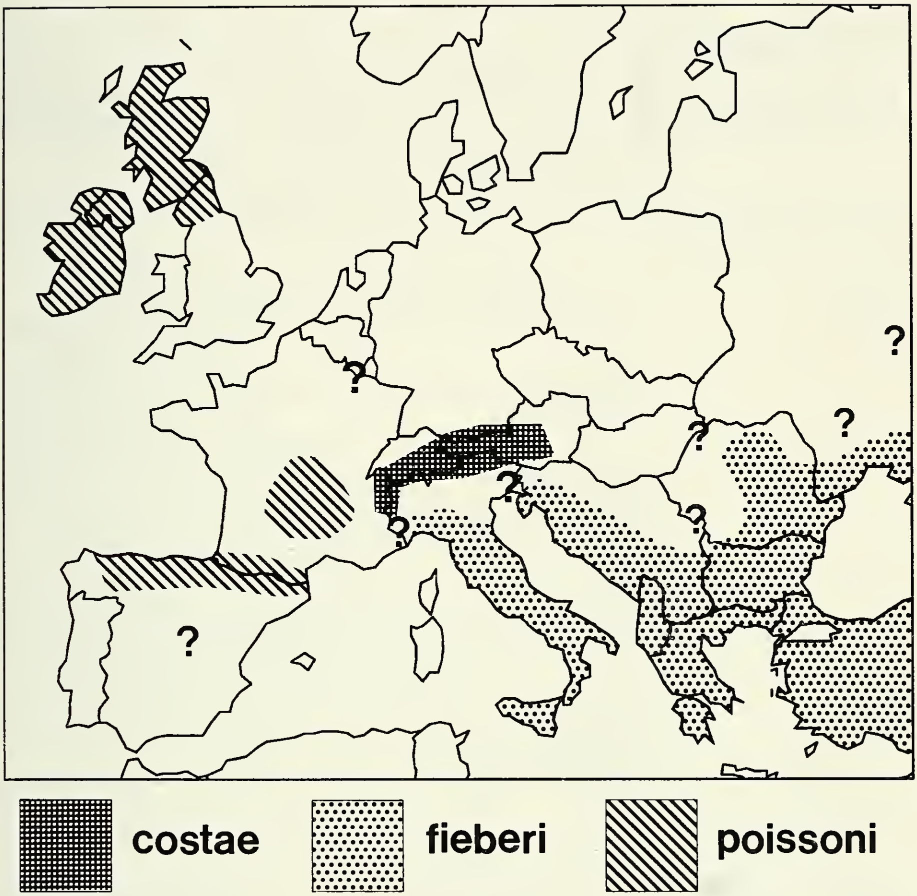

FIG. 1.

Approximate distribution ranges of the subspecies of *Gerris costae*, mainly based on NIESER (1978) and WAGNER and ZIMMERMANN (1955).

because of the low level of genetic differentiation in the loci considered. Although WAGNER and ZIMMERMANN (1955) mentioned that body size varies between subspecies, morphometric methods have not yet been used to examine the geographic variation of *G. costae*.

The purpose of this paper is to assess the geographic variation of *Gerris costae* in Europe by means of multivariate morphometrics, to show the genetic base of variability by comparing samples collected in the field and reared in the laboratory, and to examine if the pattern of geographic variation is consistent with the segregation into subspecific taxa.

MATERIAL AND METHODS

MATERIAL AND MEASUREMENTS

Material from various parts of Europe (Table 1) was used in this study. Samples from the Alps, the French Massif Central, the Pyrenees, and from Greece, including living specimens for rearing experiments, were collected during field trips in 1986 and 1987. Additional material was obtained from collections at the Zoological Institute of the University of Bern. Laboratory mass rearings were carried out under standardized conditions (temperature 20°C, stationary long-day photoperiod 18L:6D) as specified by GROSSEN and HAUSER (1982), using frozen cockroaches (*Nauphoeta cinerea*) as food. Since food was provided in large quantities, and the numbers of larvae in different rearings were similar, effects of different rearing densities (crowding) can be ruled out. After the imaginal molt, the laboratory-reared offspring were kept until their cuticles were completely hardened, and then killed by deep-freezing.

TABLE 1

Samples sizes by subspecies, geographic region, and sex. For laboratory cultures, geographic regions refer to parent populations.

Presumed subspecies	Geographic region	Sample size Males	Females
G. c. costae	Central Alps	118	153
	Eastern Alps	53	33
	Southern Alps	14	20
G. c. fieberi	Northern Greece	65	40
	Northern Italy	1	2
	Calabria	1	–
G. c. poissoni	Scotland	9	9
	Northern Ireland	4	1
	French Massif Central	36	29
	Pyrenees	39	36
	Laboratory cultures		
G. c. costae	Central Alps	34	36
G. c. fieberi	Northern Greece	33	34
G. c. poissoni	French Massif Central	25	28
G. c. poissoni	Pyrenees	30	33

All specimens were stored in 70% ethanol for at least two months before measuring. By this treatment the bright markings (e.g., the patch on the pronotum) became clearly visible and distinctly delimited, even in specimens that had not yet overwintered and appeared uniformly dark brown before storage. Only individuals with firmly hardened cuticle were included. Specimens for which one or more characters could not be measured were excluded from the study.

Measurements were taken in millimetres using a Wild M5 dissecting microscope fitted with a Wild MMS 235 digital length measuring equipment. In a preliminary step 56 variables were measured in males and 57 in females (Table 2, Figs 2, 3). Of these, 12

TABLE 2

List of measured variables. Morphological terms according to Andersen (1982). Variables marked with an asterisk were selected for the reduced set of characters.

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1. Total length.
2. Pronotum length.
3. Distance from anterior margin of pronotum to mesopleural tubercles.
4. Length of bright median line on pronotum.
5. Length of bright pronotum patch.
6*. Eye length.
7. Distance from first to second pair of cephalic trichobothria.
8. Distance from first to third pair of cephalic trichobothria.
9. Distance from third to fourth pair of cephalic trichobothria.
10. Length of radial cell.
11. Length of cubital cell.
12. Distance between apical ends of radial and cubital cells.
13. Pronotum width.
14*. Width of bright pronotum patch.
15. Distance between anterior corners of pronotum.
16*. Distance between mesopleural tubercles.
17. Distance between outermost points of mesoacetabula.
18. Distance between outermost points of metaacetabula.
19*. Head width.
20*. Smallest distance between eyes.
21. Distance between outermost points of antennal sockets.
22. Distance between first cephalic trichobothria.
23*. Distance between second cephalic trichobothria.
24. Distance between third cephalic trichobothria.
25. Distance between fourth cephalic trichobothria.
26*. Abdominal width at posterior margin of second abdominal segment.
27. Abdominal width at posterior margin of sixth abdominal segment.
28. Distance between end points of connexival spines.
29. Width of fore wing.
30. Distance between end points of longitudinal ridges of mesosternum.
31. Prosternum length.
32. Mesosternum length.
33. Metasternum length.
34. Distance between anterior margin of prosternum and posterior end points of coxal clefts of mesoacetabula.
35*. Distance between anterior margin of prosternum and outermost visible points of borderline between metaacetabula and hind coxae.
36. Distance between metathoracic scent orifice and posterior margin of metasternum.
37. Length of second abdominal sternite.
38. Length of third abdominal sternite.
39. Length of fourth abdominal sternite.
40. Length of fifth abdominal sternite.
41. Length of sixth abdominal sternite.
42. Length of seventh abdominal sternite.
43*. Length of first antennal segment.
44. Length of second antennal segment.
45. Length of third antennal segment.
46. Length of fourth antennal segment.
47. Length of fore femur.
48. Length of fore tibia.

49*. Length of middle femur.
50*. Length of middle tibia.
51. Length of first segment of middle tarsus.
52. Length of second segment of middle tarsus.
53*. Length of hind femur.
54. Length of hind tibia.
55. Length of first segment of hind tarsus.
56. Length of second segment of hind tarsus.
57. (Measured for females only). Distance between midpoint of posterior margin of seventh abdominal sternite and endpoints of connexival spines.

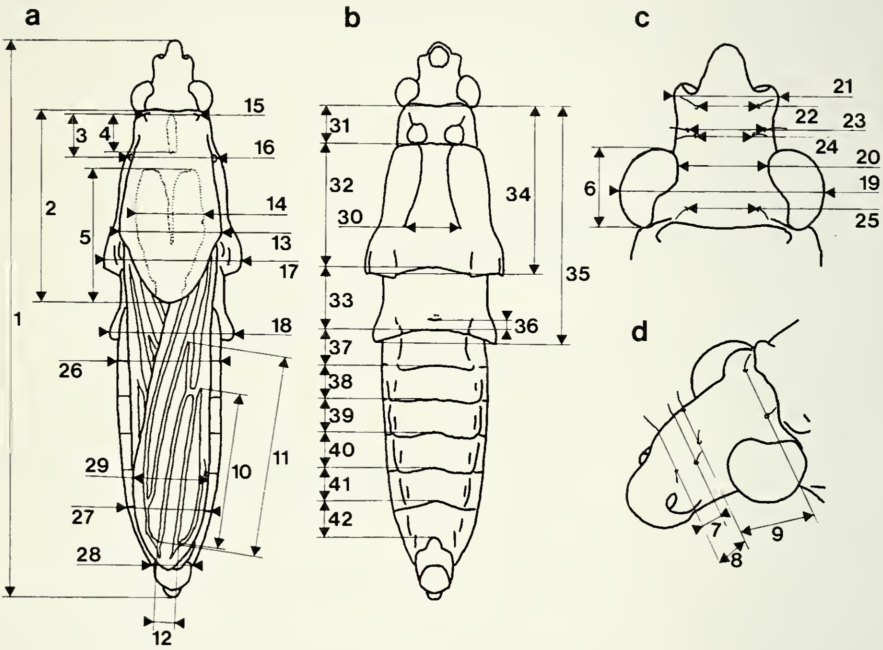

FIG. 2.

Drawings illustrating the measurements nos 1-42. (a) Dorsal view. (b) Ventral view. (c) Head in dorsal view. (d) Head in oblique view. Legs, antennae, and rostrum are omitted. Descriptions of the characters are given in Table 2.

variables were selected for detailed study using linear discriminant analysis (see below). Character 57 was included for females due to the taxonomic value attributed to the connexival spines in the paper of WAGNER and ZIMMERMANN (1955), but could not be measured for males.

STATISTICAL ANALYSIS

This study only considers morphometric variation in adult specimens of *Gerris costae*. Because the adult is a clearly defined stage in insects, and since environmental

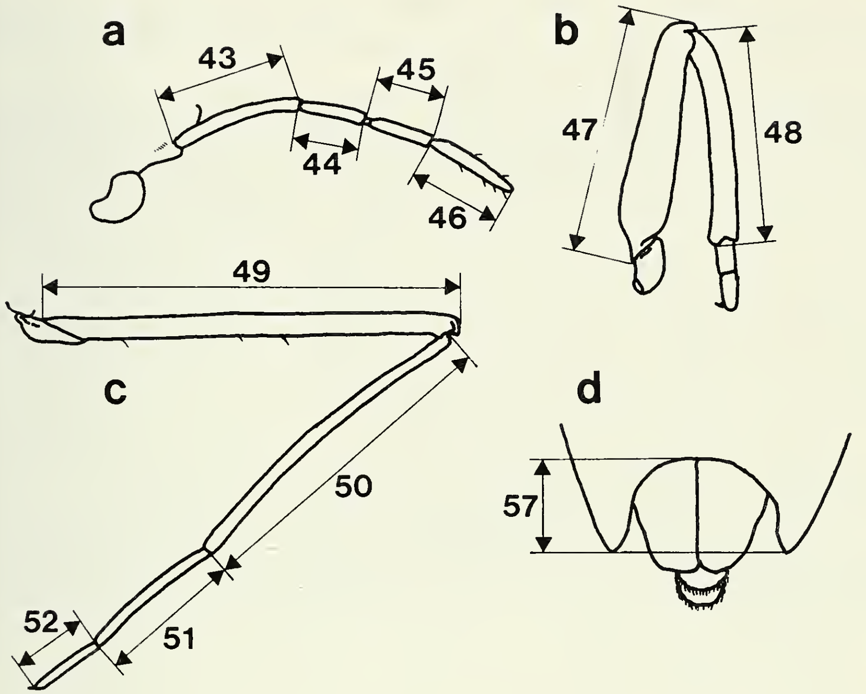

FIG. 3.

Drawings illustrating the measurements nos 43-57. (a) Antenna. (b) Fore leg. (c) Middle leg. Characters nos 53-56 are measured analogously on the hind leg. (d) Abdominal end of a female in ventral view. Descriptions of the characters are given in Table 2.

effects are controlled by the rearing experiments, there was no need to exclude variation in size from the analysis (ATCHLEY, 1983; THORPE, 1983). All analyses were carried out separately for males and females on untransformed variables using the SAS statistical software package (SAS INSTITUTE INC., 1985). Formal statistical testing and calculation of standard errors was not appropriate due to the inhomogeneity of the material and disparate sample sizes. Therefore, congruence of results from separate analyses for both sexes provided a measure of reliability of the observed patterns.

Specimens from the field were allocated to the three subspecies *G. c. costae*, *G. c. fieberi*, and *G. c. poissoni* according to their sampling locations, using the subspecies division and the distribution ranges given by WAGNER and ZIMMERMANN (1955) and NIESER (1978), as shown in Fig. 1. The only ambiguity about subspecies status concerned the samples from Northern Italy (see Introduction). They were provisionally allocated to *G. c. fieberi* becvause of three reasons: the general appearance of the specimens (they were very large and bright brown in color), the low altitude of the locations (200 m and 500 m), and their habitats (A. Scholl, pers. comm.) that seemed more similar to Greek than to Alpine populations.

In a preliminary step all the 56 or 57 variables were included. This dataset comprised 216 males and 201 females altogether, that were collected in all the geographic regions listed in Table 1 (except Calabria), and from the rearings of specimens from the Central Alps, the Franch Massif Central, and the Pyrenees.

Linear discriminant functions between each pair of subspecies were calculated separately for the field samples of both sexes by means of linear regression (FLURY and RIEDWYL, 1985, 1988). For every pairwise comparison of subspecies, a pseudo-variable was coded either 0 or 100 according to the subspecies status of each specimen. This pseudovariable was then used as dependent variable in a linear regression analysis. The number of variables was reduced by backward elimination, using multivariate standard distance (FLURY and RIEDWYL, 1986, 1988) as a criterion for the separation of groups. In all analyses, standard distance fell slowly during the first elimination steps, but more rapidly when fewer than 10-12 variables were retained. As the sets of variables retained in the different analyses were similar, it was possible to select 12 variables as a 'compromise' between subspecies comparisons, weighting difficult distinctions (*G. c. costae* – *G. c. poissoni*) somewhat more than others.

Congruence between the full and reduced sets of variables was expressed as the product-moment correlation coefficients of corresponding component scores of PCAs (pooled samples from the laboratory and the field) using the two character sets.

After measuring additional specimens for the 12 selected characters (see Table 1 for sample sizes), an ordination by means of principal component analysis (PCA) was used to display the multivariate structure of the data from field samples in fewer dimensions (PIMENTEL, 1979; FLURY and RIEDWYL, 1988). The correlation matrix of the untransformed variables of the pooled samples was used for PCA.

Canonical variate analysis (CVA; ALBRECHT, 1980; CAMPBELL and ATCHLEY, 1981; REYMENT *et al*., 1984) was used to check if the separation into the three subspecies was reflected by the data for the field samples. Two different CVAs were carried out for each sex, the geographic regions listed in Table 1 and the subspecies status (as specified above) being used as criteria for the definition of *a priori* groups.

Comparisons of specimens from laboratory rearings with field-collected samples of their parental populations were carried out by CVA. If offspring from such cultures show a pattern of variation between rearings similar to that between corresponding field populations, this is taken as evidence for the genetic determination of morphometric variation. However, if differing environmental conditions determine to a large extent the variation between geographic regions, less variation between laboratory cultures is expected than between field populations, and patterns of variation between rearings will differ from the patterns between their parent populations.

The linear discriminant functions were recalculated with extended sample sizes. Multivariate standard distance was used as a measure of separation between groups. The discriminant functions were tested for reliability in two ways: by establishing percentages of individuals misclassified by the discriminant functions, and additionally by means of a cross-validation procedure (EFRON and GONG, 1983). For the latter, discriminant functions were recalculated omitting one sample location (test sample) from the analysis, and then the mean discriminant score of the test sample was evaluated. This step was repeated for all subspecies comparisons and all sampling locations in both sexes, yielding 106 separate analyses.

RESULTS

COMPARISON OF CHARACTER SETS

A reduced set of 12 characters was selected from the full set using stepwise discriminant analysis. This reduced set represents most body parts, although some imbalance exists. One length (variable 6) and three width measurements (19, 20, 23) of the head, two variables of thoracic (14, 16) and one of abdominal (26) width, one thoracic length (35), but no abdominal length measurements are included. Appendages are represented by lengths of one antennal (43) and three leg segments (49, 50, 53).

The congruence between character sets, measured as the product-moment correlation between first principal component (PC) scores from analyses using the reduced character set and all variables, is 0.98 for males and 0.97 for females. The first PC in males takes up 51% of the total variance in the analysis of the full character set, and 60% in the analysis of the reduced set. Corresponding figures for females are 45% and 53%. Correlations between second PC scores are 0.86 for males, where the second PC explains 8% of total variance in the full character set and 14% in the reduced set. For females, where second PCs explain 9% and 16% of total variance of the full and reduced character sets respectively, the correlation coefficient between these components is 0.88. Correlations of the third and following PCs are lower, and in females third and fourth components are interchanged with respect to those of the males. Because these components have considerably smaller eigenvalues, however, differences in components between the character sets are less important. Thus, the reduced character set represents the main patterns of variation in the data fairly well.

TABLE 3

Principal component analysis. Tabled values are correlations of the original variables with the first, second, and third PCs for males and females, and corresponding eigenvalues and percentages of total variance.

Character		Males			Females	
number	PC 1	PC 2	PC 3	PC 1	PC 2	PC 3
6	0.775	–0.043	0.267	0.727	–0.039	–0.482
14	0.714	0.062	–0.521	0.783	0.105	–0.218
16	0.845	0.141	–0.172	0.825	0.130	–0.011
19	0.880	0.225	0.045	0.862	0.287	–0.222
20	0.739	0.471	–0.054	0.739	0.549	0.102
23	0.483	0.681	0.386	0.524	0.604	0.423
26	0.767	0.138	–0.346	0.662	0.226	–0.206
35	0.924	–0.134	–0.046	0.927	–0.132	–0.003
43	0.851	–0.304	0.117	0.779	–0.439	–0.022
49	0.899	–0.274	0.102	0.879	–0.323	0.242
50	0.875	–0.249	0.138	0.858	–0.233	0.243
53	0.897	–0.295	0.134	0.869	–0.382	0.185
Eigenvalue	7.92	1.11	0.71	7.56	1.34	0.71
Percentage	66.0	9.3	6.0	63.0	11.2	6.0

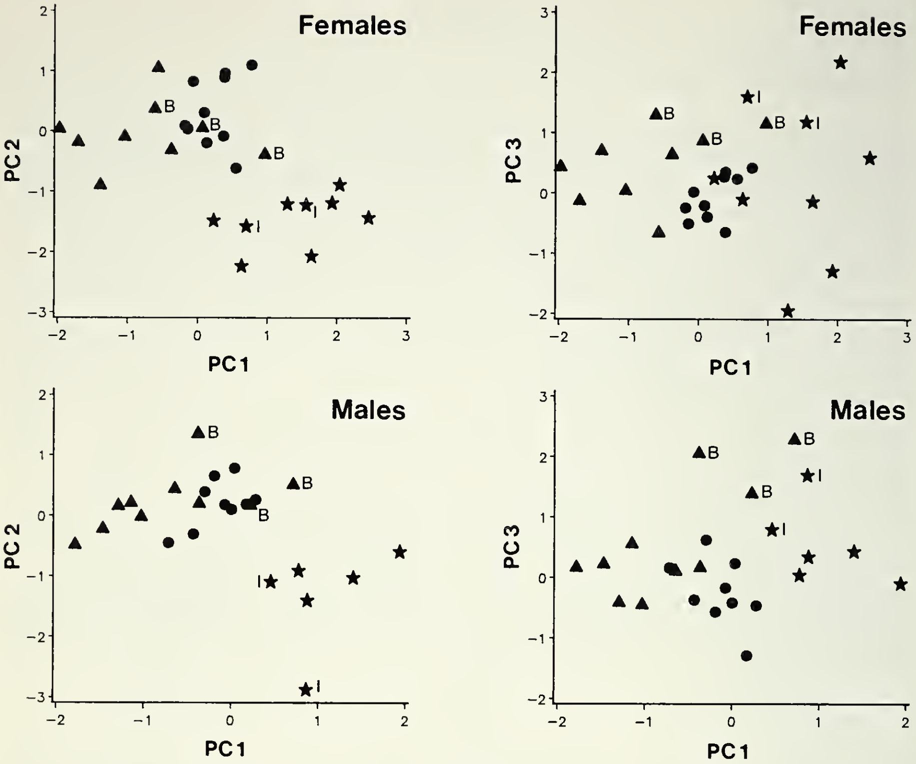

Fig. 4.

Principal component analysis. Plots of second and third versus first principal component scores for specimens from free-living populations. Points represent sample centroids. Symbols for subspecies: dots, *G. c. costae*; stars, *G. c. fieberi*: triangles, *G. c. poissoni*. Letters for geographic regions mentioned in the text: B, British Isles; I, Italy (Upper Italy and Calabria).

Principal component analysis

The PCAs, using the reduced character set and all specimens from free-living populations, revealed that about 80% of total variance is accounted for by the first three principal components (PCs; Table 3). The first PCs alone take up about two thirds of total variance. Scores of the first PCs have positive and relatively high correlations with all 12 original variables in both sexes. The character 23 (distance between second cephalic trichobothria) has distinctly smaller component correlations compared to the other characters. Some other differences in component correlations, although smaller, are also consistent in both sexes. The second PCs mainly contrast antennal and leg segments (characters 43, 49, 50 and 53; large negative component correlations) with measurements of head width (19, 20, 23; large positive component correlations). Correlations of the third PCs with the original variables are all low to moderate (positive for variables 49, 50, 53, and 23; negative for 14 and 26) for males and females, and show considerable differences between the sexes (especially in variables 6 and 19). As the proportion of total variance for which the third PC accounts is rather small, sampling error may be important in this component.

The patterns revealed by the first three PCs are similar for both sexes (Fig. 4). The plots of second versus first PC scores show rather clear discontinuities in the scatter of sample centroids (points representing sample means) between the presumed subspecies *G. c. fieberi* and the other groups. *G. c. costae* and *G. c. poissoni* are not clearly separable in these plots, although *G. c. poissoni* samples tend to have lower first PC scores than *G. c. costae* samples. Within *G. c. poissoni*, samples from the British Isles tend to have both higher first and second PC scores than samples from continental Europe. The one male *G. c. fieberi* from Upper Italy scores extremely low on the second PC, whereas the one from Calabria and the two females from Upper Italy are within the clusters of samples from Greece. The third PCs mainly contain variation within subspecies, but there is a tendency towards separation between *G. c. costae* and *G. c. poissoni* sample centroids, *G. c. costae* having lower third PC scores than most *G. c. poissoni* samples with similar first PC scores. Again, there is some differentiation between *G. c. poissoni* from the British Isles and continental Europe. Further, there is considerable variation among samples from Greece. In all three PCs considered here *G. c. costae* forms rather tight clusters, and thus there seems to be little geographic variation among the different regions of the Alps.

CANONICAL VARIATE ANALYSIS

The results of CVA, using the three presumed subspecies as an *a priori* classification criterion, are also very similar for the two sexes (Fig. 5). *G. c. fieberi* is again well separated from the other groups, mainly by the first CVs, which account for 73% of the between-subspecies variance in males and for 65% in females. The second CVs, which explain the remaining between-subspecies variance, separate *G. c. costae* and *G. c. poissoni* sample centroids into two distinct groups, although there is some overlap if one considers individual specimens. Two samples of male *G. c. poissoni* from the Pyrenees have considerably lower first and higher second CV scores than the other samples of this subspecies.

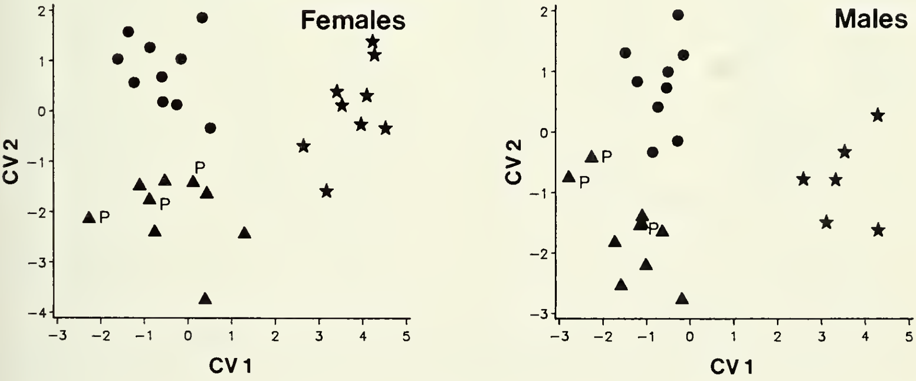

FIG. 5.

Canonical variate analysis, using subspecies status as *a priori* grouping criterion. Plots of second versus first canonical variates for specimens from free-living populations. Points represent sample centroids. Symbols for subspecies: dots, *G. c. costae*; stars, *G. c. fieberi*; triangles, *G. c. poissoni*. The samples from the pyrenees are labeled with the letter P.

If the 10 geographic regions listed in Table 1 are used as a grouping criterion for CVA instead of the presumed subspecies status, the plots of second versus first CV scores (Fig. 6) are strikingly similar to the results of the previous analysis. The first CVs explain 61% and 55% of between-region variance for males and females, the second CVs 23% and 28% respectively, and the third CVs 8% for both sexes. There is, mainly in the third CVs, substantial variation within subspecies, especially for *G. c. poissoni*, where samples from the French Massif Central have the lowest, and samples from the British Isles the highest third CV scores. Within *G. c. fieberi*, there is no clear distinction between Italian and Greek specimens.

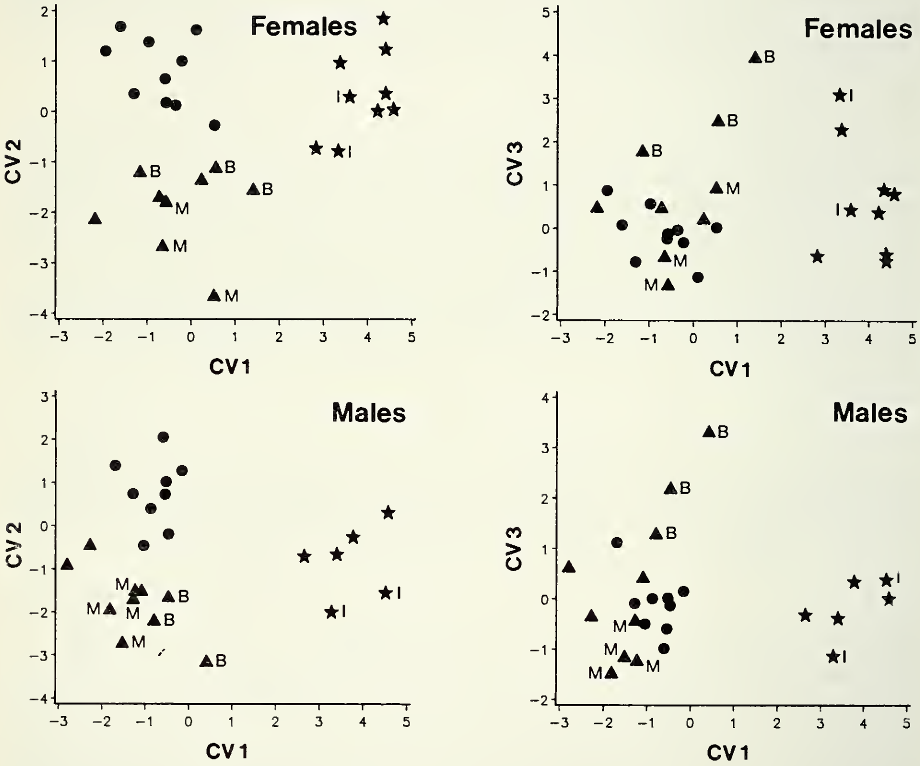

FIG. 6.

Canonical variate analysis, using geographic region as *a priori* grouping criterion. Plots of second and third versus first canonical variates for specimens from free-living populations. Points represent sample centroids. Symbols for subspecies: dots, *G. c. costae*; stars, *G. c. fieberi*; triangles, *G. c. poissoni*. Letters for geographic regions mentioned in the text: B, British Isles; I, Italy (Upper Italy and Calabria); M, French Massif Central.

LINEAR DISCRIMINANT ANALYSIS

As evidenced by the multivariate standard distances, linear discriminant analysis revealed a clear separation of *G. c. fieberi* from the other two subspecies, and a less important differentiation between *G. c. costae* and *G. c. poissoni* (Table 4). The coefficients of the discriminant functions are not easily interpretable, because the variances of the variables differ widely, as variables were not standardized prior to analysis, and because of intercorrelations of the variables. Yet it can be seen that variables 14, 16, and 23 are more important in differentiating between *G. c. costae* and *G. c. poissoni* than in other comparisons. Besides some similarities between sexes, there are also marked differences (e.g., in character 43).

TABLE 4.

Linear discriminant analysis. Subspecies considered for each pairwise comparison, coefficients of discriminant functions, and corresponding classification limits and standard distances (D_{12}). % mis (ssp. 1) and % mis (ssp. 2) denote percentages of misclassified specimens from subspecies 1 and 2, respectively.

Subspecies 1	*G. c. costae*		*G. c. costae*		*G. c. fieberi*	
Subspecies 2	*G. c. poissoni*		*G. c. fieberi*		*G. c. poissoni*	
Character	Males	Females	Males	Females	Males	Females
6	447.07	615.86	711.42	638.45	–116.09	–529.15
14	–139.24	– 94.33	5.45	– 0.40	– 23.67	0.29
16	184.46	162.05	– 49.31	– 15.17	86.75	28.95
19	–470.51	–501.79	–422.50	–381.20	189.59	314.19
20	–395.57	–354.37	–144.58	–366.43	–155.95	235.35
23	618.03	485.70	– 78.00	64.60	371.15	47.54
26	– 65.20	– 96.48	– 14.85	– 17.70	– 11.91	10.90
35	20.31	– 1.33	104.59	69.35	– 62.76	– 61.61
43	–198.00	– 62.59	142.40	97.07	–242.70	–110.50
49	–108.20	– 35.64	– 62.03	– 43.01	– 21.46	29.71
50	– 17.58	– 40.63	– 5.21	9.86	11.45	– 1.51
53	119.36	62.14	59.12	53.06	11.26	– 44.15
Intercept	648.05	675.96	–174.14	– 57.56	290.53	185.79
Limit	43.31	40.13	45.33	41.18	51.04	52.42
D_{12}	2.74	2.63	4.52	4.40	4.72	4.54
% mis (ssp. 1)	7.6	10.2	0	0	1.5	0
% mis (ssp. 2)	6.8	9.3	1.5	2.4	0	1.3

Note. – For each comparison, subspecies 1 and 2 were coded 0 and 100, respectively. Thus, new samples should be allocated to subspecies 1 if their discriminant score is lower than the classification limit, and to subsepcies 2 if the discriminant score exceeds the limit.

The percentages of misclassified specimens (Table 4) should be interpreted with caution, because the discriminant functions were both computed and tested on the same set of data, and therefore the probabilities of misclassification tend to be underestimated (but see the results of cross-validation, below). Yet it can be seen that far more false classifications occur in discriminating between *G. c. costae* and *G. c. poissoni* than in the other comparisons. The cross-validation procedure was designed to test the discriminant functions for errors in classifying sample means (centroids). In the 106 separate discriminant analyses so obtained, the test sample was always allocated to the correct subspecies, although the mean discriminant score of some samples differed from the classification limit by as little as 1.7. However, the discriminant functions can be said to be reliable tools for identifying subspecies, at least when sample means are considered.

COMPARISON OF LABORATORY CULTURES AND FREE-LIVING PARENTAL POPULATIONS

The results of CVAs show that laboratory cultures exhibit a pattern of variation clearly corresponding to the pattern among the respective parental populations (Fig. 7). It also closely resembles the results of CVAs for all samples from the field (Figs 5, 6). However, there is a consistent shift in first, second, and third CV scores from wild populations to their laboratory offspring.

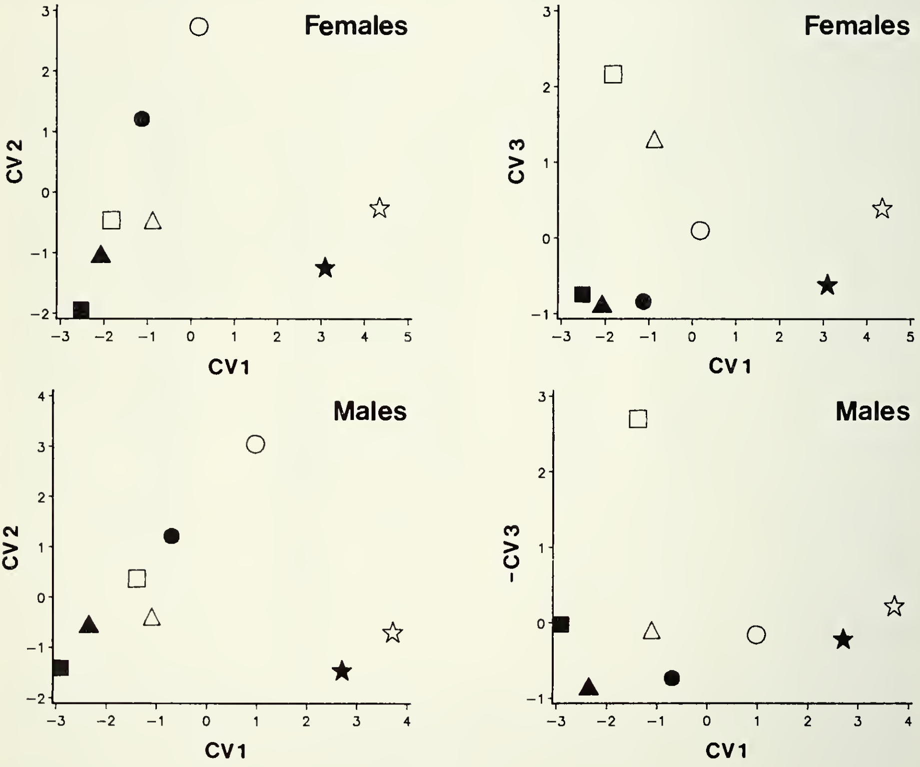

FIG. 7.

Comparison of specimens from laboratory cultures and corresponding free-living populations. Plots of second and third versus first canonical variate scores. Centroids of population samples and laboratory rearings are represented by solid and open symbols respectively: dots, central Alps; stars, northern Greece; squares, French Massif Central; triangles, Pyrenees.

A general pattern of variation in first and second CVs holds for both sexes in the laboratory cultures and in the field. The populations from the Pyrenees and the French Massif Central have both low first and second CV scores. The animals from the Alps have low to intermediate first but high second CV scores. The Greek specimens score high on the first and low on the second CV. For males 59% and 24% of between-group variance are explained by the first and second CV, and 59% and 22% for females, respectively. Only comparatively minor differences in the relative positions of the centroids of wild and laboratory samples occur, especially between the populations from the Pyrenees and the Massif Central. The upward shift in second CV scores between wild and laboratory-reared specimens seems to be less marked for the Pyrenees population than for the others. This is most clearly visible for males.

These differences become more apparent in the third CV, which accounts for 10% and 11% of between-group variance for males and females respectively. In females, this CV separates the parent populations from their laboratory offspring, most markedly for the specimens from the Pyrenees and the Massif Central. The sign of the third CV for males had to be reversed, but this does not influence the interpretation of patterns of variation. There is a large difference in third CV scores between wild and laboratory samples for the Massif Central population, but only small differences for the others. A considerable difference between sexes occurs in the relative position of the laboratory-reared specimens of the Pyrenees population.

PCAs carried out with specimens from laboratory cultures and corresponding parent populations revealed results similar to those for all field samples. Laboratory cultures always had higher scores than corresponding parent populations on the first PC which contained 'size' variation. Some smaller differences were also found in 'shape' components.

DISCUSSION

Three multivariate statistical procedures were applied to study different aspects of morphometric variation in *Gerris costae*. Principal component analysis (PCA) of all samples together was used as an ordination procedure to display the overall pattern of variability in fewer dimensions (PIMENTEL, 1979; REYMENT *et al.*, 1984). PCA does not require any *a priori* grouping of the specimens included in the analysis. However, it should be kept in mind that such an analysis reveals an overall pattern but does not distinguish variation within groups from differentiation among groups (THORPE, 1983; GIBSON *et al.*, 1984; AIROLDI and FLURY, 1988). Canonical variate analysis (CVA) is especially suitable to assess the pattern of variation between groups defined *a priori*, e.g., different free-living populations, and to compare laboratory-reared and field samples (ALBRECHT, 1980; CAMPBELL and ATCHLEY, 1981; REYMENT *et al.*, 1984). Finally, linear discriminant analysis was used to evaluate phenetic distance, and to classify additional samples into subspecies (PIMENTEL, 1979; REYMENT *et al.*, 1984).

The main patterns of variation in the full set of variables are well represented by a much smaller number of characters. Congruence between the full and reduced character sets, as measured by product-moment correlations of principal component scores, is comparable in magnitude to the corresponding asymptotic values in THORPE's (1985) computer simulations of character selection.

The results of PCA show that the overall pattern of variation concerns both 'size' and 'shape'. Especially *G. c. fieberi* differs considerably from the other groups in the first (mainly 'size') component, but is also clearly distinguished by the second PC. The other two subspecies are more similar, although *G. c. costae* scored somewhat higher on the 'size' component than *G. c. poissoni*, as is consistent with univariate measurements (WAGNER and ZIMMERMANN, 1955). In a similar study of the housefly and the face fly in the United States, BRYANT and TURNER (1978) also found congruence between sexes in PCAs, although it is noteworthy that they excluded one strongly dimorphic character from the analysis in males. The 'size' component (first PC) accounted for more than 83% and 90% of the total variance in the housefly and the face fly, respectively, whereas these figures are considerably lower in *Gerris costae* (66% and 63% in males and females). This may be due to the fact that in *G. costae* there is more geographic diversification in habitat and niche utilization, and thus increased morphometric differentiation, than in the two fly species, where even the more variable species was considered to have uniform ecological requirements across the United States (BRYANT, 1977).

The CVA using the 10 geographic regions of Table 1 as *a priori* group criterion revealed a pattern of variation of the first two canonical variates (Fig. 6) strikingly similar to that of the CVA using the three presumed subspecies as groups (Fig. 5). As the same pattern was revealed by CVAs with two different *a priori* grouping criteria, this pattern is not an artifact of the analysis using subspecies groups. In both sexes more than 80% of the between-region variance is accounted for by the first two CVs which clearly reflect the division into the three subspecies, whereas other variation patterns only appear from the third CVs onward, and explain comparatively minor portions of between-group variance. Thus the three subspecies recognized by WAGNER and ZIMMERMANN (1955) and NIESER (1978) in fact reflect the main pattern of geographic variation between samples from different regions of Europe. The variability within subspecies is greatest in *G. c. poissoni*, particularly reflecting some differentiation between populations from the British Isles and from continental Europe. This intrataxon variation makes discrimination between *G. c. costae* and *G. c. poissoni* somewhat difficult.

Linear discriminant analysis yielded results consistent with PCA and CVA. The standard distances indicate that *G. c. costae* and *G. c. poissoni* are more similar to each other (D_{12}-values about 2.6) than to *G. c. fieberi* (D_{12}-values about 4.5). Standard distance, which equals the square root of Mahlanobis' generalized distance D^2 (FLURY and RIEDWYL, 1986), can easily be compared among different studies. In their study of an aphid, FOOTITT and MACKAUER (1980) found three main phenetic groups which they later recognized as subspecies (FOOTITT and MACKAUER, 1983), with averaged standard distances between groups of about 4 to 5.3 (18 mensural characters). In a study of an aquatic beetle (ZIMMERMAN and LUDWIG, 1974), standard distances between samples ranged from about 1 to 6 (14 mensural characters), and partitioned the samples into two major groups. In the present study, error rates of discriminant functions in allocating individuals are comparable in magnitude to those of FOOTITT and MACKAUER (1980). The cross-validation test showed that the discriminant functions given here can be considered as reliable tools for the identification of samples or populations.

The main pattern of variation among free-living populations was also found in offspring reared under standardized laboratory conditions, suggesting a major role of genetic determination in explaining the observed geographic variation. This interpretation is consistent with the analyses of BRYANT (1977) and BRYANT and TURNER (1978), showing a considerable genetic component of geographic variation in two species of flies. In *G. costae* the effects of differences in environmental conditions between the habitats of the parental populations seem to be rather small compared to the effects imposed by the transfer to laboratory conditions. Thereby a factor of prime importance for explaining the increased size of laboratory-reared specimens probably is increased availability of food in captivity. Field enclosure experiments demonstrated that supplying *Gerris buenoi* larvae with additional food increased the weight they achieved as adults (SPENCE, 1986), and also linear size (J. R. Spence, pers. comm.). Increased size in laboratory-reared specimens was also found in waterstriders of the genus *Limnoporus* (J. R. Spence, pers. comm.). In other studies of environmental factors, larval crowding (which relates to food availability; MURDIE, 1969; BLACK and KRAFSUR, 1986), food quality (BERNAYS, 1986), and temperature (MURDIE, 1969) have been reported to influence insect morphology. The relative importance and interactions of genetic and environmental determination of morphometric variation certainly merit further study. Crossbreeding experiments with specimens of different geographic origin revealed no evidence of premating barriers of F_1 hybrid inviability between presumed subspecies (pers. obs.; R. Hauser, C. Largiadèr, pers. comm.).

Although the objective of this paper is not a formal taxonomic revision of the European subspecies of *Gerris costae*, the results can be interpreted as supporting the segregation into the three subspecies recognized by WAGNER and ZIMMERMANN (1955) and NIESER (1978). They form coherent units characterized by genetically determined morphometric differences. Even in *G. c. poissoni*, which is the most heterogeneous group, a clear morphometric separation of the populations from the Brisith Isles from those of the European continent is not possible. The few specimens from Italy that were available for this study were similar to the animals from Greece, suggesting that Italy should be considered as part of the range of *G. c. fieberi* (this conclusion is supported by additional material, C. Largiadèr, pers. comm.). The subspecific status of *Gerris costae* in the USSR and western Asia (NIESER, 1978; KANYUKOVA, 1982) remains to be resolved.

Some interesting questions arise in relation to the distribution ranges of the subspecies. It is tempting to speculate about Pleistocene refuges of the present subspecies (see also JANSSON, 1980; THORPE, 1984). As a possible scenario it can be imagined that *G. c. fieberi* had its refuge in southeastern Europe or Asia Minor, the refuge of *G. c. poissoni* extended along the Atlantic coast from Iberia to the present British Isles (which was then contiguous because of the eustatic sea level drop), and *G. c. costae* remained between the Alpine and Scandinavian ice shields. This historical scenario suggests an explanation for the present distribution ranges and the ecological differentiation of the subspecies. In northern Italy and in northern Yugoslavia or southern Austria there are two areas where *G. c. costae* and *G. c. fieberi* possibly come into close contact (see Fig. 1). The ecological differences between these two subspecies, *G. c. costae* being restricted to high altitudes whereas *G. c. fieberi* also occurs at low elevations and in a wider range of habitat types, make such possible secondary contact zones particularly interesting. Further work on this topic is in progress (C. Largiadèr, pers. comm.).

SUMMARY

Geographic variation of *Gerris costae* (Herrich-Schaeffer) in Europe was studied by three multivariate morphometric methods. Twelve characters were selected from a larger set (56 or 57 variables for males and females, respectively) by means of stepwise discriminant analysis (backward elimination). Good congruence between full and reduced character sets was found. Various aspects of the patterns of geographic variation were assessed using principal component analysis and canonical variate analysis, and revealed three main groups consistent with the previously described subspecies *G. c. costae* (Herrich-Schaeffer), *G. c. fieberi* Stichel, and *G. c. poissoni* Wagner and Zimmermann. Comparisons of patterns of morphometric variation between populations of different geographic origin and between laboratory-reared offspring showed that geographic variation is genetically determined for the most part. Linear discriminant functions are provided to allocate new samples to the subspecies groups.

ACKNOWLEDGMENTS

In am very grateful to Prof. R. Hauser, the supervisor of this study, and to Prof. A. Scholl; they introduced me to the problem, and provided various support and encouragement. I express special thanks to Prof. H. Riedwyl for invaluable advice in statistical questions. L. Frauchiger and R. Köpfli assisted with laboratory cultures during times when I was absent from Bern. Some of the material was supplied by M. Bächler. Dr. J.-P. Airoldi, Dr. N. Møller Andersen, C. Largiadèr, Prof. J. R. Spence, and Dr. M. Zimmermann made very helpful comments on earlier versions of this paper. I thank all of them kindly for their contributions. Final analyses and preparation of the manuscript were mainly done during a stay at Kiel University, when I was supported by the German Academic Exchange Service (grants No. 313/024/005/9 and 313/024/007/0).

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Revue suisse Zool.	Tome 99	Fasc. 1	p. 31-79	Genève, mars 1992

Anthuridae of the genera *Amakusanthura*, *Cortezura* and *Mesanthura* from the Caribbean Sea of Colombia (Crustacea: Isopoda)

by

Hans-Georg MÜLLER *

With 180 figures

ABSTRACT

New species and records are presented for the isopod genera *Amakusanthura*, *Cortezura* and *Mesanthura* (Anthuridae) from the Santa Marta area, Caribbean Sea of Colombia. *Amakusanthura paramagnifica* n. sp., *A. tengo* n. sp. and *A. vermiformis* n. sp. are described. Complete redescriptions are given for *Amakusanthura signata* (Menzies & Glynn, 1968), *Mesanthura* cf. *brasiliensis* Koening, 1980, *M. hopkinsi* Hooker, 1985 and *M. punctillata* Kensley, 1982. An additional description is provided for *Cortezura confixa* (Kensley, 1978). The interspecific affinities of most species are discussed and notes upon the habitat preference and geographical distribution are also given.

This account forms part of a series surveying the free-living marine isopods of the Santa Marta area, Caribbean Sea of Colombia. The family Anthuridae is represented with 10 species out of 4 genera. Except for one new species of *Skuphonura* Barnard, 1925, which is treated elsewhere (Brusca & Müller 1991), this material is dealt with herein. Beside the three new species found, several already known species also required detailed descriptions.

Most specimens were collected by the author during a fieldwork of almost 14 months in 1985-86, carried out at the Instituto de Investigaçiones marinas de Punta de Betin in Santa Marta, Colombia (INVEMAR/COLÇIENCIAS).

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* Pfaffenmühlerweg 2, D-6331 Waldsolms-Brandoberndorf, Germany (present address).

Laboratoire de Biologie marine et de Malacologie, Université de Perpignan, Avenue de Villeneuve, F-66025 Perpignan Cedex, France.

My thanks are due to the German Academic Exchange for a financial grant to make to fielwork possible over such a long time and also to the staff of the INVEMAR for technical support. Bernd Werding and Luz-Elena Velasquez kindly made available several specimens of *Cortezura confixa*. I am also grateful to Thomas E. Bowman and Marilyn Schotte from the National Museum of Natural History, Washington, for the loan of type material of *Amakusanthura cracenta* and *A. magnifica*.

Specimens are deposited in the Muséum d'Histoire naturelle, Genève (MHNG), the Muséum national d'Histoire naturelle, Paris (MNHN), the marine biological station INVEMAR and in the author's private collection.

ANTHURIDAE

AMAKUSANTHURA Nunomura, 1977

Amakusanthura paramagnifica n. sp. (Figs 1-23)

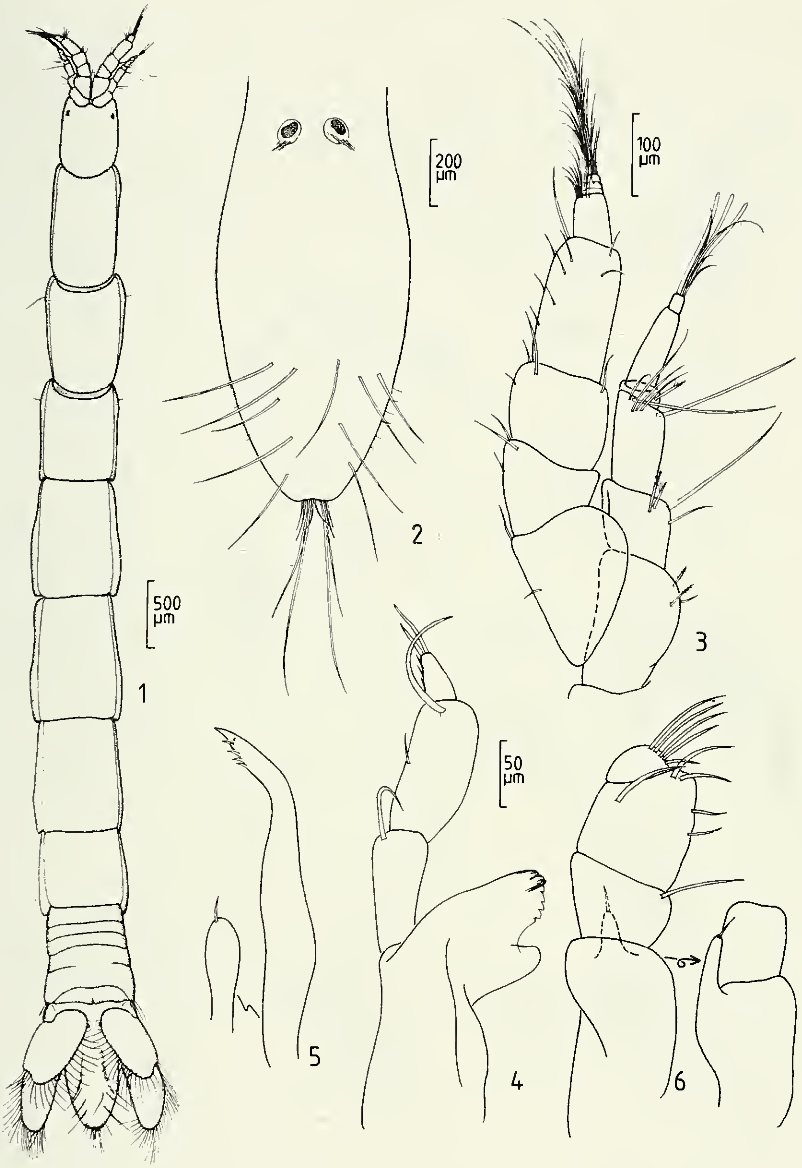
Holotype. – Non-reproductive adult (MHNG); Santa Marta, Punta de Betin; under rocks on sand bottom, 1-2 m, 4 February 1986.

Paratype. – ♂ (MHNG; collected together with the holotype.

Derivatio nominis. – The specific name refers to the pressumed close relationship to *Amakusanthura magnifica* (Menzies & Frankenberg, 1966).

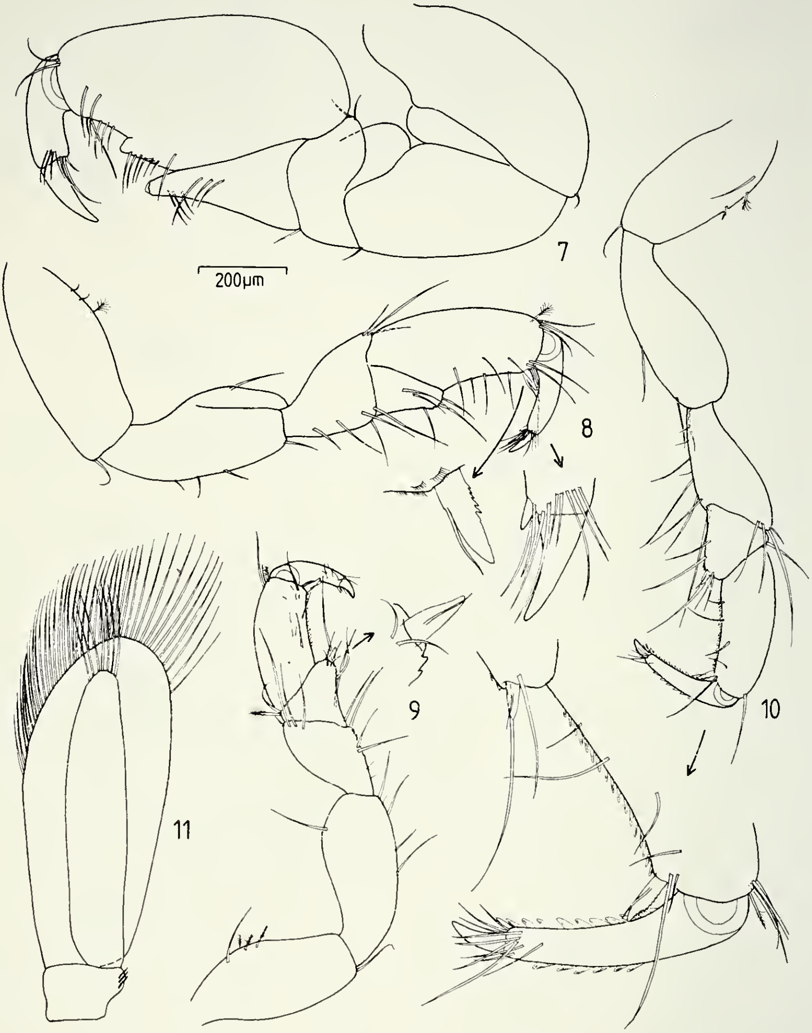
Description, non-reproductive adult. – Body relatively slender, 11 times longer than wide, colourless. Total length 7.7 mm. Cephalon 1.4 times longer than wide, with small, darkly pigmented dorsolateral eyes in distal third. Body proportions: C<1>2>3<4=5>6>7. Three anterior pleonites with distinct suture line dorsally; this line lacking between fourth and fifth pleonite. Telson tongue-shaped, raised middorsally, setose distal margin with shallow concavity; dorsolateral surface of telson with 5 pairs of long simple setae in distal half; distal margin of telson with 3 pairs of short and 2 pairs of long simple setae.

Antenna 1, peduncle 3-articulated; proximal article longest and widest; short second article with a long, laterally directed seta at outer distal margin; slender third peduncular article with 2 long, laterally directed setae; flagellum 3-articulated; first article short, much wider than long; slender second article longest; small terminal article with 4 simple setae and 3 aesthetascs. Antenna 2, peduncle 5-articulated; second article largest, grooved to accomodate peduncle of antenna 1; flagellum of 4 setose articles; first article longer than other flagellar articles together. Incisor of mandible 3-cuspidate, lamina dentata with 4 identations; molar process cone-shaped; second article of 3-articulated mandibular palp longest and widest; both first and second palp article with curved, slender spine near distal margin; terminal article smallest, with two short distal spines.Maxilla slender, medially curved in distal third, inner distal margin with 5 teeth and a very short seta between third and fourth tooth. Maxilliped with relatively short, slender endite tipped with a short, simple seta; palp of maxilliped 3-articulated; proximal article with simple seta at mediodistal margin; second article with 4 curved setae at mediodistal margin and another seta near outer distal margin; terminal article roughly semicircular, mediodistal margin bearing 5 curved setae along medial margin, increasing in length distally. Propodus of pereopod 1 expanded, palm with several setae and a tooth-shaped turbercle at about midlength; dactylus 1.2 times length of unguis; carpus elongate-triangular, posterodistal margin bearing fringe of scales. Pereopods 2-7 in shape and size similar among one another, moderately setose; posterior margin of propodus faintly concave, bearing a short



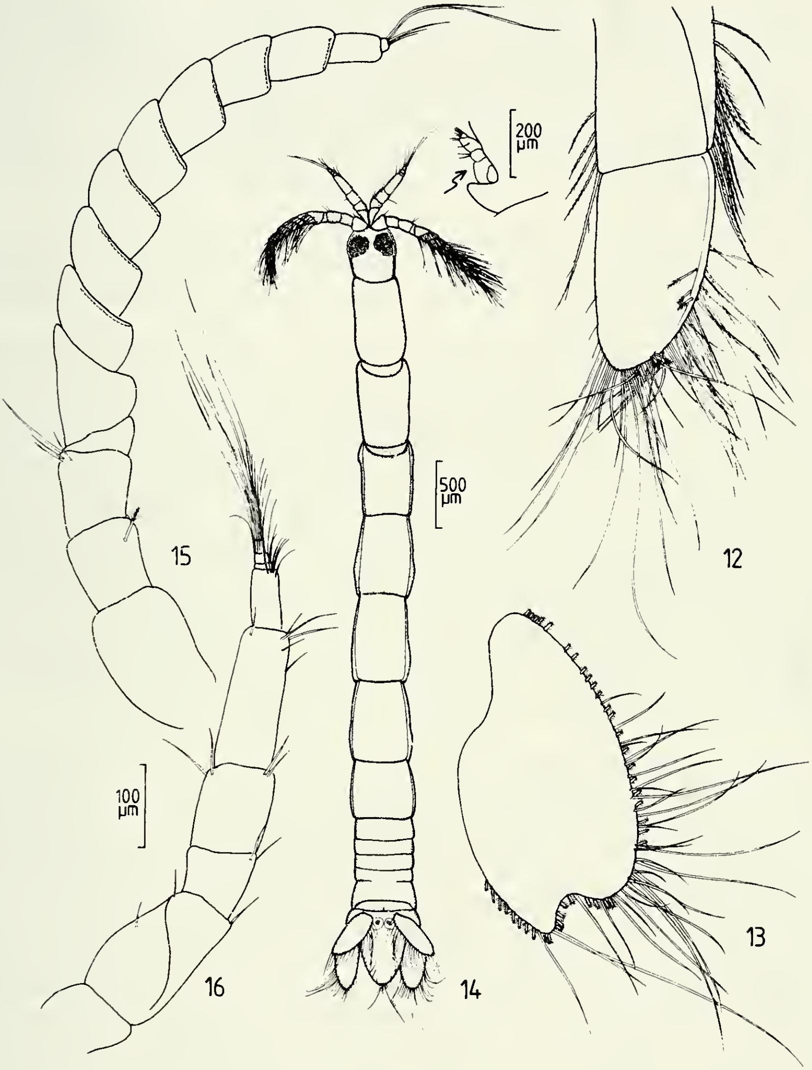
Figs 1-6.

Amakusanthura paramagnifica n. sp., non-reproductive adult: 1) dorsal view; 2) telson; 3) antenna 1 and 2; 4) mandible; 5) maxilla; 6) maxilliped.



FIGS 7-11.

Amakusanthura paramagnifica n. sp., non-reproductive adult: 7) pereopod 1; 8) pereopod 2; 9) pereopod 4; 10) pereopod 7; 11) pleopod 1.



Figs 12-16.

Amakusanthura paramagnifica n. sp. – Non-reproductive adult: 12) uropodal sympodite and endopodite; 13) uropodal exopodite. ♂: 14) dorsal view; 15) antenna 1; 16) antenna 2.

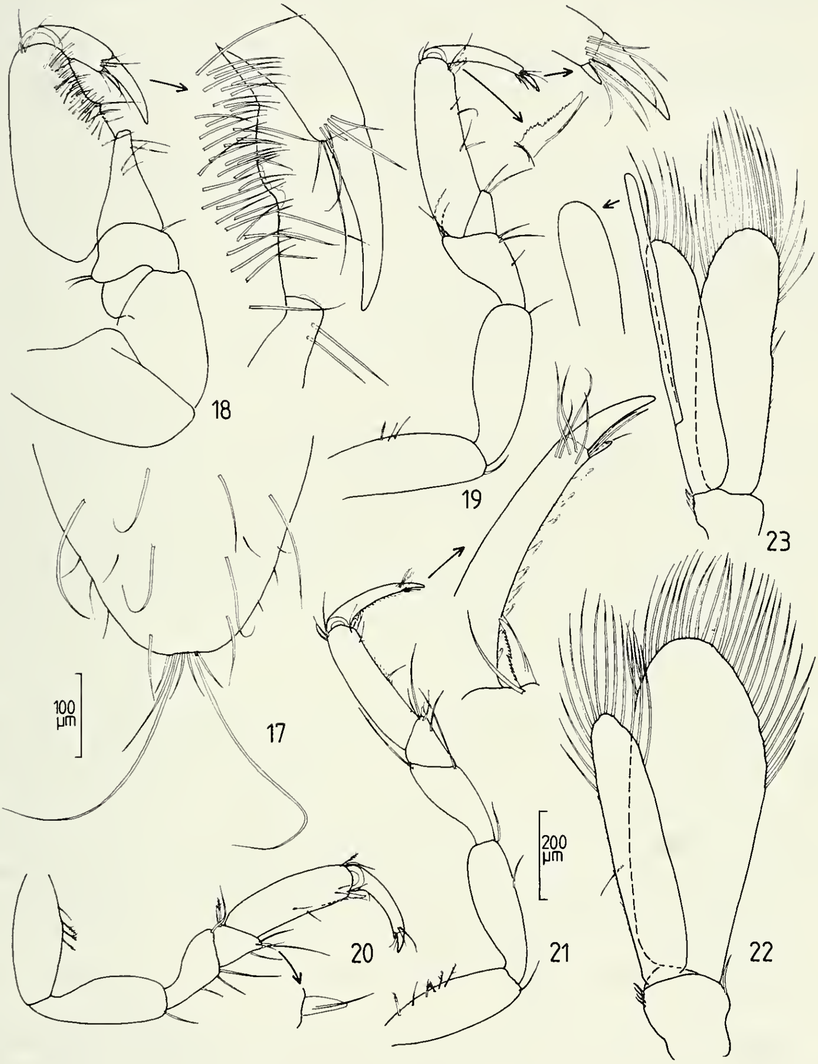
denticulate comound spine distally; carpus of pereopods 2-3 roughly triangular, lacking free anterior margin; carpus of pereopods 4-7 trapezoid, free anterior margin very short; posterodistal margin of carpus with short, non-denticulate compound spine; anterior and posterior margin of dactylus, as well as posterior margin of propodus in pereopod 7 bearing row of several scales. Pleopod 1, slender endopodite 9/10 length of operculiform exopodite; distal margin of endopodite with 7, of exopodite with 39 plumose setae (drawn as simple setae); sympodite with 3 retinaculae. Uropodal endopodite relatively slender, ovate, longer than sympodite and extending slightly beyond distal margin of telson; outer and distal margin of endopodite bearing many long and short simple setae; dorsal surface of endopodite, near outer and distal margin with 6 feathered sensory setae; ovate exopodite with deep distal concavity; exopodite bearing several simple and plumose marginal setae.

♂. – Habitus similar to non-reproductive adult. Total length 5.7 mm. Eyes darkly pigmented and very large, in distal half of cephalon. Cephalon anterior of maxilliped articulation with rounded tubercle. Dorsolateral surface of telson with 4 pairs of relatively short, simple setae in distal third.

Antenna 1 with 11-articulated, elongate flagellum; articles 2-9 bearing whorl of filiform aesthetascs; terminal article minute, with 4 distal simple setae. Articles of second antenna more slender than in non-reproductive adult. Pereopods more slender than in non-reproductive adult, propodus of pereopod 1 less expanded. Palm of pereopod 1 propodus with shallow tubercle bearing fringe of scales, mesial surface of propodus with 36 curved setae; posterodistal projection of carpus shorter than in non-reproductive adult. Propodus of pereopods 2-7 with finely denticulate compound spine at posterodistal margin. Posterior margin of dactylus and propodus in pereopod 7 with row of several scales. Pleopod 1, slender endopodite 4/5 length of operculiform exopodite; distal margin of endopodite with 13, of exopodite with 27 plumose setae (drawn as simple setae); sympodite with 4 retinaculae. Both rami of pleopod 2 relatively slender, endopodite slightly shorter than exopodite; appendix masculina slender, articulating in proximal third, extending with about 3/10 of its entire length beyond distal margin of endopodite; distal margin of endopodite with 7, of exopodite with 16 plumose setae (drawn as simple setae).

Remarks. – *A. paramagnifica* n. sp. seems to be closely allied with *Amakusanthura magnifica* (Menzies & Frankenberg, 1966), from which the holotype, a non-reproductive adult, was available for comparison (registration number USNM 111073, type locality off Georgia). Both species are very similar in their general habitus. However, there are some differing features, which indicate that *A. magnifica* and the colombian material are not conspecific. The holotype of *A. magnifica* bears only 2 pairs of long simple setae at the dorsodistal surface of the telson, which has been correctly figured in the original description (Menzies & Frankenberg, 1966: 83, fig. 17 B). Moreover, the distal margin of the telson bears only 4 long and 4 short setae in that species. Other features to distinguish *A. magnifica* from the new species is the less projected distal part of the carpus in pereopod 1 and the shallowly concave distal margin of the uropodal exopodite in the former. Though the ♂ paratype of *A. magnifica* was not available for comparison, some differing features are mentioned in the original description. The palmar tubercle of the pereopod 1 propodus is longer in that species. Moreover, the mesial surface of the propodus bears only about 16 curved setae. The appendix masculina of *A. magnifica* seems to be curved in its distal part, only slightly extending beyond the distal margin of the endopodite.

It remains doubtful, wether the material recorded and figured by some other authors under the name *A. magnifica* truly belongs to that species (Kruczynski & Myers, 1976:



FIGS 17-23.

Amakusanthura paramagnifica n. sp., ♂: 17) distal part of telson; 18) pereopod 1; 19) pereopod 2; 20) pereopod 4; 21) pereopod 7; 22) pleopod 1; 23) pleopod 2.

355; Schultz, 1978: 909; Kensley & Schotte, 1989: 20). The specimens described in these publications disagree in several features with the type material of *A. magnifica* and need a careful revision.

Because only 2 specimens of *A. paramagnifica* were found in the Santa Marta area, nothing is known upon its habitat preference and vertical distribution.

Distribution. – Caribbean Sea of Colombia.

Amakusanthura signata (Menzies & Glynn, 1968) (Figs 24-51)

Apanthura signata Menzies & Glynn, 1968: 28-29, fig. 10.
Apanthuretta signata; Wägele, 1981: 135.
Apanthura signata; Kensley, 1982a: 325, fig. 143.
Apanthuretta signata; Negoescu & Wägele, 1983: 109.
Apanthura signata; Ortiz, Lalana & Gómez, 1987: 30.
Amakusanthura signata; Kensley & Schotte, 1989: 21-23, fig. 6 A-E.

Material. – Bahia de Santa Marta: 1 manca (MHNG); Punta de Betin; coral rubble, 15-20 m, 29 November 1985. 1 non-reproductive adult (MHNG); Punta de Betin; coral rubble, 12 m, 29 November 1985. 1 non-reproductive adult (Coll. Müller); Punta de Betin; coral rubble with hydroids, 22-27 m, 1 December 1985. 1 non-reproductive adult (Coll. Müller); *Thalassia*, 2-3 m, 7 December 1985. 1 postmanca (MHNG); Punta de Betin; coral rubble covered with debris and sand, 12-15 m, 15 December 1985. 2 non-reproductive adults, 1 manca (MNHN); Punta de Betin; coral rubble, 22 m, 18 December 1985. 1 non-reproductive adult (MHNG); Punta de Betin; coral rubble, 16 m, 2 January 1986. 1 non-reproductive adult, 2 mancas (MHNG); Punta de Betin; coral rubble, 14 March 1986.

Isla Morro Grande de Santa Marta: 1 non-reproductive adult (Coll. Müller); coral rubble covered with detritus and sand, 21-22 m, 9 December 1985.

Punta Ancón, near Taganga, about 5 km east of Santa Marta: 1 ♂, 1 postmanca (MHNG); coral rubble, 15 m, 2 August 1985.

Punta Aguja, about 5 km north-east of Santa Marta: 2 non-reproductive adults (1 preparatory ♂) (Coll. Müller); coral rubble with hydroids, 24 September 1985. 1 non-reproductive adult (Coll. Müller); coral rubble, 17-20 m, 7 December 1985. 1 non-reproductive adult (Coll. Müller); coral rubble, 17-19 m, 9 January 1986.

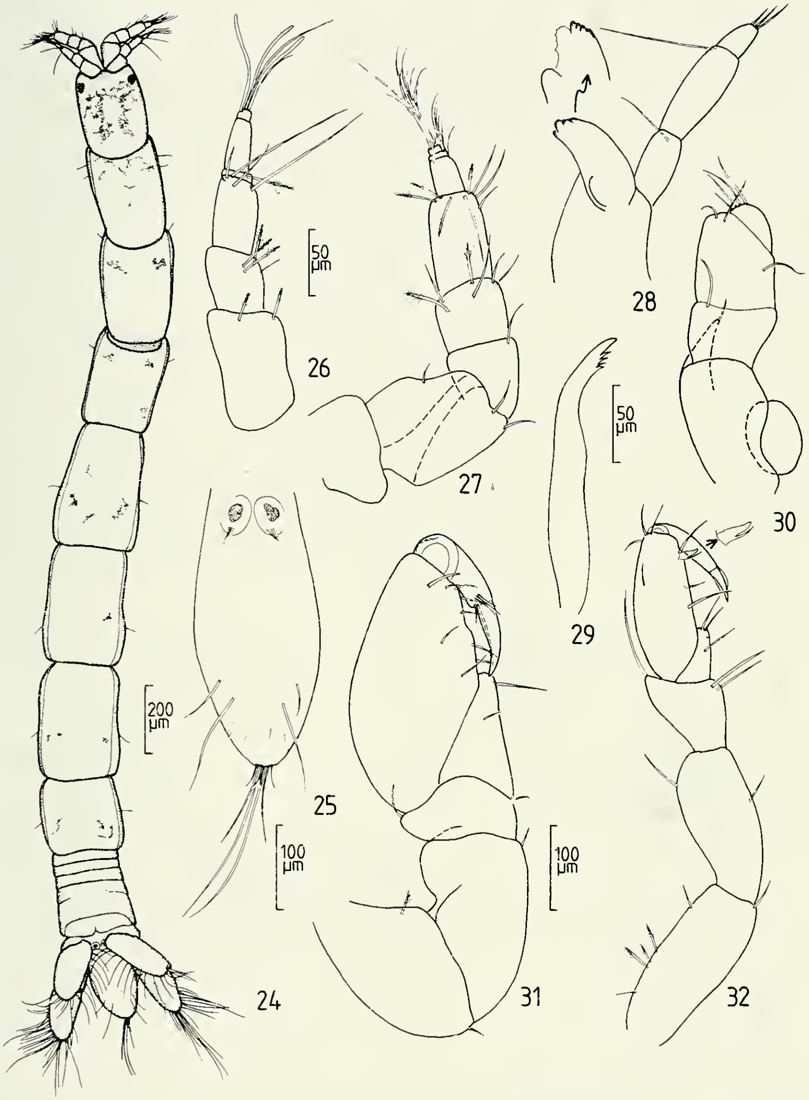
Bahia Concha, about 10 km north-east of Santa Marta: 1 non-reproductive adult (INVEMAR); from *Sargassum cymosum* on rocky shore, 5 l substratum, 0-0.5 m, 7 June 1985. 1 non-reproductive adult (Coll. Müller); *Thalassia*, 2-3 m, 8 November 1985. 15 non-reproductive adults (1 preparatory ♂), 2 postmancas, 4 mancas (MHNG); *Thalassia* and coralline algae, 2-3 m, 7 January 1986.

Bahia de Chengue, about 15 km north-east of Santa Marta: 7 non-reproductive adults, 2 mancas (Coll. Müller); *Thalassia*, 2-3 m, 2 May 1986.

Bahia de Cinto, about 30 km north-east of Santa Marta: 1 manca (Coll. Müller); from algae, hydroids and detritus, 6 m, 4 June 1985.

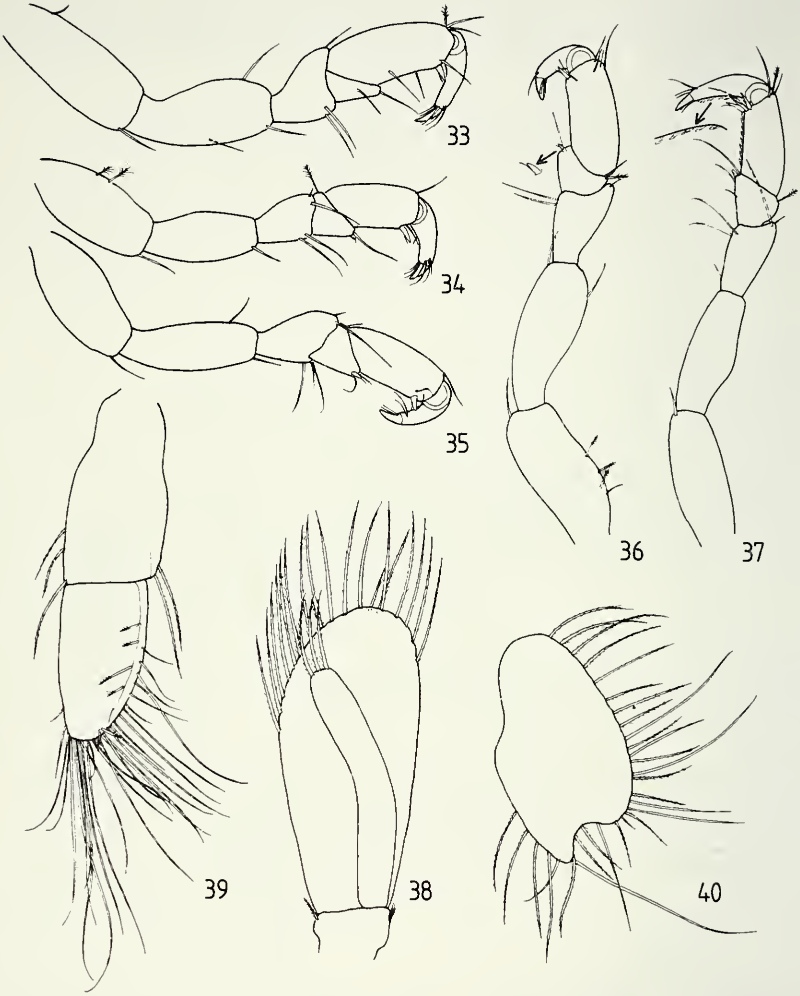
Description, non-reproductive adult. – Body slender, 12 times longer than wide. Total length 2.7-4.2 mm. Dorsum of cephalon and pereonites with some small, irregular pigment reticulations. Cephalon 1.4 times longer than wide; dorsolateral eyes well pigmented, in distal third of cephalon. Body proportions: C<1<2>3<4=5>6>7. Three anterior pleonites with distinct suture line dorsally, suture line lacking between fourth and fifth pleonite dorsally. Telson tongue-shaped, its distal margin narrowly rounded; dorsolateral surface of telson with 2 pairs of slender simple setae; distal margin of telson with 2 pairs of short and 2 pairs of longer setae.

Antenna 1, peduncle 3-articulated; proximal article longest and widest; third peduncular article with 2 long, laterally directed setae; flagellum 3-articulated; first article shortest, much wider than long; second article longest; small terminal article with 2 simple



FIGS 24-32.

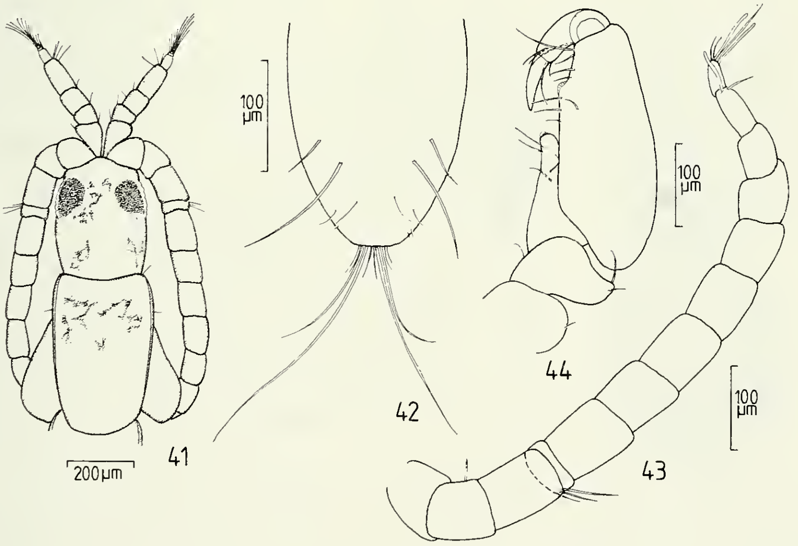
Amakusanthura signata (Menzies & Glynn, 1968), non-reproductive adult: 24) dorsal view; 25) telson; 26) antenna 1; 27) antenna 2; 28) mandible; 29) maxilla; 30) maxilliped; 31) pereopod 1; 32) pereopod 2.



FIGS 33-40.

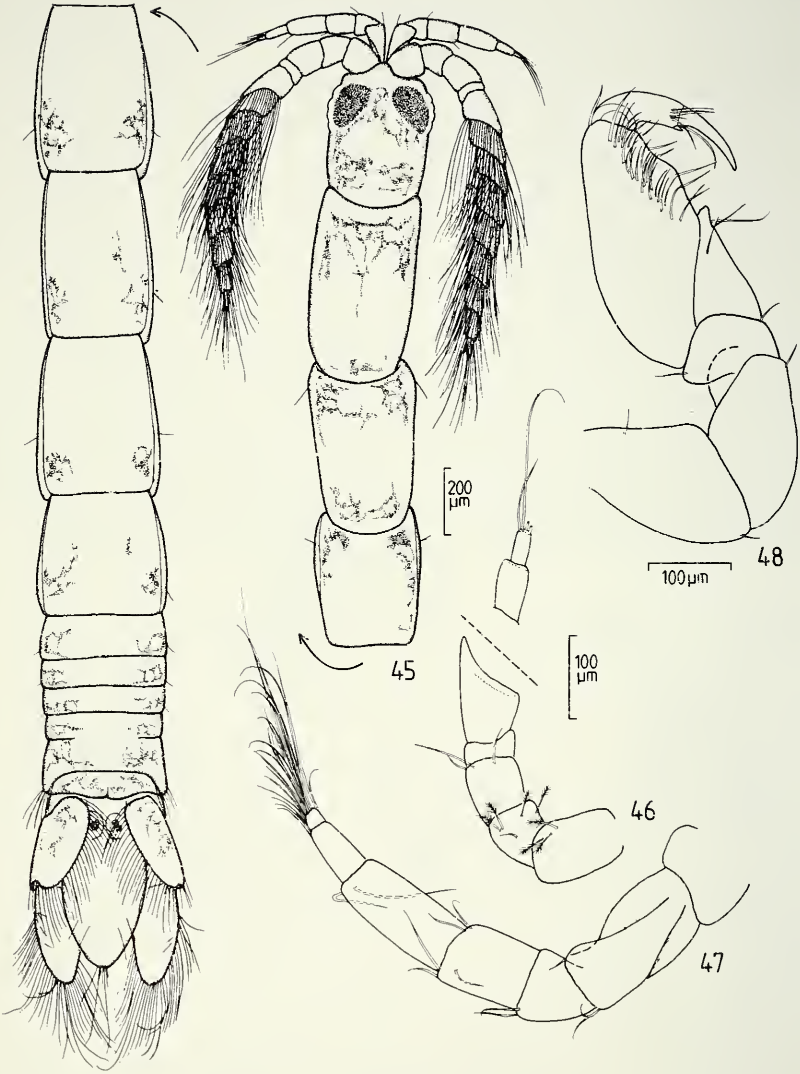
Amakusanthura signata (Menzies & Glynn, 1968), non-reproductive adult: 33) pereopod 3; 34) pereopod 4; 35) pereopod 5; 36) pereopod 6; 37) pereopod 7; 38) pleopod 1; 39) uropodal sympodite and endopodite; 40) uropodal exopodite.

setae and 3 aesthetascs. Antenna 2, peduncle 5-articulated; second article longest and widest, grooved to accomodate peduncle of antenna 1; flagellum of 3 setose articles; proximal article much longer than two distal articles together. Incisor of mandible 4-cuspidate, lamina dentata with 4 small identations; molar process cone-shaped; second article of 3-articulated mandibular palp longest, with long, laterally directed seta; proximal article with shorter seta a distal margin; terminal article smaliest, with 3 short distal spines. Maxilla slender, medially curved in distal third, distal part 5-toothed. Maxilliped with slender endite extending beyond proximal half of first palp article; endite tipped with short simple seta; palp of maxilliped 3-articulated; first article bearing a simple seta, second article with 3 simple setae; terminal article semiovate, with 4 curved setae at mediodistal margin. Propodus of pereopod 1 expanded, palm with shallow tubercle and some simple setae; dactylus 1.2 times length of unguis; carpus triangular, weakly produced posterodistally. Pereopods 2-7 in shape and size similar among one another; posterior margin of propodus straight or faintly concave, bearing a short compound spine distally; moreover, posterodistal margin of pereopod 7 with 2 more slender compound spines; carpus of pereopods 2-3 triangular, lacking free anterior margin; carpus of pereopods 4-7 trapezoid, with free anterior margin and short compound spine at posterodistal margin; posterior margin of propodus and dactylus in pereopod 7 with row of scales. Pleopod 1, endopodite slender, 4/5 length of operculiform exopodite; distal margin of endopodite with 3, of exopodite with 18 plumose setae; sympodite with 3 retinaculae. Uropodal sympodite 1.2 times length of relatively slender, ovate endopodite; endopodite bearing many long, slender simple setae at outer and distal margin; dorsal surface of endopodite, near outer and distal margin with 6 feathered sensory setae; uropodal exopodite ovate, with deep distal concavity; exopodite with some simple and several plumose setae.



Figs 41-44.

Amakusanthura signata (Menzies & Glynn, 1968), preparatory ♂: 41) anterior part of body, dorsal view; 42) distal half of telson; 43) antenna 1; 44) distal part of pereopod 1.



FIGS 45-48.

Amakusanthura signata (Menzies & Glynn, 1968), ♂: 45) dorsal view; 46) antenna 1, some flagellar articles omitted; 47) antenna 2; 48) pereopod 1.

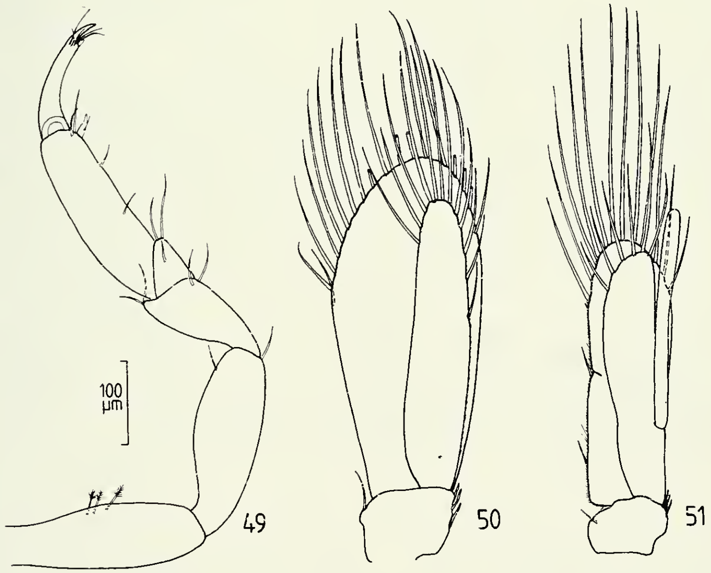
Preparatory ♂. – In general habitus similar to other non-reproductive adults. Total length 3.1 mm. Eyes enlarged, darkly pigmented. Setation of telson quite similar to other developmental stages.

Antenna 1 with 10-articulated, elongate flagellum; penultimate article with single aesthetasc and a simple seta; terminal article bearing 2 aesthetascs and 3 simple setae. Pereopod 1 more slender than in other non-reproductive adults; tubercle of propodal palm and posterodistal margin of carpus with short fringe of scales.

♂.– Habitus similar to immature specimens. Total length 4.6 mm. Eyes larger than in preparatory ♂. Cephalon, pereonites, pleonites and uropodal exopodite with irregular pigment reticulations.

Flagellum of antenna 1 with 10 articles; articles 2-9 bearing whorl of aesthetascs. Antenna 2 more slender than in immature specimens; setose flagellum biarticulate. Pereopod 1 in outline quite similar to preparatory ♂, mesial surface of propodus with 24 curved spines. Pereopods 2-7 more slender than in immature specimens. Pleopod 1, slender endopodite with 12, operculiform exopodite with 18 plumose marginal setae (drawn as simple setae); sympodite with 3 retinaculae. Both rami of pleopod 2 relatively slender, endopodite slightly shorter than exopodite; appendix masculina slender, articulating in proximal third, extending with about 1/5 of its entire length beyond distal margin of endopodite; distal margin of endopodite with 5-6, of exopodite with 12 plumose marginal setae (drawn as simple setae); sympodite with 3 retinaculae.

Postmanca and manca. – In general habitus similar to non-reproductive adults. Total length 2.9-3.4 and 1.8-2.1 mm, respectively.



FIGS 49-51.

Amakusanthura signata (Menzies & Glynn, 1968), ♂: 49) pereopod 2; 50) pleopod 1; 51) pleopod 2.

Remarks. – In its general habitus *A. signata* resembles *Amakusanthura geminsula* Kensley, 1982, which is known from Belize, Jamaica and Martinique (see Kensley & Schotte, 1989: 18; Müller, 1991: 741). The former is easily distinguishable from the latter by the presence of chromatophores on cephalon, pereonites and pleon. Moreover, the pleonites 1-3 of *A. geminsula* are not demarked by dorsal folds. The telson of *geminsula* bears only one pair of seta on the distal, dorsolateral surface and the uropodal exopodite has only a shallow distal concavity.

Amakusanthura signata has a vertical distribution ranging from the intertidal to 27 m, where it has been more often found associated with coral rubble.

Distribution. – Cuba, Puerto Rico, Belize (Kensley & Schotte, 1989: 23). The colombian records considerably extend the known range of this species southward to the northern coast of South America.

Amakusanthura tengo n. sp. (Figs 52-79)

Holotype. – Non-reproductive adult (MHNG); Bahia de Chengue, about 15 km north-east of Santa Marta; coral rubble, 7-8 m, 27 September 1985.

Paratypes. – Bahia Concha, about 10 km north-east of Santa Marta: 1 manca (MHNG); *Thalassia*, 1 m, 27 June 1985. 1 non-reproductive adult (MHNG); *Thalassia*, 0.5-3 m, 9 September 1985. 2 non-reproductive adults, 1 postmanca, 2 mancas (MNHN); *Thalassia*, 5 l substratum, 2-4 m, 2 October 1985. 11 non-reproductive adults (1 preparatory ♂), 7 postmancas (Coll. Müller); *Thalassia*, 2-3 m, 7 December 1985. 1 non-reproductive adult (MHNG); coralline algae in *Thalassia* bed, 2-3 m, 7 January 1986. 7 non-reproductive adults, 1 postmanca, 2 mancas (MHNG); *Thalassia* with coralline algae, 1.5-2 m, 12 February 1986. 10 non-reproductive adults, 2 ♂♂, 2 postmancas, 3 mancas (Coll. Müller); *Thalassia* with coralline algae, 1.5-2 m, 3 March 1986. 8 non-reproductive adults, 1 postmanca, 3 mancas (MHNG); *Thalassia*, 1-2 m, 2 April 1986. 3 non-reproductive adults, 2 postmancas, 1 manca (INVEMAR); *Thalassia*, 2-3 m, 2 May 1986.

Bahia de Chengue, about 15 km north-east of Santa Marta: 2 postmancas (MHNG); *Thalassia*, 0.5-1 m, 8 September 1985. 1 non-reproductive adult (MHNG), 1 non-reproductive adult (Coll. Müller); collected together with holotype. 8 non-reproductive adults (2 preparatory ♂♂), 2 mancas (MHNG); *Thalassia*, 1 m, 1 November 1985. 13 non-reproductive adults, 1 ♂, 5 postmancas, 1 manca (MHNG); under rocks, 0.5 m, 4 April 1986. 5 non-reproductive adults (1 preparatory ♂), 1 postmanca (Coll. Müller); from *Halimeda* on reef-flat, lower intertidal, 14 April 1986.

Bahia de Nenguangue, about 25 km north-east of Santa Marta: 1 non-reproductive adult, 1 postmanca, 1 manca (MHNG); from brown algae on rocky shore, intertidal, 30 July 1985. 2 non-reproductive adults (Coll. Müller); Playa del muerto; *Thalassia* with hydroids and brown algae, 30 July 1985.

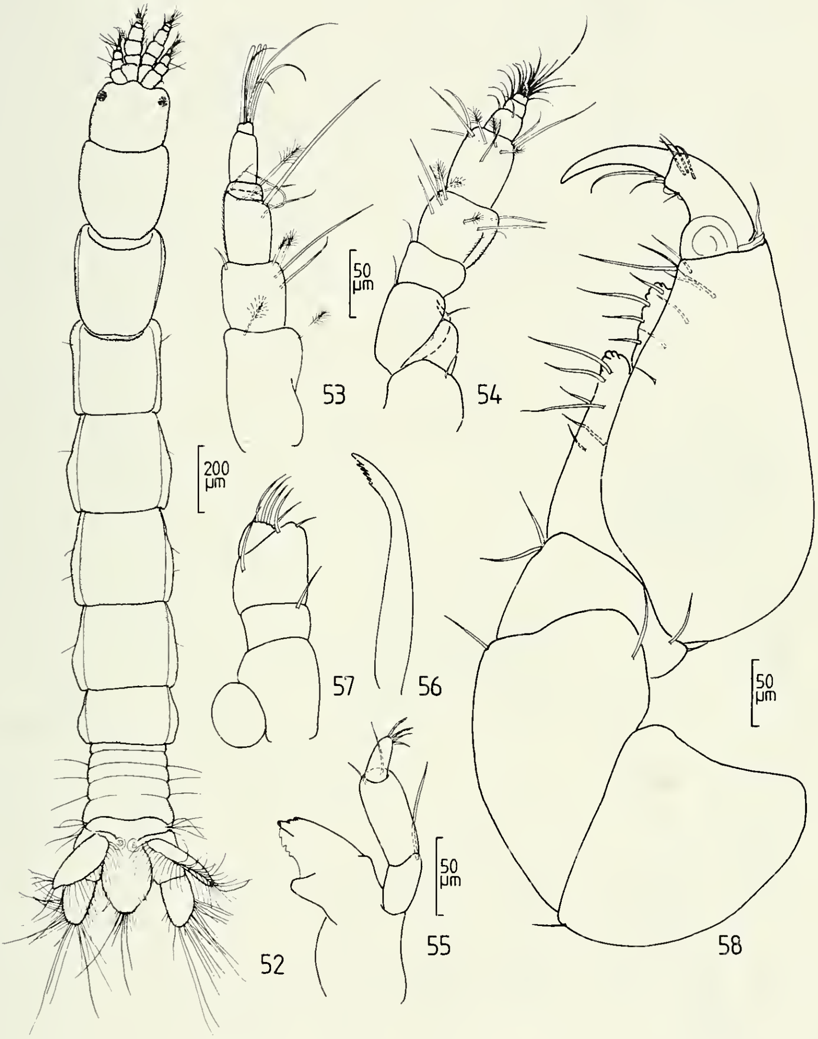
Bahia de Cinto, about 30 km north-east of Santa Marta: 2 non-reproductive adults, 1 postmanca (Coll. Müller); under stones, 0.5 m, 14 April 1986.

Bahia de Guachaquita, about 35 km north-east of Santa Marta: 7 non-reproductive adults, 2 postmancas, 2 mancas (Coll. Müller); coral rubble, 13 m, 28 February 1986.

Arrecifes near Cañaverales, about 40 km north-east of Santa Marta: 4 non-reproductive adults (Coll. Müller); from algae, hydroids and bryozoans on rocks, 6-10 m, 26 September 1985.

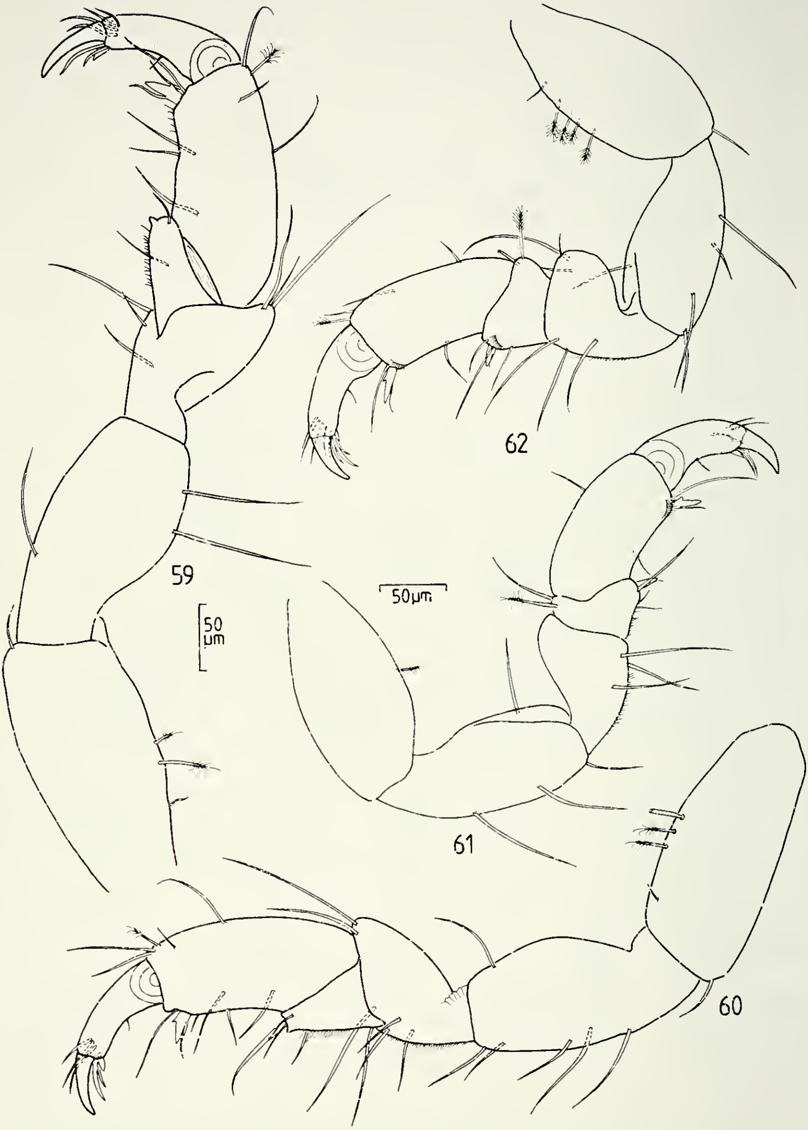
Derivatio nominis. – The specific name is an artificial combination of letters.

Description, non-reproductive adult. – Body relatively robust, 8 times longer than wide, colourless. Total length 2.4-3.6 mm. Cephalon slightly wider than long, dorsolateral eyes well pigmented, located in distal third of cephalon. Body proportions: C<1<2>3<4=5>6>7. Three anterior pleonites with dorsal suture line, incomplete line between pleonites 4 and 5. Telson tongue-shaped, with serrulate margin in distal half; dorsolateral surface of telson with 2 pairs of short setae and one pair of long setae in distal



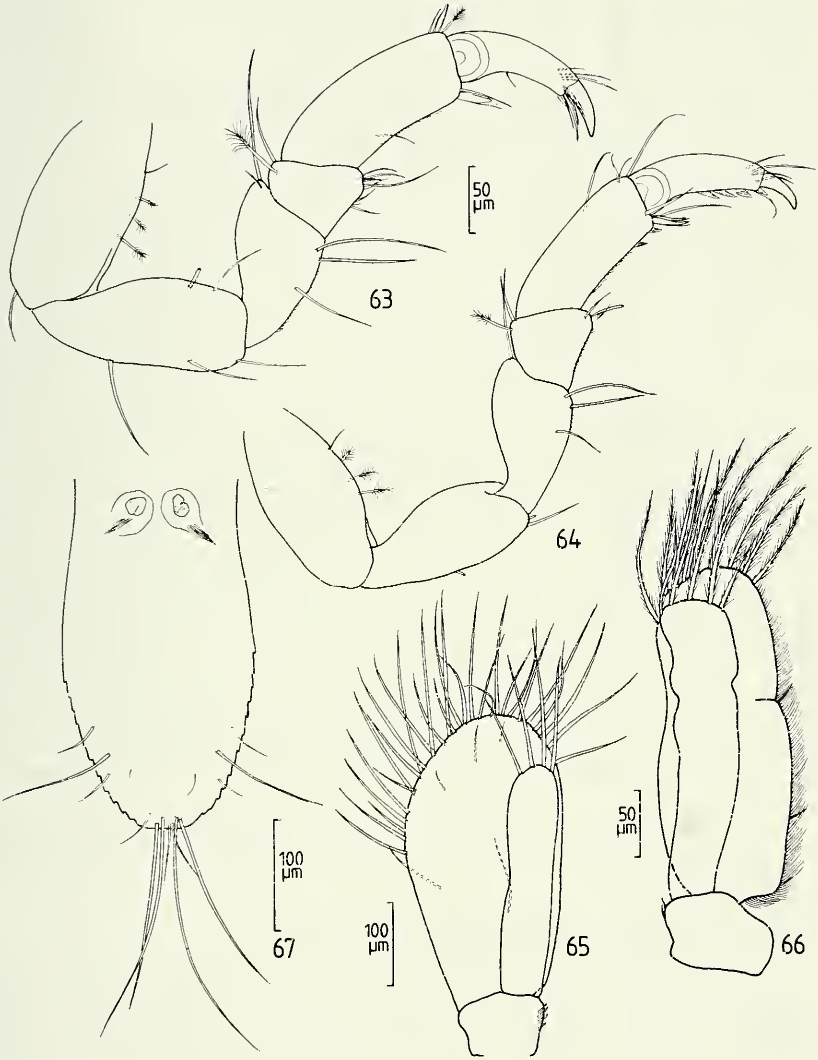
FIGS 52-58.

Amakusanthura tengo n. sp., non-reproductive adult: 52) dorsal view; 53) antenna 1; 54) antenna 2; 55) mandible; 56) maxilla; 57) maxilliped; 58) pereopod 1.



FIGS 59-62.

Amakusanthura tengo n. sp., non-reproductive adult: 59) pereopod 2; 60) pereopod 3; 61) pereopod 4; 62) pereopod 5.



Figs 63-67.

Amakusanthura tengo n. sp., non-reproductive adult: 63) pereopod 6; 64) pereopod 7; 65) pleopod 1; 66) pleopod 2; 67) telson.

third; rounded distal margin of telson with a medial pair of short setae and 2 pairs of long setae.

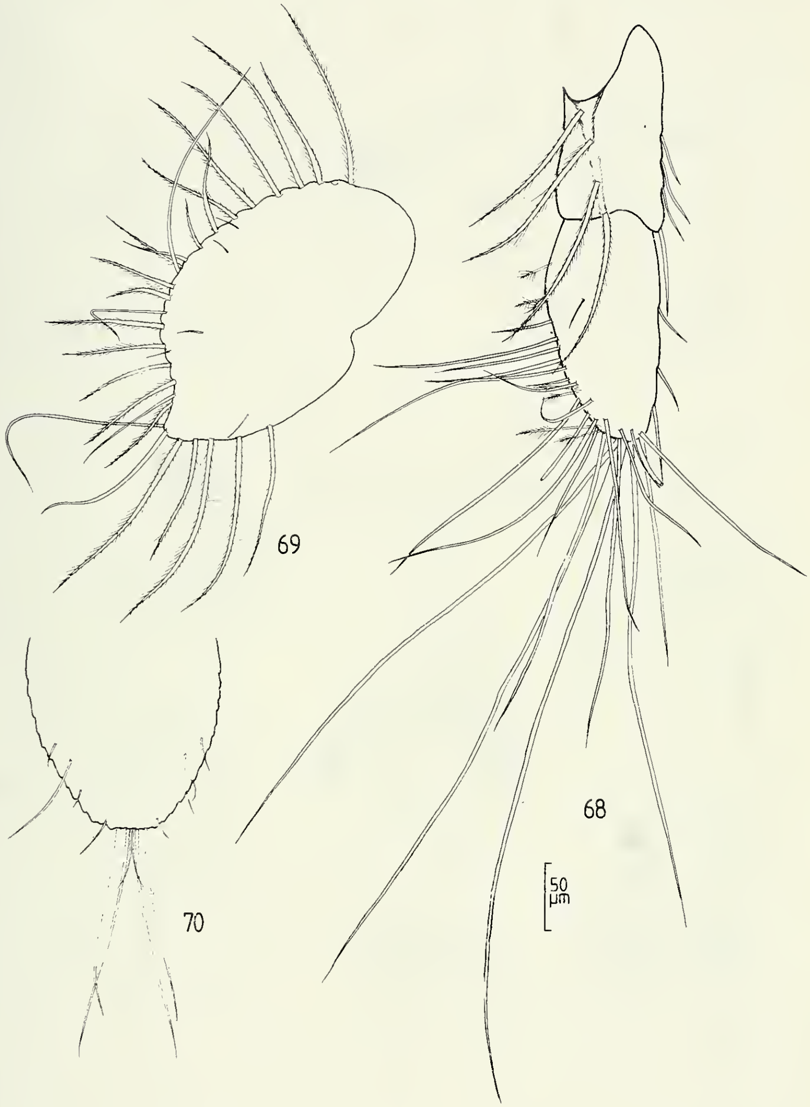
Antenna 1, peduncle 3-articulated; proximal article longest and widest; second article with 2 long, laterally directed setae at outer distal margin; third article with a long laterally directed seta in the same position; first article of 3 articulated flagellum wider than long; second flagellar article longest; small terminal article bearing 4 simple setae and 3 aesthetascs. Antenna 2 relatively robust, peduncle 5-articulated; second article slightly longer than fourth article, grooved to accomodate peduncle of antenna 1; flagellum of 3 setose articles. Incisor of mandible 3-cuspidate, lamina dentata with 4 identations; molar process cone-shaped; second article of 3-articulated palp longest; first article with one, second with 2 setae near distal margin; terminal article bearing 4 short distal spines. Maxilla slender, medially curved in distal third, distal part 6-toothed, Maxilliped lacking endite, bearing a 3-articulated palp; first and second palp article with a seta at mediodistal margin; moreover, second article with a curved seta near outer distal margin; terminal article semi-circular, with 4 curved setae along medial margin. Propodus of pereopod 1 expanded, palm with angular projection bearing row of 4 setae; carpus elongate-triangular, distal part granular; dactylus and unguis subequal in length. Pereopods 2-7 relatively robust, similar among one another; posterior margin of propodus straight or faintly concave, bearing a robust, denticulate compound spine distally; posterodistal margin of propodus with 2 slender compound spines in pereopod 7; carpus of pereopods 2-3 triangular, lacking free anterior margin and bearing a small tubercle posterodistally; carpus of pereopods 4-7 trapezoid, posterodistal margin with small compound spine; posterodistal margin of dactylus and propodus with some scales. Pleopod 1, slender endopodite 4/5 length of operculiform exopodite; distal margin of endopodite with 4, of exopodite with 28 plumose setae (drawn as simple setae); sympodite bearing 4 retinaculae. Endopodite of pleopod 2 narrower and 9/10 length of exopodite; distal margin of endopodite with 5, of exopodite with 8 plumose setae; sympodite bearing 2 retinaculae. Uropodal endopodite somewhat longer than sympodite, bearing several long and short simple setae at outer and distal margin; most of these setae longer than endopodite; dorsal surface of endopodite, near outer and distal margin with 7 feathered sensory setae; uropodal exopodite ovate, with shallow distal concavity; margin of exopodite with several plumose and some simple setae.

Preparatory ♂. – In habitus similar to other non-reproductive adults, eyes somewhat enlarged. Total length 2.8-3.3 mm. Dorsolateral surface of telson with 6-7 pairs of short setae in distal third.

Flagellum of antenna 1 elongate, of 7 articles; penultimate article bearing one aesthetasc, terminal article with 2 aesthetascs and 3 simple setae.

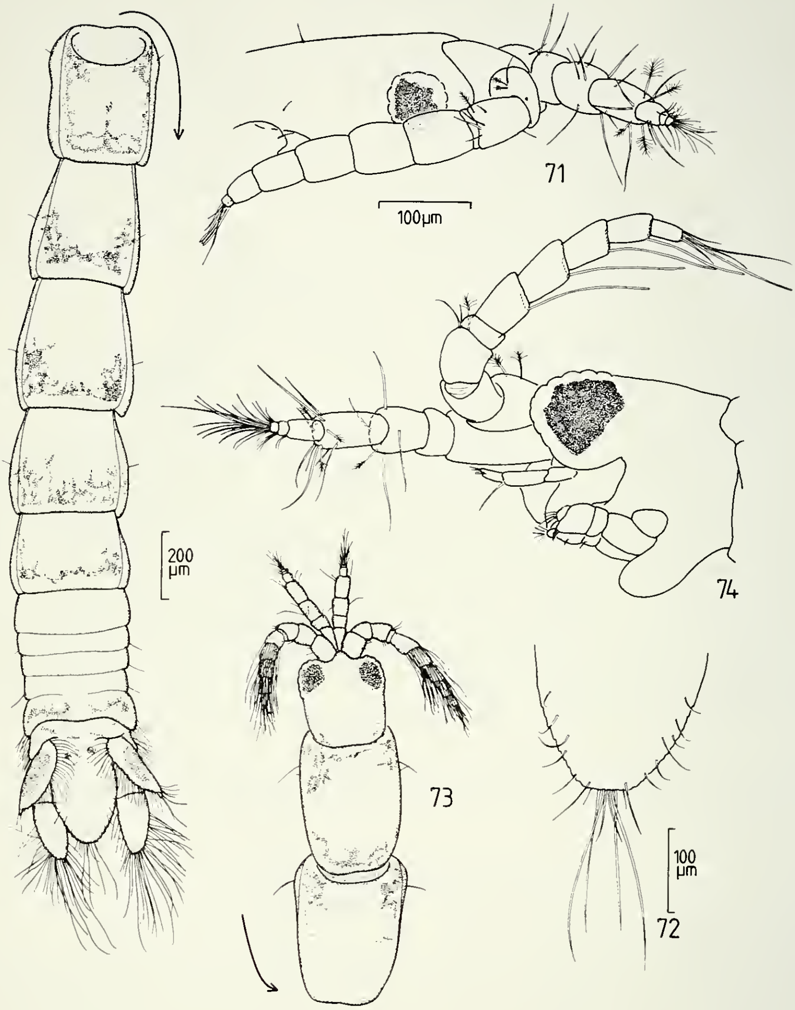
♂. – More slender than non-reproductive adults, 9.5 times longer than wide. Total length 3.4 mm. Dorsum of body with some irregular pigment reticulations. Cephalon slightly longer than wide. Dorsolateral eyes much larger than in non-reproductive adults, located in anterior half of cephalon. Cephalon ventrally, anterior of maxilliped articualtion with strong, rounded tubercle. Dorsal surface of telson with several setules and 3-4 pairs of short setae in distal half.

Antenna 1 with 6 flagellar articles; articles 2-5 bearing whorl of filiform aesthetascs. Pereopods generally more slender than in immature specimens; propodus of pereopod 1 with distinct palmar tubercle at about midlength, bearing fringe of scales; mesial surface of that propodus with about 25 curved setae; carpus triangular, not elongate distally. Posterodistal margin of propodus in pereopods 2-6 with finely denticulate compound spine. Pleopod 1, slender endopodite 4/5 length of operculiform exopodite; distal margin of endopodite with 9, of exopodite with 28 plumose setae (drawn as simple setae);



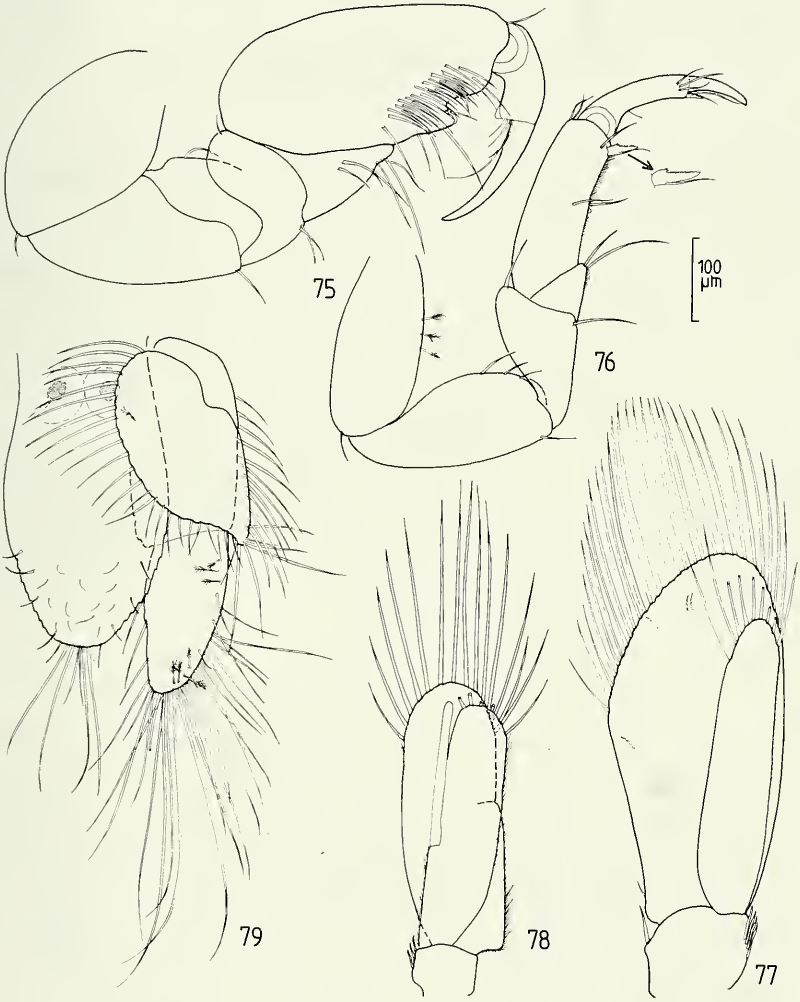
FIGS 68-70.

Amakusanthura tengo n. sp. – Non-reproductive adult: 68) uropodal sympodite and endopodite; 69) uropodal exopodite. Postmanca: 70) distal half of telson.



FIGS 71-74.

Amakusanthura tengo n. sp. – Preparatory ♂: 71) cephalon and antennae in lateral view; 72) distal half of telson. ♂: 73) dorsal view; 74) cephalon and antennae in lateral view.



FIGS 75-79.

Amakusanthura tengo n. sp., ♂: 75) pereopod 1; 76) pereopod 2; 77) pleopod 1; 78) pleopod 2; 79) telson and right uropod.

sympodite bearing 4 retinaculae. Endopodite of pleopod 2 more slender and slightly shorter than exopodite; narrow appendix masculina articulating in proximal half, reaching to distal margin of endopodite; distal margin of endopodite with 6, of exopodite with 13 plumose setae (drawn as simple setae); sympodite with 3 retinaculae. Uropods quite similar to non-reproductive adult.

Postmanca. – In general features similar to non-reproductive adults. Total length 2.1-2.4 mm. Telson dorsolaterally with 4 pairs of setae in distal third.

Manca. – Quite similar to postmanca. Total length 1.6-1.7 mm.

Remarks. – *Amakusanthura tengo* is very similar to *Amakusanthura lathridia* (Wägele, 1982), which is known only from the holotype, a non-reproductive adult from Cuba. Though being almost identical in their habitus, some other features indicate that both might be sibling species. The following characters of *A. lathridia* serve to distinguish this species from *A. tengo*: Terminal article of mandibular palp with only 3 short spines. Dorsolateral surface of telson with 5 pairs of setae in distal third. Both rami of pleopod 1 more slender, with different number of setae. Compound spine of posterior propodal margin in pereopods 2-6 with more than one denticle (Only one denticle in the new species). Most setae of the uropodal endopodite much shorter than in *A. tengo* (see Wägele, 1982: 44). Unfortunately the ♂ of *A. lathridia* is unknown, which does not allow a more detailed comparison with the colombian species.

Amakusanthura tengo has no particular substrate preference. It was common in *Thalassia* beds and in dead coral substratum. The vertical distribution rangs from the intertidal to 13 m. It should be noted that none of the specimens has been collected west of Bahia Concha, though this area has also been studied extensively. Therefore it is supposed that *A. tengo* does not occur at the coastline ranging from the airport of Santa Marta in the West to Punta Aguja in the East.

Distribution. – Caribbean Sea of Colombia.

Amakusanthura vermiformis n. sp. (Figs 80-98).

Holotype. – Non-reproductive adult (MHNG); Isla Morrito de Santa Marta; coral rubble, 30 m, 18 February 1986.

Paratypes. – 1 non-reproductive adult (Coll. Müller); collected together with holotype.

Santa Marta, Punta de Betin: 1 ♀ (Coll. Müller); coral rubble, 15-20 m, 27 November 1985. 2 mancas (Coll. Müller); sand bottom, partly covered with coral rubble, 5-6 m, 14 March 1986.

Isla Morro Grande de Santa Marta: 1 non-reproductive adult (INVEMAR); coral rubble covered with hydroids and bryozoans, 30 m, 19 March 1986.

Punta Ancón near Taganga, about 5 km east of Santa Marta: 2 non-reproductive adults (MHNG); coral rubble, 15 m, 2 August 1985.

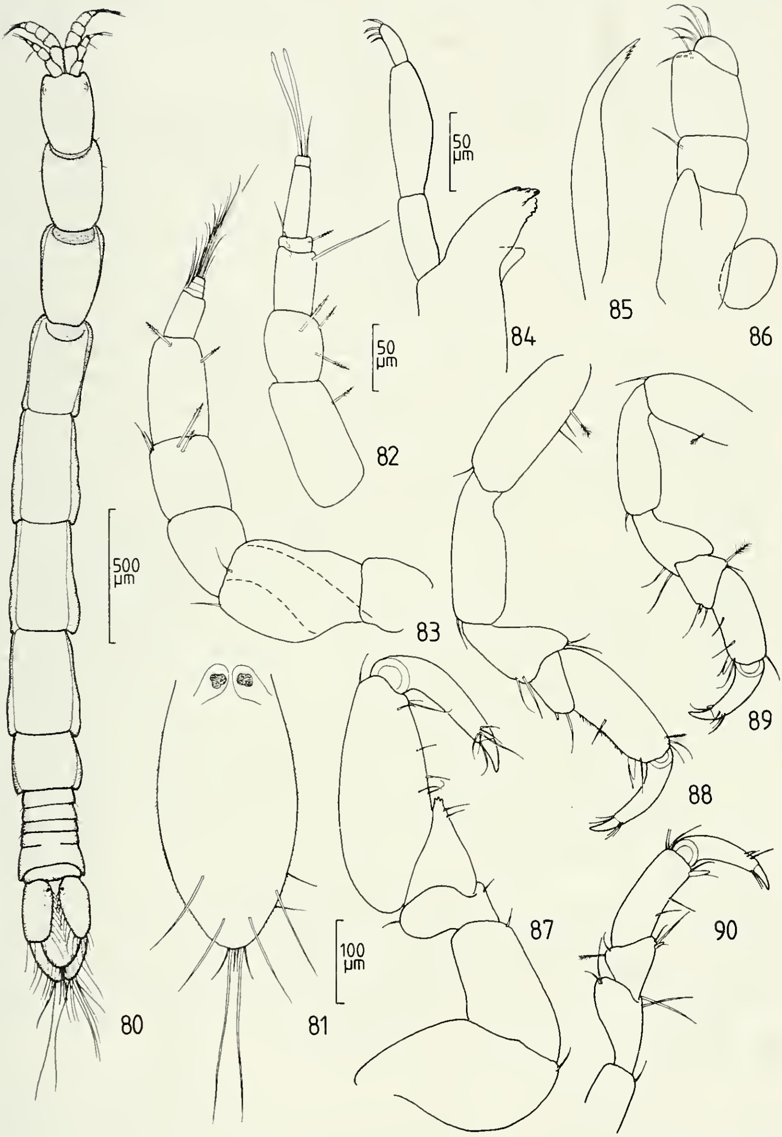
Punta Aguja, about 5 km north-east of Santa Marta: 1 non-reproductive adult (MNHN); coral rubble, 16-18 m, 16 September 1985.

Bahia de Chengue, about 15 km north-east of Santa Marta: 1 postmanca (MHNG); under rocks, 0.5 m, 4 April 1986.

Bahia de Cinto, about 30 km north-east of Santa Marta: 3 mancas (MHNG); *Syringodium*, 3 m, 20 December 1985.

Derivatio nominis. – The specific name refers to the slender, wormlike habitus of the new species.

Description, non-reproductive adult. – Body slender, 12 times longer than wide. Total length 2.3-2.6 mm. Body colourless or with some minute pigment spots on pereonites.



Figs 80-90.

Amakusanthura vermiformis n. sp., non-reproductive adult: 80) dorsal view; 81) telson; 82) antenna 1; 83) antenna 2; 84) mandible; 85) maxilla; 86) maxilliped; 87) pereopod 1; 88) pereopod 2; 89) pereopod 4; 90) distal part of pereopod 6.

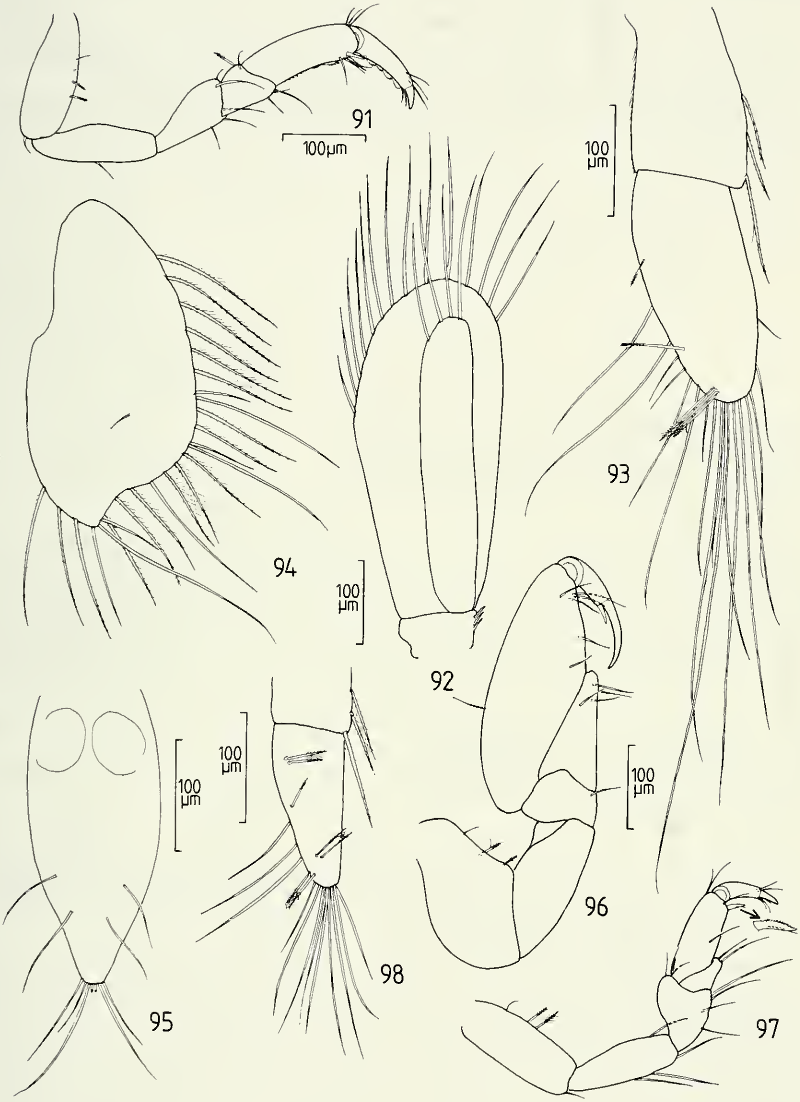
Cephalon 1.6 times longer than wide, with small, moderately pigmented eyes in distal third. Body proportions: C<1<2=3<4=5>6>7. Pleonites 1-3 with distinct suture line; suture line of pleonite 4 indicated laterally. Telson tongue-shaped, narrowly rounded apex with 4 short setae and a pair of long simple setae; dorsolateral surface of telson in distal third with 2 pairs of relatively long simple setae.

Antenna 1, peduncle 3-articulated, with second article shortest and proximal article longest; third peduncular article with a longer, laterally directed seta; flagellum 3-articulated; first article shortest and widest, second article longest; small terminal article bearing short simple seta and 2 aesthetascs. Antenna 2, peduncle 5-articulated; second article longest, 1.4 times longer than wide, grooved to accomodate peduncle of antenna 1; flagellum of 4 setose articles; proximal article longer than other flagellar articles together. Incisor of mandible 3-cuspidate, lamina dentata with 5 identations; molar cone-shaped; second article of 3-articulated palp longest; terminal article smallest, bearing 4 short spines in distal third. Maxilla slender, medially curved in distal third, distal part 5-toothed. Maxilliped with a short, non-setose endite, not extending beyond proximal half of first palp article; palp of 3 articles; first article mediodistally with single seta, second article with 2 simple setae; semicircular terminal article bearing 5 curved setae at mediodistal margin. Propodus of pereopod 1 expanded, elongate-ovate; palm almost straight and lacking tubercle, bearing only some short setae; unguis about 1/3 length of dactylus; carpus triangular, posterodistal margin with 2 short setae and three small denticles. Pereopods 2-7 in shape and size similar among one another; posterior margin of propodus straight or faintly concave, bearing a short compound spine distally; moreover, posterodistal margin of pereopod 7 with two more slender compound spines; carpus of pereopods 2-3 triangular, lacking free anterior margin; carpus of pereopods 4-7 trapezoid, with free anterior margin and short compound spine at posterodistal margin; posterior margin of dactylus in pereopod 7 with row of scales. Pleopod 1, endopodite slender, 9/10 length of operculiform exopodite; endopodite with 4, exopodite with 14 distal, plumose marginal setae (drawn as simple setae); sympodite with 3 retinaculae. Sympodite and endopodite of uropod subequal in length; endopodite relatively slender, ovate, somewhat extending beyond distal margin of telson; outer and distal margin of endopodite with several short and long setae; dorsal surface, near outer and distal margin bearing 5 feathered sensory setae. Uropodal exopodite roughly ovate, with shallow concavity at outer distal margin; exopodite with some simple and several plumose setae at outer and distal margin.

♀. – In general features as non-reproductive adult. Total length 3.6 mm.

Postmanca and manca. – In their features quite similar to non-reproductive adult and ♀. Total length 2.1 and 2.0-2.2 mm, respectively. Distal margin of telson in manca more slender than in non-reproductive adult. Pereopod 1 of manca lacking denticles at distal margin of carpus. Pereopods 2-7 more robust than in non-reproductive adult. Uropodal endopodite of manca more slender than in adult specimens.

Remarks. – *Amakusanthura vermiformis* n. sp. is most closely allied with *Amakusanthura cracenta* (Kensley, 1984), which is known from Belize and the Turks and Caicos Islands. Some adult paratype specimens of this species have been available for comparison (USNM-registration number 211220). It became obvious, in contrast to the original description, that *Amakusanthura cracenta* has the three anterior pleonites with a distinct dorsal suture line and an incomplete line between pleonites 4 and 5. This feature is characteristic for *Amakusanthura* Nunomura, 1977. According to this definition *A. cracens* has to be transfered from *Apanthura* to *Amakusanthura*. Though *A. vermiformis* and *cracenta* are very similar in their habitus, some characters allow an easy distinction of



FIGS 91-98.

Amakusanthura vermiformis n. sp. – Non-reproductive adult: 91) pereopod 7; 92) pleopod 1; 93) uropodal sympodite and endopodite; 94) uropodal exopodite. Manca; 95) telson; 96) pereopod 1; 97) pereopod 2) 98) uropodal endopodite and distal part of sympodite.

both species. The propodal palm of the pereopod 1 in *A. cracenta* has a strong tooth-shaped tubercle and the carpus is produced into a narrow, tooth-shaped posterodistal process. Moreover, the uropodal exopodite of *cracenta* has a deep distal concavity (see Kensley, 1984: 14-15, figs 9-10). In contrast to these features, neither the propodus nor the carpus of pereopod 1 of *A. vermiformis* bear a tooth-shaped tubercle or process. Also, the uropodal exopodite has only a shallow concavity at the outer distal margin.

Though collected in low number, *A. vermiformis* was found at several locations in the Santa Marta area, more often associated with coral rubble. Its vertical distribution ranges from 0.5-30 m.

Distribution. – Caribbean Sea of Colombia.

CORTEZURA Schultz, 1977

Cortezura confixa (Kensley, 1978) (Figs 99-116)

Venezanthura confixa Kensley, 1978: 782-785, figs 5-6.
Venezanthura confixa; Carvacho, 1983: 312.
Venezanthura confixa; Negoescu & Wägele, 1983: 135.
Cortezura confixa; Kensley & Schotte, 1989: 31, fig. 10.

Material. – Bahia de Santa Marta: 8 ♂♂, 17 non-reproductive adults (Coll. Müller), 5 non-reproductive adults (INVEMAR), 3 ♂♂, 2 non-reproductive adults (MHNG), 1 ♂, 4 non-reproductive adults (MNHN); dredged on sand bottom, 5-10 m, leg. B. Werding, March 1980.

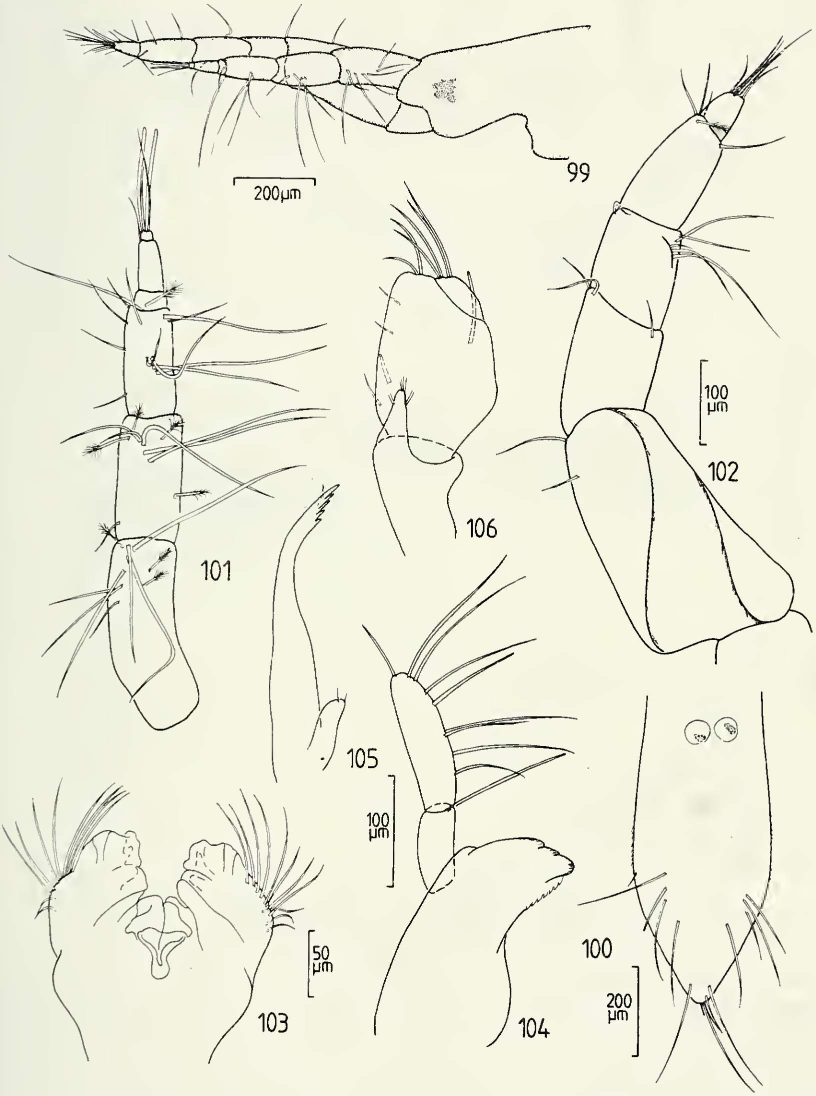
Bahia de Chengue, about 15 km north-east of Santa Marta: 1 non-reproductive adult (MHNG); from sand bottom, 5 m, leg. L.E.-Velasquez, 4 September 1985. 1 non-reproductive adult, 1 postmanca (Coll. Müller); sand bottom in *Halophila* bed, 5 m, leg. L.E.-Velasquez, 6 September 1985.

Bahia de Cinto, about 30 km north-east of Santa Marta: 1 non-reproductive adult (Coll. Müller); on sand bottom, 2-3 m, 19 September 1985.

Arreçifes near Cañaverales, about 40 km north-east of Santa Marta: 1 non-reproductive adult (Coll. Müller); sand bottom in *Syringodium* bed, 1.5-2 m, 25 February 1986.

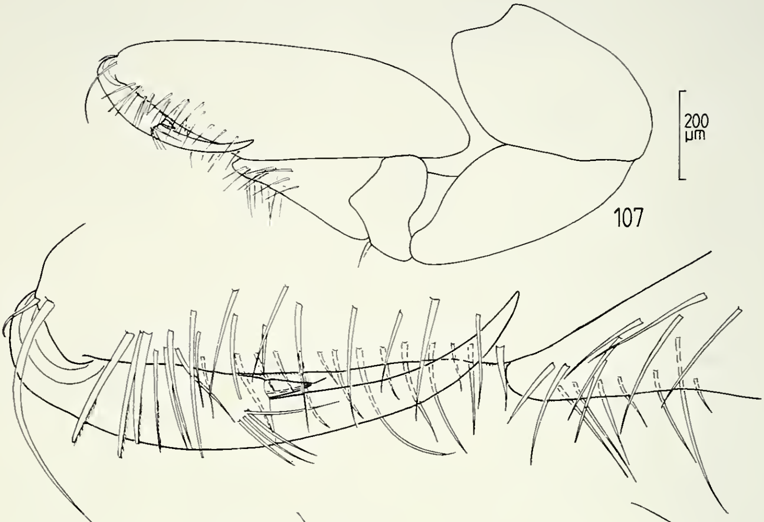
Additional description, non-reproductive adult. – Cephalon with small, weakly pigmented lateral eyes, located in distal third. Telson raised middorsally; dorsolateral surface of telson with 5 pairs of slender, simple setae in distal half; distal margin of telson narrowly rounded, with 3 pairs of simple setae.

Antenna 1, all three peduncular articles with some long, ventrally and laterally directed setae; flagellum 3-articulated, first article wider than long; second article slender, longest; minute terminal article with 3 simple setae and 2 aesthetascs. Antenna 2 with 5-articulated peduncle; second article much larger than others, grooved to accomodate peduncle of antenna 1; flagellum uniarticulate, with some distal simple setae. Lateral lobes of hypopharynx broad, with row of 10-11 curved simple setae. Incisor of mandible 3-cuspidate, lamina dentata with 7 indentations; mandibular palp biarticulate, short proximal article with a long simple seta distally; second article twice length of first articles, bearing 9 long simple setae. Maxilla slender, medially curved in distal third, with 5 distal teeth and a short seta between third and fourth tooth. Maxilliped with elongate-triangular, setulose endite; palp biarticulate; proximal article very large, mediodistal margin with 2 curved setae; second article flat, much wider than long, bearing 4 curved setae at mediodistal margin. Propodus of pereopod 1 greatly expanded, elongate-ovate in outline, palm without



FIGS 99-106.

Cortezura confixa (Kensley, 1978), non-reproductive adult: 99) cephalon and antennae, lateral view; 100) telson; 101) antenna 1; 102) antenna 2; 103) hypopharynx; 104) mandible; 105) maxilla; 106) maxilliped.



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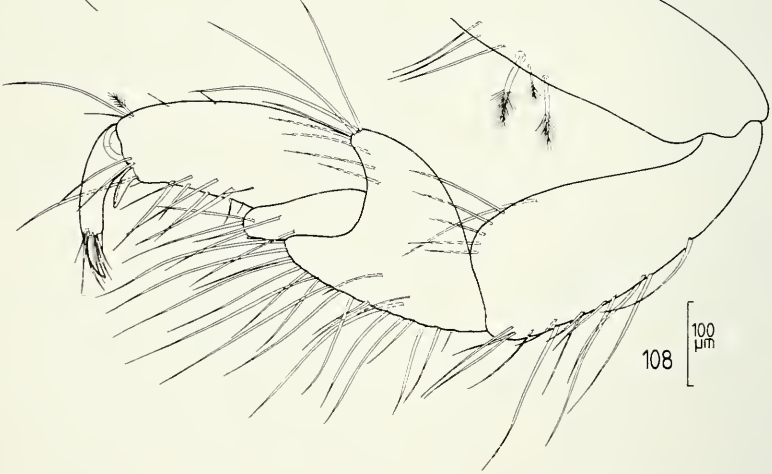

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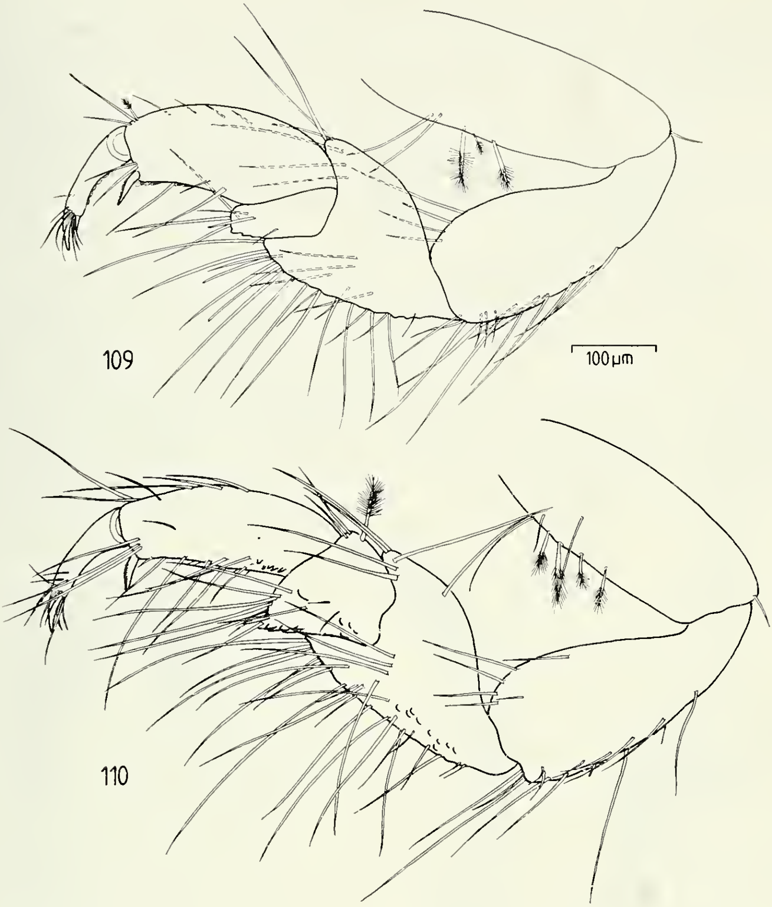
FIGS 107-108.

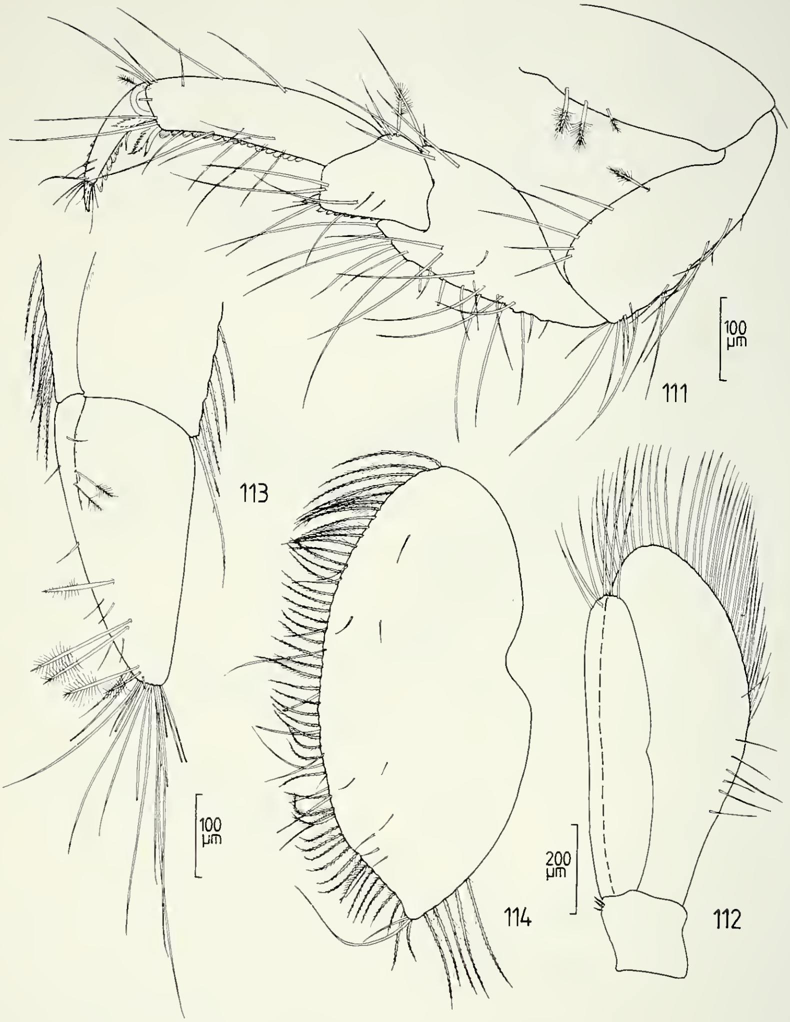
Cortezura confixa (Kensley, 1978), non-reproductive adult: 107) pereopod 1; 108) pereopod 2.



FIGS 109-110.

Cortezura confixa (Kensley, 1978), non-reproductive adult: 109) pereopod 3; 110) pereopod 4.

distinct tubercle; mesial surface of propodus and elongate-triangular carpus with several curved spines in arrangment as figured; unguis long and slender, slightly longer than dactylus; dactylus with short accessory spine near articulation of unguis. Pereopods 2-7 relatively robust and similar among one another, bearing several long setae at posterior margin of propodus, carpus, merus and ischium; posterodistal margin of propodus in pereopods 2-6 with finely denticulate compound spine; propodus of pereopod 7 with 3 denticulate compound spines in that position; carpus of pereopods 2-3 short, lacking free anterior margin; trapezoid carpus of pereopods 4-7 with free anterior margin and short, non-denticulate compound spine at posterodistal margin; anterior and posterior margin of dactylus, as well as posterior margin of propodus and carpus in pereopod 7 bearing row of several scales. Pleopod 1, slender endopodite 9/10 length of operculiform exopodite; distal margin of endopodite with 6, of exopodite with 33 plumose setae (drawn as simple setae);



FIGS 111-114.

Cortezura confixa (Kensley, 1978), non-reproductive adult: 111) pereopod 7; 112) pleopod 1; 113) uropodal sympodite and endopodite; 114) uropodal exopodite.

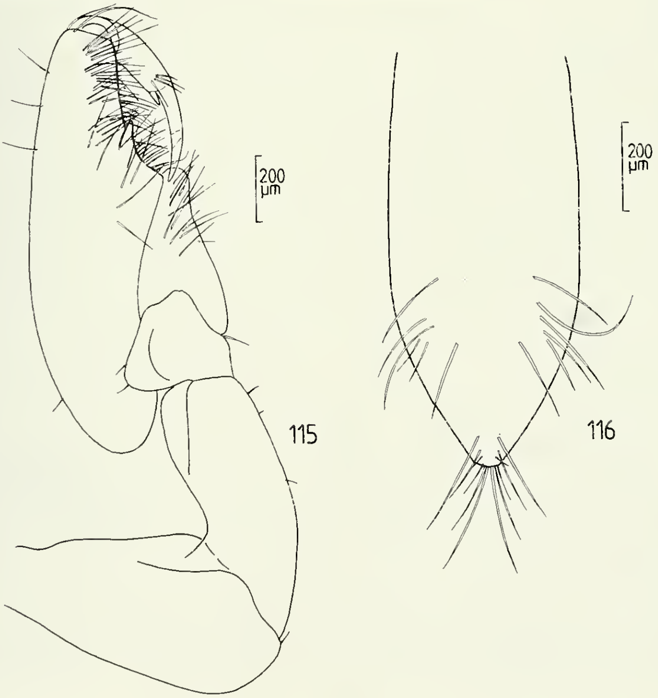
sympodite with 3 retinaculae. Uropodal endopodite slender, roughly triangular in outline; narrowly rounded distal margin bearing several long, simple setae; dorsal surface of endopodite with 7 feathered sensory setae near outer and distal margin. Uropodal exopodite ovate, outer distal margin shallowly concave; outer and distal margin of exopodite bearing many plumose and some simple setae.

♂. – Telson with 9 pairs of dorsolateral simple setae in distal half.

Palm of pereopod 1 propodus concave, with strong toothshaped tubercle in proximal half; setae on mesial surface of propodus and carpus more numerous than in non-reproductive adult.

Remarks. – Because the original description is restricted to the ♂ holotype, some additional features are described for the non-reproductive adult specimens. The ♂ pereopod 1 and the telson are also figured in detail.

Little was known concerning the substrate preference of *Cortezura confixa*. Because all specimens taken in the Santa Marta area were found on sand bottom, it is supposed that this species is an exclusive inhabitant of that substratum. This agrees with the type locality, where the holotype was collected "in 4-10 m from sand and algal bottom" (Kensley, 1978: 785). *C. confixa* apparently is a subtidal shallow-water species. Its known vertical distribution ranges from about 2 to 10 m.



FIGS 115-116.

Cortezura confixa (Kensley, 1978), ♂: 115) pereopod 1; 116) telson.

Distribution. – The species was already recorded from the Santa Marta area (Carvacho, 1983: 312). The only other record is the type locality, Isla Cubagua in Venezuela.

MESANTHURA Barnard, 1914

Mesanthura cf. **brasiliensis** Koening, 1980 (Figs 117-133)

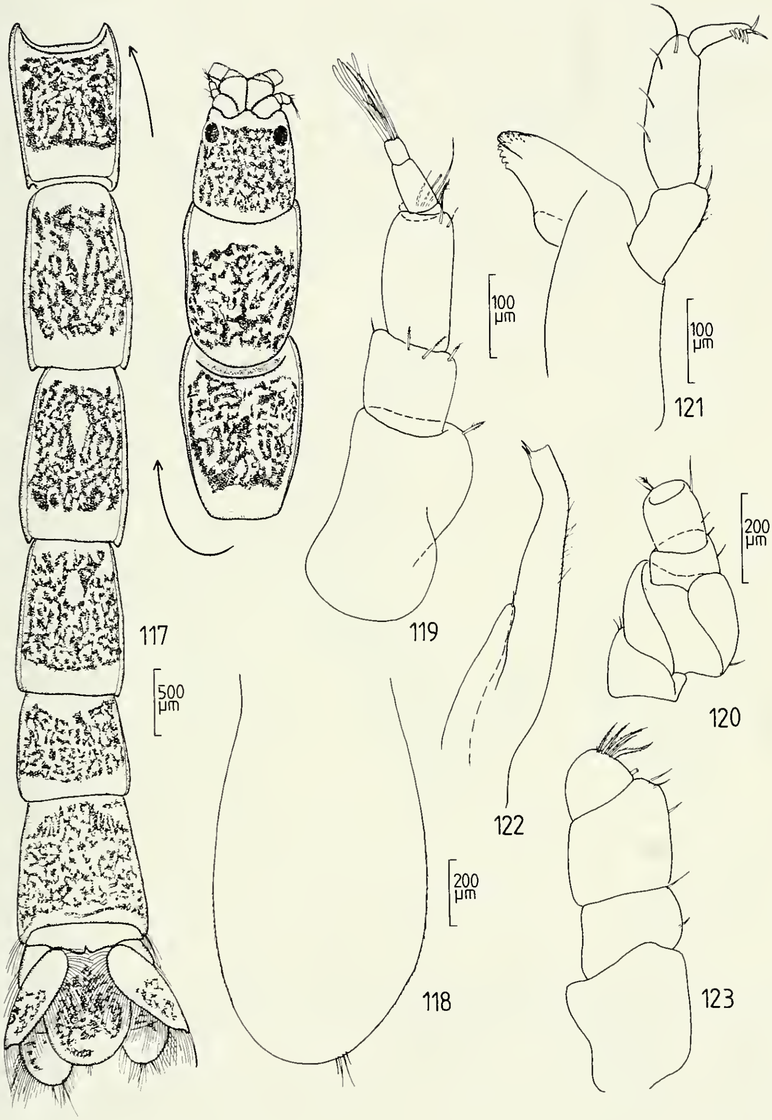
Mesanthura brasiliensis Koening, 1980: 357-364, fig. 1.
Mesanthura brasiliensis; Negoescu & Wägele, 1983: 125.

Material. – 1 non-reproductive adult (MHNG); Isla Morrito de Santa Marta; coral rubble, 30 m, 18 February 1986.

Description, non-reproductive adult. – Body relatively slender, 11 times longer than wide. Total length 10.7 mm. Dorsum of cephalon, pereonites and pleon with dense pigment reticulations and pigment spots. Dorsum of pereonites 4-6 with non-pigmented ovate central area. Cephalon slightly longer than wide, somewhat narrowing distally; dorsolateral eyes in distal third of cephalon, well pigmented. Body proportions: C<1<2>3<4>5>6>7. Telson tongue-spahed; broadly rounded distal margin with 4 short simple setae.

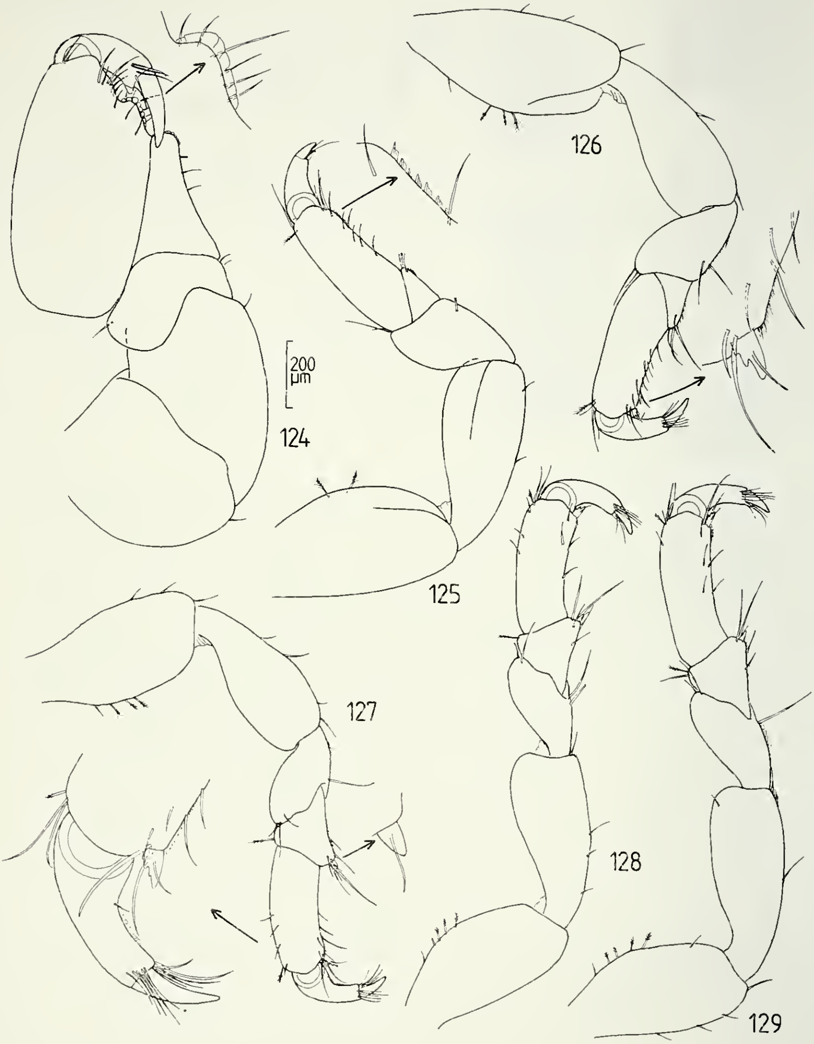
Antenna 1, penduncle 3-articulated; second article shortest, proximal article longest and widest; flagellum 3-articulated; first article much wider than long, second article longest; small terminal article with 4 simple setae and 3 aesthetascs. Antenna 2 broken off at 4th peduncular article; second article largest, about as long as wide, grooved to accomodate peduncle of antenna 1. Incisor of mandible 4-cuspidate, lamina dentata with 5 indentations; second article of 3-articulated palp longest; first article with a simple seta and second article with 4 simple setae; slender terminal article bearing 6 short spines in distal half. Maxilla elongate, distal part medially curved, apex broken off. Maxilliped lacking endite, palp 3-articulated; medial margin of first palp article with 2, of second with 3 simple setae; terminal article semiovate, with 6 setae along medial margin; four of these setae plumose, proximal seta broken off at base. Pereopod 1 propodus expanded; palm with shallow tubercle in proximal half, bearing 6 simple setae and fringe of scales; mesial surface of propodus with 7 curved setae near palm; carpus roughly elongate-triangular, with distal fringe of scales. Pereopods 2-7 in shape and size similar among one another; posterodistal margin of propodus with robust, denticulate compound spine; moreover, posterodistal margin of pereopod 7 propodus with two more slender compound spines; carpus of pereopods 2-3 triangular, lacking free anterior margin; carpus of pereopods 4-7 trapezoid, with free anterior margin and short compound spine at posterodistal margin. Pleopod 1, slender endopodite slightly shorter than operculiform exopodite; endopodite with 16, exopodite with about 50 plumose setae at distal margin (drawn as simple setae); sympodite with 5 retinaculae. Uropodal sympodite twice as long as semiovate endopodite; endopodite with several plumose and simple marginal setae, all drawn as simple setae; dorsal surface near outer margin bearing 5 feathered sensory setae; uropodal exopodite roughly ovate, with shallow concavity at outer distal margin; exopodite with numerous simple and plumose marginal setae, all drawn as simple setae.

Remarks. – The single specimen from Colombia most probably is conspecific with *Mesanthura brasiliensis* Koening, 1980, which is known only from the ♀ holotype described from Brazil. Unfortunately the original description is too short to allow a



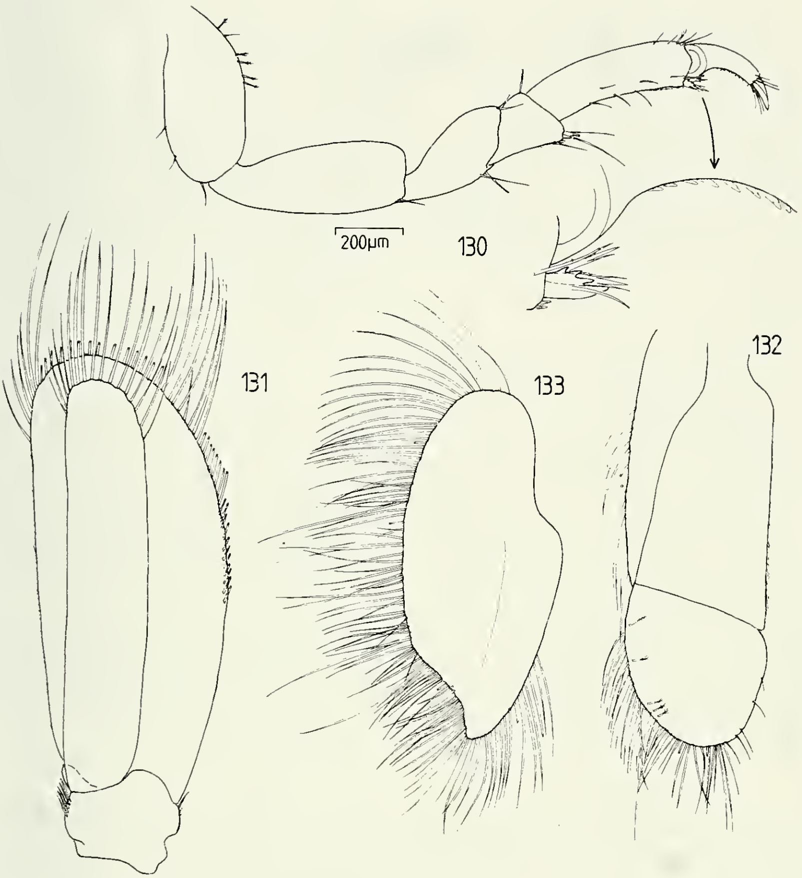
Figs 117-123.

Mesanthura cf. brasiliensis Koening, 1980, non-reproductive adult: 117) dorsal view; 118) telson; 119) antenna 1; 120) four proximal articles of antenna 2; 121) mandible; 122) maxilla; 123) maxilliped.



Figs 124-129.

Mesanthura cf. brasiliensis Koening, 1980, non-reproductive adult: 124) pereopod 1; 125) pereopod 2; 126) pereopod 3; 127) pereopod 4; 128) pereopod 5; 129) pereopod 6.



FIGS 130-133.

Mesanthura cf. brasiliensis Koening, 1980, non-reproductive adult: 130) pereopod 7; 131) pleopod 1; 132) uropodal sympodite and endopodite; 133) uropodal exopodite.

recognition of this species with certainty and the type material was not available for comparison. The drawings of the appendages are restricted to the pereopods, which do not show any details of the spination. The outlines of the pigmentations in *M. brasiliensis* are very similar to the colombian specimen, having also non-pigmented ovate central areas at the pereonites 4-6. However, most of the pigmentations in the original description are drawn as spots, separated among one another, whereas the specimen from the Santa Marta area shows distinct pigment reticulations. Moreover, the non-reproductive adult from Colombia has only 4 short distal setae at the telsonic margin, whereas 11 short setae have been drawn in the habitus figure of brasiliensis. Due to these disagreements, the status of the colombian material remains uncertain.

Mesanthura hopkinsi Hooker, 1985 (Figs 134-158)

Mesanthura hopkinsi Hooker, 1985: 276-279, figs 14-15.
Mesanthura hopkinsi; Kensley & Schotte, 1989: 51, figs 18 C, 20 I-L.

Material. – Punta brava, near airport of Santa Marta: 1 manca (Coll. Müller); brown algae on rocky shore, interdital, 1 August 1985.

Bahia de Santa Marta: 1 preparatory ♂ (Coll. Müller); pilings in the harbour of Santa Marta, from bryozoans, sponges and detritus, 27 February 1985. 1 non-reproductive adult (Coll. Müller); Punta de Betin, coral rubble, 11 m, 17 June 1985. 1 postmanca (MHNG); Punta de Betin, in detritus, 22 June 1985. 1 postmanca, 1 manca (Coll. Müller), fouling on pilings in the harbour of Santa Marta, 0.5-6 m, 3 September 1985. 1 ♂ (Coll. Müller); Punta de Betin, under stones on sand bottom, 0-1 m, 28 January 1986. 1 preparatory ♂ (MHNG); Punta de Betin, under rocks on sand bottom, 1-2 m, 4 February 1986.

Isla Morro Grande de Santa Marta: 1 non-reproductive adult (Coll. Müller); coral rubble, 30 m, 19 March 1986.

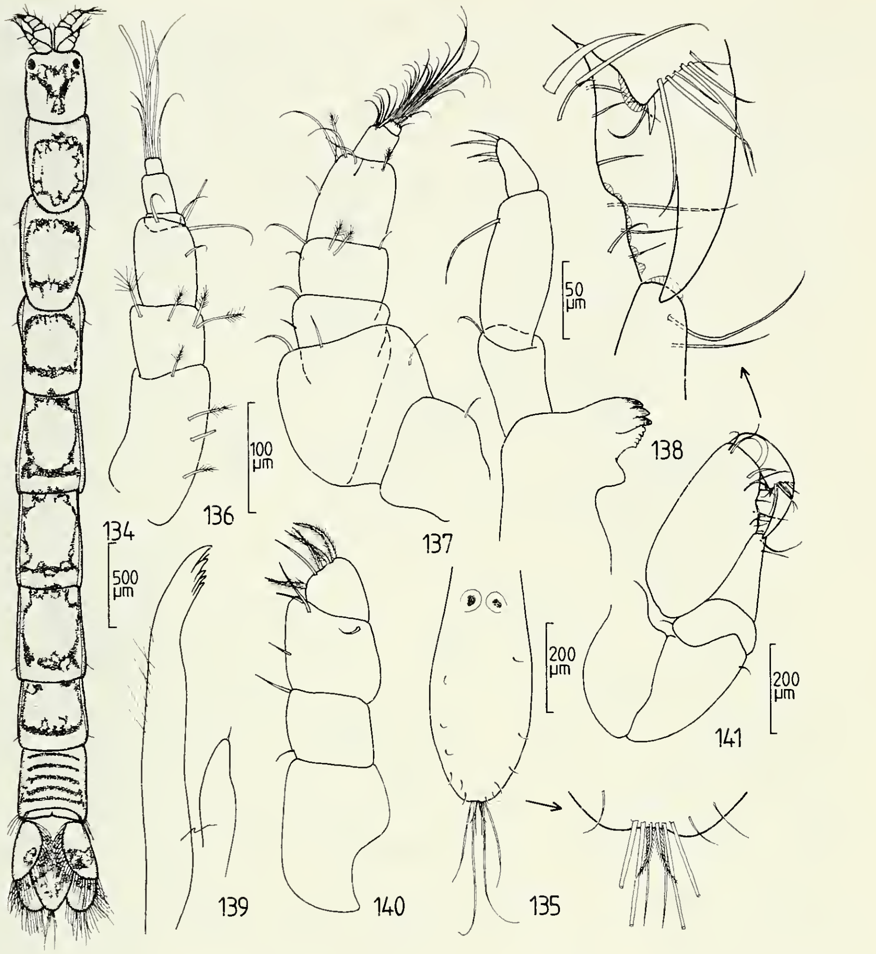
Punta Aguja, about 5 km north-east of Santa Marta: 1 non-reproductive adult (Coll. Müller); from hydroids and bryozoans, 11-15 m, 20 October 1985.

Bahia Concha, about 10 km north-east of Santa Marta: 1 non-reproductive adult (MHNG); *Thalassia*, 0.5-3.5 m, 13 August 1985. 1 non-reproductive adult (MNHN); Thalassia, 0.5-3 m, 9 September 1985. 1 non-reproductive adult (MHNG); *Thalassia*, 5 l substratum, 2-4 m, 2 October 1985. 1 postmanca (MHNG); *Thalassia*, 2-3 m, 8 Novembr 1985. 3 mancas (MHNG); from coralline algae in *Thalassia* bed, 2-3 m, 7 January 1986. 4 mancas (Coll. Müller); *Thalassia* and coralline algae, 1.5-2 m, 12 February 1986. 2 non-reproductive adults (INVEMAR); *Thalassia*, 5 l substratum, 1.5-2 m, 3 March 1986. 1 postmanca, 1 manca (Coll. Müller); *Thalassia*, 1-2 m, 2 April 1986. 2 mancas (MHNG); *Thalassia*, 2-3 m, 2 May 1986.

Bahia de Chengue, about 15 km north-east of Santa Marta: 1 postmanca (Coll. Müller); *Thalassia*, 0.5-1 m, 8 September 1985. 1 non-reproductive adult (MHNG); coral rubble, 0.5 m, 13 September 1985. 2 non-reproductive adults, 1 postmanca (Coll. Müller); coral rubble in *Thalassia* bed, 1 November 1985. 1 postmanca, 2 mancas (MHNG); under stones, 0.5 m, 4 April 1986. 1 non-reproductive adult, 1 postmanca (MHNG); from *Halimeda* on reef-flat, intertidal-0.5 m, 14 April 1986. 1 larvigerous ♀ (Coll. Müller); *Thalassia*, 0.5 m, 17 January 1986.

Description, non-reproductive adult. – Body slender, about 12 times longer than wide. Total length 3.4-5.1 mm. Dorsal pigmentation of cephalon roughly triangular with non-pigmented central areas; dorsal pigmentation of pereonites nearly circular or ovate, with non-pigmented central area. Fused pleonite section with 5 transverse pigment stripes; telson and uropods with irregular pigment reticulations. Cephalon 1.2 times longer than wide, with well pigmented dorsolateral eyes in distal third. Body proportions: C<1<2>3=4=5=6>7. Pleonites fused. Telson tongue-shaped, about twice longer than wide; distal margin of telson shallowly concave, with 2 short plumose setae, a pair of short simple setae and 2 pairs of long simple setae.

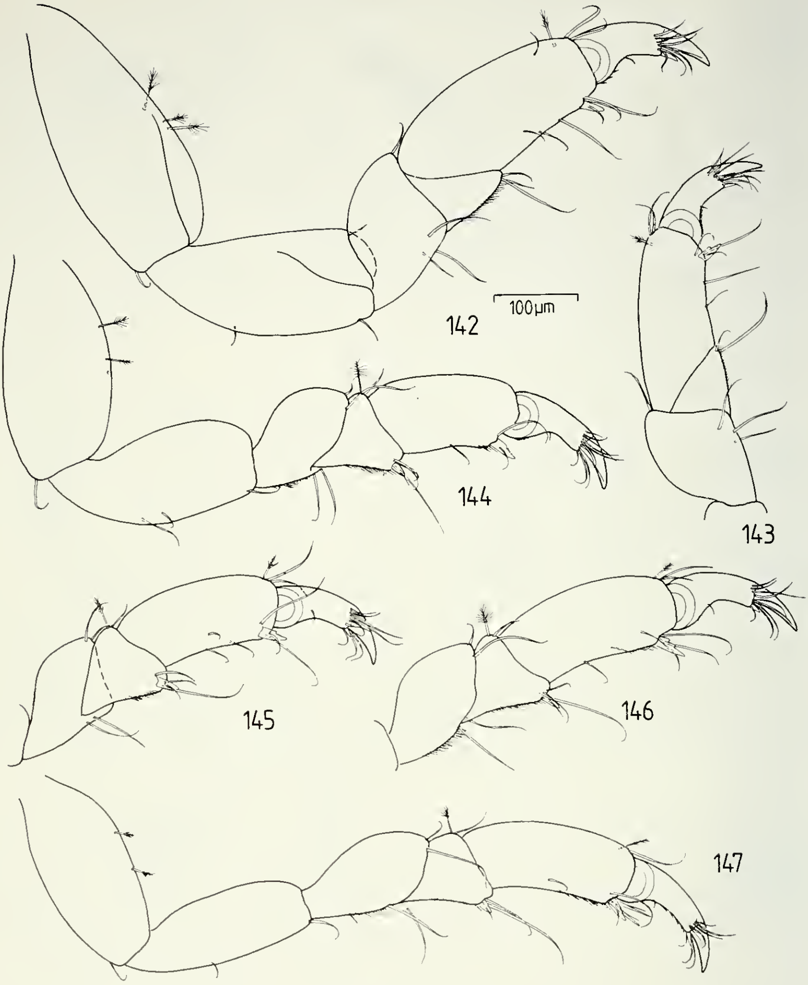
Antenna 1, penduncle 3-articulated, with second article shortest and proximal article longest; flagellum 3-articulated; first article much wider than long; second article longest; small terminal article with 5 simple setae and 2 aesthetascs. Antenna 2 robust, peduncle 5-articulated; second article largest, about as long as wide, grooved to accomodate peduncle of antenna 1; flagellum of 2 setose articles. Incisor of mandible 3-cuspidate, lamina dentata with 4 identations; second article of 3-articulated palp longest; first and second palp article bearing seta at outer distal margin; small terminal article with 4 short setae in distal half. Maxilla elongate, medially curved in distal fourth; distal part 5-toothed, with short seta between fourth and fifth tooth. Maxilliped lacking endite, palp 3-articulated; first palp article with 2, second with 4 simple setae; medial and distal margin of semiovate terminal article bearing a simple seta and 4 plumose setae. Pereopod 1 with propodus



FIGS 134-141.

Mesanthura hopkinsi Hooker, 1985, non-reproductive adult: 134) dorsal view; 135) telson; 136) antenna 1; 137) antenna 2; 138) mandible; 139) maxilla; 140) maxilliped; 141) pereopod 1.

expanded; palm with shallow tubercle in proximal half, bearing row of some scales; mesial surface of propodus with 2 simple setae and a curved spine distally; unguis about as long as dactylus; carpus elongate-triangular, with distal fringe of scales and 2 posterodistal simple setae. Pereopods 2-7 in shape and size similar among one another; posterodistal margin of propodus with robust compound spine; moreover, posterodistal margin of pereopod 7 propodus with two more slender compound spines; carpus of pereopods 2-3 triangular, lacking free anterior margin; carpus of pereopods 4-7 trapezoid, with free anterior margin and short compound spine at posterodistal margin. Pleopod 1, endopodite slender, slightly shorter than operculiform exopodite; endopodite distally with 5, exopodite with 20 plumose marginal setae (drawn as simple setae); sympodite with 3

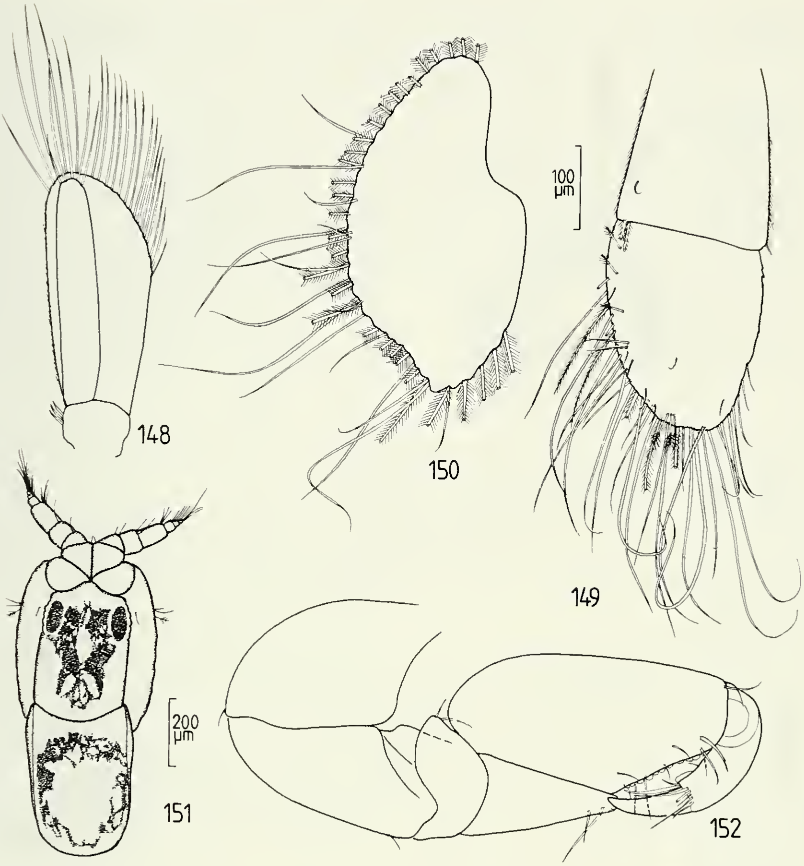


FIGS 142-147.

Mesanthura hopkinsi Hooker, 1985, non-reproductive adult: 142) pereopod 1; 143) distal part of pereopod 2; 144) pereopod 4; 145) distal part of pereopod 5; 146) distal part of pereopod 6; 147) pereopod 7.

retinaculae. Sympodite of uropod subequal in length to semiovate endopodite; endopodite with some plumose and many simple marginal setae; dorsal surface near ectal and distal margin with 8 feathered sensory setae; endopodite not extending beyond distal margin of telson; exopodite roughly ovate, with shallow concavity at outer distal margin; exopodite with several simple and many plumose marginal setae.

♀. – In general features quite similar to non-reproductive adult. Total length 4.6 mm.



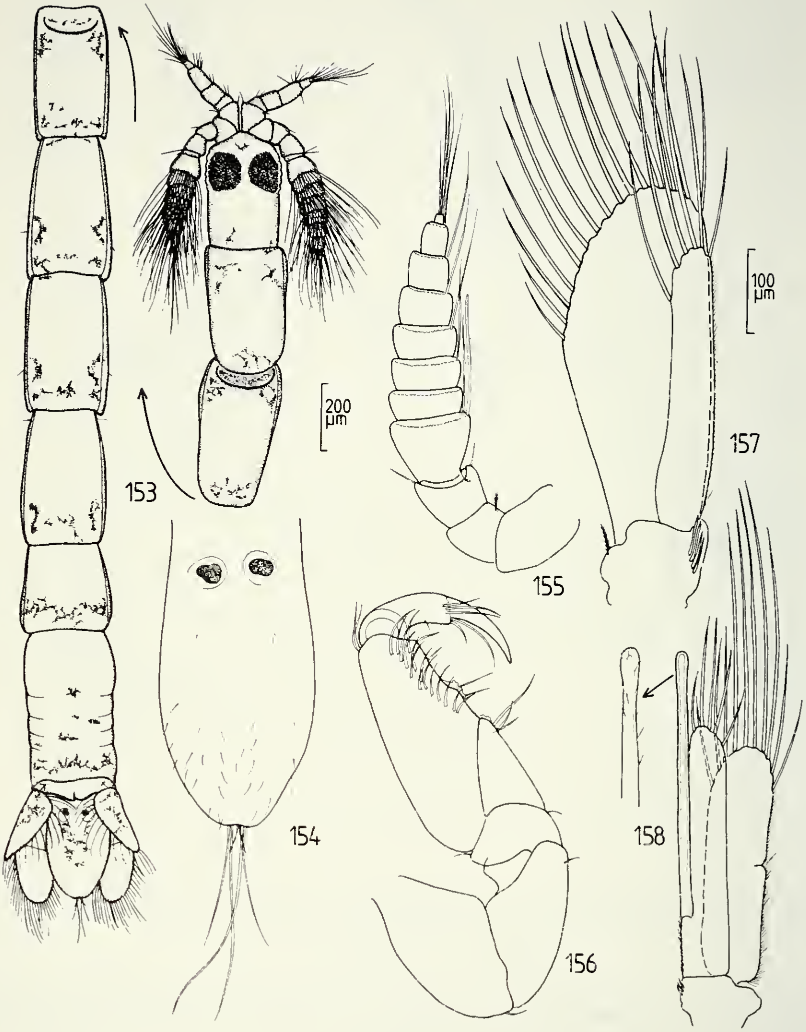
FIGS 148-152.

Mesanthura hopkinsi Hooker, 1985. – Non-reproductive adult: 148) pleopod 1; 149) uropodal sympodite and endopodite; 150) uropodal exopodite. Preparatory ♂: 151) cephalon and first pereonite; 152) pereopod 1.

Preparatory ♂. – In general features similar to other non-reproductive adults and ♂. Total length 2.3-4.5 mm. Eyes somewhat enlarged.

Antenna 1 with only one proximal article; distal part of antenna 1 swollen, all articles fused. Pereopod 1 more robust than in mature ♂.

♂. – In habitus similar to non-reproductive adults and ♀; cephalon, fused pleonite section and pereopods more slender. Total length 3.7 mm, body 14 times longer than wide. Dorsum of body with few irregular pigment reticulations. Cephalon 1.6 times longer than wide, with large, well pigmented dorsolateral eyes. Telson similar to non-reproductive adults, distal margin with 2 short plumose and 2 pairs of long simple setae; dorsal surface of telson with several short setules in distal half.



Figs 153-158.

Mesanthura hopkinsi Hooker, 1985, ♂: 153) dorsal view; 154) telson; 155) antenna 1; 156) pereopod 1; 157) pleopod 1; 158) pleopod 2.

Antenna 1, peduncle 3-articulated, proximal article longest; flagellum of 9 articles, first one shortest and much wider than long; terminal article minute, with 4 distal simple setae; articles 2-8 swollen, bearing whorl of many aesthetascs. Pereopods generally more slender than in ♀ and non-reproductive adults. Palm of pereopod 1 propodus with shallow tubercle in proximal half, fringed with some scales; mesial surface of propodus with 15 slender, curved spines. Pleopod 1, slender endopodite about 4/5 length of operculiform exopodite; endopodite with 6, exopodite with 15 plumose marginal setae (drawn as simple setae); sympodite with 4 retinaculae. Rami of pleopod 2 relatively slender; endopodite slightly longer than exopodite; spinulose appendix masculina articulating in proximal third, extending with about 1/4 of its entire length beyond distal margin of endopodite; endopodite with 5, exopodite with 10 distal plumose setae (drawn as simple setae); sympodite with 3 retinaculae.

Postmanca and manca. – In general habitus quite similar to non-reproductive adults and ♀. Total length 2.7-3.2 and 2.0-2.8 mm, respectively.

Remarks. – *M. hopkinsi* is easily distinguishable from its congeners in the Atlantic Ocean by the circular or ovate, solid pigmentations of the pereonites and by the transverse pigment stripes on the fused pleonite section. The pigment pattern of this species superficially resembles *Mesanthura catenula* (Stimpson, 1855) from south Africa and *Mesanthura occidentalis* Menzies & Barnard, 1959 from California. However, these species have a solid pigment patch on the fused pleonite section (see Kensley, 1982b: 154, fig. 36; Wägele, 1984a: 5-3, fig. 8). The ♂ of *Mesanthura hopkinsi* is described herein for the first time.

In the Santa Marta area *M. hopkinsi* did not show a distinct habitat preference, though many specimens have been found associated with *Thalassia* sea grass. As for *Mesanthura punctillata* redescribed herein, it is a surprising fact, that none of the specimens collected occured in *Syringodium* beds. In addition to the association with *Thalassia*, *M. hopkinsi* has been found on the fouling of pilings in the harbour of Santa Marta, in algal vegetation, coral rubble and under rocks on sand bottom. Summarizing the information from Colombia and literature, *M. hopkinsi* has a vertical distribution from the intertidal to 55 m.

Distribution. – Up to now the species was known only from Florida and the Gulf of Mexico (Kensley & Schotte, 1989: 51). The present record extends its known range considerably southward to the northern coast of South America.

Mesanthura pulchra Barnard, 1925

References for this species are given in Müller (1991: 750).

Material. – Punta brava, near airport of Santa Marta: 2 ♂♂, 6 non-reproductive adults (1 preparatory ♂) (MHNG); from *Sargassum* on rocky shore, lower intertidal. 2 ♂♂, 4 non-reproductive adults, 2 mancas (Coll. Müller); from *Sargassum* on rocky shore, lower intertidal, 9 October 1985. 2 non-reproductive adults, 4 mancas (MNHN); *Sargassum* on rocky shore, intertidal, 18 November 1985.

Playa de las rocas, near Santa Marta, El Rodadero: 1 manca (Coll. Müller); under stone on sand bottom, 0-1 m, 9 January 1986.

Playa blanca near Punta Gaira, Santa Marta: 1 non-reproductive adult (Coll. Müller); under stone on sand bottom, 0.5-1 m, 30 December 1985.

Harbour of Santa Marta, fouling on pilings: 1 ♀ (Coll. Müller); 27 May 1985. 1 non-reproductive adult (MHNG), 0-1 m, 31 July 1985. 1 non-reproductive adult (INVEMAR); 0.5-6 m, 3 September. 1 ovigerous ♀, 1 non-reproductive adult (Coll. Müller); 0-1 m 24 November 1985. 1 postmanca (MHNG); 0-2 m, 1 February 1986. 2 non-reproductive adults, 1 manca (MNHN); 0-1 m, 14 March 1986.

Bahia de Santa Marta, other records: 2 mancas (Coll. Müller); Punta de Betin, from hydroids and detritus, 22-23 m, 19 June 1985. 1 non-reproductive adult (Coll. Müller); *Thalassia*, 2 m, 10 September 1985. 4 non-reproductive adults, 1 manca (MHNG); Punta de Betin, coral rubble, 22 m, 17 December 1985.

Bahia Concha, about 10 km north-east of Santa Marta: 1 ♂, 1 non-reproductive adult, 1 manca (MHNG); from algae on rocky shore, intertidal, 22 May 1985. 1 ♂ (Coll. Müller); from *Digenia simplex* on rocky shore, 5 l substratum, intertidal, 7 June 1985. 1 postmanca (MHNG); *Thalassia*, 1 m, 27 June 1985. 1 manca (MHNG); *Thalassia*, 5 l substratum, 2 m, 8 July 1985. 4 non-reproductive adults (Coll. Müller); *Digenia simplex* on rocky shore, intertidal, 13 August 1985. 1 non-reproductive adult (Coll. Müller); *Digenia simplex* on rocky shore, lower intertidal, 2 October 1985. 1 non-reproductive adult (Coll. Müller); *Digenia simplex* on rocky shore, 51 substratum, intertidal, 8 November 1985. 1 ♀ (MHNG); from *Thalassia* and coralline algae, 1.5-2 m, 12 February 1986.

Bahia de Chengue, about 15 km north-east of Santa Marta: 1 ♂, 1 non-reproductive adult, 1 postmanca (MHNG); coral rubble in *Thalassia* bed, 1 November 1985. 3 non-reproductive adults, 1 postmanca (MHNG); under stones, 0.5 m, 4 April 1986. 3 non-reproductive adults, 1 postmanca (Coll. Müller), *Halimeda* on reef-flat, intertidal-0.5 m, 14 April 1986.

Bahia de Nenguangue, about 25 km north-east of Santa Marta: 3 non-reproductive adults, 2 mancas (MHNG); from brown algae on rocky shore, intertidal, 5 August 1985. 1 ♂ (MHNG), 3 non-reproductive adults (Coll. Müller); Playa del muerto, from *Digenia* and *Sargassum* on rocky shore, intertidal, 30 July 1985. 1 manca (MHNG); from *Cladophyllum schnetteri* on rocky shore, intertidal-0.5 m, 23 September 1985.

Bahia de Cinto, about 30 km north-east of Santa Marta: 1 non-reproductive adult (MHNG), 2 non-reproductive adults, 1 postmanca, 2 mancas (Coll. Müller); from algae on rocky shore, intertidal, 27 May 1985. 3 non-reproductive adults, 1 postmanca, 1 manca (MHNG); from algae, hydroids and detritus, 6 m, 4 June 1985. 3 non-reproductive adults (MHNG); under stones, 0-0.5 m, 14 April 1986.

Punta el Diamante near Cañaverales, about 40 km north-east of Santa Marta: 4 non-reproductive adults, 1 postmanca, 1 manca (Coll. Müller); from algae, hydroids and bryozoans on rocks, 6-10 m, 26 September 1985.

Arreçifes near Cañaverales, about 40 km north-east of Santa Marta: 1 ♂, 1 postmanca, 1 manca (Coll. Müller); *Thalassia* in lagoon, 1-1.5 m, 25 February.

Remarks. – Though *Mesanthura pulchra* is the most often collected species of the genus in the Caribbean, no information was available concerning its substrate preference. Based upon the data from the Santa Marta area it becomes obvious, that specimens have been often found associated with algal substratum. The species was also not uncommon in *Thalassia* beds, coral rubble and fouling on pilings in the harbour of Santa Marta. It should be noted that no material of *M. pulchra* was found in Bahia de Gairaca (located between Bahia Concha and Bahia de Nenguangue), where extensive samples have been taken. Summarizing the information from the literature and Colombia, the species has a vertical distribution from the intertidal to about 36 m.

Mesanthura pulchra is easily distinguishable from its congeners in the Western Atlantic by its characteristic pigment pattern (see Kensley & Schotte, 1989: 49, fig. 19B). The morphological features have been redescribed in detail by Wägele (1984b: 389).

Distribution: Up to now *M. pulchra* was known from several locations in the Caribbean and the Gulf of Mexico (listed in Kensley & Schotte, 1989: 53). The species is first recorded from the southern Caribbean Sea.

Mesanthura punctillata Kensley, 1982 (Figs 159-180)

Mesanthura punctillata Kensley, 1982a: 339, figs 154-155.
Mesanthura punctillata; Negoescu & Wägele, 1989: 127.
Mesanthura punctillata; Kensley & Schotte, 1989: 53, figs 19 C, 22 A-F.

Material. – Punta brava, near airport of Santa Marta: 2 non-reproductive adults, 1 postmanca, 1 manca (Coll. Müller); *Sargassum* on rocky shore, lower intertidal, 9 October 1985.

Bahia de Santa Marta: 2 non-reproductive adults (MHNG); *Thalassia*, 2 m, 10 September 1985. 1 larvigerous ♀, 2 non-reproductive adults (Coll. Müller); *Thalassia*, 1-2 m, 13 January 1986.

Bahia Concha, about 10 km north-east of Santa Marta: 2 non-reproductive adults (MHNG); *Thalassia*, 1 m, 27 June 1985. 2 non-reproductive adults, 2 postmancas (INVEMAR); *Thalassia*, 1 m, 5 l substratum, 5 July 1985. 1 non-reproductive adult, 1 postmanca (Coll. Müller); *Thalassia*, 2 m, 5 l substratum, 8 July 1985. 1 non-reproductive adult (MHNG); *Thalassia*, 0.5-3.5 m, 13 August 1985. 1 non-reproductive adult, 4 mancas (MHNG); *Thalassia*, 0.5-3 m, 9 September 1985. 1 ♂, 1 non-reproductive adult, 1 postmanca (Coll. Müller); *Thalassia*, 2-4 m, 5 l substratum, 2 October 1985. 1 postmanca (MHNG); Thalassia, 2-3 m, 8 November 1985. 2 ovigerous ♀, 8 non-reproductive adults, 4 postmancas, 2 mancas (MHNG); *Thalassia*, 2-3 m, 7 December 1985. 1 non-reproductive adult, 1 postmanca, 1 manca (MHNG); *Thalassia*, 1-2 m, 2 April 1986.

Bahia de Chengue, about 15 km north-east of Santa Marta: 1 ovigerous ♀ (Coll. Müller); from floating *Sargassum* over sand bottom, 7-9 m, 31 May 1985.

Bahia de Gairaca, about 20 km north-east of Santa Marta: 1 non-reproductive adult, 1 postmanca (Coll. Müller); *Thalassia*, 1-2 m, 4 October 1985. 2 non-reproductive adults, 2 postmancas (MHNG); *Thalassia*, 1-2 m, 17 January 1986. 3 non-reproductive adults, 2 mancas (MHNG); *Thalassia*, 1-3 m, 24 January 1986.

Bahia de Nenguangue, about 25 km north-east of Santa Marta: 1 ovigerous ♀ (INVEMAR), 1 non-reproductive adult (Coll. Müller); *Thalassia*, 0.5-2 m, 30 July 1985.

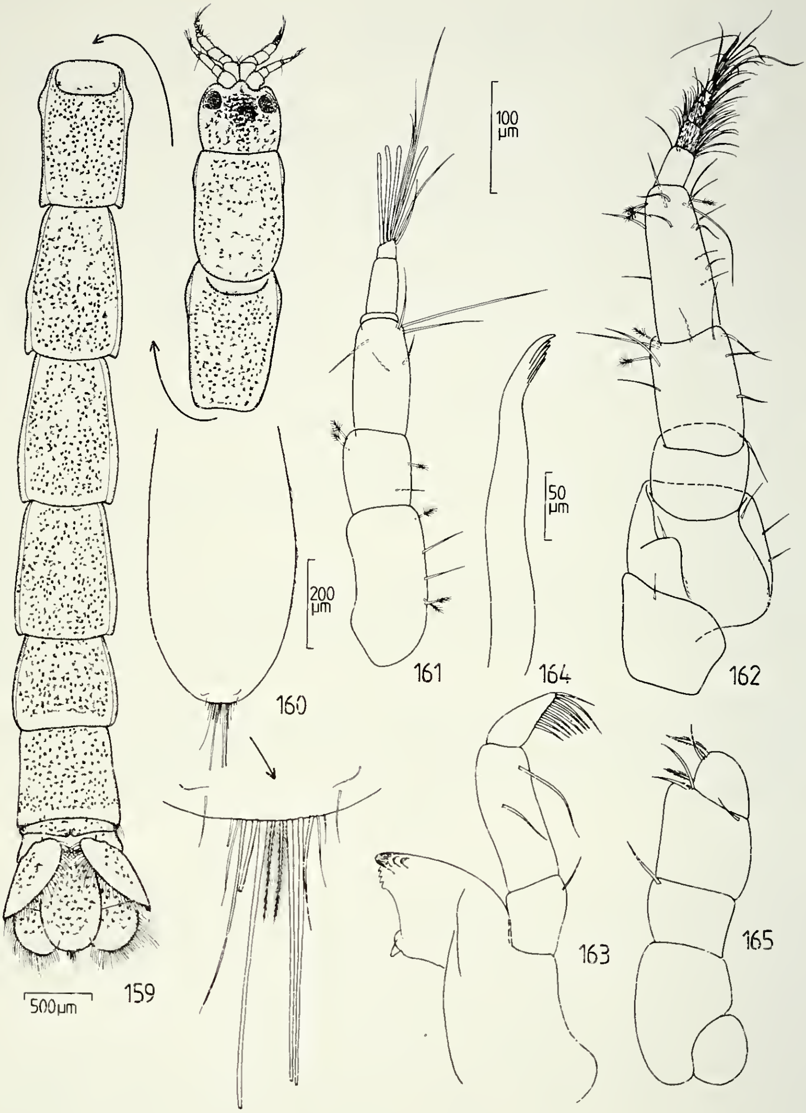
Bahia de Cinto, abouit 30 km north-east of Santa Marta: 1 non-reproductive adult (MHNG); from algae, hydroids and detritus, 6 m, 4 June 1985. 1 non-reproductive adult (Coll. Müller); *Thalassia*, 1-3.5 m, 8 August 1985. 2 ♀♀ (1 ovigerous), 3 non-reproductive adults (MNHN); *Thalassia*, 1-3 m, 5 September 1985.

Punta el Diamante near Cañaverales, about 40 km north-east of Santa Marta: 1 larvigerous ♀, 1 postmanca (Coll. Müller); from algae, hydroids and bryozoans, 6-10 m, 26 September 1985.

Arreçifes, about 40 km north-east of Santa Marta: 2 non-reproductive adults, 3 postmancas (Coll. Müller); *Thalassia* in lagoon, 1-1.5 m, 25 February 1986.

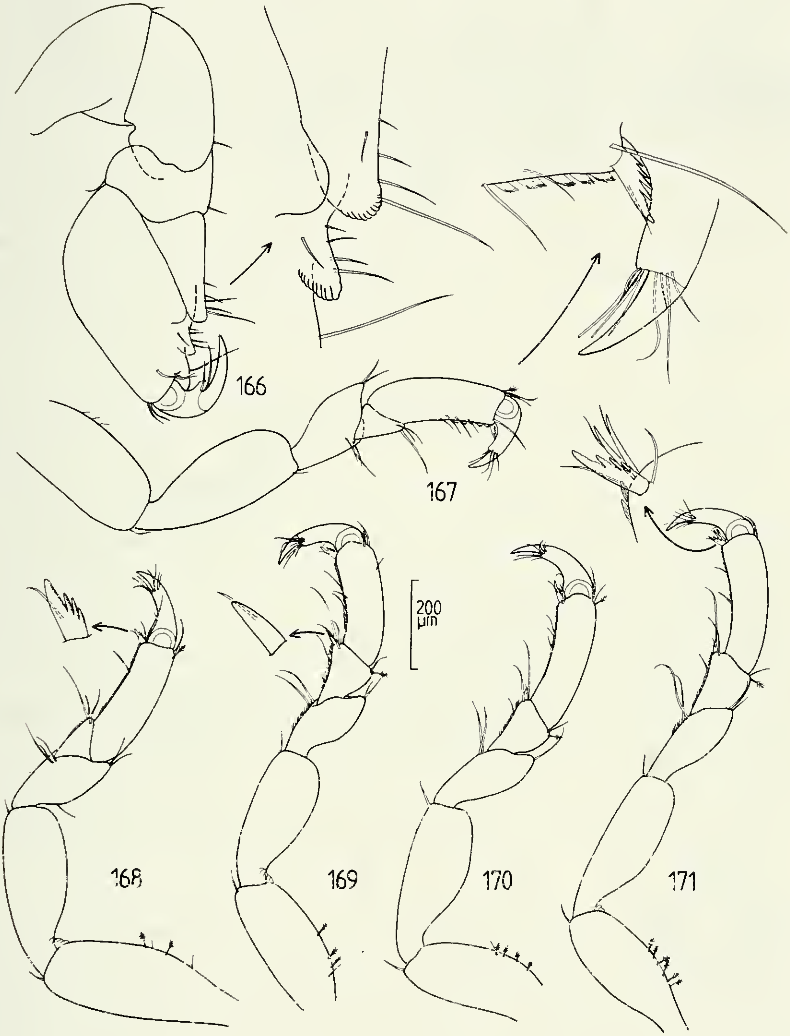
Description, non-reproductive adult. – Body slender, about 11 times longer than wide. Total length 3.1-6.9 mm. Dorsum of body covered with numerous small pigment spots. These spots concentrated on the mediodorsal surface of the cephalon, forming an almost solid patch. Cephalon sligthly wider than long, with well pigmented dorsolateral eyes. Body proportions: C<1=2>3<4>5>6>7. Pleonites fused. Telson tongue-shaped, twice longer than wide; rounded distal margin with some short setae (two of them plumose) and 4 long setae in arrangment as figured.

Antenna 1, peduncle 3-articulated, with second article shortest and proximal article longest; third peduncular article with 2 long, laterally directed setae; flagellum 3-articulated; first article shortest and widest, second article longest; terminal article bearing 5 simple setae and 4 aesthetascs. Antenna 2, peduncle 5-articulated; second article largest, grooved to accomodate peduncle of antenna 1; flagellum of 5 setose articles, decreasing in size distally. Incisor of mandible 4-cuspidate, lamina dentata with 4 indentations; second article of 3-articulated palp longest; first article bearing one seta, second with 2 setae, third article with 9 short setae in two distal thirds. Maxilla elongate, medially curved in distal half, distal part 5- toothed. Maxilliped lacking endite, palp 3-articulated; first palp article with one seta, second with 3 setae; third article almost semicircular, medial margin with a



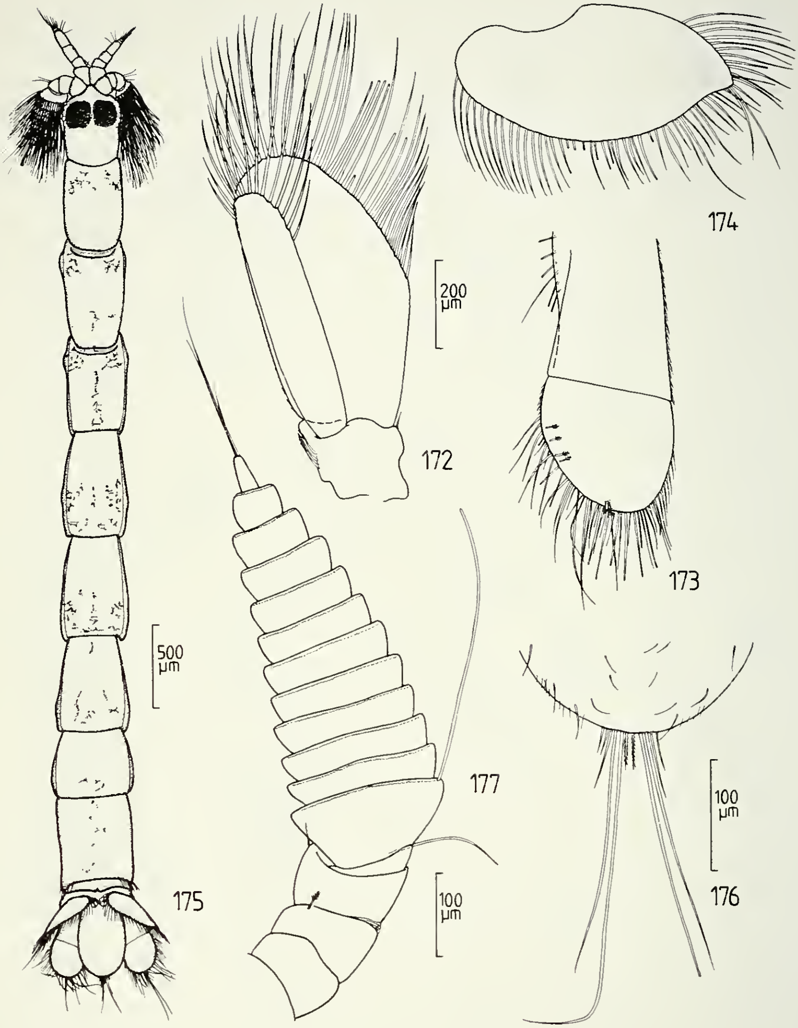
FIGS 159-165.

Mesanthura punctillata Kensley, 1982, non-reproductive adult: 159) dorsal view; 160) telson; 161) antenna 1; 162) antenna 2; 163) mandible; 164) maxilla; 165) maxilliped.



FIGS 166-171.

Mesanthura punctillata Kensley, 1982, non-reproductive adult: 166) pereopod 1; 167) pereopod 2; 168) pereopod 3; 169) pereopod 4; 170) pereopod 6; 171) pereopod 7.



FIGS 172-177.

Mesanthura punctillata Kensley, 1982. – Non-reproductive adult: 172) pleopod 1; 173) uropodal sympodite and endopodite; 174) uropodal exopodite. ♂: 175) dorsal view; 176) distal part of telson; 177) antenna 1.

simple and 2 plumose setae. Pereopod 1 with propodus expanded; palm with short, ovate process having transverse ridges and bearing 4 simple setae; unguis twice length of dactylus; carpus elongate-triangular, posterodistal margin with 4 simple setae increasing in length distally; distal margin of carpus with several transverse ridges. Pereopods 2-7 in shape and size similar among one another; posterior margin of propodus faintly concave, bearing row of scales and a denticulate compound spine distally; moreover, posterodistal margin of pereopod 7 propodus with two more slender compound spines; carpus of pereopods 2-3 triangular; carpus of pereopods 4-7 trapezoid, with free anterior margin and short compound spine at posterodistal margin. Pleopod 1, endopodite relatively slender, 9/10 length of operculiform exopodite; endopodite distally with 13, exopodite with 35 plumose setae (drawn as simple setae); sympodite with 3 retinaculae. Sympodite of uropod somewhat longer than endopodite; endopodite semiovate, bearing several simple and plumose marginal setae (drawn as simple setae); dorsal surface near ectal and distal margin with 7 feathered sensory setae; endopodite not extending beyond distal margin of telson; exopodite twoce longer than wide, with sinuous outer margin, bearing many simple and plumose marginal setae (drawn as simple setae).

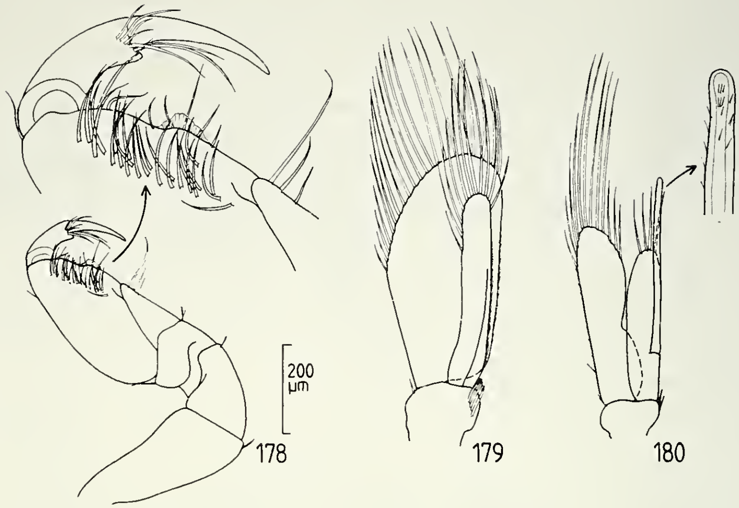
♀. – In general features quite similar to non-reproductive adult. Total length 6.8-8.7 mm.

♂. – In habitus similar to non-reproductive adult and ♀. Total length 5.4 mm. Dorsum of pereonites and fused pleonite section with few pigment spots and reticulations. Telson quite similar to ♀ and immature specimens, with some short and 2 pairs of long distal setae.

Antenna 1, peduncle 3-articulated, articles wider than long; flagellum of 13 articles, first one shortest and much wider than long; slender terminal article with 3 simple setae; articles 2-12 swollen, bearing whorl of many filiform aesthetascs. Pereopods generally more slender than in other developmental stages. Palm of pereopod 1 propodus lacking distinct projection, bearing only a short lamella; mesial surface of pereopod 1 propodus with group of 24 slender curved spines. Pleopod 1, slender endopodite about 4/5 length of operculiform exopodite; endopodite with 11, exopodite with 21 plumose marginal setae (drawn as simple setae). Rami of pleopod 2 relatively slender; endopodite about 4/5 length of exopodite; spinulose appendix masculina slender, articulating at distal proximal third, extending with almost half of its entire length beyond distal margin of endopodite; endopodite with 4, exopodite with 12 distal plumose setae (drawn as simple setae); sympodite with 2 retinaculae.

Postmanca. – In general habitus quite similar to non-reproductive adult and ♀. Total length 2.9-3.1 and 2.2-2.4 mm, respectively.

Remarks. – *M. punctillata* is easily distinguishable from its congeners in the Atlantic Ocean by its characteristic pigment pattern. The affinities to other species are not clear, because most species of the genus are incompletely described and differ only in few morphological characters. The colombian material differs from the original description (based upon material from Belize) in some aspects. All setae at the terminal article of the maxillipedal palp of the ♀ drawn in the original description are shown as simple setae. However, there are 2 plumose setae at this article in colombian specimens. The presence of plumose setae at the terminal article of the maxilliped is a common feature for *Mesanthura*. Therefore it seems, that this feature has been overlooked in the Belizean material. Moreover, the appendix masculina of the figured ♂ in the original description is distinctly shorter than in colombian males. It extends beyond the endopodite with only 1/5 of its entire length (cf. Kensley, 1982a: 339, figs 154-155).



Figs 178-180.

Mesanthura punctillata Kensley, 1982, ♂: 178) pereopod 1; 179) pleopod 1; 180) pleopod 2.

In the Santa Marta area *M. punctillata* shows a preference to *Thalassia* beds. Surprisingly, none of the specimens collected has been found in *Syringodium* seagrass, where extensive samples have also been taken. Few specimens were found associated with algae or other substratum. Specimens from Belize were collected from "coral rubble and coarse sediments" (Kensley, 1982a: 339). The vertical distribution of this species ranges from the intertidal to 20 m.

Distribution. – *Mesanthura punctillata* was known from the Turks and Caicos Islands and from Belize (Kensley & Schotte, 1989: 53). It is first recorded from the southern Caribbean Sea.

ZUSAMMENFASSUNG

Es wird über neue Arten und Funde mariner Isopoden der Gattungen *Amakusanthura*, *Cortezura* und *Mesanthura* (Anthuridae) aus der Region Santa Marta, Karibische Küste von Kolumbien berichtet. *Amakusanthura paramagnifica* n. sp., *A. tengo* n. sp. und *A. vermiformis* n. sp. werden beschrieben. Vollständige Wiederbeschreibungen werden für *Amakusanthura signata* (Menzies & Glynn, 1968), *Mesanthura cf. brasiliensis* Koening, 1980, *M. hopkinsi* Hooker, 1985 und *M. punctillata* Kensley, 1982 gegeben, eine ergänzende Beschreibung für *Cortezura confixa* (Kensley, 1978). Die Verwandtschaftsbeziehungen der meisten Arten werden diskutiert, mit Angaben zu deren Substratpräferenz und geographischer Verbreitung.

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Revue suisse Zool.	Tome 99	Fasc. 1	p. 81-85	Genève, mars 1992

Association of some spiders with ants

by

Jean-Luc BOEVÉ *

ABSTRACT

Spiders and syntopic ants have been collected in the field. Four spider species were relatively abundant, among them the myrmecophagous *Callilepis nocturna* (L.) and *Zodarion gallicum* (Canestrini). *Phrurolithus festivus* (C. L. Koch) is obviously myrmecophilous. *Aulonia albimana* (Walckenaer) was also always associated with ants, but this seems to be an indirect consequence of the same search, by the spider and the ants, for a place under a stone.

INTRODUCTION

In Europe, the spiders which are well known to feed exclusively on ants belong to the gnaphosid genus *Callilepis* (HELLER 1976) and the zodariid genus *Zodarion* (HARKNESS 1977, COUVREUR 1989). Species like *Oecobius annulipes* Lucas (GLATZ 1967) and some theridiids have also been observed feeding on ants. In the field, especially the ants of the genera *Formica*, *Lasius* (Formicinae), and *Tapinoma* (Dolichoderinae) are preyed. The preference for only some ant taxa is certainly determined by several eco-ethological factors. Moreover, physiological differences between ants seem to make them more or less sensitive to the spider venom. Formicines and *Tapinoma* are rapidly paralysed when bitten by *Callilepis nocturna* during experiments in the laboratory. In contrast, myrmicines (*Myrmica*, *Tetramorium*, *Messor*, *Pheidole*, *Monomorium*) appear generally much more resistant (HELLER 1976).

The present field work gives some ecological details about four spider species which are either surely or possibly related to ants. It is discussed if a syntopy necessarily involves a direct relation between the arachnid and the insect, as for ant-eating or ant-resembling spiders.

MATERIAL AND METHODS

Spiders and ants have been collected in a stone-pit not in progress for over 40 years (Péry, Canton Bern, Switzerland). The arthropods have been collected from May 30 until June 14, 1990, between 11.00 a.m. and 5.00 p.m.

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* Abteilung Synökologie, Zoologisches Institut, Universität Bern, Baltzerstr. 3, CH-3012 Bern.

When a spider was seen, it was captured as well as all syntopic ant species. An ant is defined as syntopic when observed in a ray of 20 cm around a spider and in the minute following the collection of a spider. Very often, stones have been turned up in order to look for spiders.

The spiders listed in Table 1 have been identified with HEIMER & NENTWIG (1991) and GRIMM (1985). The others (see Table 2) were identified by A. HÄNGGI (Basel). Ants of the genus *Lasius* have been identified with KUTTER (1977), whereas ants of the genera *Tapinoma*, *Myrmica*, and *Formica* were identified by C.A. COLLINGWOOD (Leeds, England).

RESULTS

A total of 85 spiders have been found. The most abundant species are listed in Table 1. *Aulonia albimana* (Lycosidae) is more frequently associated with *Tapinoma erraticum* in comparison to *Callilepis nocturna* and to *Phrurolithus festivus* (Liocranidae) which are both more associated with *Lasius niger* ($P<0.005$ two times, Fisher exact probability test).

TABLE 1

Number of spiders often found associated with ants.

	Ant species				
Spider species	*Lasius niger*	*Tapinoma erraticum*	*Lasius flavus*	>1 sp$^+$	none
Callilepis nocturna	13	5	0	2	1
Zodarion gallicum	1	3	1	6	1
Phrurolithus festivus	9	2	0	5	4
Aulonia albimana	1	9	0	4	0

($^+$) At least two of the following species: *Lasius niger* (L.), *L. flavus* (Fabr.), *Tapinoma erraticum* (Latr.), *Myrmica sabuleti* Mein., *Formica cunicularia* Latr.

The number of males, females, and juveniles was 2, 16, and 0 respectively for *Callilepis nocturna*; 9, 1, and 2 for *Zodarion gallicum*; 11, 7, and 2 for *Phrurolithus festivus*; and 8, 2, and 4 for *Aulonia albimana*. All spiders were generally found under stones. Individuals of a same species were found sometimes together in *C. nocturna* (all of them have then not been captured), *P. festivus*, and *A. albimana*. In the laboratory, 3 females of *C. nocturna* produced a cocoon from which hatched, 34-37 days later, 7, 8, and 12 individuals per cocoon. One *P. festivus* laid a cocoon from which hatched 4 individuals, 31 days later.

The remaining spider species are listed in Table 2. Only *Enoplognatha thoracica*, *Heliophanus flavipes*, and in a less extend *Drassodes lapidosus* are obviously thermo- and/or xerophilous (HEIMER & NENTWIG 1991). Spider species of Table 2 are not known to feed regularly on ants. The spider-ant association is probably more due to chance than to a trophic relation.

TABLE 2

Spiders found associated with ants, but less abundant than those listed in Table 1.

Spider species	Ant species		
	Lasius niger	*Tapinoma erraticum*	>1 sp$^+$
Gnaphosidae:			
Drassodes lapidosus (Walck.)	1 f		
Drassodes sp.		1 j	
Zelotes sp.			1 f sa
gnaphosid sp.		1 m sa	
Linyphiidae:			
Diplocephalus cristatus (Blackw.)	1 m		
Meioneta rurestris (C.L. Koch)	1 f		
Walckenaeria vigilax (Blackw.)		1 m	
linyphiid sp.	1 j		
Theridiidae:			
Enoplognatha thoracica (Hahn)	1 f	2 f, 1 m	
Salticidae:			
Euophrys frontalis (Walck.)	1 f		
Evarcha arcuata (Clerck)	1 m		
Heliophanus flavipes C.L. Koch		1 f	
Agelenidae:			
Tegenaria sp.	1 j		1 f sa
Thomisidae:			
Xysticus sp.		1 j	

(m) male, (f) female, (j) juvenile, (sa) subadult. ($^+$) At least two of the following species: *Lasius niger*, *L. flavus*, *Tapinoma erraticum*, *Formica cunicularia*.

DISCUSSION

The ant *Lasius niger* was common on the studied area. Their nests are populous (KUTTER 1977), about five times more than those of *Tapinoma* (BECKERS *et al.* 1989). A probable consequence is that several individuals of *Callilepis nocturna* easily hunt *Lasius* workers of a same colony. Moreover, the spider is not aggressive against congeners (HELLER 1974) which allows a reciprocal proximity. This aggregation (which facilitates reproduction) is certainly without function during hunting. Indeed, cooperation is not needed for a spider when catching an ant as described by HELLER (1976).

Phrurolithus festivus is generally found with ants (Table 1) but, as far as I know, it is not preying on them. In any case, the myrmecophilous habit seems to be highly specialized: the spider looks and walks like an ant; it is found sometimes in close proximity to an ant colony; like all liocranids, it probably builds no hunting-web (HEIMER & NENTWIG 1991); it has a low number of juveniles per cocoon. These characteristics are also encountered in other *Phrurolithus* species (BONARIC 1974, PENNIMAN 1978).

In the present paper, *Aulonia albimana* is observed probably for the first time specifically associated with ants. However, I do not believe the spider to be, therefore, necessarily myrmecophilous. The syntopy more probably results from several independent facts. On the first hand, *A. albimana* builds a web (JOB 1974). Thus, individuals can remain long times at the same place (on the contrary of *Callilepis*, *Zodarion*, or *Phrurolithus*). On the other hand, the settlement of *Tapinoma*'s colonies is particularly unstable; these ants move their nest very easily when they are disturbed (FOREL 1920). Finally, both the spider and the ants are generally found under stones. A competition certainly occurs for such places. Thus, it is possible that *A. albimana* only tolerates the momentary presence of a *Tapinoma*'s colony under a stone where the spider was already established, but not the permanent presence of other ant species. This could explain why the spider is frequently syntopic with *Tapinoma*, but rarely with *Lasius* (Table 1).

ACKNOWLEDGEMENTS

I am indebted to the Fonds national suisse de la recherche scientifique for financial support (grant n° 31-28016.89).

RÉSUMÉ

Des araignées et des fourmis syntopiques ont été récoltées sur le terrain. Quatre espèces d'araignées sont relativement abondantes, parmi lesquelles *Callilepis nocturna* (L.) et *Zodarion gallicum* (Canestrini) qui sont l'une et l'autre myrmécophages. *Phrurolithus festivus* (C. L. Koch) est de toute évidence myrmécophile. *Aulonia albimana* (Walckenaer) est toujours associée à des fourmis, mais ceci semble être la conséquence indirecte de la recherche d'une même place sous une pierre de la part de l'araignée et des fourmis.

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Revue suisse Zool.	Tome 99	Fasc. 1	p. 87-108	Genève, mars 1992

Dynamique du développement du terrier de la forme fouisseuse du campagnol terrestre (*Arvicola terrestris* L.) en terrarium vertical et dans le terrain

par

J.-P. AIROLDI *

Avec 7 figures et 6 tableaux

ABSTRACT

Dynamics of the burrow system construction of the fossorial form of the water vole (*Arvicola terrestris* L.) **in a vertical terrarium and in the field.**

Two kinds of experiments were carried out in order to study the construction dynamics of the burrow system of the water vole's fossorial form.

a) animals released in the field

b) animals kept in a terrarium (190 cm in length, 90 cm in height and 6 cm deep)

In the first case, 2 couples were released in the field and studied over a period of 10 or 26 days. A map of the mounds was made on average twice a day. At the end of each experiment, the burrow system was excavated and mapped. The dynamics of the burrow development were reconstructed according to the position and emergence of mounds as a function of time. The following variables were evaluated for each observation: total length, number, surface area and volume of mounds, increments in burrow length, surface area and volume of mounds between 2 observations, number of vertices (=intersections and dead-ends), edges (=distances between 2 vertices) and the corresponding mean and standard deviation, as well as the increase of length, surface area and volume of the mounds as a function of time.

Total length of the system, cumulated surface area and volume of the mounds over time, number of vertices and edges strongly correlated with each other and with time; surface area and volume differences correlated only with each other; mean and standard deviation of the edges correlated strongly with each other.

The average increase in length of the studied burrow systems was about 80 and 170 cm/day, respectively. The mounds were modified quite frequently, due to newly excavated dirt pushed out of the burrow.

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* Brevet d'enseignement secondaire, Biologie, Université de Berne, G. Wokerstr. 5, CH-3012 Berne.

In the second case, either a single individual (2 experiments), or a couple (2 experiments) was studied. A map of the burrow system was made on average every 1-3 days. The following variables were evaluated for each observation: total length and volume of the system, increments in length and volume between 2 observations, newly excavated volume and/or volume of refilled galleries, number of vertices, edges, elementary cycles, mean and standard deviation of the edges.

Total length, volume, number of vertices and edges correlated with each other and with time; the length and volume differences correlated with each other, but not with the time interval between two observations; the mean and standard deviation of the edges usually correlated with each other.

Total length, volume, number of vertices and edges correlated with each other and with time; the length and volume differences correlated with each other, but not with the time interval between two observations; the mean and standard deviation of the edges usually correlated with each other.

A burrow system in a terrarium is longer when inhabited by a couple: $x = 4.7$ and 5.7 m vs. 3.1 and 3.4 m.

The ratio of the standard deviation and the average length of the edges of a burrow system (=coefficient of variation), either in a terrarium or in the field is rather constant and usually close to 1.0 (0.66-1.2).

The relationships between the different variables are analysed, interpreted and discussed.

INTRODUCTION

De nombreux travaux ont été publiés sur les terriers des Mammifères souterrains, particulièrement les Insectivores et les Rongeurs (revues dans Kucheruk, 1983; Hickman 1990; Reichman et Smith, 1990). Si certains ont pour objet une description plus ou moins détaillée du terrier d'une espèce (Bernard et Bollaerts, 1960; Hamar *et al.*, 1970; Jarvis et Sale, 1971; Brown et Hickman, 1973; Airoldi, 1976, 1980, 1981, 1991; Hickman, 1977; Rahm, 1980; Reichman *et al.* 1982; Andersen, 1987, 1988; Lovegrove et Painting, 1987; Schauer, 1987; Cameron *et al.* 1988; Sparks et Andersen, 1988; Heth, 1989), la plupart n'offrent que des données anecdotiques.

Généralement les terriers analysés correspondent à un instantané dans la dynamique de leur développement. A part les travaux de Andersen (1988, 1990) et Sparks et Andersen (1988), il n'existe pas d'études sur le développement du terrier d'un rongeur à mode de vie souterrain. Le présent article devrait combler partiellement cette lacune pour la forme fouisseuse d'*Arvicola terrestris*, puisqu'il y est fait état de données en fonction du temps. Un travail semblable a été tenté également par Uj (1984), mais n'a pas fait l'objet d'une publication.

Précisons d'emblée que ce genre d'étude n'est pas aisé, notamment dans le cas d'*Arvicola terrestris*, car généralement les individus lâchés dans le terrain ne restent pas là où on les met; sans que l'on sache exactement pourquoi, il vont creuser un réseau ailleurs. Pour l'instant, nous ignorons quelles sont les conditions optimales à l'établissement d'un animal seul ou d'un couple. Comme les individus lâchés ont été capturés dans la nature et maintenus quelque temps en captivité, il est possible qu'au moment de leur libération, ils cherchent à regagner leur domaine vital antérieur.

Des indications sur la vitesse de creusage d'un réseau de galeries, les relations entre différentes variables comme la longueur du terrier, le nombre de segments, d'intersections et culs-de-sac, de taupinières et le volume de celles-ci sont donnés.

Les expériences en terrarium sont plus faciles à conduire, vu que les animaux ne peuvent pas s'échapper. Le seul problème qui peut subsister, c'est la coopération ou non de l'animal, qui paraît quelquefois bien aléatoire.

MATÉRIEL ET MÉTHODES

a) lâchers d'individus dans le terrain

En tout, 14 tentatives ont été effectuées à Changins. Dans tous les cas sauf 1, il s'agissait de couples d'adultes pesant de 65-105 g (mâles) et de 63-120 g (femelles); les poids du couple de subadultes furent de 44 g (mâle) et 39 g (femelle), respectivement. Tous les individus ont été capturés dans un même terrier à 2-3 km du lieu des lâchers, à l'exception d'un couple provenant d'une localité à plus de 20 km. Seuls 3 couples sont restés plus de 2 jours là où ils furent relâchés. Le Tableau 1 indique les différents paramètres concernant ces derniers. A l'endroit du lâcher, une cavité sphérique de 15 cm de diamètre environ fut aménagée, une galerie de 30 cm creusée et de la nourriture mise à disposition (carottes). Chaque jour, 1-3 relevés de taupinières (contours uniquement) furent réalisés à l'échelle 1:50, et les signes d'activité notés. Uj (1984) a procédé à 5 tentatives de lâcher de couples de campagnols dans le terrain. Dans 2 cas seulement, les individus sont restés plus de 10 jours, soit 18 et 29 jours, après quoi, ils ont disparu. Cet auteur a aussi effectué un sondage des galeries de manière régulière, chose que nous n'avons pas faite, afin de ne pas perturber les campagnols.

Tableau 1

Expériences dans le terrain (terriers)

		Expériences	
	A1	**A2**	**A3**
Poids (g) ♂	80	80	73
♀	84	97	84
Début observations	23.10.73	7.11.74	19.11.74
Fin observations	19.11.73	11.11.74	24.11.74
Durée (jours)	26	4	5
N observations/24 h	1.7	1.5	1.5
Remarques	recapturés	échappés	échappés

Indications générales sur les individus utilisés dans les expériences de terrain A1, A2 et A3.

Nous n'avons pas relevé la hauteur des taupinières, paramètre nécessaire au calcul du volume de ces dernières. Par la suite (1980), 200 taupinières de 8-34 cm de diamètre et 4-

14 cm de hauteur ont été mesurées à Vuadens (canton de Fribourg); les dimensions retenues furent la longueur (LONG), la largeur, les grand et petit arcs de cercle et la hauteur. Une régression simple $\boldsymbol{h}$=0.301333LONG + 1.83833 permet d'estimer la hauteur avec suffisamment de précision (r^2=0.72) pour calculer ensuite le volume de terre que représente une taupinière. L'évaluation du volume est délicate, car la forme des taupinières se rapproche davantage d'une calotte d'ellipsoïde que de celle d'une sphère. Pour calculer une calotte d'ellipsoïde, il faudrait connaître la longueur et la largeur de celui-ci, ce qui est impossible, vu qu'on peut faire passer plusieurs ellipsoïdes correspondant à la surface d'une taupinière, ce qui est illustré à la Figure 1. Finalement, nous avons retenu la calotte de sphère, dont le volume est $V=\pi.h[(3L^2/4)+h^2]/6$ comme modèle le plus simple. Pour tenir compte du fait que la calotte n'est pas toujours régulière, nous avons modifié la formule comme suit: $V=\pi.h[(3L\text{x}1/4)+h^2)]/6$, où h est la hauteur, estimée par $\boldsymbol{h}$, L et 1 les grand et petit diamètres de la base, respectivement. L'erreur commise par excès n'est probablement pas supérieure à 15-20%, dans le pire des cas.

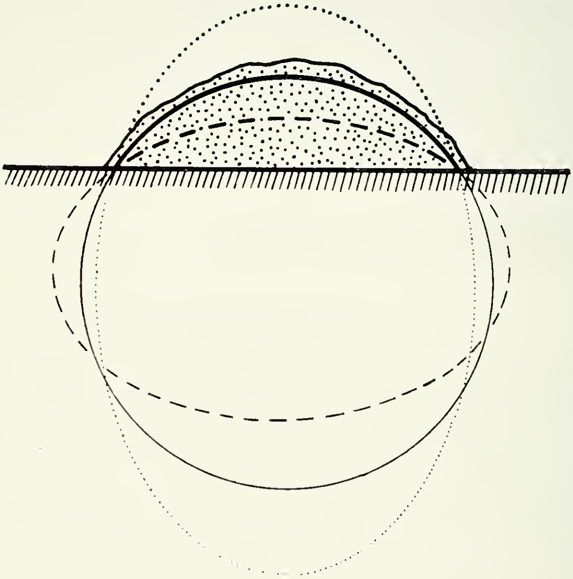

FIG. 1.

Différentes courbes (cercle et ellipses) correspondant au profil d'une taupinière.

A la fin de chacune des expériences, le terrier a été excavé et cartographié. Sur la base du plan du terrier et de la position des taupinières au cours du temps, il a été possible de reconstituer l'évolution probable du terrier. Evidemment que des galeries ont été rebouchées; dans les cas où la terre n'était pas trop compacte, il fut possible d'en tenir compte. Les sondages tels que les a effectués UJ (1984), permettent de se faire une meilleure idée au sujet des tronçons de galeries rebouchées. De toute manière, la méthode que nous avons utilisée ne conduit qu'à une approximation de la réalité, ce qui montre également ses limites.

Pour chaque relevé, i, nous avons défini les paramètres suivants: (i=1,2...k)

DTIME	différence de temps entre 2 relevés ($t_i - t_{i-1}$)
SDTIME	temps cumulé du temps t_{i-1} à t_k (=ΣDTIME)
NOTAUPI	numéro de chaque taupinière fraîchement creusée ou modifiée (il peut y avoir plusieurs taupinières nouvelles ou modifiées par relevé)
LONG	longueur de la base de chaque taupinière
LARG	largeur de la base de chaque taupinière
S1	surface de la base d'une taupinière (LONGxLARGxπ/4)
DS1	somme des accroissements de surface de la base des taupinières pour une période donnée (t_{i-1} à t_i) DS1 $=\Sigma\Delta S1_j$ (j=nombre de taupinières; j=1,2,...n); $\Delta S1_j = S1_{i,j} - S1_{i-1,j}$
S1CUMUL	somme cumulée des accroissements de surface $DS1_i$ du temps t_{i-1} à t_k; (S1CUMUL = ΣDS1)
NRSQMM2	nombre de mm^2 que représente la surface de la base d'une taupinière sur le plan à l'échelle 1:50
S2	surface de la base découlant de NRSQMM2
DS2	somme des accroissements de surface pour une période donnée (t_{i-1} à t_i)
S2CUMUL	somme cumulée des accroissements de surface
VOL	volume d'une taupinière (voir formule ci-dessus)
DVOL	DVOL = $\Sigma\Delta VOL_j$ (j=nombre de taupinières); $\Delta VOL_j = VOL_{ij} - VOL_{i-1,j}$
VCUMUL	somme cumulée des accroissements de volume
NSOM	nombre de sommets (=n intersections et culs-de-sac)
NARETES	nombre d'arêtes (arête=segment reliant 2 intersections ou une intersection et un cul-de-sac)
MOYAR	moyenne de la longueur des arêtes
ETYPE	écart-type de la longueur des arêtes
LTOT	longueur totale du terrier
DLONG	différence de longueur entre 2 relevés; DLONG = $LTOT_i - LTOT_{i-1}$

En outre, les vitesses d'accroissement suivantes ont été calculées:

V_S	accroissement de surface V_S = DS1/DTIME (cm^2/h)
V_V	accroissement de volume V_V = DVOL/DTIME (cm^3/h)
V_L	accroissement de longueur V_L = DLONG/DTIME (cm/h)

b) Terrarium

Les expériences ont été conduites dans des terrariums verticaux identiques à ceux décrits dans Airoldi *et al.* (1976). Ceux-ci sont constitués de deux plaques de verre de 190x90x0.6 cm maintenues équidistantes de 6 cm par un cadre en bois en forme de U et rempli de terre tassée jusqu'à une hauteur de 70 cm environ. Parfois, 2 terrariums ont été utilisés simultanément. Le Tableau 2 résume les différentes expériences effectuées. En fait, 3 buts ont été poursuivis parallèlement: 1) étude du comportement en général et du comportement fouisseur en terrarium (Airoldi *et al.* 1976); 2) étude du développement du terrier en milieu confiné; 3) étude du rythme d'activité en milieu confiné par marquage radioactif (Airoldi, 1979). Nous avons veillé à ce que les interférences résultant de ces approches différentes soient réduites au minimum.

La paroi de verre du terrarium a été divisée en carrés de 10 x 10 cm, afin de disposer d'un réseau de coordonnées permettant de situer dans l'espace les différentes observations

Tableau 2

Expériences en terrarium

	Expériences			
	B1	**B2**	**B3**	**B4**
Poids/Age (g) ♂	? ad	? ad	-	-
♀	? ad	? ad	71 ad	? ad
Début observations	6.9.73	6.9.73	8.8.74	25.9.74
Fin observations	13.11.73	3.10.73	22.8.74	28.12.74
Durée (jours)	68	27	14	94
N observations/24 h	0.29	0.37	1.40	0.95
Remarques	♀ morte le 19.9, remplacée par ♀ de l'exp. B2	♂ échappé le 19.9, ♀ utilisée dans exp. B1	marquage radioactif le 14.8	marquage radioactif dès le début

Indications générales sur les individus utilisés dans les expériences en terrarium B1, B2, B3 et B4.

effectuées (position des campagnols, modifications de la structure du terrier, etc.). Ces relevés ont été faits sur un plan à l'échelle 1:25 (1 carré de 4 mm de côté représentant une surface de 10 x 10 cm). L'épaisseur des galeries a également été notée. Celle-ci ne fut pas régulière. Le volume du réseau a été estimé en comptant le nombre de mm^2 sur le plan (1 mm^2 = 6.25 cm^2) et en multipliant par 6 cm (distance entre les 2 plaques de verre). Les variables suivantes ont été définies et analysées pour chaque relevé i (i=1,2...k):

DTIME, SDTIME, NSOM, NARETES, MOYAR, ETYPE, LTOT, DLONG (voir leurs définitions ci-dessus)

VTOTAL	volume total du terrier au temps t_i
VNOUV	volume de terre nouvellement excavé entre t_{i-1} et t_i
VREBOUCH	volume des galeries rebouchées entre t_{i-1} et t_i
DVTOTAL	augmentation du volume total $DVTOTAL_i = VNOUV_i - VREBOUCH_i$ $VTOTAL_i = VTOTAL_{i-1} + DVTOTAL_i$
NCYCLES	nombre de cycles élémentaires

Dans les 2 types d'expériences, lâchers d'animaux dans le terrain et étude en terrarium, les variables ont été analysées statistiquement. Les moyennes, écarts-types et corrélations ont été calculées. Afin de mieux faire ressortir les relations entre les variables, une analyse de clusters, ainsi qu'une analyse en composantes principales ont été effectuées. Les programmes du paquet statistique BMDP ont été utilisés.

RÉSULTATS

A. EXPÉRIENCES DANS LE TERRAIN

a) **généralités**

La Figure 2 représente divers stades de l'évolution du terrier de l'expérience A1, tels qu'ils ont pu être reconstitués en fonction de l'apparition des taupinières au cours du temps.

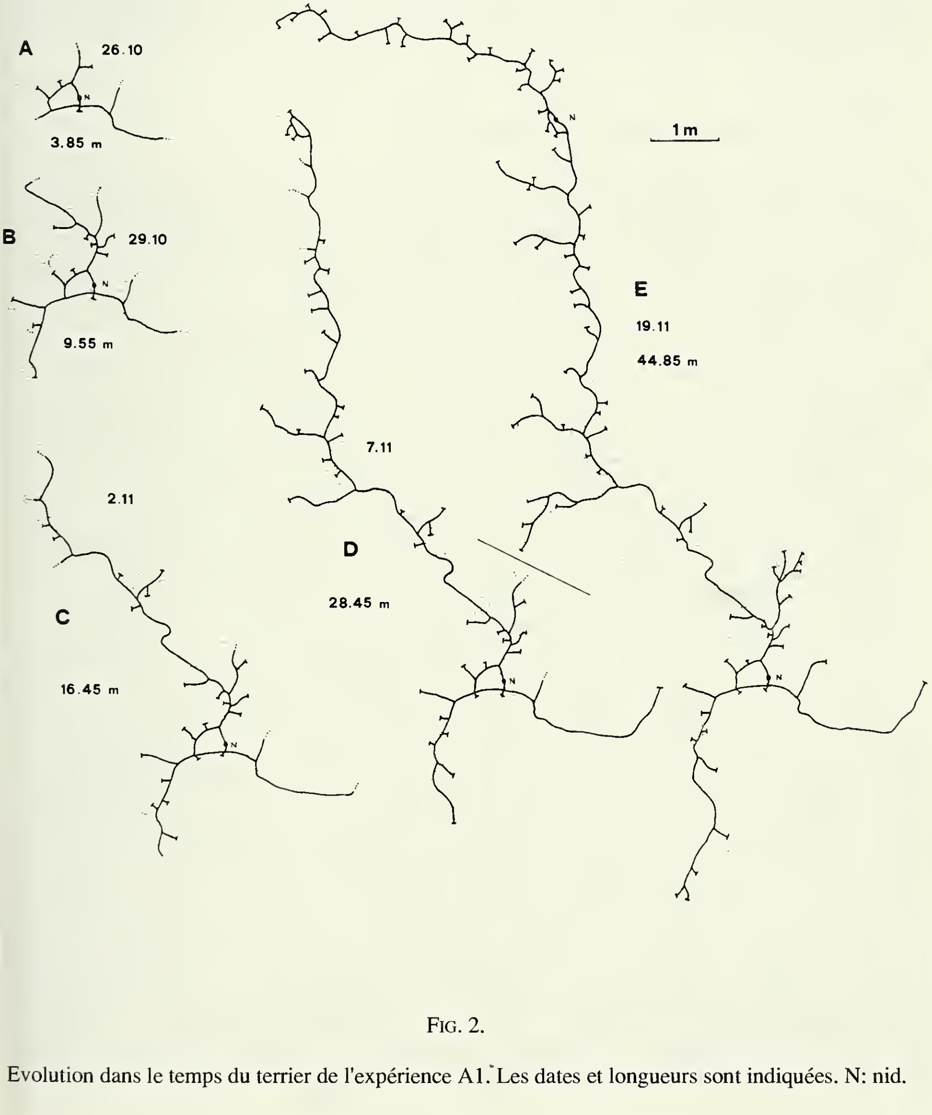

FIG. 2.

Evolution dans le temps du terrier de l'expérience A1. Les dates et longueurs sont indiquées. N: nid.

On constate que le terrier s'étend principalement dans une direction. Les ramifications se font à un angle proche de 90°, de manière plus ou moins régulière, tantôt à gauche, tantôt à droite de la galerie principale. Cette séquence de construction est comparable à celle décrite par ANDERSEN (1988) pour *Geomys bursarius*.

Les deux méthodes d'évaluation de la surface de la base d'une taupinière sont équivalentes. Dans l'expérience A1, la corrélation est de 0.998 pour les valeurs absolues et de 0.980 pour les accroissements (n=314). Les chiffres correspondants pour l'expérience A2+3 sont 0.997 et 0.991 (n=48). Du point de vue statistique, toutes les valeurs ne sont pas indépendantes puisque lorsqu'une taupinière a augmenté de volume, ce qui accroît aussi la surface de sa base, elle sera comptée plusieurs fois, or ces valeurs successives sont corrélées entre elles. De plus, elles ne sont pas distribuées normalement. Une analyse utilisant le coefficient de corrélation de rang de Spearman donne cependant des résultats très semblables.

b) **moyennes, médianes, étendues et écarts-types**

Le Tableau 3 résume les paramètres ci-dessus pour les variables retenues. Rappelons que cela n'a pas de sens de calculer ceux-ci pour les variables cumulées (DS1, S1CUMUL, etc.). De manière générale, les variables ne sont pas dsitribuées normalement, elles sont asymétriques, avec un nombre plus grand de valeurs à gauche qu'à droite. C'est pourquoi, la médiane donne souvent une meilleure idée que la moyenne.

Les intervalles entre 2 observations (=relevés) furent plus longs dans l'expérience A2+3 que dans A1. La médiane est la valeur qui divise une distribution de nombres en 2 parties égales. Dans notre cas, on peut dire que dans la première expérience, la moitié des intervalles a été inférieure à 6 heures environ, alors que la valeur correspondante pour la seconde expérience est de 17 heures environ, soit près du triple. L'étendue des valeurs est cependant différente, avec un maximum pour la première expérience près du double de celui de la seconde. Les écarts-types sont relativement élevés, traduisant bien la grande variabilité de ces valeurs. Il serait souhaitable dans ce genre d'étude d'avoir des observations échelonnées régulièrement dans le temps. Pour différentes raisons, cela n'est pas toujours possible, notamment la nuit, ou lors des fins de semaine. De plus, il arrive aussi que les campagnols ne manifestent aucun signe d'activité extérieure, ce qui ne veut pas dire que rien ne se passe dans les profondeurs du terrier (creusage, remblayage, etc.).

Les longueur et largeur moyennes des taupinières sont assez proches entre l'expérience A1 et Vuadens. Dans ce dernier cas, la distribution des valeurs peut être considérée comme normale, ce qui n'est pas vrai pour les 2 expériences, où on observe une légère asymétrie. Dans l'expérience A2+3, les moyennes sont légèrement inférieures. Ces différences dans les dimensions de la base des taupinières entre les 2 expériences se répercutent sur la surface de leur base, ainsi que leur volume total qui pour la première expérience est plus du double de celui de la seconde. Les valeurs pour S1 et S2 sont quasiment identiques, montrant bien que les 2 méthodes d'estimation sont équivalentes. Notons ici un aspect statistique intéressant: l'ellipse de longueur et largeur moyennes n'équivaut pas à la surface moyenne (S1 ou S2); cela serait le cas, si L et l n'étaient pas corrélés (voir Appendice A). Dans l'expérience A2+3, L et l corrèlent fortement (r=0.94, n=46). Pour l'expérience A1, les choses sont un peu plus complexes, vu que les moyennes pour L et l sont calculées à partir de 302 observations et celles de S1 et S2 à partir de 314 observations. Etant donné que quelques taupinières avaient une forme peu régulière, la mesure de L et l n'avait pas beaucoup de sens, d'où le nombre plus faible d'observations pour ces deux variables. Nous avons décomposé ces taupinières en unités plus petites pour

Tableau 3

Variables	n	$\bar{x}$	md	étendue	s
A1					
DTIME (min)	58	666.2	375.0	0-2820	606.2
LONG (cm)	162	18.1	17.5	5-37.5	7.6
LARG (cm)	162	14.5	15.0	5-35	6.8
S1 (cm^2)	171	301.4	206.2	19.6-2800	345.9
S2 (cm^2)	171	300.4	200.0	25-2750	344.1
VOLUME (cm^3)	171	1748.8	921.4	52.4-19754.2	2409.5
MOYAR (cm)	46	30.6	30.4	25.4-46.7	3.0
ETYPE (cm)	46	30.9	31.4	16.7-41.4	4.8
DS1/DTIME (cm^2/h)	57	125.7	74.8	4.9-621.0	135.0
SCUMUL/SDTIME		79.4			
DVOL/DTIME (cm^3/h)	57	723.7	439.5	17.3-3921.8	803.0
VCUMUL/SDTIME		461.3			
DLONG/DTIME (cm/h)	46	13.5	9.4	1.0-73.0	16.4
LTOT/SDTIME		7.0			
A2 + A3					
DTIME (min)	15	961.0	1020.0	0-1500	484.2
LONG (cm)	42	14.2	13.8	5-27.5	6.5
LARG (cm)	42	11.5	11.3	5-22.5	4.7
S1 (cm^2)	42	149.6	110.4	19.6-441.8	116.6
S2 (cm^2)	42	147.6	112.5	25-425	111.6
VOL (cm^3)	42	715.2	425.8	52.4-2501.1	715.9
MOYAR (cm)	15	27.3	26.5	21.4-31.4	3.0
ETYPE (cm)	15	25.4	26.7	8.0-34.9	7.7
DS1/DTIME (cm^2/h)	14	29.7	21.6	2.6-75.9	23.2
SCUMUL/SDTIME		26.2			
DVOL/DTIME (cm^3/h)	14	142.4	110.9	10.3-327.6	114.8
VCUMUL/SDTIME		125.0			
DLONG/DTIME (cm/h)	14	3.7	1.6	0.0-18.3	4.8
LTOT/SDTIME		3.4			
Vuadens					
LONG (cm)	200	18.7	18.0	8-34	5.5
LARG (cm)	200	16.0	16.0	7-31	4.9

Moyenne (x), médiane (md), étendue et écart-type (s) des variables des expériences A1 et A2 +3, ainsi que des données comparatives de Vuadens; n = nombre d'observations.

estimer S1. De plus, certaines valeurs extrêmes de L et 1 poussent les moyennes et écarts-types vers le haut. La corrélation entre L et 1 dans l'expérience A1 est de 0.93 (n=302).

Les moyennes de la longueur des arêtes et de l'écart-type correspondant sont très proches, fait que nous avions déjà signalé précédemment (Airoldi, 1981).

Les vitesses de creusage donnent des valeurs différentes, suivant qu'on prend la moyenne des quotients (DLONG/DTIME par ex.) ou qu'on divise les valeurs cumulées (LTOT/SDTIME). Si DLONG/DTIME et SDTIME n'étaient pas corrélés, alors la Somme des DLONG/DTIME divisée par n serait égale à LTOT/SDTIME (voir Appendice B).

Dans l'expérience A1, la moyenne des quotients vaut presque le double du quotient des valeurs cumulées, aussi bien pour la surface, le volume que la longueur. Comme les variables ont des distributions plutôt asymétriques, la médiane donne une meilleure image de la réalité; celle-ci est d'ailleurs très semblable aux quotients des valeurs cumulées. Dans l'expérience A2+3, la moyenne des quotients est très proche du quotient des valeurs cumulées. Nous allons donc retenir les estimations fournies par les quotients des valeurs cumulées.

Les vitesses de creusage ont des ordres de grandeur très différents entre les 2 expériences: d'un facteur d'environ 3 pour la surface, de 3.7 pour le volume et de 2 pour la longueur. Nous n'avons pas d'arguments convaincants pour expliquer cette différence. Uj (1984) a trouvé des accroissements de la longueur des terriers de 20 et 40 cm par jour, valeurs largement dépassées dans notre cas: 168 cm/j pour A1 et 82 cm/j pour A2+3. *Geomys bursarius* peut creuser jusqu'à 12.8 m de galeries par jour (Andersen, 1987).

Rappelons que nous ne tenons pas compte des galeries qui ont été rebouchées au cours du temps. En réalité, la longueur des galeries creusées dépasse les valeurs ci-dessus, qui ne sont que des approximations par défaut.

Le nombre de taupinières corrèle fortement avec la longueur totale du terrier (r=0.99 pour A1 et r=0.98 pour A2+3). Le nombre moyen de taupinières nouvelles par accroissement de longueur d'un mètre est de 4.4 pour A1 et 6.2 pour A2+3. Cette différence est statistiquement significative.

La terre évacuée sous forme de taupinières a été comparée au volume du terrier excavé. Nous avons assimilé le terrier à un cylindre de 5 cm de diamètre. Pour l'expérience A1, ce volume est de 88 dm^3, alors que la terre rejetée représente 290 dm^3; les valeurs correspondantes pour la seconde expérience sont 16 dm^3 et 30 dm^3, respectivement. Il faut tenir compte du fait que pour le volume du terrier, la terre est compacte. Dans la première expérience, la terre évacuée correspond à 3.3 fois le volume du terrier, dans la seconde à seulement 1.9 environ. On ne peut pas expliquer cette différence par des taux de compacité différents, vu que les deux expériences ont été effectuées à proximité l'une de l'autre, sur le même terrain. Il est possible que dans le second cas, davantage de terre résultant du creusage des galeries ait été utilisée pour en reboucher d'autres, ce qui pourrait aussi expliquer la différence de longueur de galerie creusée par heure, indiquée ci-dessus. Andersen (1987) signale que chez *Geomys bursarius*, 41-87% de la terre est évacuée en surface, le reste étant utilisé pour reboucher d'anciennes galeries.

c) corrélations entre variables

Les corrélations (r de Pearson) entre les différentes variables de l'expérience A1 sont représentées sous forme de dendrogramme à la Figure 3. Les nombres de valeurs distinctes sont indiquées pour chaque variable. Lors de la comparaison de 2 variables, c'est toujours le plus petit des nombres qui correspond au nombre de couples sur lesquels la corrélation a été calculée. Nous avons utilisé le programme BMDP1M (cluster analysis), option «liens moyens», pour effectuer les regroupements. Comme les corrélations n'ont pas été calculées sur un nombre identique de couples, c'est la moyenne harmonique ($H=68$) qui a été utilisée.

On reconnaît aisément 6 groupes dans la Figure 3, qui sont d'ailleurs confirmés par une analyse en composantes principales effectuée sur la matrice de corrélation. Certaines variables ont dû être éliminées préalablement, vu leur trop forte corrélation avec d'autres, ce qui rendait la matrice de variance-covariance singulière. En tout, 46 observations ayant des valeurs acceptables pour les 13 variables retenues ont pu être utilisées. Le premier groupe réunit toutes les variables cumulées, qui corrèlent très fortement entre elles; le deuxième groupe est formé des variables de surface et volume, et le troisième des différences de surface et volume. La moyenne et l'écart-type de la longueur des arêtes corrèlent fortement et forment également un groupe. DTIME et DLONG sont isolés et ne présentent pas de corrélations élevées avec les autres variables. Ce qui est plus surprenant, ce sont les corrélations relativement faibles, quoique statistiquement significatives de DS1, DS2 avec DTIME ($r=0.41$, $p<1\%$) et DLONG ($r=0.32$, $p<5\%$), DVOL avec DTIME ($r=0.30$, $p<5\%$). Un calcul du coefficient de corrélation de Spearman, justifié vu que les variables ne sont pas distribuées normalement, conduit même à des valeurs non significatives. Ceci est le signe d'une grande variabilité en ce qui concerne les accroissements de longueur, de surface et de volume en fonction du temps, point que nous avons déjà évoqué plus haut.

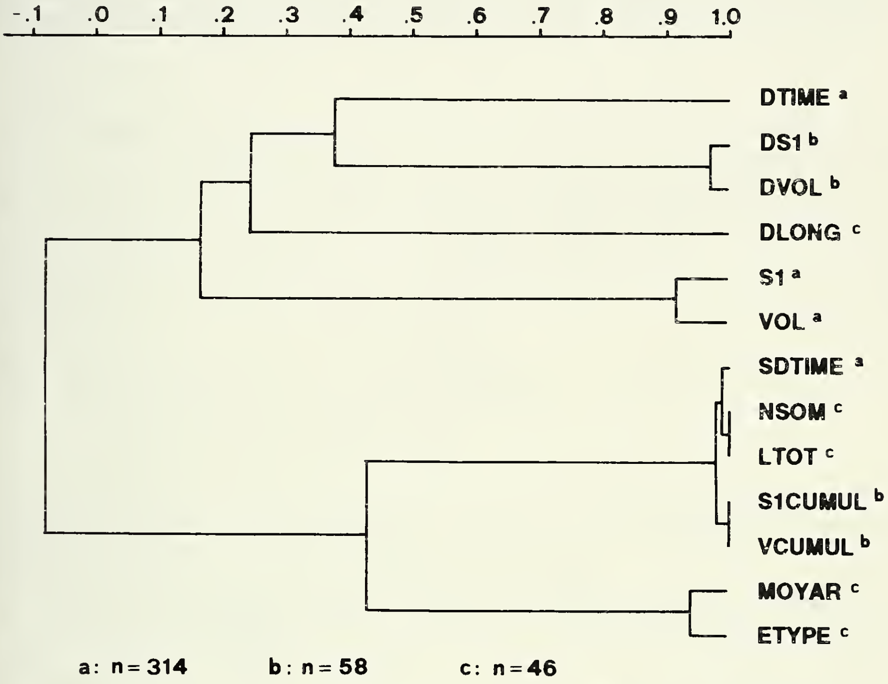

FIG. 3.

Dendrogramme représentant les corrélations entre les variables principales du terrier de l'expérience A1.

Les résultats pour l'expérience A2+3 sont très semblables et nous renonçons à les présenter en détail.

d) taupinières modifiées

La Figure 4 montre l'évolution des taupinières en fonction du temps pour les 13 premiers jours de l'expérience A1. On constate que plusieurs d'entre elles sont modifiées

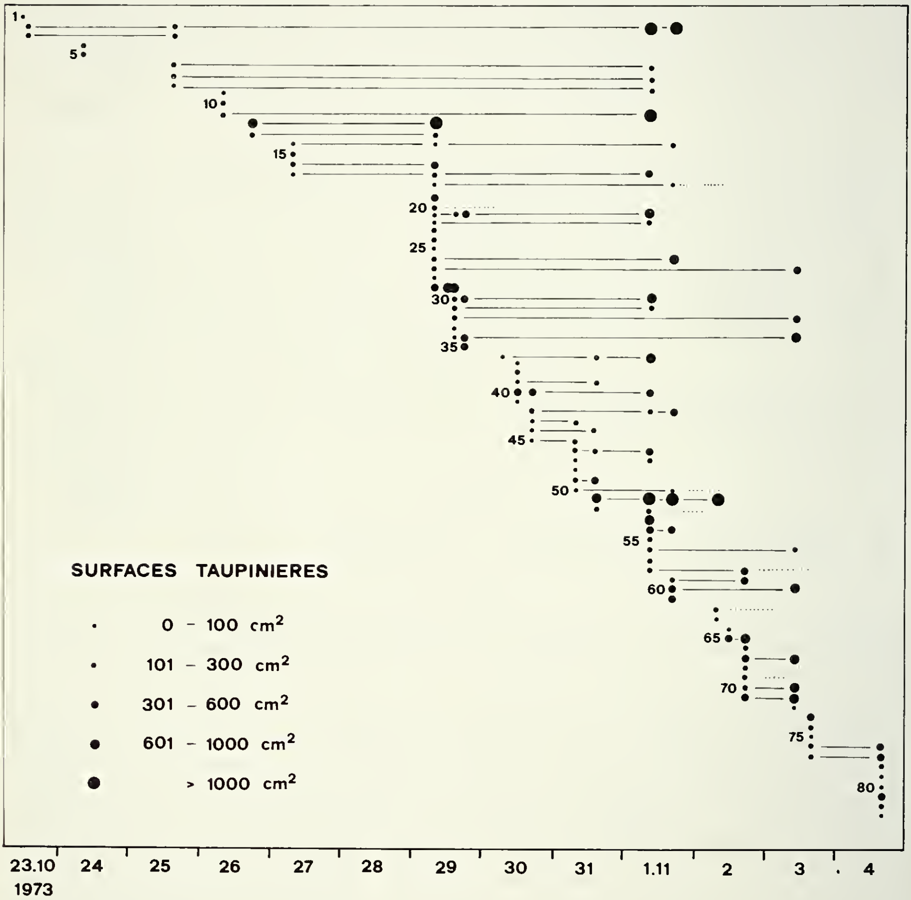

Fig. 4.

Evolution des taupinières du terrier de l'expérience A1 du 23.10 au 4.11.1973. Les nombres à côté des taupinières correspondent à leur numérotation. Les .... indiquent que la taupinière a encore été modifiée ultérieurement.

dans le sens d'un agrandissement à plusieurs reprises, ce qui signifie que les campagnols réutilisent certaines galeries d'évacuation. Le Tableau 4 résume les observations au sujet des modifications des taupinières. On note une différence importante entre les deux expériences; même si la seconde a duré moins longtemps que la première, le nombre de modifications est modeste. En effet, pour la première expérience, après 10 jours, temps qu'a duré la seconde, nous avions déjà plus de 55% de taupinières modifiées. Il est difficile d'interpréter cette différence.

Tableau 4

	modifications				N taupi. modif.	N total taupi.	% taupi. modif.	Ntot modi-fica.	% modi-fica.
	0	1	2	3					
A1	107 28	64 21	19 11	6 3	89 35	196 63	45.4 55.6	120 52	61.2 82.5
A2+A3	37	6	-	-	6	43	14.0	6	14.0

Indications au sujet des taupinières modifiées des expériences A1 et A2+3. La 2e ligne de A1 correspond à la situation après 10 jours, temps qu'a duré l'expérience A2+3.

Les intervalles de temps entre la création d'une taupinière et sa modification ultérieure ou entre deux modifications correspond à une distribution exponentielle décroissante. Près de la moitié des changements se font dans un intervalle d'environ 24 heures, mais l'intervalle le plus long a été de plus de 15 jours.

Nous avons émis l'hypothèse que le volume ajouté à une taupinière existante lors de sa modification était corrélé au volume de celle-ci. La corrélation est faiblement positive ($r=0.21$, $p<5\%$) et la variabilité très grande.

B. Terrariums

a) généralités

La Figure 5 montre l'évolution de 2 terriers en terrarium (expériences B1 et B4). Les différences sont importantes, mais découlent des conditions dans lesquelles elles ont été réalisées. Le premier plan de terrier (Fig. 5, en haut à gauche) est le résultat de l'activité de fouissement d'un couple après 15 jours, alors que pour l'expérience B4, le premier plan (Fig. 5 en haut à droite) correspond à l'activité de fouissement d'un seul individu après seulement 4.5 heures. La Figure 5 donne cependant un bon aperçu de la dynamique d'un réseau de galeries dans des conditions très différentes.

b) moyennes, médianes, étendues et écart-types

Les Tableaux 5a et 5b résument les paramètres ci-dessus pour les variables retenues. En général, ces dernières sont distribuées normalement, du moins les différences ne sont pas statistiquement significatives. Un premier examen des Tableaux 5a et 5b montre que

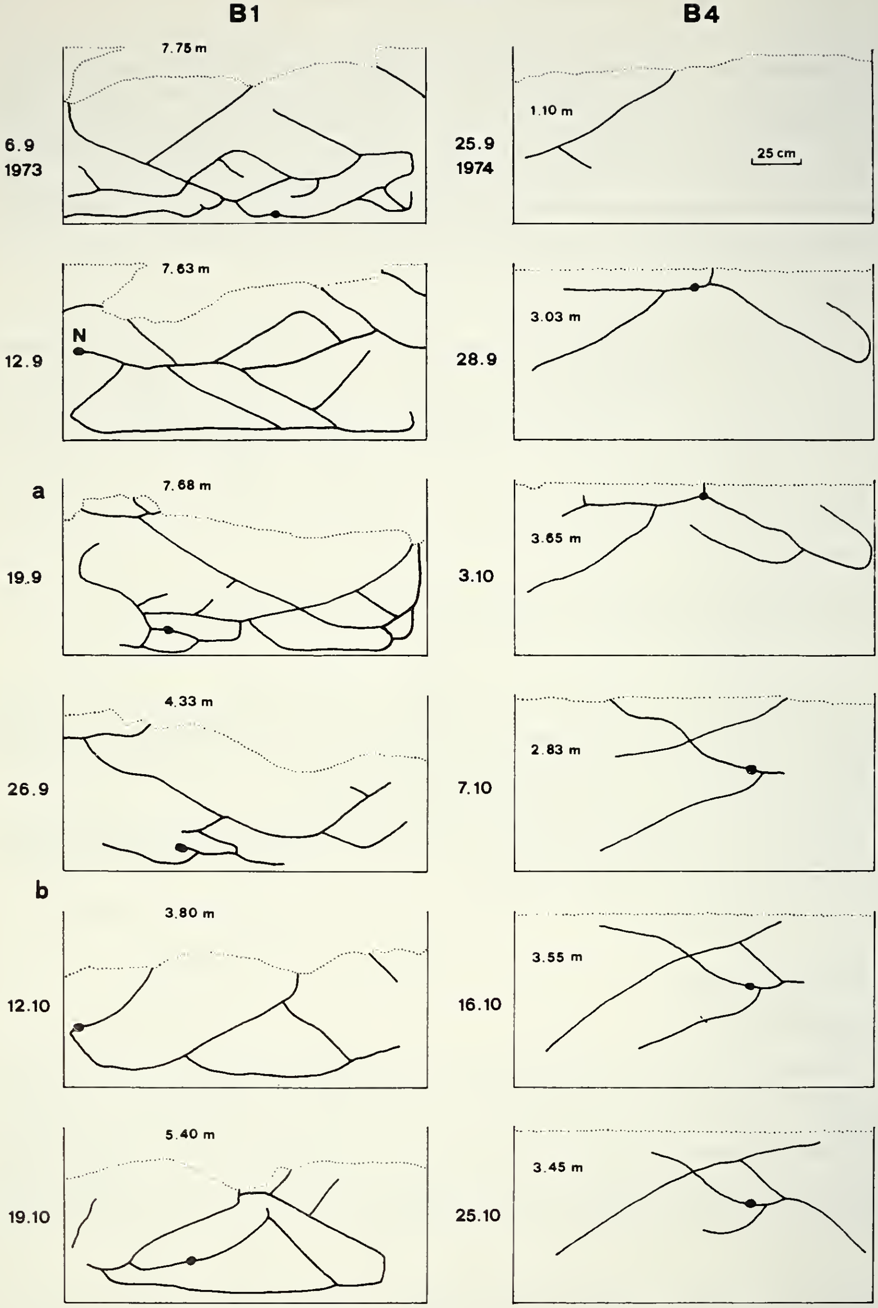

FIG. 5.

Evolution au cours du temps du terrier de 2 expériences en terrarium: B1 (couple) et B4 (individu seul). Les dates et longueurs des terriers sont indiquées. a: femelle trouvée morte; b: nouveau couple formé par l'introduction de la femelle de l'expérience B2, le 3.10.1973. N: nid.

Tableau 5a

Variables	n	$\bar{x}$	md	étendue	s
B1					
DTIME (heures)	20	81.9	73.3	0-223.5	52.0
LTOT (cm)	20	569.5	562.5	350-775	150.4
VTOT (dm^3)	20	12.0	11.8	6.8-17.7	3.1
MOYAR (cm)	20	34.9	32.3	30.3-54.3	8.2
ETYPE (cm)	20	25.9	25.0	14.7-39.2	7.3
NSOM	20	17.8	17.0	8-29	6.2
NARETES	20	17.6	16.5	7-32	7.0
NCYCLES	20	2.2	2.0	0-6	1.4
B2					
DTIME (heures)	10	64.8	56.4	0-153	42.8
LTOT (cm)	10	465.0	465.0	402.5-535.0	43.7
VTOT (dm^3)	10	10.8	10.4	8.7-13.0	1.5
MOYAR (cm)	10	30.6	29.3	22.8-38.3	5.4
ETYPE (cm)	10	22.5	21.9	15.7-33.3	5.5
NSOM	10	16.1	16.0	10-22	4.1
NARETES	10	15.7	15.5	11-21	3.4
NCYCLES	10	1.9	2.0	1-3	0.7

Moyenne ($\bar{x}$), médiane (md), étendue et écart-type (s) des variables des expériences B1 à B4; n = nombre d'observations.

les expériences B1 et B2 ont des paramètres très semblables d'une part, tout comme B3 et B4, d'autre part. Dans le premier cas, nous avions des couples, dans le second des individus isolés. L'intervalle de temps entre deux observations fut nettement supérieur pour B1 et B2. C'est la raison pour laquelle nous avons renoncé à estimer les volumes des galeries nouvellement creusées (VNOUV) ou rebouchées (VREBOUCH). En effet, au cours d'un intervalle de temps de plusieurs jours, de nombreuses modifications peuvent intervenir dans la configuration d'un terrier, particulièrement en terrarium, ainsi que l'illustre la Figure 5.

La longueur du réseau de galeries est en moyenne supérieure lorsque ce dernier est habité par un couple, bien que les longueurs maximales soient du même ordre de grandeur, sauf pour l'expérience B1. Le nombre d'arêtes est une fonction linéaire du nombre de sommets lorsqu'il n'y a pas de cycles (Airoldi, 1976; 1980), c'est pourquoi ces deux grandeurs corrèlent fortement. Leur corrélation avec la longueur du terrier est statistiquement

Tableau 5b

Variables		n	$\bar{x}$	md	étendue	s
B3						
DTIME	(heures)	20	17.2	15.8	3-62	13.6
LTOT	(cm)	20	310.9	326.3	87.5-440	107.9
VTOT	(dm^3)	20	9.1	9.7	2.4-14.0	3.4
VNOUV	(dm^3)	20	2.3	2.3	0.3-5.8	1.5
VREBOUCH	(dm^3)	20	1.5	1.4	0.0-4.7	1.3
MOYAR	(cm)	20	54.8	50.2	27.0-93.3	20.4
ETYPE	(cm)	20	55.0	59.9	9.4-96.7	27.5
NSOM		20	7.0	6.0	4-12	1.9
NARETES		20	6.0	5.0	3-11	1.9
B4						
DTIME	(heures)	89	24.9	19.5	4.5-265.0	29.7
LTOT	(cm)	89	339.4	340.0	110.0-537.0	62.7
VTOT	(dm^3)	89	9.2	9.2	3.6-15.1	1.5
VNOUV	(dm^3)	89	1.3	1.1	0.0-6.0	1.1
VREBOUCH	(dm^3)	89	1.2	1.0	0.0-4.5	1.0
MOYAR	(cm)	89	40.7	38.5	26.1-117.5	12.3
ETYPE	(cm)	89	26.7	25.0	7.1-64.5	10.7
NSOM		89	9.8	10.0	4-14	2.3
NARETES		89	8.9	9.0	2-15	2.5
NCYCLES		89	0.4	0.0	0-2	0.6

Moyenne ($\bar{x}$), médiane (md), étendue et écart-type (s) des variables des expériences B1 à B4; n = nombre d'observations.

significative ($P<0.1\%$ pour B1 et B4; $P=1\%$ pour B3 et $P=5\%$ pour B2), mais relativement faible. La corrélation est de $r=0.657$ ($r^2=0.43$) pour B4, ce qui revient à dire que moins de la moitié de la variation totale est «expliquée» par la relation entre les deux variables. Cela signifie qu'à des longueurs de terriers égales ne correspondent pas des nombres d'arêtes identiques.

Le nombre de cycles est généralement faible (maximum=6) ou même nul. La moyenne de la longueur des arêtes oscille entre environ 30 cm et 55 cm. Nous reviendrons ci-dessous sur la relation entre la moyenne et l'écart-type de la longueur des arêtes. Le volume de terre nouvellement excavé (VNOUV) est supérieur au volume rebouché (VREBOUCH) dans l'expérience B3, mais presque égal à ce dernier dans l'expérience B4, ce qui maintient une longueur quasi constante au cours du temps. Ce fait est illustré à la Figure 6.

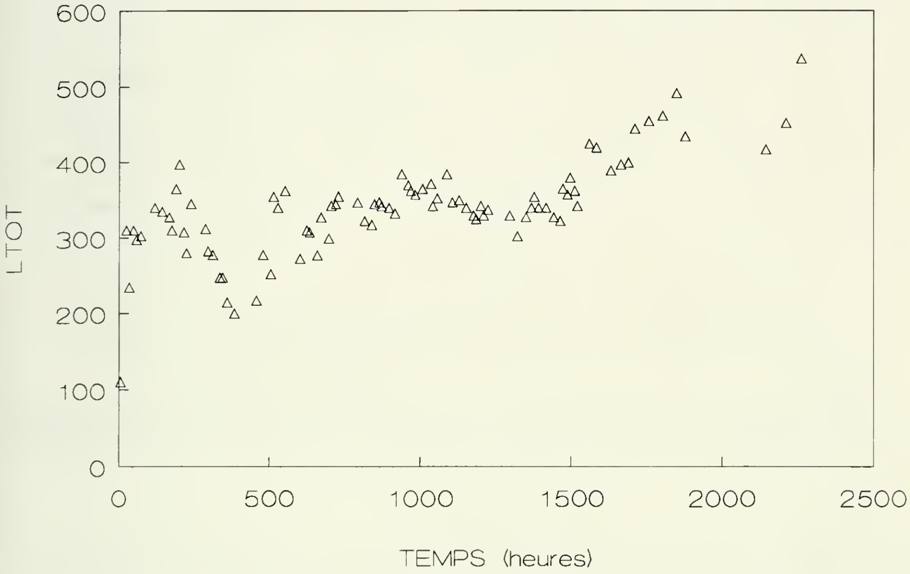

FIG. 6.

Evolution de la longueur totale du terrier de l'expérience B4 en fonction du temps. Δ = LTOT.

c) **corrélations entre variables**

Les corrélations (r de Pearson) des différentes variables de l'expérience B4 sont représentées sous forme de dendrogramme à la Figure 7. Les corrélations sont basées sur 89 observations. Les dendrogrammes pour les 3 autres expériences sont très semblables à ceux de la Figure 7. Deux grands groupes émergent, le premier renferme les variables NSOM, NARETES, LTOT, VTOT, SDTIME et dans une moindre mesure NCYCLES et DTIME, le second regroupe les variables exprimant une différence, comme DLONG, DVTOT, VNOUV et VREBOUCH qui est un peu à part. La moyenne des arêtes (MOYAR) et l'écart-type (ETYPE) correspondant se retrouvent aussi dans ce groupe, mais corrèlent plus faiblement avec les autres variables. Ce qui surprend, c'est que les paramètres exprimant une différence ne corrèlent pas plus fortement avec la longueur des intervalles de temps (DTIME). A nouveau, on doit conclure que l'accroissement de la dimension d'un terrier ne se fait pas de manière régulière, mais plutôt par à-coups.

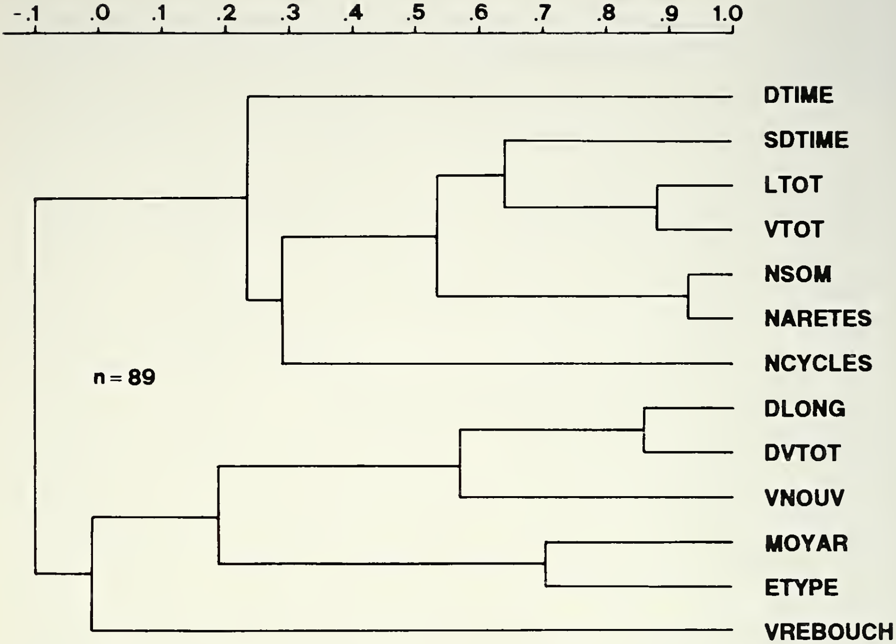

FIG. 7.

Dendrogramme représentant les corrélations entre les variables principales du terrier de l'expérience B4.

C. Relations entre la moyenne et l'écart-type de la longueur des arêtes

Nous avons observé que pour des terriers de longueurs allant de 5 à 200 m environ, provenant de biotopes différents et excavés au cours des années, la moyenne de la longueur des arêtes et l'écart-type correspondant étaient très proches. En effet, le quotient entre l'écart-type et la moyenne, ou coefficient de variation (CV), est voisin de 1.0. Nous avons calculé les moyennes des CV de l'ensemble des terriers étudiés à ce jour et testé (t de Student) si elles différaient significativement de 1.0. Les résultats sont donnés au Tableau 6. On constate que dans 2 cas seulement, la différence n'est pas significative. Il faut cependant préciser que pour A1 - A3 et B1 - B4, nous avons des estimations de CV pour les différentes étapes du développement d'un même terrier, alors que pour les terriers T1 - T48, nous n'avons qu'une valeur par terrier, celle calculée sur la base de la configuration lors de son excavation.

Pour un même terrier, le CV reste relativement constant, ce que reflète son écart-type qui est généralement assez faible. En terrarium, le CV a tendance à être inférieur à 1.0 et dans le terrain, supérieur à 1.0. Plus le milieu est confiné, moins il y aura de longues galeries, à cause des intersections inévitables avec des galeries existantes, et plus l'écart-type sera faible.

Tableau 6

	n	$\overline{CV}$	s_{CV}	t
B1 **6.9 - 13.11.73**	20	0.749	0.158	7.12 **
B2 **6.9 - 3.10.73**	10	0.731	0.096	8.86 **
B3 **8 - 22.8.74**	20	0.950	0.328	0.69
B4 **25.9 - 28.12.74**	89	0.665	0.186	17.00 **
A1 **23.10 - 19.11.73**	44	1.036	0.110	2.13 *
A2 + A3 **7 - 24.11.74**	12	1.026	0.082	1.08
T1 - T48	40	1.196	0.236	5.25 **

Coefficient de variation (CV=écart-type de la longueur des arêtes/moyenne de celles-ci), écart-type correspondant et valeur de t (test de l'hypothèse $\overline{CV}=1.0$); n = nombre d'observations. Explications complémentaires dans le texte.

4. DISCUSSION

Les 2 types d'expérience effectuées (terrain et terrarium) ont permis d'explorer les différents aspects de la dynamique du développement du terrier du campagnol terrestre et de situer les limites de notre approche. La manière de procéder utilisée peut s'appliquer à la plupart des Rongeurs fouisseurs et il serait souhaitable de disposer de données d'autres espèces, en plus des travaux de ANDERSEN (1988, 1990) et SPARKS ET ANDERSEN (1988), ceci dans une perspective d'étude comparative.

Nous pensons cependant qu'il y aurait lieu de moderniser les méthodes de relevé, par exemple par la digitalisation des plans des taupinières et des terriers, comme l'a fait ANDERSEN (1990). Cela allégerait toute la procédure d'analyse des données et éviterait aussi bon nombre d'erreurs pouvant se glisser au cours des diverses étapes conduisant de l'observation sur le terrain à l'analyse statistique proprement dite. Il faudrait évidemment disposer d'un logiciel, qui reste à créer, rendant possible de manière aisée et confortable l'exploitation et l'analyse des données.

Du point de vue pratique, divers problèmes subsistent, liés avant tout à l'établissement des campagnols à un endroit précis. Normalement, les individus ne restent pas là où on les lâche. Travailler dans des enclos comme le fait ANDERSEN (1988, 1990) alourdit sérieusement le dispositif d'étude et peut influencer le comportement des individus.

Les résultats obtenus en terrarium ne peuvent être transposés sans autre à une situation de terrain; ils fournissent néanmoins des indications intéressantes si on sait les interpréter avec précaution. Le fait d'avoir simultanément des résultats d'individus en captivité et dans le terrain permet de comparer les deux approches et d'en fixer les limites.

L'influence de la météorologie (température, précipitations) sur l'activité de fouissement mériterait d'être étudiée de manière approfondie. En effet, les fluctuations observées pourraient s'expliquer, en partie du moins, par une action directe ou indirecte de ces facteurs.

La comparaison de nos résultats à ceux d'autres espèces fouisseuses est difficile. Les Géomyidés (ANDERSEN, 1987, 1990), *Tachyoryctes, Heliophobius* (JARVIS ET SALE, 1971), les Spalacidés (HETH, 1989) vivent seuls dans leur terrier, ont des tailles supérieures à celle d'*Arvicola terrestris* et présentent souvent un dimorphisme sexuel. *Heterocephalus glaber* (JARVIS ET SALE, 1971) vit en colonies de plusieurs dizaines d'individus. La plupart de ces espèces habitent des milieux arides ou semi-arides. Généralement, une grande variabilité dans les différents paramètres des terriers est observée, quelles que soient les espèces considérées. Une corrélation a pu être établie entre la structure du terrier et la productivité végétale chez *Thomomys bottae* (REICHMAN *et al.*, 1982) et *Spalax ehrenbergi* (HETH, 1989). Le taux d'excavation ne semble pas être en relation avec la saison ou la biomasse végétale hypogée chez *Geomys bursarius* (ANDERSEN, 1987; SPARKS ET ANDERSEN, 1988).

Nous souhaitons que notre travail incite d'autres chercheurs à étudier le développement du terrier chez d'autres espèces fouisseuses.

RÉSUMÉ

Deux types d'expériences ont été conduites afin d'étudier la dynamique du développement du terrier de la forme fouisseuse du campagnol terrestre:

a) lâcher d'individus dans le terrain

b) étude d'animaux en terrarium vertical (dimensions 190x90x6cm)

Dans le premier cas, 2 couples ont été lâchés dans le terrain et suivis, l'un pendant 10 jours, l'autre pendant 26 jours. Un plan des taupinières fut effectué en moyenne 2 fois par jour. A la fin de chacune des expériences, le réseau de galeries fut excavé et cartographié. L'évolution du terrier fut reconstituée à l'aide du plan du réseau, en tenant compte de l'emplacement des taupinières au cours du temps. Les paramètres suivants furent évalués pour chaque relevé: longueur totale, nombre de taupinières, surface de la base et volume de celles-ci, différences de longueur du terrier, de la surface et du volume des taupinières, nombre de sommets (=intersections et culs-de-sac) et d'arêtes (=distances entre 2 sommets), moyenne et écart-type de ces dernières, ainsi que les accroissements de longueur, surface et volume en fonction du temps.

La longueur totale du terrier, la surface et le volume cumulés des taupinières, les nombres de sommets et d'arêtes corrèlent entre eux et avec le temps; les différences de surface et de volume ne corrèlent qu'entre elles; la moyenne de la longueur des arêtes et l'écart-type correspondant corrèlent fortement.

L'accroissement moyen de la longueur d'un terrier est d'environ 80 cm et 170 cm/jour, respectivement pour les 2 expériences. Les taupinières sont souvent modifiées au cours du temps, par apport de terre nouvellement creusée.

Dans le second cas, soit un individu seul (2 expériences), soit un couple (2 expériences) furent observés. Un plan du réseau de galeries fut établi en moyenne tous les 1-3 jours. Les paramètres suivants ont été évalués pour chaque relevé: longueur et volume totaux du réseau, différences de longueur et de volume entre 2 relevés, volume nouvellement creusé et/ou rebouché, nombres de sommets, d'arêtes, de cycles élémentaires, la moyenne et l'écart-type des longueurs des arêtes.

La longueur totale du terrier, le volume, les nombres de sommets et d'arêtes corrèlent entre eux et avec le temps; les différences de volume et de longueur corrèlent entre elles, mais pas avec la durée de l'intervalle entre 2 relevés; la moyenne de la longueur des arêtes

et l'écart-type correspondant corrèlent généralement. Lorsqu'il y a 2 individus dans un même terrarium, le terrier est plus long: $x = 4.7$ et 5.7 m contre 3.1 et 3.4 m.

Dans les 2 cas, les relations entre les différentes variables ont été analysées et interprétées.

REMERCIEMENTS

Les données de ce travail ont été récoltées lors de l'engagement de l'auteur à la Station fédérale de recherches agronomiques de Changins à Nyon (Suisse), et nous remercions Monsieur A. Meylan, Service de Zoologie des Vertébrés, de son accueil.

APPENDICE

A. **Formulation mathématique:**

$(\Sigma \pi L x 1/4)/n - \pi \bar{L} x \bar{1}/4 > 0$. Comme $\pi/4$ est une constante, on peut en faire abstraction. Le problème peut être reformulé de la manière suivante: $(\Sigma L x 1)/n - (\Sigma L)/n \ x \ (\Sigma 1)/n > 0$. Or, cette différence, multipliée par n et divisée par n-1, est égale à la covariance entre L et 1; lorsque celle-ci est nulle, c'est-à-dire que les variables ne sont pas corrélées entre elles, les 2 expressions sont égales.

B. **Formulation mathématique:**

LTOT=Somme des DLONG=ΣDLONG et SDTIME=Somme des DTIME=ΣDTIME et on a: Σ(DLONG/ DTIME)/n = ΣDLONG/ΣDTIME? ΣDLONG peut s'écrire Σ(DTIME xDLONG/ DTIME), d'où on peut poser Σ(DLONG/DTIME)/n = Σ(DTIMExDLONG/ DTIME)/ΣDTIME? ce qui peut s'écrire Σ(DTIMExDLONG/DTIME) – (Σ(DLONG/ DTIME) x ΣDTIME)/n > 0; cette expression, divisée par n-1 est égale à la covariance entre DTIME et DLONG/TIME. Si celle-ci vaut 0.0, alors les deux quotients sont identiques.

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Revue suisse Zool. | Tome 99 | Fasc. 1 | p. 109-118 | Genève, mars 1992

Taxonomie et variation de taille des hermines et des belettes en Europe: revue de littérature et commentaire

par

Jean-Steve MEIA* et Claude MERMOD*

Avec 2 figures

Abstract

Taxonomy and size variation of Stoats and Weasels in Europe. – The substantial size variation through their range complicates the taxonomy of Stoats and Weasels. We present a summary of published works and opinions from 1912 to 1989 on the taxonomy of both species in continental Europe and comment on it in the light of a study of size variation.

For both species, the existing taxonomy is based mainly on size differences which could be confirmed (except one in the Weasel). However, the overlap of size measurements is substantial, detailed studies of the populations which are taxonomically distinguished are lacking, and furthermore, body size is influenced by climate, ecology, and history. For these reasons we propose to consider only one subspecies in the Stoat and one (or two) in the Weasel.

INTRODUCTION

La taxonomie de l'hermine, *Mustela erminea* L., et de la belette, *Mustela nivalis* L., pose problème depuis longtemps. La variation de taille des deux espèces est grande. De nombreuses sous-espèces, définies presque exclusivement sur des critères de taille, ont été proposées. L'existence de ces sous-espèces a déjà été discutée par plusieurs auteurs. Cependant, il manquait d'une part une vision globale de la variation de taille et d'autre part une revue de l'état des connaissances dans ce domaine. Pour tenter de combler ces lacunes, nous avons entrepris une étude de la variation de taille en Europe continentale des hermines et des belettes. La méthode et les résultats de cette étude ont déjà été présentés (Meia 1990a): l'examen de 1500 crânes provenant de 9 pays européens a confirmé l'importante variation de taille et mis en évidence sa complexité; elle ne s'organise pas en gradient clair mais plutôt en mosaïque.

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* Institut de Zoologie, Université de Neuchâtel, Chantemerle 22, 2007 Neuchâtel, Suisse.

Nous nous proposons de résumer ici les différentes opinions concernant la taille et la taxonomie des hermines et des belettes en Europe et de les commenter brièvement en fonction de nos résultats.

REVUE DE LITTÉRATURE

HERMINE

Deux problèmes peuvent être distingués: premièrement la possible existence de deux sous-espèces en Europe continentale, deuxièmement la possible existence d'une forme naine en altitude.

(a) *Europe continentale*

MILLER (1912), ELLERMAN & MORRISON-SCOTT (1951), et REICHSTEIN (1957) distinguent deux sous-espèces pour l'Europe continentale: *Mustela e. erminea* Linnaeus 1758 de petite taille et *Mustela e. aestiva* Kerr 1792 de taille plus grande. Selon MILLER (1912) et ELLERMAN & MORRISON-SCOTT (1951) la limite entre les deux sous-espèces serait située en Suède, *M. e. aestiva* occupant encore le sud de ce pays. MONTÉN (1943), lui, conclut à l'existence d'une seule sous-espèce en Suède, *M. e. erminea*; sa conclusion est reprise par REICHSTEIN (1957) et ANDERSON (in KING 1983).

Cependant, selon KRATOCHVIL (1977a) seule *M. e. erminea* est à considérer pour toute l'Europe continentale, les autres formes ayant valeur de natii (sous-unités de la sous-espèce). CORBET (1978) et KING (1989a) se rattachent à cette opinion. De même, STUBBE (1978), malgré l'obtention d'une différence significative entre les valeurs moyennes de taille de Suède et de RDA, attribue les hermines de l'Europe moyenne à *M. e. erminea* en raison du recouvrement important des mesures.

On mentionnera également le travail de ERLINGE (1987) qui note une augmentation de taille «Nord de la Suède – Sud de la Suède – Europe centrale» et finalement MÜLLER (1970) qui mentionne, vraisemblablement par erreur, que les animaux du nord sont plus grands que ceux du sud.

(b) *Altitude*

Une diminution de la taille des hermines avec l'altitude est mentionnée par plusieurs auteurs. STUDER (1913) décrit 3 exemplaires reçus au musée de Berne confirmant l'existence d'une forme naine dans les Alpes, *Putorius ermineus minimus* Cavazza 1912. ANDERSON (in KING 1983) considère cette sous-espèce valable. VAN DEN BRINK (1967) relève, lui aussi, l'existence d'une forme naine dans les Alpes. SAINT GIRONS (1973) signale deux exemplaires des Pyrénées particulièrement petits. GÜTTINGER & MÜLLER (1989) obtiennent, lors de la comparaison d'individus de haute et de basse altitudes, une relation négative altitude-taille. KING (1989b) montre que les hermines d'Eurasie sont plus petites dans les climats froids.

Toutefois, REICHSTEIN (1957) n'observe pas, dans ses données, de diminution de la taille avec l'altitude.

BELETTE

Nous distinguerons d'une part la taxonomie de la belette en Europe continentale et ceci par région afin de rendre la compréhension de la problématique plus aisée, et d'autre part l'éventuelle existence d'une belette naine.

(a) *Europe continentale*

Sud de l'Europe:

Plusieurs travaux constatent l'existence de belettes de grande taille au sud des Alpes. Ainsi, MILLER (1912), ELLERMAN & MORRISON-SCOTT (1951), REICHSTEIN (1957), BEAUCOURNU & GRULICH (1968), et KRATOCHVIL (1977b) mentionnent l'existence de *Mustela n. boccamela* Bechstein 1801 dans la zone méditerranéenne.

FRECHKOP (1963) et CORBET (1978) limitent l'aire de répartition de *M. n. boccamela* à la Sardaigne. DOUMA-PETRIDOU & ONDRIAS (1987) font de même et considèrent une sous-espèce particulière en Italie, de taille un peu plus petite: *Mustela n. italicus* Barrett-Hamilton 1906. Il faut noter que Frechkop attribue à la «boccamele» le rang d'espèce.

SAINT GIRONS (1973) et CHEYLAN (1988) mentionnent l'existence d'une belette particulière en Corse *Mustela n. corsicana* Cavazza 1908.

KING (1989a) ne reconnaît qu'une sous-espèce pour tout le centre et le sud de l'Europe, *Mustela n. vulgaris* Erxleben 1777.

Péninsule ibérique:

MILLER (1912), ELLERMAN & MORRISON-SCOTT (1951), et KRATOCHVIL (1977b) y distinguent une belette de taille importante (mais plus petite que *M. n. boccamela*): *Mustela n. iberica* Barrett-Hamilton 1900.

CORBET (1978) inclut les belettes de cette région dans *Mustela n. nivalis* Linnaeus 1766, alors que REICHSTEIN (1957) et KING (1989a) considèrent qu'elles font partie de *M. n. vulgaris.*

Est de l'Europe:

Une taille assez importante est généralement relevée pour les belettes de l'est (Danube). ZIMMERMANN (1940), REICHSTEIN (1957), et DOUMA-PETRIDOU & ONDRIAS (1987) considèrent pour cette région *Mustela n. trettaui* Kleinschmidt 1937.

CORBET (1978) inclut les belettes de cette région dans *M. n. nivalis*, KRATOCHVIL (1977b) dans *M. n. boccamela*, et KING (1989a) dans *M. n. vulgaris.*

Centre et nord de l'Europe:

MILLER (1912), et ELLERMAN & MORRISON-SCOTT (1951) considèrent une seule sous-espèce pour tout le nord et le centre de l'Europe, *M. n. nivalis.*

D'autres auteurs pensent que deux sous-espèces doivent être distinguées: une de petite taille au nord et une de plus grande taille au centre de l'Europe. Ainsi, ZIMMERMANN (1940), OGNEV (1962), REICHSTEIN (1957), STOLT (1979), DOUMA-PETRIDOU & ONDRIAS (1987) et KING (1989a) distinguent *M. n. nivalis* au nord et *M. n. vulgaris* en Europe centrale. Selon STOLT (1979), FRANK (1985) et KING (1989a), cette distinction serait appuyée par deux caractéristiques du pelage: premièrement, *M. n. nivalis* devient généralement blanche en hiver alors que *M. n. vulgaris* garde sa couleur estivale, et deuxièmement, la ligne de démarcation entre les deux couleurs du pelage est rectiligne chez *M. n. nivalis* alors qu'elle est ondulée chez *m. n. vulgaris.* FRANK (1985) a montré que ces deux types de pigmentation sont causés par deux allèles d'un même gène. KING (1989a) mentionne également des différences dans la reproduction de ces deux sous-espèces. BEAUCOURNU & GRULICH (1968) et KRATOCHVIL (1977b) proposent une nomenclature différente: les deux sous-espèces sont plutôt *Mustela n. pygmae* Allen 1903 (nom provisoire) dans le nord et *M. n. nivalis* en Europe centrale.

Mandhal & Fredga (1980) ont montré que les belettes du nord ne sont pas spécifiquement distinctes de celles du centre car leur caryotype est identique.

(b) *Le cas de la belette naine*

Plusieurs publications font mention de l'existence d'une belette naine en Europe centrale. Gaffrey (1940), Zimmermann (1940), Haltenorth (1950), Kahmann (1951, 1952) et Bauer & Rokitansky (1953) décrivent cette belette naine *Mustela minuta* Pomel 1853 tout en reconnaissant la difficulté de la distinguer de la belette ordinaire. Reichstein (1957) en fait une sous-espèce *M. n. minuta*.

Reprenant cette distinction, Frechkop & Misonne (1952) concluent à l'existence d'une seule espèce de belette en Belgique. Corbet (1966) se déclare d'avis qu'il n'existe qu'une espèce de belette en Europe. Beaucournu & Grulich (1968) concluent que les exemplaires de *M. minuta* sont des exemplaires à caractéristiques jeunes de la belette ordinaire, et que la belette naine n'existe pas en tant qu'espèce ou sous-espèce parce que mêlée aux belettes ordinaires. De même Mazàk (1970) conclut que la belette naine n'est qu'une partie de la distribution de taille de *M. nivalis*. King (1980) fait remarquer que les critères utilisés pour définir *M. minuta* sont en partie dépendant de l'âge.

Certains auteurs (Reichstein 1957, van den Brink 1967, Frank 1985, Güttinger & Müller 1988) pensent que les petites belettes du centre de l'Europe correspondent à la sous-espèce *M. n. nivalis* du nord de l'Europe.

On notera finalement que plusieurs auteurs font mention d'une diminution de la taille avec l'altitude (Reichstein 1957, Corbet & Southern 1977, Kratochvil 1977b, Güttinger 1988). King (1989b) montre que les belettes d'Eurasie sont plus petites dans les climats froids.

COMMENTAIRE

Hermine

(a) *Europe continentale*

On peut considérer comme acquis le fait que les hermines de Suède soient plus petites que celles d'Europe centrale. Nous avons également mis clairement en évidence ce fait (Meia 1990a), appuyant ainsi la distinction entre *M. e. erminea* et *M. e. aestiva* faite par certains auteurs.

Cependant, l'important chevauchement des valeurs de taille existant (Figure 1), le fait que Erlinge (1987) ait pu mettre en évidence 3 catégories de taille, et l'absence de critères autres que la taille, confirment plutôt l'opinion de Kratochvil (1977a), Corbet (1978) et Stubbe (1978) qui ne considèrent qu'une seule sous-espèce *M. e. erminea* présentant un cline (gradient de caractères).

(b) *Altitude*

Le cas des hermines d'altitude reste en suspens. La diminution de la taille avec l'altitude est mentionnée également ailleurs qu'en Europe: au Japon, par exemple (Sheng 1987). Cependant, la mise en évidence de manière claire de cette diminution se heurte à la faible quantité de matériel provenant de hautes altitudes. De plus, le fait que les crânes des individus d'altitude ne présentent que rarement des caractéristiques adultes types (Meia 1990b) réduit encore le nombre de crânes utilisables pour une étude de la variation de taille.

Les petites hermines d'altitude ne constituent pas une espèce selon les gels enzymatiques de Donzé (comm. pers.). Faut-il, comme Studer (1913) et Anderson (in King 1983), les considérer comme une sous-espèce? Des études plus approfondies devraient être entreprises dans les zones d'altitude.

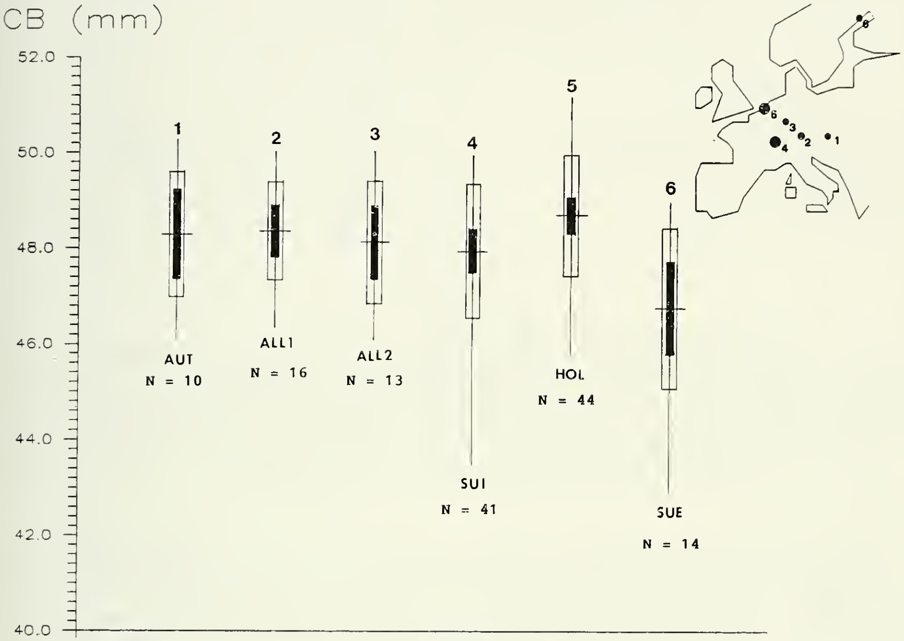

Fig. 1.

Comparaison de 6 populations européennes d'hermines. 1. AUT = Autriche (environs de Wien) 2. ALL1 = Allemagne (environs de München). 3. ALL2 = Allemagne (environs de Frankfurt). 4. SUI = Suisse (environs de Neuchâtel). 5. HOLL = Hollande (environs de Amsterdam). 6. SUE = Suède (environs de Luleå). Ligne horizontale: moyenne; ligne verticale fine: étendue de la variation; ligne verticale noire large: intervalle de confiance sur la moyenne; ligne verticale blanche large: écart-type.

Belette

(a) *Europe continentale*

Des différences de taille plus marquées que chez l'hermine sont observées entre les belettes des différentes régions d'Europe, expliquant une taxonomie encore plus discutée. Nous avons pu (Meia 1990a) séparer significativement 4 catégories de taille qui correspondent aux différentes formes mentionnées dans la littérature (tableau 1). Par contre, bien que ce soit la seule distinction supportée par des critères autres que la taille (voir la revue de littérature), nous n'avons pas pu séparer significativement nos valeurs de Suède de celles d'Europe centrale, peut-être parce que nos valeurs de Suède proviennent de la partie sud de ce pays.

Très grande taille	Iles méditerranéennes	- *M. n. boccamela* 1,2,3,4,5,6,7
		- *M. n. corsicana* (Corse) 8,9
Grande taille	Italie et sud de la France	- *M. n. boccamela* 1,2,3,4,5,6,7,8
		- *M. n. italicus* (Italie) 10
Taille moyenne	Péninsule ibérique et ouest de la France	- *M. n. iberica* 1,2,5
		- *M. n. nivalis* 7
		- *M. n. vulgaris* 3,8
	Région du Danube	- *M. n. boccamela* 5
		- *M. n. trettaui* 3,10,11
		- *M. n. nivalis* 7
Petite taille (avec plus ou moins grande variation)	Europe centrale et du nord	- *M. n. nivalis* 1,2,3,4,5,10,11,12,13,14,19
		- *M. n. vulgaris* 3,10,11,12,13,14,19
		- *M. n. pygmae* 4,5
		- *M. n. minuta* 3,11,15,16,17,18

Tableau 1.

Gradient de taille pour la belette avec régions correspondantes et sous-espèces mentionnées dans la littérature. *1* Miller (1912), *2* Ellerman & Morrison-Scott (1951), *3* Reichstein (1957), *4* Beaucournu & Grulich (1968), *5* Kratochvil (1977b), *6* Frechkop (1963), *7* Corbet (1978), *8* Saint Girons (1973), *9* Cheylan (1988), *10* Douma-Petridou & Ondrias (1987), *11* Zimmermann (1940), *12* Ognev (1962), *13* Stolt (1979), *14* Frank (1985), *15* Gaffrey (1940), *16* Haltenorth (1950), *17* Kahmann (1951, 1952), *18* Bauer & Rokitansky (1957), *19* King (1989a).

Un recouvrement important des valeurs de taille est à nouveau observé (Figure 2), suggérant que l'on est plutôt en présence de clines, en accord avec l'opinion de Beaucournu & Grulich (1968). On relèvera que peu de travaux sont basés sur l'examen de matériel (à l'échelle européenne: Miller 1912 et Reichstein 1957); le matériel du sud des Alpes a, par exemple, totalement été négligé jusqu'ici. Comme Cheylan (1988), on regrettera le manque d'études génétiques limitées pour l'instant à quelques problèmes du nord de l'Europe (Mandhal & Fredga 1980). Ainsi, par exemple, décider si la boccamele, *M. n. boccamela*, doit être spécifiquement distinguée de la belette n'est pas possible pour l'instant.

(b) *Le cas de la belette naine*

La plupart des critères utilisés pour définir la belette naine, crête sagittale et allure globuleuse du crâne, dépendent de l'âge; lors de nos examens de matériel dans les musées européens, nous n'avons trouvé parmi les crânes portant la mention «*Mustela minuta*» que des crânes de belette ordinaire, ou des crânes présentant des caractéristiques juvéniles typiques. Même le critère de la taille, caractéristique première de la belette naine, ne semble pas être utilisable: «Au sud, *M. minuta* augmente en taille jusqu'à dépasser la belette ordinaire» (Kahmann 1952). Nous rejoindrons donc les nombreux auteurs qui concluent à l'inexistence de cette forme (voir la revue de littérature) en pensant que l'idée de l'existence d'une belette naine est due au dimorphisme sexuel important, à la grande variation de taille, à la possibilité de reproduction durant la première année (Corbet 1966), et à l'existence possible d'individus nés tard dans l'année et ayant encore une petite taille à l'arrivée de l'hiver (King 1989a).

Nous ne pouvons pas commenter l'opinion des auteurs qui incluent les belettes de petite taille du centre de l'Europe avec la possible sous-espèce du nord, *M. n. nivalis*, car la distinction est basée sur des critères que nous n'avons pas étudiés (pelage et reproduction). GÜTTINGER & MÜLLER (1988) ont montré que les deux types de pigmentation sont présents dans les Alpes.

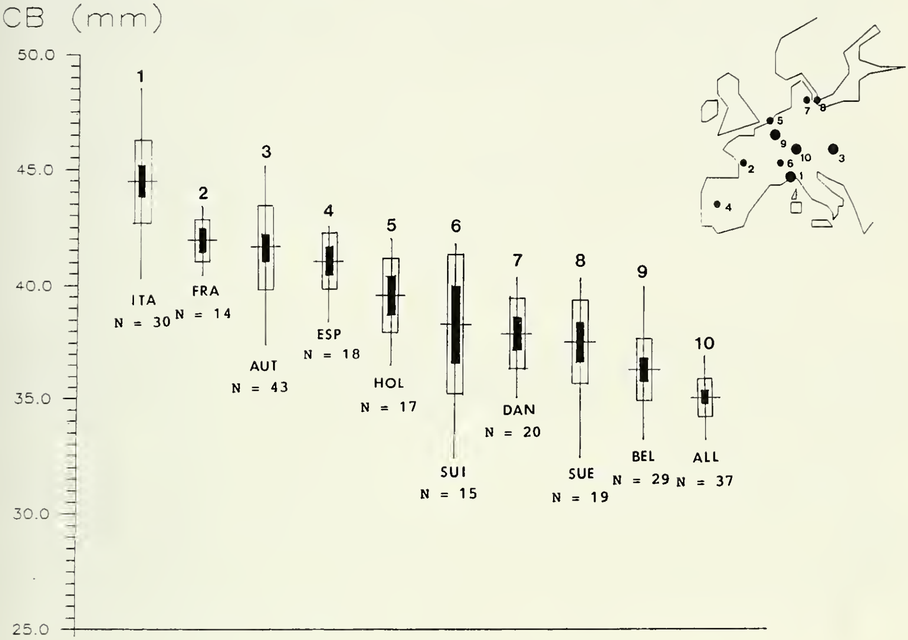

FIG. 2.

Comparaison de 10 populations européennes de belettes. 1. ITA = Italie (environs de Genova). 2. FRA = France (environs de La Rochelle). 3. AUT = Autriche (environs de Wien). 4. ESP = Espagne (environs de Salamanca).5. HOLL = Hollande (environs de Amsterdam). 6. SUI = Suisse (environs de Lausanne). 7. DAN = Danemark (environs de Kalundborg). 8. SUE = Suède (environs de Malmö). 9. BEL = Belgique (environs de Liège). 10. ALL = Allemagne (environs de Stuttgart). Ligne horizontale: moyenne; ligne verticale fine: étendue de la variation; ligne verticale noire large: intervalle de confiance sur la moyenne; ligne verticale blanche large: écart-type.

CONCLUSION

Une revue de littérature approfondie et une étude de la variation de taille amènent les constatations suivantes:

La variation de taille des deux espèces est grande et les différences de taille à la base des distinctions taxonomiques ont pu être confirmées dans la majorité des cas. Cependant, les remarques suivantes doivent être faites:

1. Le recouvrement des valeurs de taille est grand.
2. Peu de travaux ont été basés sur l'examen de matériel. Les populations faisant l'objet de distinction taxonomique n'ont que peu ou pas été étudiées.

3. La taille est le seul critère utilisé pour distinguer les sous-espèces (à l'exception d'une distinction chez *M. nivalis*).
4. La taille est contrôlée par différents facteurs. On peut citer: température et par conséquent latitude et altitude (ROSENZWEIG 1968, RALLS & HARVEY 1985), taille des proies (McNAB 1971, ERLINGE 1987, GÜTTINGER & MÜLLER 1989), écologie (SANDELL 1989) et histoire (KRATOCHVIL 1977b). L'influence de la présence d'un compétiteur est mentionnée par ROSENZWEIG (1966, 1968) et McNAB (1971) mais n'a pas été confirmée par RALLS & HARVEY (1985). Ces facteurs et leur importance relative ont été largement présentés par KING (1989b).

Ainsi, dans l'état actuel des connaissances, et comme la taille ne paraît pas être un critère adéquat pour définir une sous-espèce, il nous semble difficile de soutenir les distinctions établies. Dans l'attente d'études nouvelles, nous proposons de conserver une sous-espèce d'hermine et une (voire 2) sous-espèce(s) de belette uniquement.

RÉSUMÉ

La taxonomie de l'hermine et de la belette pose problème depuis longtemps. La variation de taille des deux espèces est grande et de nombreuses sous-espèces, presque exclusivement définies sur des critères de taille, ont été proposées. A la suite d'une étude de la variation de taille de ces deux espèces en Europe continentale, nous avons jugé utile de présenter un résumé de la littérature qui traite de ce problème et de la commenter en fonction de nos résultats.

Les différences de taille qui ont donné lieu à des différenciations taxonomiques ont été confirmées dans la majorité des cas; cependant, le recouvrement des mesures est important. On relève le peu de travaux basés sur l'examen de matériel et le fait que la taille est soumise à différentes pressions (écologiques, climatiques et historiques). Ainsi, dans l'état actuel des connaissances, il est difficile de soutenir les distinctions taxonomiques établies.

REMERCIEMENTS

Nous tenons à remercier toutes les personnes qui ont participé à l'élaboration de notre manuscrit, tout particulièrement le Dr J.M. Weber de ses précieux commentaires.

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Revue suisse Zool. | Tome 99 | Fasc. 1 | p. 119-124 | Genève, mars 1992

Notes sur les Coléoptères Scarabaeoidea du Muséum de Genève. V

par

Renaud PAULIAN *

ABSTRACT

Notes on Coleoptera Scarabaeoidea of the Geneva Museum. V. Three new species of *Madrasostes* (Ceratocanthidae) from Sumatra, and three new species of *Panelus* (Scarabaeidae) from the Oriental Region are described.

INTRODUCTION

Les récoltes de MM. Löbl et Burckhardt à Sumatra en 1989 apportent une contribution précieuse à la connaissance des Ceratocanthides de cette île. Jusqu'ici, en effet, on ne connaissait que douze espèces de la famille, dont sept appartenaient au seul genre *Eusphaeropeltis*, à brillante coloration métallique et qui vivaient sans doute sur le feuillage.

Le matériel devant nous renferme six espèces dont cinq, appartenant au seul genre *Madrasostes* n'étaient pas encore connues de Sumatra. De ces espèces trois sont nouvelles pour la Science. Il s'agit d'espèces de coloration noire, vivant dans la litière des sols forestiers. Leur découverte porte à vingt-cinq le nombre d'espèces de *Madrasostes* connues à ce jour de l'Asie des Moussons.

Ces récoltes, qui complètent si bien de récentes récoltes des mêmes chercheurs à Bornéo, montrent que la faune indonésienne de Cératocanthides est encore très incomplètement connue et peut laisser espérer encore bien des découvertes.

CÉRATOCANTHIDES DE SUMATRA

Madrasostes variolosum (Harold, 1874)

SUMATRA: Aceh, Mt. Leuser NP, 300 m, Kitambe, 23-90.XI.1989. – Espèce connue de Malaisie et de Sumatra.

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* Les Hespérides Saint Christoly, 4, rue Beaubadat, F-33000 Bordeaux.

Madrasostes boucomonti R. Paulian, 1976

SUMATRA; Aceh, Mt. Leuser NP, 300 m, Kitambe, 23-30.XI.1989. – Espèce décrite de Malaisie.

Madrasostes sculpturatum R. Paulian, 1989

SUMATRA, Aceh, Mt. Leuser NP, 300 m, Kitambé, 23-30.XI.1989. – Espèce décrite de Bornéo, Sabah.

Madrasostes depressum nov. sp.

Holotype: un ex., sexe non vérifié: SUMATRA Ouest, Panti, 250 m, 19.XI.1989 (Agosti, Löbl et Burckhardt). Muséum de Genève. Long. déroulé: 6 mm. – Corps noir, convexe, large.

Tête régulièrement convexe, assez large. Clypéus en très large ogive surbaissée, à bord finement crénelé, dent médiane obtuse, angle externe très obtus. Surface à points ocellés moyens, assez serrés, ronds en arrière, un peu transverses en avant; l'espace entre les points relevé en bourrelets granuliformes; un court et assez fort cal longitudinal sur le milieu du front.

Pronotum très transverse, plus grande largeur au milieu; angles antérieurs tronqués, la saillie externe de la troncature en lobe obtus suivi vers l'arrière par une échancrure; côtés lisses; base à rebord entier, fortement bisinuée, peu saillante vers l'arrière; rebord antérieur entier. Disque déprimé sur les 2/3 postérieurs et avec la trace d'un faible sillon longitudinal médian en avant. Sculpture formée de points ronds, médiocres, ocellés, serrés, les intervalles entre les points irrégulièrement mais plus ou moins relevés en granules forts ou en bourrelets.

Ecusson en triangle à gros points superficiels et serrés.

Elytres un peu déprimés le long de la suture vers la base, avec un léger relief longitudinal médian souligné, vers la base, par quelques granules. Surface uniformément à gros points en fer à cheval ouverts vers l'arrière, serrés, dont les intervalles forment parfois des granules. Pas de stries ou de lignes régulières de points; quelques granules le long du bord externe de l'élytre à l'épaule et, dans la région apicale externe, deux courtes rangées de granules.

La sculpture élytrale et thoracique isole cette espèce dans le genre *Madrasostes*.

Madrasostes inaequale nov. sp.

Holotype: un ex. sexe non vérifié: SUMATRA Ouest: Palopo Nat. Res. N., Bukittinggi, 900 m, 18-20.XI.1989 (Löbl, Agosti et Burckhardt), Muséum de Genève.

Paratypes: vingt-et-un spécimens de même provenance et date, Muséum de Genève et Muséum Nat. Hist. nat. Paris.

Long. 5,25 mm. – Corps noir brillant, en ovale relativement large, convexe, pronotum un peu plus étroit que les élytres.

Tête transverse; clypéus à côtés légèrement convexes en dehors, très faiblement crénelés; angle antérieur marqué mais pas très vif; angle externe arrondi; joues convexes en dehors. Tête avec un léger relief longitudinal médian marqué par des callosités allongées. Partie dorsale des yeux en très étroit croissant. Surface de la tête à grands points ocellés, superficiels, réguliers et serrés, mêlés de quelques granules lisses; un fort granule devant chaque oeil.

Pronotum très transverse; plus grande largeur en arrière du milieu; angles antérieurs tronqués, l'angle externe de la troncature saillant en dehors en dent obtuse; les côtés fortement crénelés en arrière. Base saillante largement en arrière au milieu, sinuée; côtés de la base échancrés en forte courbe; une rangée de callosités lisses, transverses, doublent la base en dessus. Disque avec une trace de sillon longitudinal médian limité par deux lignes longitudinales de petites callosités lisses; une callosité plus forte au second tiers de chaque côté du sillon; le reste de la surface à callosités en gros granules épars, plus nombreux le long du bord antérieur et vers les côtés. Ponctuation à gros points ocellés, superficiels, serrés.

Ecusson arqué et très transverse.

Elytres à trois rangées longitudinales de forts tubercules allongés, lisses, parfois très saillants en lames, la première rangée occupe l'espace juxtasututral; deux rangées de fins granules écartés entre les rangées de tubercules. En dehors de la troisième rangée de tubercules, un large espace porte, peu avant le milieu un fort tubercule allongé, puis, en dehors, une rangée longitudinale de trois tubercules. Ponctuation dense, formée de points ocellés, assez grands, superficiels, serrés, un peu ovalaires et allongés dans le sens des rangées de tubercules sur les espaces internes, plus ronds en dehors.

Tibias antérieurs à deux fortes dents marginales externes obtuses, l'apicale dirigée vers l'avant.

Tibias postérieurs à champ sternal interne à fines et légères lignes longitudinales peu serrées et ramifiées; champ externe à denses lignes obliquement transverses, fines.

Espèce très caractérisée par le relief longitudinal de la tête et par la sculpture hétérodyname des élytres; celle-ci peut cependant s'atténuer, mais elle ne disparaît jamais.

Je rattache à l'espèce un individu de Sumatra Ouest, Pani, 250 m, bien que la sculpture soit un peu différente: sur le pronotum, les granules forment des reliefs irréguliers, en bourrelets plus ou moins longitudinaux.

Madrasostes sumatranum nov. sp.

Holotype, un ex. sexe non vérifié: SUMATRA: Aceh, Mt Leuser NP, 300-500 m, Kitambe, 23-30.XI.1989 Löbl, Agosti et Burckhardt), Muséum de Genève.

Cinq paratypes de même provenance et date, Muséum de Genève et Muséum Nat. d'Hist. nat. de Paris.

Long. 5,5 mm. – Corps noir, assez large, convexe.

Tête transverse, faiblement convexe. Clypéus à côtés presque droits entre l'angle médian bien denté et l'angle externe marqué mais arrondi; bord ondulé; joues à bord externe concave. Ponctuation uniformément à gros points superficiels, ocellés, serrés; les intervalles entre les points relevés en granules formant souvent des bourrelets saillants, plus ou moins longitudinaux.

Pronotum très transverse, plus grande largeur en avant du milieu. Angles antérieurs tronqués presque droit en dehors, l'angle externe de la troncature en nette dent obtuse dirigée vers l'extérieur, suivie, vers l'arrière, d'une forte échancrure. Rebord antérieur en bourrelet simple, fort, entier. Base faiblement et largement saillante en courbe plate vers l'arrière, à rebord entier et assez fin. Disque avec une très légère trace de sillon longitudinal médian; deux grosses callosités ponctuées au milieu du bord antérieur, flanquées, sur les côtés, de quelques petits granules; une rangée transverse de granules, certains en bourrelets, au tiers antérieur: deux grosses callosités ponctuées, plus écartées l'une de l'autre que les antérieures, au second tiers, flanquées de quelques granules; deux petites callosités transverses encadrant le milieu de la base et flanquées de quelques petits granules. Ponctuation à grands points ocellés, superficiels, serrés. Côtés à rebord lisse, doublé d'une ligne de petits granules.

Ecusson triangulaire.

Elytres à neuf rangées longitudinales de tubercules médiocres, plus ou moins cariniformes, sensiblement égaux, plus marqués sur l'arrière de la septième rangée et près de la base de la neuvième. Ponctuation à gros points ocellés, superficiels, assez serrés.

Madrasostes inaequale nov. sp., *M. sumatranum* nov. sp. et *M. depressum* nov. sp., paraissent proches; elles montrent une évolution régulière de la sculpture des élytres; les callosités ponctuées de *M. sumatranum* nov. sp. isolent complètement cette espèce des autres *Madrasostes* connus à ce jour.

Pterothochaetes brevisetosus Gestro, 1899

SUMATRA: Aceh, Mt. Leuser NP, 300-500 m, Kitambe, 23-39.XI.1989 (Löbl, Agosti et Burckhardt). – Espèce connue de Malaisie.

TROIS NOUVEAUX *Panelus* (Scarabeidae) ASIATIQUES

Panelus deuvei nov. sp.

Holotype mâle et trois paratypes: NEPAL Central, 2000 m, vallée de Kathmandou, Nagar Kot, 15.VII.1983 (Th. Deuve et N. Perreau), Muséum Nat. Hist. nat. Paris.

Long. 2,5 mm. – Corps brun – rougeâtre, convexe, luisant, en ovale assez large et très régulier; élytres à soies microscopiques, jaunes; toute la surface lisse, non chagrinée.

Tête à peu près aussi longue que large, bidentée en avant, les dents séparées par une échancrure en U très large; côtés en courbe régulière vers l'angle externe arrondi des joues, juste interrompus par un très faible denticule à la jonction clypéo-génale. Ponctuation fine, régulière et écartée.

Pronotum à angles antérieurs aigus; côtés courtement et fortement élargis, puis en ligne faiblement convexe en dehors jusqu'à la base. Base avec une dépression transverse étroite, limitée par une fine strie. Ponctuation du disque moyenne, régulière, pas très serrée.

Elytres à stries fines, à points très écartés et fins; interstries faiblement convexes, à points très fins, épars et irréguliers.

Tibias antérieurs du mâle à apophyse apicale interne pas très longue, élargie en spatule et tronquée en avant; marge externe crénelée, avec trois dents marginales, l'apicale très forte, la basale très faible, plus écartée de la médiane que ne l'est celle-ci de l'apicale.

Tibias postérieurs très grêles et longs, fortement arqués sur le tiers apical. Premier article des tarses postérieurs beaucoup plus court que le second.

Panelus deuvei nov. sp. rappelle, par la forme du corps, *P. assamensis* Arrow, mais il en diffère par les téguments non chagrinés.

Panelus sabahi nov. sp.

Holotype, sexe non vérifié, un ex. BORNEO, Sabah, Mt. Kinabalu, 1750 m, 27.IV.1987 (Burckhardt et Löbl), Muséum de Genève.

Dix paratypes de la même localité, de 1150 à 1900 m, du 24 au 29.IV.1987 (Burckhardt et Löbl), Muséum de Genève et Muséum Nat. Hist. nat. Paris.

Long. 2 à 2,25 mm. – Corps convexe, en ovale allongé, noir-rougeâtre à pattes plus claires; surface lisse, brillante, sans chagrination. Pubescence caduque, dense, longue et très fine.

Tête plus large que longue, fortement bidentée en avant, les dents légèrement déversées vers l'extérieur, l'échancrure en V très ouvert à sommet un peu arrondi; côtés élargis en ligne droite des dents antérieures au fort denticule clypéo-génal, puis en courbe faiblement convexe en dehors jusqu'aux angles externes, très arrondis, des joues. Ponctuation assez forte, régulière, peu serrée.

Pronotum très transverse; angles antérieurs vifs; côtés élargis en ligne droite ou presque, en dehors, sur le 1/5 antérieur; angle externe très arrondi; côtés ensuite élargis faiblement en ligne droite. Base marquée par une ligne de points médiocres, serrés, dans un faible sillon; milieu de l'aire basilaire nettement déprimé sans ligne de démarcation indiquée par une suture; avec quelques gros points laissant une bande longitudinale médiane lisse; le reste de la surface du disque à assez forte ponctuation régulière, pas très serrée.

Elytres en ovale allongé, plus élargi sur les côtés; interstries à peine convexes, à points médiocres, épars sauf le long des stries où ils tendent à s'aligner; stries fines, finement ponctuées.

Tibias antérieurs arqués, à saillie apicale interne courte et large, tronquée au sommet. Tibias postérieurs courts et arqués. Tarses postérieurs à article I bien plus court que le second.

P. sabahi nov. sp. rsssemble aux *Panelus* du groupe de *P. tonkinenis* R. Paulian, mais en diffère par l'absence de chagrination des téguments.

Je rattache à cette espèce neuf exemplaires de Borneo: Sabah, Crocker Ra, 1700-1800 m,, route Kota Kinabalu, Tambunan, 18.V.1987 et trois exemplaires de Borneo, Sabah, Poring Hot Springs, 500 m, 7.V.1987, tous récoltés par Burckhardt et Löbl et partagés entre le Muséum de Genève et le Muséum Nat. Hist. nat. Paris.

Panelus borneensis nov. sp.

Holotype, un ex. sexe non vérifié, BORNEO, Sabah, Kibongol V., 7 km N. Tambunan, 700 m, 20.IV.1987 (Burckhardt et Löbl), Muséum de Genève.

Long. 2,5 mm. – Corps court, large, convexe, noir luisant à pattes claires, sans trace de chagrination; pubescence à soies jaunes microscopiques.

Tête aussi longue que large, longuement bidentée en avant, les dents séparées par une échancrure en U assez étroite; un net denticule interrompt, à la jonction clypéo-génale, le bord externe de la tête qui est en faible courbe convexe en dehors jusqu'à l'angle externe des joues qui est largement arrondi. Ponctuation fine, régulière, pas très serrée, plus fine vers l'avant, avec de plus gros points au bord interne des yeux.

Pronotum très transverse, très convexe, à angles antérieurs vifs, côtés fortement élargis en dehors sur le 1/5 antérieur, puis rectilignes et parallèles jusqu'à la base. Base marquée, sur les côtés par une ligne de points assez gros; aire médiane basilaire définie par une strie transverse arquée, à surface à gros points peu distincts; le reste du disque à ponctuation moyenne, régulière, assez serrée.

Elytres: un peu plus larges que le pronotum à la base, nettement élargis vers le milieu; stries fines, à points très fins et très écartés. Interstries convexes faiblement, à points très fins et épars mais montrant une tendance à se regrouper en lignes le long de stries.

P. borneensis nov. sp., qui, par sa forme, rappelle le *Paelus orousseti* R. Paulian des Philippines, est bien distinct de la plupart des *Panelus*. Les élytres sont fortement élargis et courts; les téguments sont parfaitement lisses entre les points. L'holotype unique ne permet pas de vérifier si la faible courbure des tibias postérieurs est un caractère sexuel ou, au contraire, un caractère spécifique. Le premier article des tarses postérieurs n'est que de peu plus court que le second article.

Revue suisse Zool.	Tome 99	Fasc. 1	p. 125-145	Genève, mars 1992

Aleocharinae nepalesi del Museo di Ginevra Parte VI: Myrmedoniini (Coleoptera, Staphylinidae)

(112° Contributo alla conoscenza delle Aleocharinae)

di

Roberto PACE *

Con 50 figure

Abstract

Aleocharinae from Nepal in the Geneva Museum. Part VI: Myrmedoniini. (112th Contribution to the knowledge of Aleocharinae). – The author records 27 different species of tribe Myrmedoniini collected in recent years to Nepal most of which are preserved in the Geneva Museum. The collection comprises 15 species which are described as new and includes the first known micropterous species of the genus *Tetrabothrus* Cameron.

INTRODUZIONE

Nel corso delle loro spedizioni entomologiche in Nepal, il Dr. Ivan Löbl del Museo di Storia Naturale di Ginevra e il Dr. Ales Smetana noto studioso di Staphylinidae, hanno raccolto tra l'altro, oltre alle specie della sottofamiglia Aleocharinae pubblicate nei miei precedenti cinque contributi, anche una piccola serie di specie appartenenti alla tribù Myrmedoniini (= Zyrasini), pure della sottofamiglia Aleocharinae.

Se le numerose specie della tribù Athetini, precedentemente trattata, sono di origine paleartica, le specie della tribù Myrmedoniini al contrario, prevalentemente appartengono alla Regione Orientale, anche perché prediligono il clima tropicale.

Gli holotypi delle nuove specie si conservano nel Museo di Storia Naturale di Ginevra (MHNG), nel British Museum (Natural History) (BM) e in collezione Franz (CFR). Paratypi si conservano nelle medesime collezioni, nel Museo Nazionale di Storia Naturale di Parigi (MNP) e nella mia collezione (CPA).

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* Via Vittorio Veneto, 13 – 37032 Monteforte d'Alpone (Verona), Italia.

ELENCO DELLE SPECIE

Amaurodera veluticollis (Motschulsky, 1858)

Falagria veluticollis Motschulsky, 1858: 261
Amaurodera veluticollis: Fauvel, 1905: 143; Cameron, 1939: 456

5 es., Nepal, Khandbari, distr., Arun River at Num, 1500-1600 m, 12.IX.1983 (Smetana & Löbl leg., MHNG, CPA).

Specie diffusa solo nell'India settentrionale e in Nepal.

Amaurodera opacicollis (Eppelsheim, 1895)

Astilbus opacicollis Eppelsheim, 1895: 385
Amaurodera opacicollis: Fauvel, 1905: 143; Cameron, 1939: 454

2 ♀♀, Nepal, Khandbari distr., for. above Ahale, 2400 m, 25.III. 1982, (A. & Z. Smetana leg., MHNG); 13 es., Nepal, Prov. Bagmati, 2900 m, 14-16-18.IV.1981, (Löbl & Smetana leg., MHNG, CPA); 6 es., Prov. Bagmati, Phulchauki, 2500 m, 10+V.1981, (Löbl leg., MHNG); 2 es., Prov. Bagmati, Tarke Ghyang, 2650 m, 19.IV.1981, (Löbl & Smetana leg., MHNG).

Specie del Sikkim, nuova per il Nepal.

Amaurodera bomfordi (Eppelsheim, 1890)

Drusilla bomfordi Eppelsheim, 1890: 273
Amaurodera bomfordi: Cameron, 1939: 453

9 es., Nepal, Khandbari distr., Arun River at Num, 1500 m, 10.IV.1982, (Löbl & Smetana leg., MHNG, CPA); 2 ♀♀, Khandbari distr., for. above Ahale, 2400 m, 25.III.1982, (A. & Z. Smetana leg., MHNG); 1 es., Nepal, Lalitpur distr., 2 Km S Godawari, 1700 m, 12.IX.1983, (Smetana & Löbl leg., MHNG); 1 es., Kathmandu distr., Phulcoki, 2650 m, 22.IV.1982, (A. & Z. Smetana leg., MHNG).

Specie diffusa anche nell'India settentrionale.

Amaurodera soror Cameron, 1939

Amaurodera soror Cameron, 1939: 455

1 ♀, Nepal, Prov. Bagmati, 4 Km S Tarang Marang, 900 m, 23.IV.1981, 'Löbl & Smetana leg., MHNG).

Specie nota dell'India settentrionale.

Amaurodera silvana sp. n. (figg. 1-3)

Amaurodera smetanai sp. n. (figg. 4-7)

Amaurodera loebli sp. n. (figg. 8-11)

Drusilla obliqua (Bernhauer, 1916), **comb. n.**

Astilbus obliquus Bernhauer, 1916: 427; Cameron, 1939: 470

1 ♂, Nepal, Prov. Bagmati, Gokana, for. nr. Kathmandu, 1400 m, 31.III.1981, (Löbl & Smetana leg., MHNG); 3 ♂♂ e 1 ♀, Nepal, Khandbari distr., 1700 m, 23.III.1982, (A. & Z. Smetana leg., MHNG, CPA). Esemplari comparati con i tipi.

Specie diffusa dall'India alla Birmania.

Drusilla kathmanduensis sp. n. (figg. 12-14)

Drusilla franzi sp. n. (figg. 15-17)

Drusilla smetanai sp. n. (figg. 18-19)

Drusilla nepalensis sp. n. (figg. 20-21)

Orphnebius (s. str.) **hauseri** Eppelsheim, 1895, (figg. 22-25)

Orphnebius hauseri Eppelsheim, 1895: 54

7 es., Nepal, Khandbari distr., "Bakan" W of Tashigaon, 3250 m, 4.IV.1982, (A. & Z. Smetana leg., MHNG, CPA); 5 es., Khandbari distr., above Sheduwa, 3000 m, 9.IV.1982, (A. & Z. Smetana leg., MHNG, CPA); 10 es., Nepal, Prov. Bagmati, Malemchi, 2800 m, 14.IV.1981, (Löbl & Smetana leg., MHNG); 5 es., Prov. Bagmati, Pokhare, 2800 m, 2.V.1981, (Löbl & Smetana leg., MHNG); 1 es., Prov. Bagmati, Gokana, for. nr. Kathmandu, 1400 m, 1.IV.1981, (Löbl & Smetana leg., MHNG); 2 es., Prov. Bagmati, above Shermathang, 2900 m, 26.IV.1981, (Löbl & Smetana leg., MHNG); 3 es., Prov. Bagmati, Kutumsang, 2200-2400 m, 6.IV.1981, (Löbl & Smetana leg., MHNG); 1 es., Prov. Bagmati, below Tarke Ghyang, 2600 m, 25.IV.1981, (Löbl & Smetana leg., MHNG); 2 ♀♀, Nepal, Mustang distr., 2550 m, 2.X.1983, (Smetana & Löbl leg., MHNG).

Specie diffusa anche nell'India settentrionale.

Orphnebius (s. str.) *newar* sp. n. (figg. 26-27)

Orphnebius (s. str.) *loebli* sp. n. (figg. 28-30)

Tetrabothrus laticornis (Wasmann, 1896), (figg. 31-32)

Orphnebius laticornis Wasmann, 1896: 624
Tetrabothrus laticornis: Cameron, 1939: 459

1 ♀, Nepal, Khandbari distr., above Tashigaon, 3100 m, 8.IV.1982, (A. & Z. Smetana leg., MHNG).

Specie finora nota solo del vicino Bengala. Nuova per il Nepal.

Tetrabothrus nepalensis sp. n. (figg. 33-36)

Tetrabothrus micropterus sp. n. (figg. 37-40)

Zyras (s. str.) **ruficauda** Cameron, 1939

Zyras (s. str.) *ruficauda* Cameron, 1939: 543

1 ♂ e 1 ♀, Nepal, Prov. Bagmati, Pokhare, NE Barahbise, 2800 m, 2.V.1981, (Löbl & Smetana leg., MHNG, CPA); 2 es., Prov. Bagmati, Dobate Ridge, 2700 m, 2.V.1981, (Löbl & Smetana leg., MHNG); 2 es., Nepal, Parbat distr., Ghoropani Pass, N slope, 2700 m, 6.X.1983, (Smetana & Löbl leg., MHNG, CPA). Esemplari comparati con l'holotypus ♀ che ha il capo rosicchiato da Antreni o simili.

Specie diffusa anche nell'India settentrionale.

Zyras (s. str.) **perforatus** (Champion, 1921)

Myrmedonia (Zyras) perforatus Champion, 1921: 178
Zyras (s. str.) *perforatus*: Cameron, 1939: 535

3 es., Nepal; Prov. Bagmati, Pokhare, NE Barahbise, 2700 m, 2.VI.1981, (Löbl & Smetana leg., MHNG, CPA).

Specie finora nota solo dell'India.

Zyras (s. str.) **pindarae** (Champion, 1921)

Myrmedonia (Zyras) pindarae Champion, 1921: 179
Zyras (s. str.) *pindarae*: Cameron, 1939: 542

1 ♂, Nepal, Prov. Bagmati, Malemchi, 2800 m, 14.IV.1981, (Löbl & Smetana leg., MHNG); 1 ♂ e 1 ♀, Prov. Bagmati, Dobate Ridge, NE Barhabise, 2800 m, 3.V.1981, (Löbl & Smetana leg., MHNG, CPA); 1 ♂, Nepal, Lalitpur distr., Phulcoki, 2650 m, 13.X.1983, (Smetana & Löbl leg., MHNG); 1 es., Nepal, Parbat distr., Ghoropani Pass, N slope, 2700 m, 6.X.1983, (Smetana & Löbl leg., MHNG); 1 ♂, Zentralnepal, Shermathang Malemche Bridge, (Franz leg., CFR).

Specie finora nota solo dell'India settentrionale.

Zyras (s. str.) **hirsutiventris** (Champion, 1927)

Myrmedonia (Zyras) hirsutiventris Champion, 1927: 245
Zyras (s. str.) *hirsutiventris*: Cameron, 1939: 542

1 ♂, Nepal, Khandbari distr., Arun River at Num, 1500-1600 m, (A. & Z. Smetana leg., MHNG).

Specie già nota solo dell'India.

Zyras (s. str.) **condignus** Last, 1969

Zyras (s. str.) *distinctus* Cameron, 1939: 540
Zyras condignus Last, 1969: 279

1 ♂ e 2 ♀♀, Nepal, Prov. Bagmati, Phulchauki, nr. Kathamandu, 1700 m, 10.V.1981, (Löbl leg., MHNG, CPA); 1 ♂ e 1 ♀, Prov. Bagmati, Nagarjung, for. nr. Kathmandu, 1650 m, 2.IV.1981, (Löbl & Smetana leg., MHNG); 1 ♀, Nepal, Khandbari distr., above Sheduwa, 3000 m, 2.IV.1982 (A. & Z. Smetana leg., MHNG).

Specie finora nota solo dell'India.

Zyras (s. str.) *pallipes* sp. n. (figg. 41-43)

Zyras (s. str.) *britannorum* sp. n. (figg. 44-45)

Zyras (s. str.) *manjushri* sp. n. (figg. 46-47)

Zyras (Rhynchodonia) nepalensis sp. n. (figg. 48-50)

DESCRIZIONI

Amaurodera silvana sp. n. (figg. 1-3)

TIPO. Holotypus ♂, Nepal, Manang distr., for. W Bagarchhap, 2200 m, 21.IX.1983, (Smetana & Löbl leg., MHNG).

DESCRIZIONE. Lungh. 6,5 mm. Capo ed elitre debolmente opachi, pronoto molto opaco, d'aspetto vellutato, addome lucidissimo. Corpo bruno; addome bruno-rossiccio; antenne rossicce, ma gradualmente giallo-rossicce dal settimo antennomero; zampe brune con tarsi rossicci. La reticolazione del capo è vigorosa, d'aspetto poco vellutato, quella del pronoto è vigorosa e d'aspetto nettamente vellutato, quella delle elitre è vigorosissima, ma d'aspetto poco vellutato. Il sesto urotergo libero del maschio è coperto di tubercoli assai salienti e ha il margine posteriore profondamente dentellato. Edeago figg. 2-3.

Comparazioni. Specie apparentemente simile ad *A. veluticollis* (Motschulsky, 1858), anche per la forma dell'edeago. Tuttavia la nuova specie ha la lama sternale dell'edeago in visione ventrale, priva di espansioni laterali, presenti invece in *veluticollis* e il profilo ventrale della stessa lama sternale dell'edeago della nuova specie, è più accentuatamente sinuoso, rispetto quello di *veluticollis*.

Amaurodera smetanai sp. n. (figg. 4-7)

Tipi. Holotypus ♂, Nepal, Khandbari distr., Arun River at Num, 1500-1600 m, 10.IV.1982, (A. & Z. Smetana leg., MHNG).
Paratypi: 8 es., stessa provenienza, (MHNG, CPA).

Descrizione. Lungh. 4,0 mm. Corpo rossiccio e lucido: solo il pronoto è opaco, d'aspetto vellutato; uriti liberi terzo, quarto e quinto bruno-rossicci; antenne rossicce con antennomero basale giallo; zampe gialle con ginocchia mediane e posteriori bruno-rossicce e tibie rossicce. La superficie del capo, delle elitre e dell'addome è priva di microscultura reticolare. La reticolazione del pronoto è nettissima. Edeago figg. 5-6, spermateca fig. 7.

Etimologia. Specie dedicata al Dr. Ales Smetana, uno dei suoi raccoglitori e noto studioso di Staphylinidae.

Comparazioni. Per la forma dell'edeago e della spermateca, la nuova specie sembra affine ad *A. kraepelini* Fauvel, 1905, di Giava. Tuttavia la spermateca di *kraepelini* presenta una netta introflessione apicale del bulbo distale e il pronoto e il capo sono meno larghi in *kraepelini*, con aspetto pertanto più slanciato rispetto quelli di *smetanai* sp. n. L'edeago di *kraepelini* non è noto, perché la specie è nota su sole femmine.

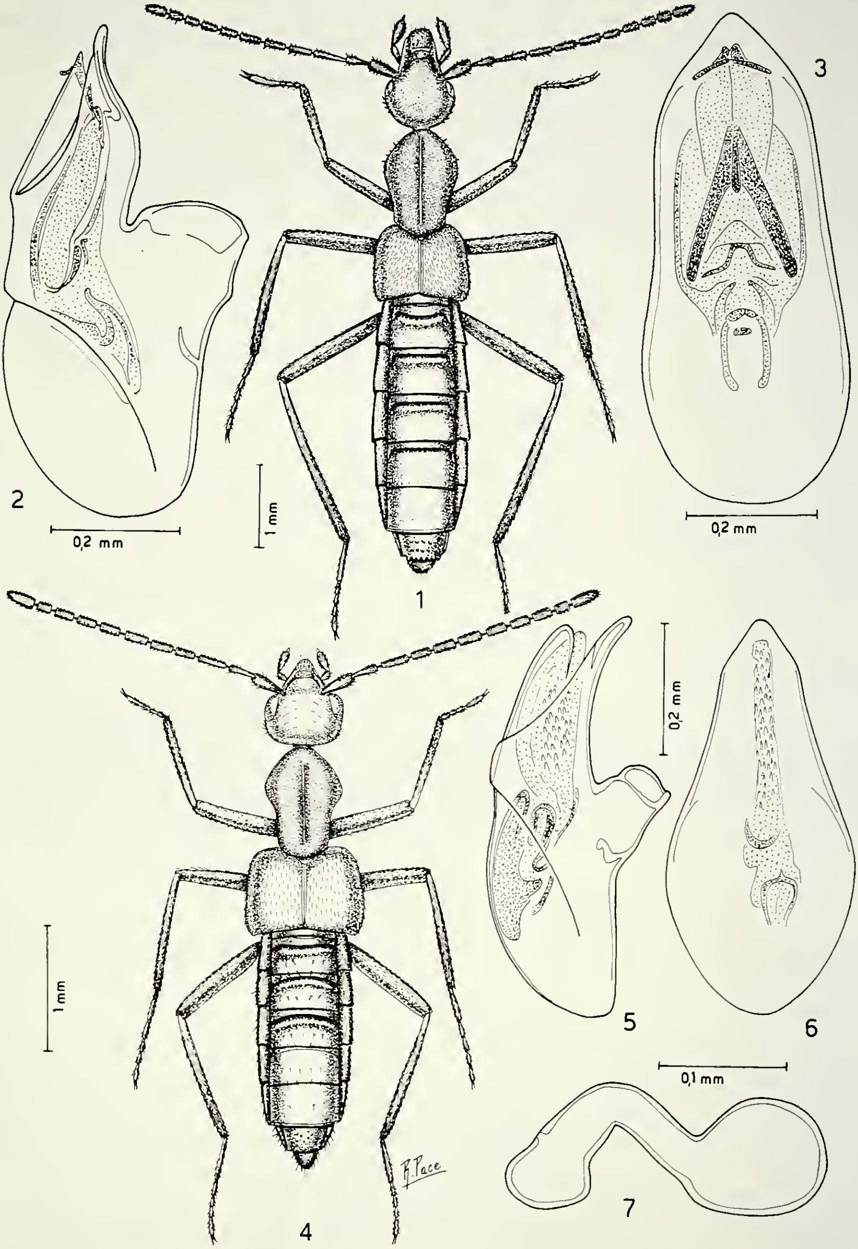
Amaurodera loebli sp. n. (figg. 8-11)

Tipi. Holotypus ♂, Nepal, Manang distr., for. W Bagarchhap, 2200 m, 22.IX.1983, (Smetana & Löbl leg., MHNG).
Paratypi: 10 es., stessa provenienza, (MHNG, CPA).

Descrizione. Lungh. 5,4 mm. Capo ed elitre opachi, ma senza aspetto di velluto; pronoto molto opaco con aspetto di velluto; addome lucidissimo. Corpo bruno-rossiccio; pronoto nero-bruno; antenne bruno-rossicce con antennomeri 9, 10 e 11 giallo-rossicci; zampe bruno-rossicce con tarsi rossicci. L'avancorpo è coperto di reticolazione vigorosa, l'addome è privo di reticolazione. Il sesto urotergo libero del maschio è coperto di reticolazione vigorosa e di tubercoli molto salienti. Edeago figg. 9-10, spermateca fig. 11.

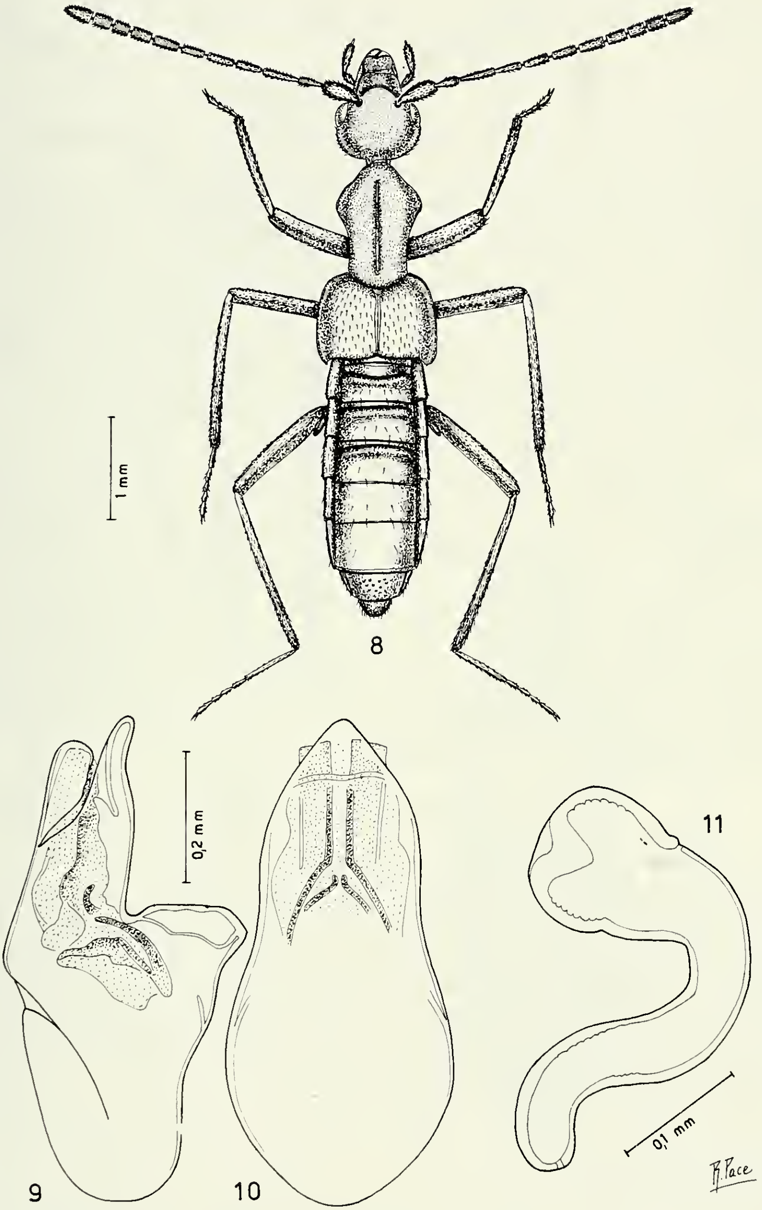
Etimologia. Specie dedicata a uno dei suoi raccoglitori, il Dr. Ivan Löbl del Museo di Storia Naturale di Ginevra.

Comparazioni. Specie affine ad *A. birmana* Pace, 1984, per la forma dell'edeago e della spermateca. Tuttavia la nuova specie presenta capo nettamente trasverso, largo quanto il pronoto e non distintamente più stretto come in *birmana*; la “crista apicalis”



FIGG. 1-7.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 1-3: *Amaurodera silvana* sp. n. Figg. 4-7: *Amaurodera smetanai* sp. n.



FIGG. 8-11.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 8-11: *Amaurodera loebli* sp. n.

dell'edeago della nuova specie è molto più sviluppata in lunghezza e la spermateca è più allungata e l'introflessione apicale del suo bulbo distale, nettamente più corta.

Drusilla kathmanduensis sp. n. (figg. 12-14)

TIPO. Holotypus ♂, Nepal, Kathmandu, British Embassy, 20.V.23.VI.1983; (Brendell leg., BM).

DESCRIZIONE. Lungh. 4,8 mm. Corpo lucidissimo e giallo-rossiccio; capo, elitre e quinto urite libero, bruno-rossicci; antenne rossicce; zampe giallo-rossicce. Il disco del capo è appiattito e coperto di reticolazione netta d'aspetto di velluto; al di fuori di quest'area vi è una reticolazione svanita con tubercoletti distinti. Due tubercoli salienti stanno posteriormente e ai margini dell'area discale opaca. Il pronoto presenta un largo solco mediano e a ciascun lato una profonda depressione; esso è coperto di tubercoletti nettamente salienti ed è privo di reticolazione. Le elitre mostrano una superficie a reticolazione svanita e a tubercoletti distinti. Gli uroterghi sono coperti di reticolazione a maglie trasverse e lievemente svanite e di fini tubercoletti. Edeago figg. 13-14.

COMPARAZIONI. *D. kathmanduensis* sp. n. si colloca sistematicamente tra le specie affini *D. bituberculata* (Motschulsky, 1858), delle Birmania, e *D. flavicornis* (Motschulsky, 1858), dell'India Orientale. La nuova specie differisce dalla prima per l'impressione mediana del pronoto del maschio, più protratta in avanti e non allargata posteriormente fino a toccare la base del pronoto stesso, per le appendici ventrali dell'edeago molto più lunghe e non appena sviluppate come in *bituberculata*, e per il colore uniformemente rossiccio delle antenne e non nericcio con base rossiccia come in *bituberculata*.

La nuova specie differisce anche da *D. flavicornis* per il minore sviluppo degli occhi, per il maggiore sviluppo dell'impressione mediana del pronoto del maschio, per l'edeago non bruscamente ristretto nella regione preapicale, in visione ventrale, e non profondamente inciso nella regione delle "crista apicalis" in visione laterale, (profondamente inciso in *flavicornis*).

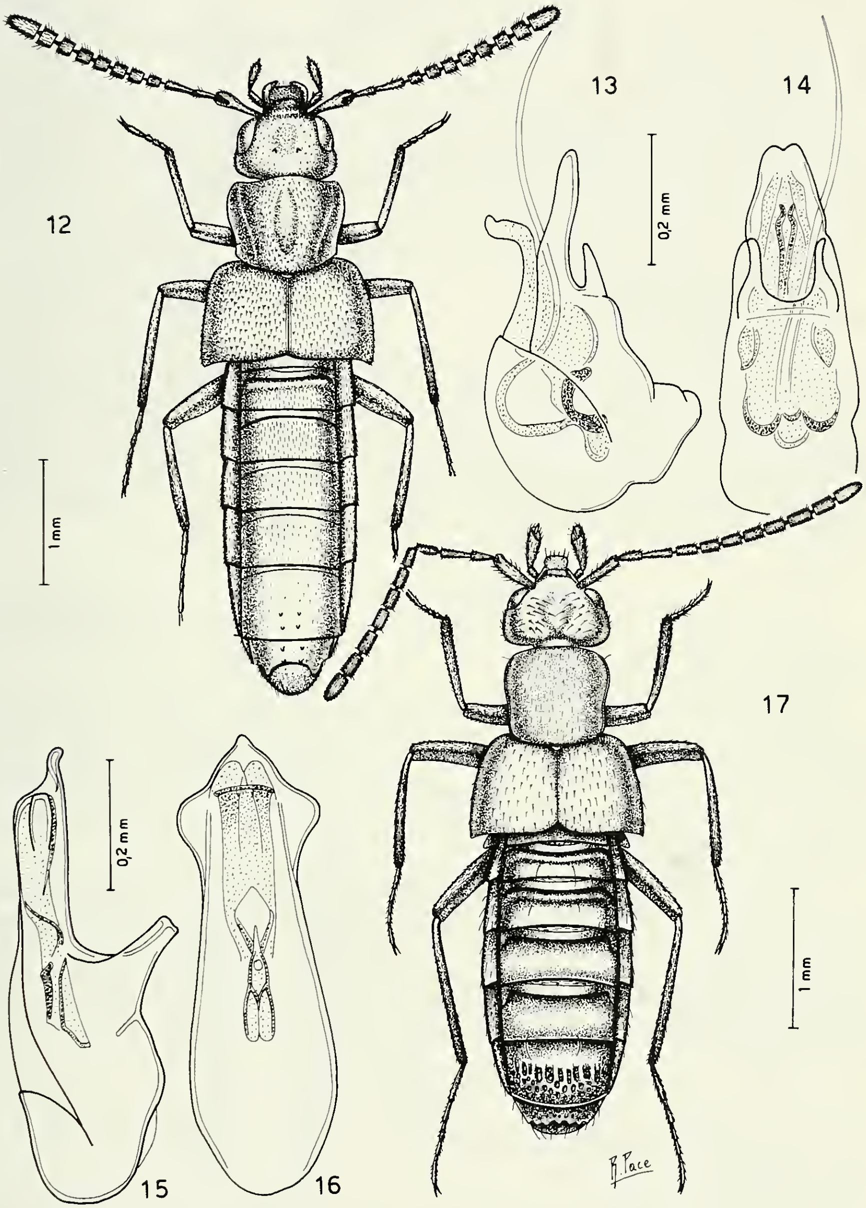
Drusilla franzi sp. n. (figg. 15-17)

TIPO. Holotypus ♂, Nepal, Umg. Dhumpus, b. Pokhara, (Franz leg., CFR).

DESCRIZIONE. Lungh. 4,2 mm. Corpo lucidissimo, solo il pronoto è opaco per presenza di reticolazione vigorosa. Capo, pronoto ed elitre rossicci; addome giallo-rossiccio con estremità rossiccia; zampe e antenne giallo-rossicce. I tubercoletti del capo sono fini e ben salienti e la reticolazione del fondo è finissima e assente in avanti. Le maglie di reticolazione delle superficie del pronoto sono vigorose e danno un aspetto vellutato alla superficie. I tubercoletti delle elitre sono fini e assai distinti, su un fondo lucido, non reticolato. Uroterghi pressoché glabri. Il quinto urotergo libero del maschio è fortemente concavo, sicché il margine posteriore risulta sollevato.

ETIMOLOGIA. Specie dedicata al suo raccoglitore, il Dr. Prof. Herbert Franz, noto specialista austriaco di Scydmaenidae.

COMPARAZIONI. Specie simile a *D. rubricollis* (Cameron, 1939), **comb. n.**, ("olim" *Astilbus rubricollis* Cameron, 1939: 468), dell'India, ma ben distinta per gli occhi meno sviluppati, per gli antennomeri 4 a 10 più slanciati e per l'edeago che nella nuova specie è molto largamente ricurvo al lato ventrale, con regione della "crista apicalis" molto protratta (carattere, questo, assente nell'edeago di *rubricollis*) e per le espansioni laterali dell'edeago stesso, largamente arrotondate, e non ad angolo come in *rubricollis*.



FIGG. 12-17.

Habitus ed edeago in visione laterale e ventrale. Figg. 12-14: *Drusilla kathmanduensis* sp. n. Figg. 15-17: *Drusilla franzi* sp. n.

Drusilla smetanai sp. n. (figg. 18-19)

Tipo. Holotypus ♀, Nepal, Khandbari distr., below Sheduwa, 2100-2350 m, 9.IV.1982, (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 6,0 mm. Corpo lucidissimo; capo e pronoto bruni; elitre e addome giallo-rossicci; angoli esterni posteriori delle elitre, sfumati di bruno; uriti liberi quarto e quinto bruno-rossicci; antenne brune con i due antennomeri basali e la base del terzo, bruno-rossicci; zampe gialle. Il capo e l'addome sono privi di reticolazione; la reticolazione del pronoto è distinta, quella delle elitre è netta. Il capo presenta punteggiatura svanita, il pronoto e le elitre punteggiatura netta. Spermateca fig. 19.

Etimologia. Specie dedicata a uno dei suoi raccoglitori, il Dr. Ales Smetana, noto studioso di Staphylinidae.

Comparazioni. La nuova specie è esternamente simile a *D. assamensis* (Cameron, 1939), comb. n. ("olim" *Astilbus assamensis* Cameron, 1939: 471), dell'Assam e della Birmania. *D. smetanai* sp. n. è da essa distinta per la presenza di un'impressione a ciascun lato del pronoto (assente in *assamensis*) e per la presenza di punteggiatura netta anche sulla metà anteriore del pronoto stesso (assai svanita in *assamensis*). La spermateca della nuova specie ha dimensioni molto minori e a forma di S raccolta e non a forma di S molto allungata e di dimensione maggiore come in *assamensis*.

Drusilla nepalensis sp. n. (figg. 20-21)

Tipo. Holotypus ♀, Nepal, Bakhri Kharka, 5500 ft., 24.IV.1954, British Museum Nepal Expedition 1954, (J. Quinlan leg., BM).

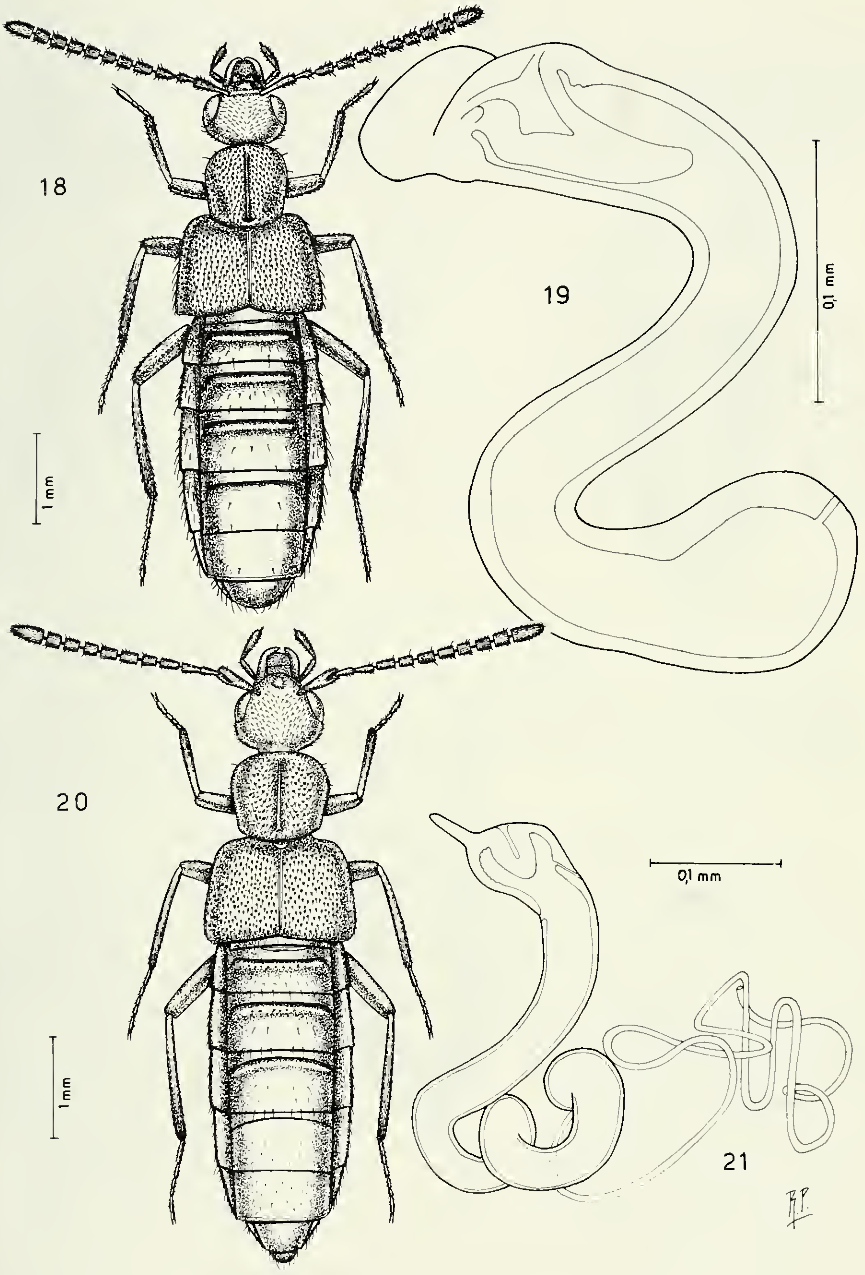
Descrizione. Lungh. 6,0 mm. Corpo lucido; capo e pronoto neri; elitre gialle con metà posteriore sfumata di bruno-rossiccio; addome bruno-rossiccio con estremità rossiccia; antenne rossicce con i due antennomeri basali giallo-rossicci; zampe gialle. Il capo è privo di reticolazione e ha punteggiatura netta e un tubercolo tra le antenne. Le elitre e il pronoto presentano punteggiatura netta e reticolazione svanita sul pronoto e distinta sulle elitre. Spermateca fig. 21.

Comparazioni. La nuova specie esternamente è simile a *D. obliqua* (Bernhauer, 1916) della Birmania e del Nepal. Ne è distinta essenzialmente per la forma della spermateca, con parte prossimale descrivente una spira e mezza e non con una sola spira come in *obliqua*, e con appendice esterna del bulbo distale della spermateca molto prolungato e non appena prominente come in *obliqua* e per la profonda introflessione apicale del bulbo distale della spermateca stessa, poco profonda in *obliqua*.

Orphnebius (s. str.) **newar** sp. n. (figg. 26-27)

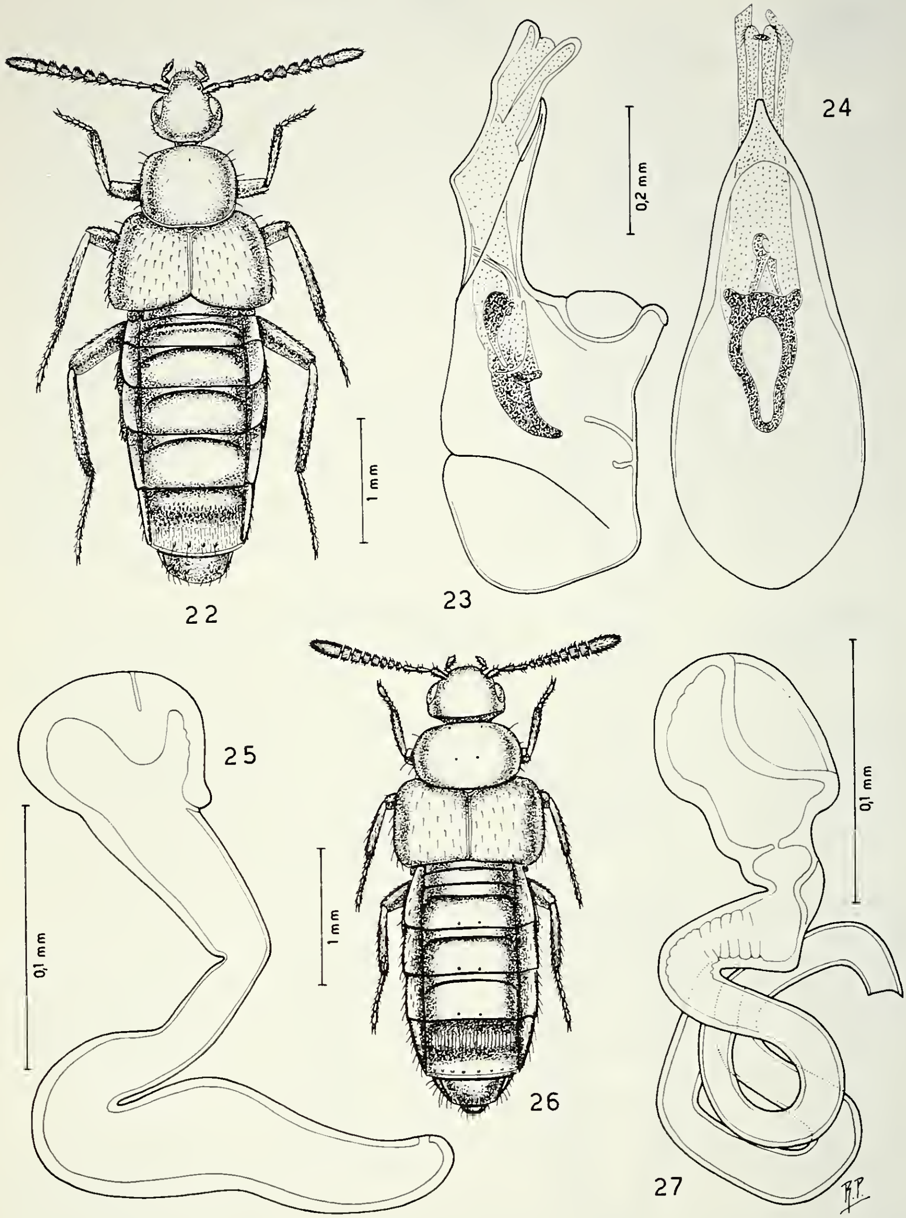
Tipo. Holotypus ♀, Nepal, Prov. Bagmati, Dobate Ridge, NE Barahabise, 2700 m, 2.V.1981, (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 3,4 mm. Corpo lucidissimo e nero; addome bruno; antenne brune con i tre antennomeri basali giallo-rossicci; zampe giallo-rossicce. Su tutto il corpo non vi è traccia di reticolazione. Il capo e il pronoto sono pressoché privi di punteggiatura. Le elitre presentano una netta impressione laterale e una punteggiatura distinta. Il quinto urotergo libero ha una profonda concavità basale solcata da rughe longitudinali. Spermateca fig. 27.



FIGG. 18-21.

Habitus e spermateca. Figg. 18-19: *Drusilla smetanai* sp. n. Figg. 20-21: *Drusilla nepalensis* sp. n.



FIGG. 22-27.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 22-25: *Orphnebius* (s. str.) *hauseri* Eppelsheim. Figg. 26-27: *Orphnebius* (s. str.) *newar* sp. n.

Etimologia. Dai Newar, gruppo etnico del Nepal.

Comparazioni. La nuova specie è distinta da *D. rufiventris* Eppelsheim, 1895, della Birmania, per il capo distintamente più stretto del pronoto (e non appena più stretto, come in *rufiventris*), per l'undicesimo antennomero lungo più dei tre precedenti antennomeri considerati insieme (e non lungo quanto i due seguenti insieme, come in *rufiventris*) e per la rugosità longitudinale del quinto urotergo libero, non diffusa fino al margine posteriore, come in *rufiventris*.

Orphnebius (s. str.) **loebli** sp. n. (figg. 28-30)

Tipo. Holotypus ♂, Nepal, Khandbari distr., Arun River at Num, 1500-1600 m, 10.IV. 1982, (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 2,7 mm. Corpo lucidissimo e bruno-rossiccio; elitre brune con base gialla; addome giallo-rossiccio con uriti liberi terzo e quarto bruni; antenne brune con i due antennomeri basali e l'apice dell'undicesimo, giallo-rossicci; zampe rossicce. La punteggiatura del capo è svanita, quella del pronoto e delle elitre è distinta e fine. Non vi è traccia di reticolazione su tutta la superficie del corpo. Il quinto urotergo libero ha la base concava e punteggiata ed è striato longitudinalmente sul resto della superficie. Edeago figg. 29-30.

Etimologia. Specie dedicata al Dr. Ivan Löbl del Mueso di Storia Naturale di Ginevra, per avermi dato in studio gli oltre 5500 esemplari di Aleocharinae del Nepal, oggetto del presente e di altri miei lavori.

Comparazioni. Specie distinta da *O. termitis* Motschulsky, 1859, dello Sri Lanka, per avere il capo nettamente più stretto del pronoto e nettamente trasverso (e non largo quanto il pronoto e subquadrato, come in *termitis*) e per le elitre bicolori, brune con base gialla e non interamente gialle come in *termitis*.

Tetrabothrus nepalensis sp. n. (figg. 33-36)

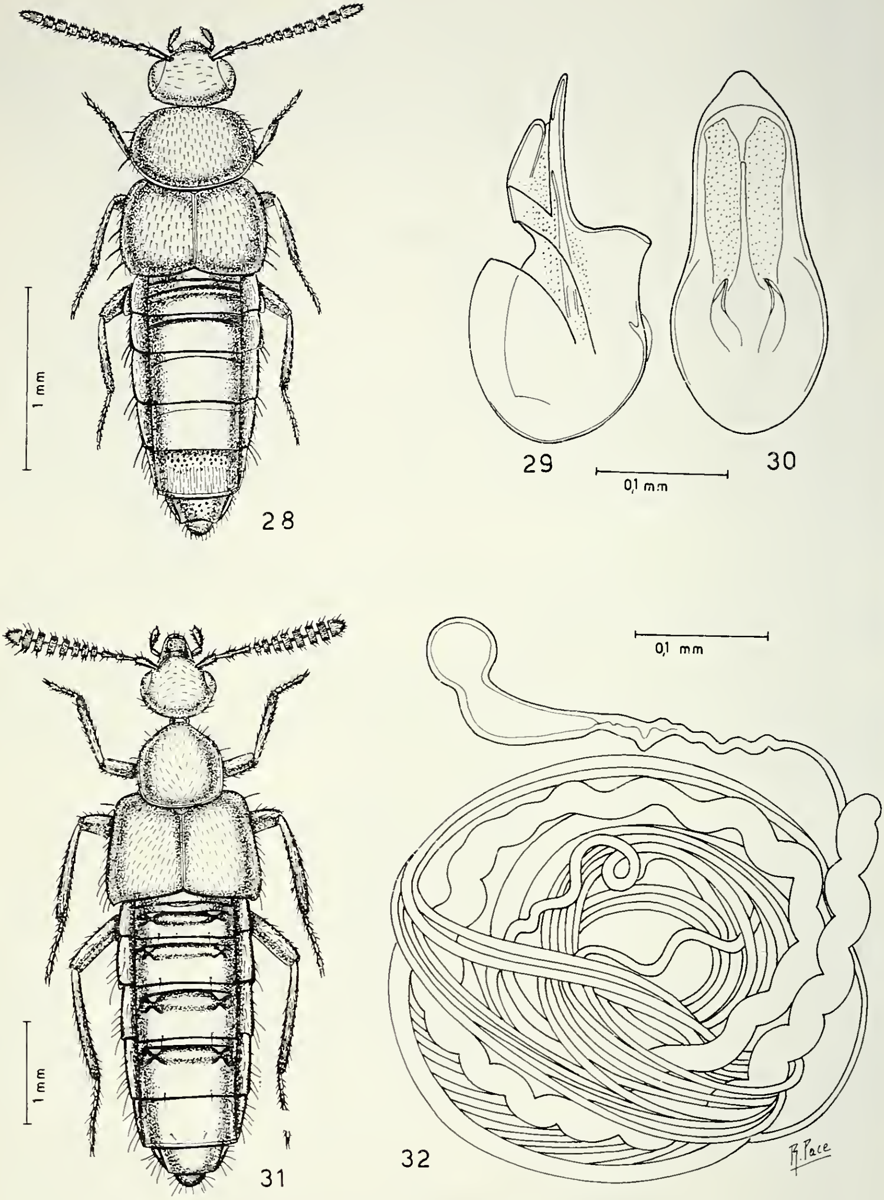
Tipi. Holotypus ♂, Nepal, Khandbari distr., Arun River at Num, 1500-1600 m, 10.IV.1982, (A. & Z. Smetana leg., MHNG).
Paratypus: 1 ♀, Nepal, Prov. Bagmati, 4 Km S Tarang Marang, 900 m, 28.IV.1981, (Löbl & Smetana leg., CPA).

Descrizione. Lungh. 5,0 mm. Corpo lucidissimo e rossiccio, comprese le antenne; femori gialli con estremità distale bruna, tibie rossicce, tarsi giallo-rossicci. Il capo, il pronoto e l'addome sono privi di reticolazione e di distinta punteggiatura. Le elitre presentano tubercoletti fini e sul terzo posteriore una lunga pubescenza pallida. Edeago figg. 34-35, spermateca fig. 36.

Comparazioni. Si veda la chiave data nella nota comparativa per la specie che segue.

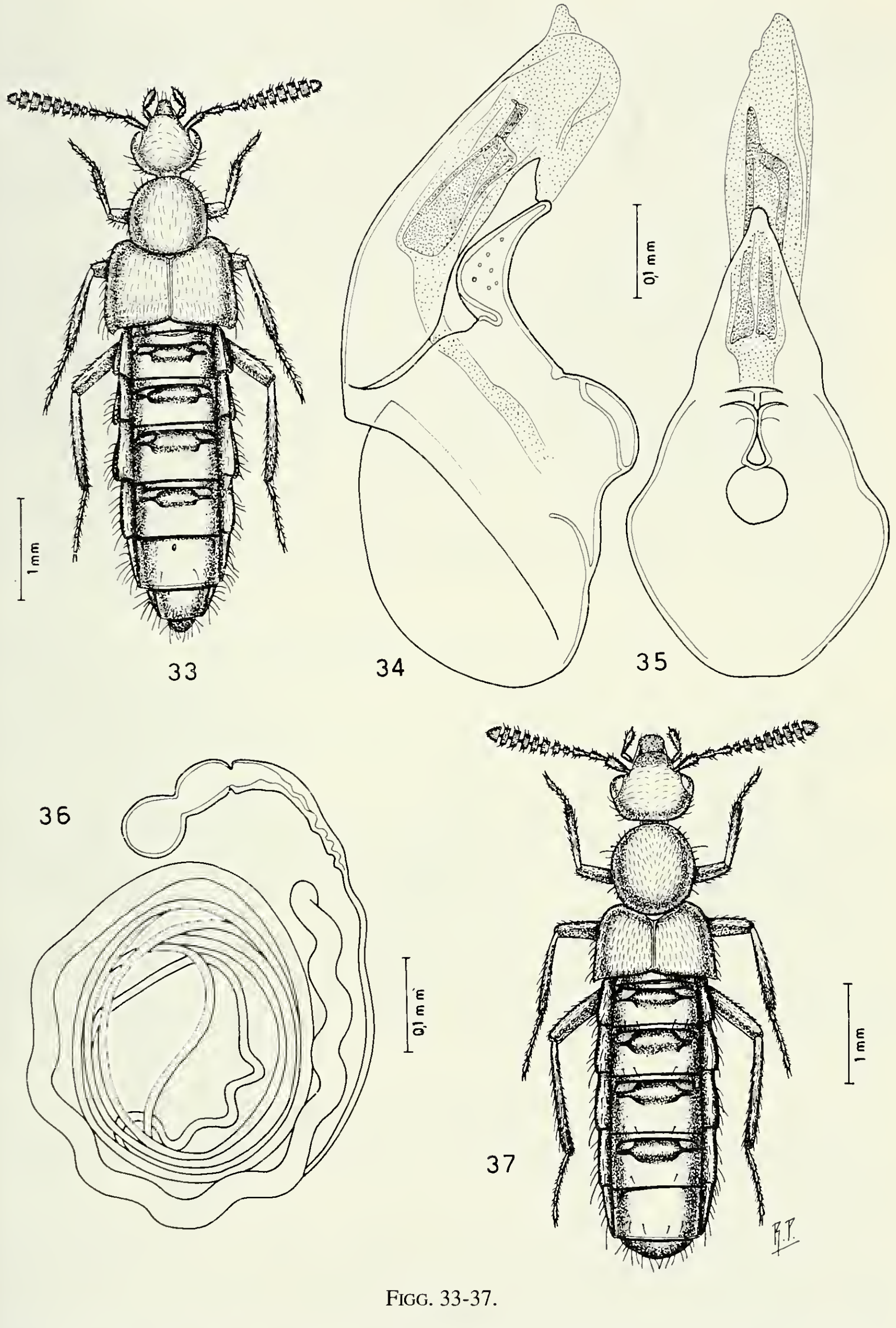
Tetrabothrus micropterus sp. n. (figg. 37-40)

Tipi. Holotypus ♂, Nepal; Lalitpur distr., Phulcoki, 2700 m, 15.X.1983, (Smetana & Löbl leg., MHNG).
Paratypi: 1 ♂, Nepal, Mt. Phulchoki, 7.V.1986 (Orousset leg., MNP); 1 ♀, Nepal, Ulleri, 83° 14'E-28° 21'S, 6,700 Ft., 18.V.1954, dry soil in decidous forest, British Museum Expedition 1954, (Keith H. Hyatt leg., BM).



FIGG. 28-32.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 28-30: *Orphnebius* (s. str.) *loebli* sp. n. Figg. 31-32: *Tetrabothrus laticornis* (Wasmann).



FIGG. 33-37.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 33-36: *Tetrabothrus nepalensis* sp.n. Fig. 37: *Tetrabothrus micropterus* sp. n.

Descrizione. Lungh. 5,0 mm. Corpo lucido e giallo-rossiccio, antenne comprese; fondo dei solchi basali degli uroterghi, rossiccio; femori gialli, con estremità distale bruna; tibie e tarsi rossicci. La punteggiatura del capo è assente, quella del pronoto è finissima. Le elitre sono coperte di tubercoletti svaniti. Su tutto il corpo non vi è traccia di reticolazione. Edeago figg. 38-39, spermateca fig. 40.

Comparazioni. La nuova specie e la precedente *T. nepalensis* sp. n., per il colore del corpo si associano a *T. indicus* Cameron, 1939, del Bengala, (di cui ho esaminato l'holotypus ♂); si differenziano per i caratteri dati nella seguente chiave:

1 Elitre monocrome, rossicce o giallo-rossicce; sutura delle elitre da poco più di 1/2 a 1/4 più corta della lunghezza del pronoto; profilo ventrale dell'edeago ricurvo nella regione preapicale, figg. 34 e 38 2

— Elitre bicolori: giallo-rossicce alla base e brune alla metà posteriore; sutura delle elitre di 1/7 più corta della lunghezza del pronoto; profilo ventrale dell'edeago, rettilineo nella regione preapicale. Lungh. 5,0 mm. Bengala....... *indicus* Cameron

2 Sutura delle elitre di 1/4 più corta della lunghezza del pronoto; antennomeri 5 a 10 meno trasversi; edeago figg. 34-35, spermateca fig. 36. Lungh. 5,0 mm. Nepal...... .... *nepalensis* sp. n.

— Sutura delle elitre poco più di 1/2 più corta della lunghezza del pronoto; antennomeri 5 a 10, estremamente trasversi; edeago figg. 38-39, spermateca fig. 40. Lungh. 5,0 mm. Nepal... *micropterus* sp. n.

Zyras (s. str.) **pallipes** sp. n. (figg. 41-43)

Tipo. Holotypus ♂, Nepal, Bakhri Kharka, 87° 75' E-28° 234 N, 5,500 ft., 24.VI.1954, damp mossy grassy earth in shade of trees & rocks, British Museum Nepal Expedition 1954, (K. H. Hyatt leg., BM).

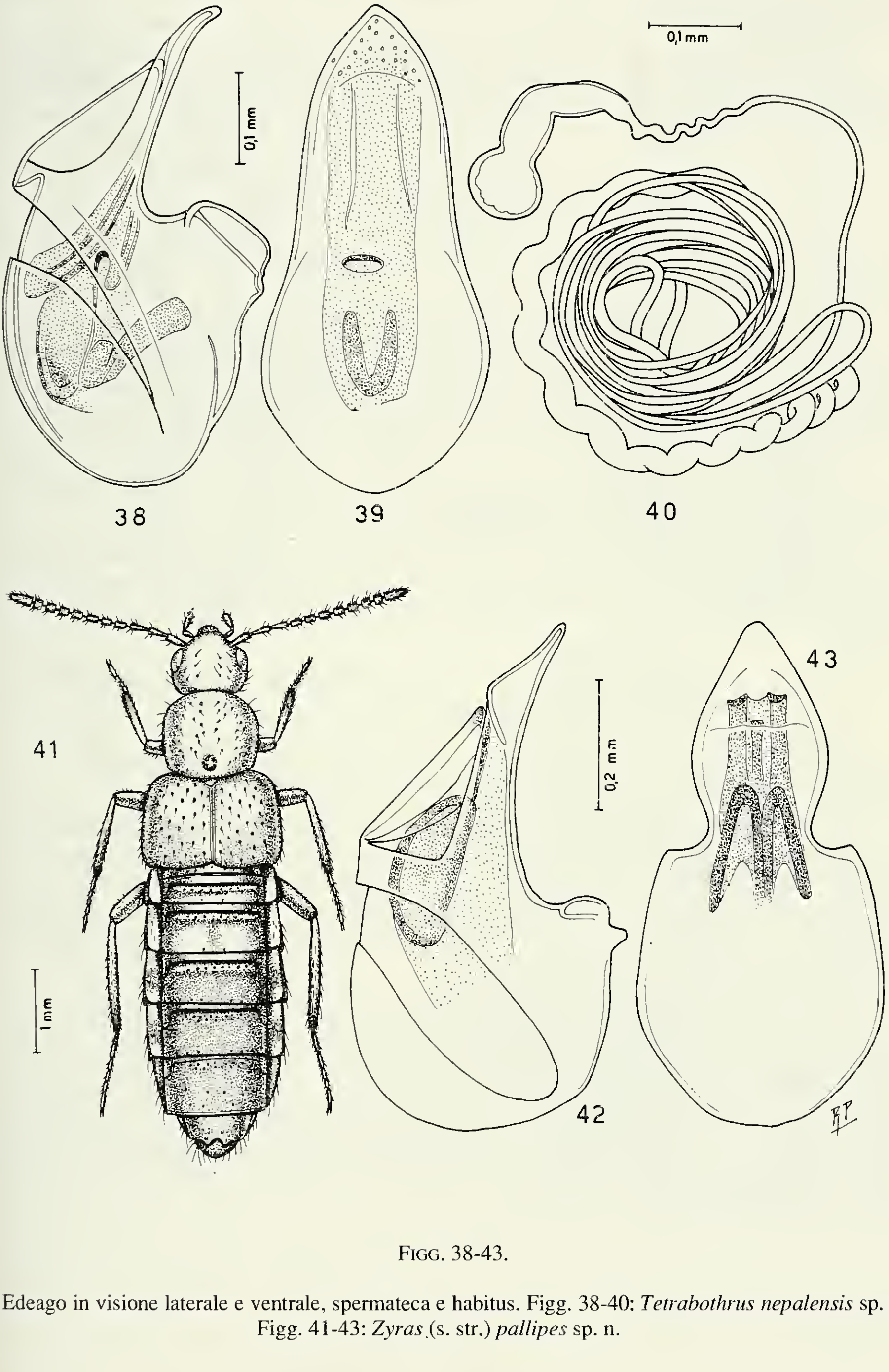
Descrizione. Lungh. 6,5 mm. Corpo lucidissimo; capo e pronoto neri; elitre rossicce con angolo posteriore esterno largamente annerito; addome rossiccio con uriti liberi 3 a 6 neri; antenne bruno-rossicce con i due antennomeri basali e l'undicesimo rossicci; zampe uniformemente giallo-rossicce. La punteggiatura sull-avancorpo è profonda. Non vi è traccia di reticolazione sul corpo. Edeago figg. 42-43.

Comparazioni. La nuova specie è distinta da *Z. nilgiriensis* Cameron, 1939, delle Nilgiri Hills, per avere solo due uriti basali rossicci e non tre, per avere l'undicesimo antennomero rossiccio e non nero come in *nilgiriensis* e per le zampe uniformemente giallo-rossicce (bicolori in *nilgiriensis*).

Zyras (s. str.) **britannorum** sp. n. (figg. 44-45)

Tipo. Holotypus ♀, Nepal, Kathmandu, British Embassy, 20.V-23.VI.1983, at light, (Brendell leg., BM).

Descrizione. Lungh. 5,2 mm. Corpo lucidissimo, privo di reticolazione; capo e pronoto neri; elitre giallo-rossicce con metà posteriore sfumata di bruno; addome giallo-rossiccio con uriti liberi quarto, quinto e sesto neri; antenne brune con i tre antennomeri basali giallo-rossicci; zampe gialle. La punteggiatura del capo e del pronoto è svanita, quella delle elitre è netta. Lo scutello è punteggiato e ha due punti grandi sulla metà posteriore. Spermateca fig. 45.



FIGG. 38-43.

Edeago in visione laterale e ventrale, spermateca e habitus. Figg. 38-40: *Tetrabothrus nepalensis* sp. n. Figg. 41-43: *Zyras* (s. str.) *pallipes* sp. n.

ETIMOLOGIA. Specie dedicata ai partecipanti delle spedizioni al Nepal del British Museum (Natural History).

COMPARAZIONI. La nuova specie è distinta da *Z. perforatus* (Champion, 1921), dell'India, per l'undicesimo antennomero nero invece di rosso-arancio e lungo quanto i tre precedenti antennomeri considerati insieme, (lungo quanto i due precedenti insieme in *perforatus*).

Zyras (s. str.) **manjushri** sp. n. (figg. 46-47)

TIPO. Holotypus ♀, Nepal, Prov. Bagmati, Tarang Marang, 1000 m, 27.IV.1981, (Löbl & Smetana leg., MHNG).

DESCRIZIONE. Lungh. 4,0 mm. Corpo lucidissimo, privo di reticolazione. Capo, elitre e uriti liberi quarto, quinto e sesto neri; pronoto e tre uriti basali giallo-rossicci; antenne brune con secondo antennomero e base del terzo giallo-rossicci; undicesimo antennomero giallo paglierino; zampe giallo-rossicce con femori gialli con apice distale bruno. Le elitre presentano pubescenza sollevata e tubercoli svaniti. Spermateca fig. 47.

ETIMOLOGIA. Da "Manjushri", divinità induista del Nepal che con la sua spada avrebbe tagliato la montagna per dar vita alla Valle di Kathmandu.

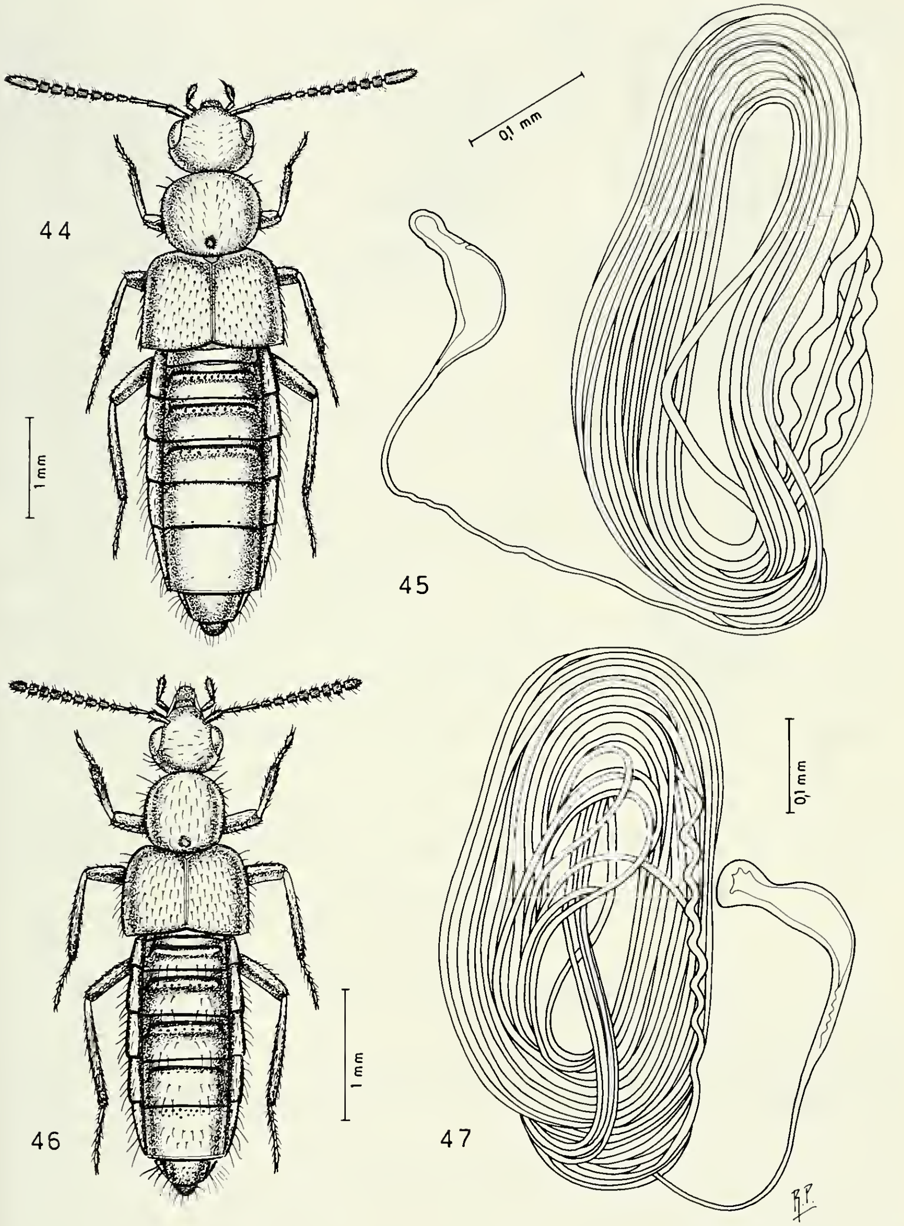
COMPARAZIONI. La nuova specie è distinta da *Z. optimus* Cameron, 1939, delle Nilgiri Hills per l'estremità addominale nera e non rossiccia, per il secondo antennomero giallo-rossiccio e non nero e per le zampe bicolori e non interamente giallo-rossicce come in *optimus*.

Zyras (Rhynchodonia) nepalensis sp. n. (figg. 48-50)

TIPO. Holotypus ♂, Nepal, Phewa-Tal, Pokhara, 85° 59' E - 22° 14' N, 2,500 ft., 8-10.V.1954, in cattle dung, British Museum Nepal Expedition 1954, (Hyatt leg., BM).

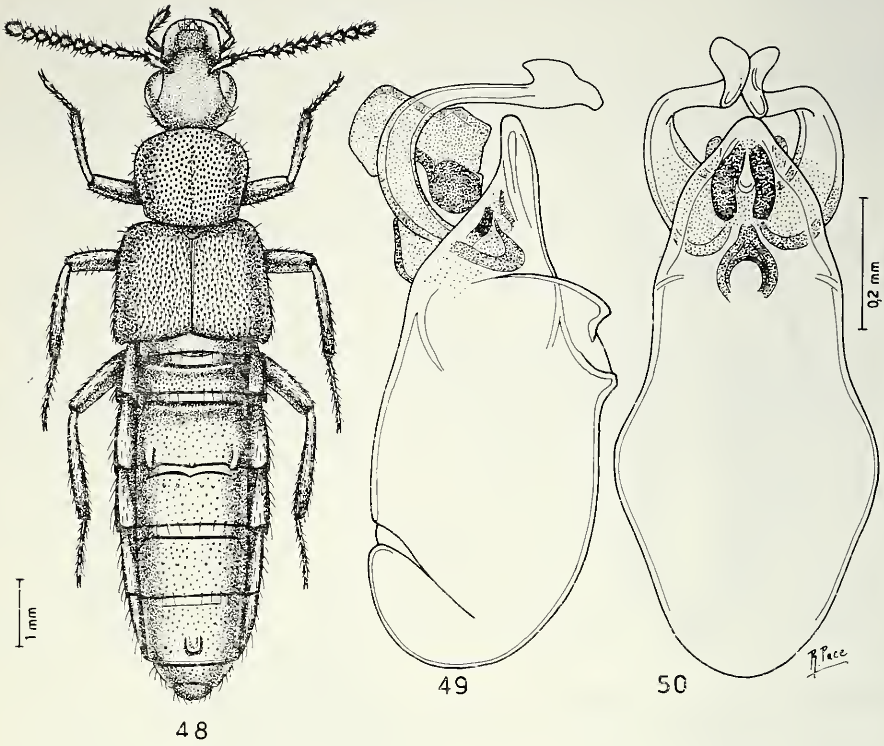
DESCRIZIONE. Lungh. 9,7 mm. Capo opaco, tranne le tempie, resto del corpo lucido e rossiccio; capo nero; elitre bruno-rossicce; antenne e zampe rossicce. Disco del capo con reticolazione vigorosa: sul resto della superficie del capo reticolazione svanita. La reticolazione del pronoto è svanita, quella delle elitre netta e quella dell'addome assai svanita. La punteggiatura del pronoto e delle elitre è netta, quella dell'addome è distinta. Edeago figg. 49-50.

COMPARAZIONI. Specie distinta da *Z. waageni* Eppelsheim, 1895, del Bengala, per il diverso colore del corpo: addome rossiccio invece di nero come in *waageni*; per il pronoto reticolato, per le elitre più lunghe del pronoto (lunghe quanto il pronoto in *waageni*), per le spine del secondo urotergo libero del maschio, non salienti; per il tubercolo mediano del quinto urotergo libero del maschio, non appuntito, ma largo, smussato e incavato superiormente e per i pezzi copulatori sporgenti dall'orifizio apicale dell'edeago meno robusti e apicalmente meno dilatati rispetto quelli di *waageni*, nonostante l'edeago della nuova specie abbia maggiore sviluppo.



FIGG. 44-47.

Habitus e spermateca. Figg. 44-45: *Zyras* (s. str.) *britannorum* sp. n. Figg. 46-47: *Zyras* (s. str.) *manjushri* sp. n.



Figg. 48-50.

Habitus ed edeago in visione laterale e ventrale. Figg. 48-50: *Zyras (Rhynchodonia) nepalensis* sp. n.

NOME E COMBINAZIONE NUOVI

Drusilla vedda, nom. n., comb. n.

Myrmedonia opacicollis Cameron, 1920: 98
Zyras opacicollis: Bernhauer & Scheerpeltz, 1926: 702
Astilbus opacicollis Cameron, 1939: 480, nec *Astilbus opacicollis* Eppelsheim, 1895: 385.

RINGRAZIAMENTI

Ringrazio molto cordialmente i Drr. I. Löbl e A. Smetana per avermi affidato in studio il materiale da essi raccolto, oggetto prevalente del presente lavoro. Per il prestito di tipi e di altro materiale di studio e di confronto, ringrazio il Dr. P. M. Hammond e collaboratori del British Museum (Natural History), il Dr. Prof. H. Franz e il collega francese J. Orousset.

RÉSUMÉ

L'auteur énumère 27 différentes espèces de la tribu Myrmedoniini, récoltées récemment au Nepal et déposées principalement au Muséum dHistoire naturelle de Genève et au British Museum. La collection inclut 15 espèces décrites comme nouvelles, dont les premières espèces microptères du genre *Tetrabothrus*.

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Revue suisse Zool.	Tome 99	Fasc. 1	p. 147-162	Genève, mars 1992

Zur Gattung *Cybaeus* im Alpenraum (Araneae: Agelenidae, Cybaeinae) – Beschreibung von *C. montanus* n. sp. und *C. intermedius* n. sp.

von

Richard MAURER *

mit 33 Abbildungen und einer Verbreitungskarte

ABSTRACT

The genus *Cybaeus* (Araneae, Cybaeinae) in alpine countries, with a description of two new species. – Newly found specimens of *Cybaeus* from southern alpine countries lead to a new interpretation of the former "*C. angustiarum*" in Italy and the Pyrénées: Two new species – *C. montanus* and *C. intermedius* – are described from the southern alps, whereas *Cybaeus* from the French Pyrénées has to be named *C. raymondi* (Simon). *C. minor* sensu BRIGNOLI 1978b (Turkey) is distinct from Kulczynski's *minor* and is now named *C. brignolii*.

EINLEITUNG UND PROBLEMSTELLUNG

Die jüngsten Diskussionsbeiträge zur Gattung *Cybaeus* in europäischen Gebirgen stammen von BRIGNOLI (1977, 1978a, 1978b). Seine Interpretation zum anscheinend auch südlich des Alpenkammes und in den französischen Pyrenäen vorkommenden "*angustiarum*" ergänzte er mit der Feststellung, es seien weitergehende Untersuchungen erforderlich, damit die offensichtlichen Unklarheiten ausgeräumt werden könnten. Seit 1987 werden im Rahmen des Projektes "Magerwiesen und -weiden im Tessin" (NF-Projekt 31-9096.87) der Universität Bern zahlreiche Brachestandorte im Kanton Tessin bearbeitet. Dabei sind neben anderen Invertebraten auch schon zahlreiche bemerkenswerte Spinnen beobachtet worden (HÄNGGI 1989). Oft ist auch die Gattung *Cybaeus* vertreten, von der sich die Weibchen anfänglich zwanglos *C. angustiarum* sensu BRIGNOLI 1977 zuordnen liessen. Das Auftauchen einer weiteren Form im männlichen Geschlecht, die morphologischen Unterschiede zu *angustiarum* nördlich der Alpen sowie die Unsicherheiten im Vergleich zu *C. minor* zeigten jedoch bald, dass eine gesamthafte Neu-

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* Kirchrain 1, CH-5113 Holderbank.

bearbeitung der südlichen Arten der Gattung unumgänglich würde. Die Überprüfung förderte in der Folge eine Reihe unzulänglicher Interpretationen des bisher vorliegenden Materials zutage. Die nun vorliegende Übersicht vermag leider auch noch nicht alle Fragen befriedigend zu klären; zumindest soll jedoch aus der Gesamtheit weiträumig zusammengetragener Belegtiere eine Basis für die restlichen Detailergänzungen geschaffen werden.

MATERIAL

Die untersuchten Belege stammen aus folgenden Sammlungen (1-8 = Abkürzungen in der Rubrik "Überprüftes Material"):

1 Naturhistorisches Museum Basel (A. Hänggi)
2 Museo civico di Scienze naturali "E. Caffi", Bergamo (M. Valle)
3 Museo civico di Storia naturale, Milano (C. Pesarini)
4 Coll. K. Thaler, Institut für Zoologie, Innsbruck
5 Coll. A. Hänggi, CH / Fehren
6 Coll. R. Maurer, CH / Holderbank
7 Coll. P. Pronini, CH / Mezzovico
8 Muséum d'Histoire naturelle. Genève (Dr. B. Hauser).

ALLGEMEINES ZUR GATTUNG

Die Gattung *Cybaeus* wurde lange Zeit den Agelenidae zugeordnet, z.T. in einer Unterfamilie Cybaeinae (ROEWER 1954). LEHTINEN (1967) behielt die Cybaeinae bei, stellte sie jedoch in die Dictynidae. BRIGNOLI (1983) und PLATNICK (1989) formieren eine eigene Familie Cybaeidae, die zwischen die Agelenidae und die Argyronetidae gestellt wird. Soweit mir die Literatur zugänglich ist, wurden bislang 30 paläarktische Arten (davon 7 in Europa), 44 nearktische, 1 äthiopische sowie 3 neotropische Arten beschrieben (die letzteren mit Vorbehalten) (Kataloge von ROEWER 1954, BRIGNOLI 1983 und PLATNICK 1989). Die Gattung weist somit weitgehend holarktische Verbreitung auf. Mit Sicherheit kann damit gerechnet werden, dass in Asien weitere Arten zum Vorschein kommen werden, stellt man den Artenreichtum in Japan in Rechnung. In Europa fehlt die Gattung bemerkenswerterweise im Norden, in England, in Spanien sowie auf den Mittelmeerinseln.

Die europäischen Vertreter der Gattung weisen alle eine relativ einheitliche Grösse und Färbung auf. Sie erinnern im Habitus an subadulte *Coelotes*. Die Gesamtlänge beträgt ca. 4,5-8 mm (meist 5-6,5), der Cephalothorax ist von hellbrauner bis graubrauner Färbung und weist meist eine deutlich zeichnende, graue Netzstruktur im Kopfteil mit Radiärstreifen auf. Die 8 Augen sind sind meist schmal dunkel umrandet. Das Abdomen ist hellgrau bis dunkelgrau; helle Winkelflecken, deren vordere und hintere getrennte Fleckenpaare bilden, fehlen fast nie.

In europäischen Aufsammlungen – vor allem mit Bodenfallen – gehört *Cybaeus* nicht eben zu den häufigen, aber doch ziemlich regelmässigen Spinnen in Waldgebieten (Schweiz: in 15% der faunistischen Arbeiten mit Spinnen, s. MAURER & HÄNGGI 1990). Dabei fällt die ausgeprägte Sommer-Stenochronie der Männchen auf.

Aus Mitteleuropa nördlich der Alpen sind *C. angustiarum* und *C. tetricus* bekannt; wo diese in Aufsammlungen mit Bodenfallen vertreten sind, erreichen sie Häufigkeiten von meist nur unter 1% aller Individuen, ausnahmsweise bis 5% (*tetricus* im Murnauer Moos mit 218 von 5200 Ind. bei 158 Arten: THALER in LÖSER *et al.* 1982; *angustiarum* in einem Fichtenforst mit 25 von 580 Ind. bei 43 Arten: HIEBSCH 1972). In Osteuropa tritt – soweit heute bekannt – *C. minor* hinzu. Hier können *C. angustiarum*, *tetricus* und *minor* sogar zu den dominanten Bodenspinnen gehören, so z.B. *tetricus* an 7, minor an 5 von 34 Waldstandorten Sloweniens (POLENEC 1976), oder *angustiarum* mit 424 von 793 Bodenspinnen eines Abieto-Fagetums Rumäniens (WEISS 1979). Ausnahmsweise ist syntopisches Vorkommen von *tetricus* und *minor* belegt (Slowenischer Fichtenwald: POLENEC 1989). Die Tiere besiedeln die Streuschicht vorwiegend reifer Waldökosysteme, wo sie ihre Fangnetze ähnlich *Coelotes* unter Steinen und in ähnlichen Habitaten anlegen. Genannt werden in erster Linie Nadelwaldungen mittlerer Feuchte, sodann auch Laubwälder: Abieto-Piceetum, Streuschicht eines trockenen Piceetums, Fichtenforst, Abieto-Fagetum, mässig feuchte bis feuchte Waldungen, auf Lehmboden von Laubwaldungen, in Laubstreu im Bereich feuchter Gräben und Senken, Fagetum silvaticae, Bergahorn-Buchenwald, Lärchenwald und Lärchenwiesen, seltener Bach-Eschenwälder oder Alneten, Ausstrahlungen in Rasenhänge oder Mähwiesen. Sumpfige oder moorige Stellen werden gemieden. In der Höhe werden Gebiete bis gegen 2000 m besiedelt. Wenige Funde stammen aus Höhlen (BAUCHHENSS *et al.* 1987, BRAUN 1961, BUCHAR 1961, CASEMIR 1961, CHERIX & BOURNE 1980, DENIS 1952, HIEBSCH 1972, 1977, THALER in LÖSER et al 1982, NOFLATSCHER 1988, POLENEC 1976, SVATON 1984, TRETZEL 1952, WEISS 1979, 1980).

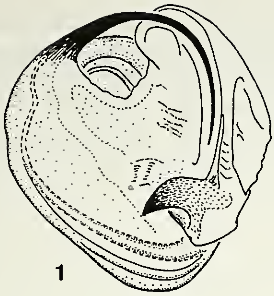
DIE MINOR-GRUPPE

ALLGEMEINES

In seiner Übersicht über die bis damals bekannten Agelenidae erwähnt BRIGNOLI 1977 die engen Beziehungen zwischen "*C. angustiarum*", *C. vignai* und *Cicurina raymondi*. Seine Zusammenfassung der italienischen Arten enthält "*angustiarum*", *vignai* und *tetricus* (mit Abbildungen). "*C. angustiarum*" wird in dieser Arbeit überdies von DE BLAUWE (1973), DI CAPORIACCO (1938) und DENIS (1963) zitiert. BRIGNOLI (1978a) synonymisiert zudem *Cicurina raymondi* Simon mit *C. angustiarum* L. Koch; allerdings weist er auch auf die Variabilität der Vulva von "*angustiarum*" und die daraus entstehenden Interpretationsprobleme hin. Zahlreiche männliche Tiere des anfänglich als "*C. angustiarum*" interpretierten Tessiner Materials zeigten dann allerdings, dass es sich hier eindeutig um etwas anderes als die Kochsche Art handelt, mit zwei deutlich verschiedenen Formen.

Was SIMON (1937) unter "*angustiarum*" abbildet, ist in Tat und Wahrheit *C. tetricus* (C. L. Koch). *Cybaeus angustiarum* ist jedoch auch nicht mit *Cicurina raymondi* identisch, wie BRIGNOLI 1978a vermutete. Ohne Zweifel ist der letztere ein *Cybaeus*, der aber auch nicht mit den südalpinen Arten übereinstimmt. Sein eigenständiger Artstatus erfordert die Bezeichnung *Cybaeus raymondi* (Simon 1916) (Übersicht über die bisherigen Funde bei BOSMANS & DE KEER, 1985). Somit ergibt sich, dass der Kochsche *angustiarum* nach heutiger Kenntnis auf das östliche Mitteleuropa, Ost- und Südosteuropa beschränkt ist.

In den Südalpen verbleiben damit die bisher nicht charakterisierten neuen Formen, die nachstehend als *montanus* und *intermedius* beschrieben werden. Sie sind bei Vorliegen beider Geschlechter einwandfrei auseinanderzuhalten. Schwierigkeiten können sich ergeben, wenn nur Weibchen zur Verfügung stehen. Männliche *intermedius* können formal *minor* recht nahe kommen. Es scheint als Arbeitshypothese am sinnvollsten, zwei neue Arten abzugrenzen, wobei es sich evtl. herausstellen könnte, dass *intermedius* als Unterart von *minor* zu erklären ist. Die beiden neuen Arten stehen in enger Beziehung zu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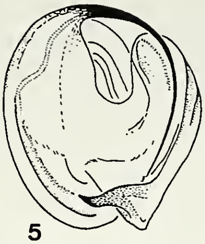
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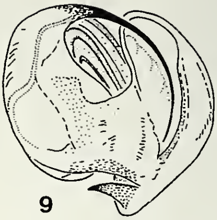
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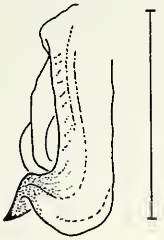
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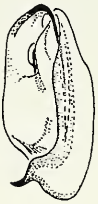
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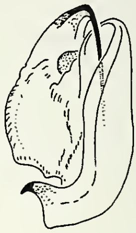
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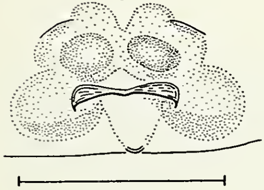
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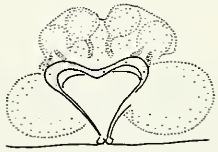
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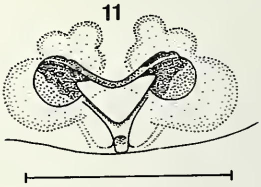
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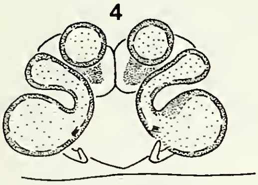
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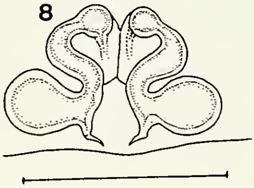
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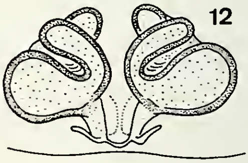
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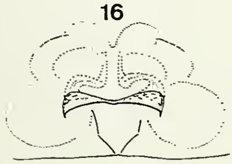
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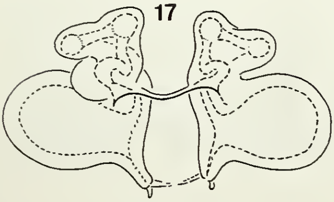
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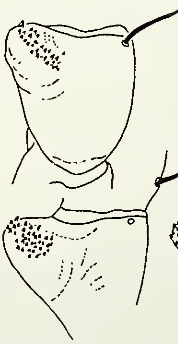
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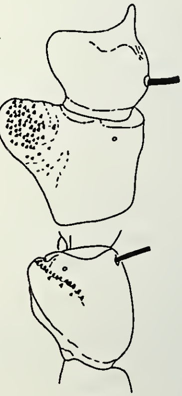
15

minor, weshalb sie zusammen als *minor*-Gruppe bezeichnet werden. Wie schon BRIGNOLI (1977) bemerkt, bestehen zwischen dieser Gruppe einerseits sowie *vignai* und *raymondi* anderseits enge Beziehungen (Kap. 5). Die Südgrenze von *montanus* in Italien ist noch unklar. Das Vorkommen in der Toskana müsste durch Funde von männlichen Tieren bestätigt werden.

Cybaeus minor Chyzer, 1897

ROEWER 1954, 2(a): 88.
BONNET 1956, 2(2): 1302.
PLATNICK, 1989: 406.
1897 *Cybaeus minor*, – CHYZER & KULCZYNSKI, *Aran. Hungar.* 2(b): 153, T. 6 Fig. 9.
1981 *Cybaeus minor*, – NIKOLIC & POLENEC, *Catal. Faunae Jugosl.* III/4, Araneae: 72.

Überprüftes Material:
I/BS: Borno, Pizzo Moren, 12.8.87: 3w (Valle, 2);
I/BS: M. Pizzocolo, 7.5.83: 1w (Pesarini / Pavesi, 3);
I/Carnia: Sappada, 5.10.69: 4w (Thaler, 4);
I/Dolomiten: Rif. Balasso, Pian Fugazze, 10.10.69: 4w (Thaler, 4);
I/Mt. Lessini: Boscochiesanuova, 16.7.80: 1 m (Paoletti / Thaler, 4);
YU/Slowenien: Vanocevec-Berg, 18.7.83: 3m, 1w (Polenec, 4);
YU/Slowenien: Bohinj 1981: 1w (Polenec / Thaler, 4).

Taster / Epigyne / Vulva: s. Abbildung 9-12, 15, 17.

Cybaeus montanus n. sp.

1977 *Cybaeus angustiarum* (ad part.), – BRIGNOLI, *Quad. Circ. speleol. "V. Rivera"* 2(2): 30 (inkl. zitierte Literatur!).

Überprüftes Material (P = Paratyp):

CH/TI: Arogno, 13.7.87: 1m (P); Mte Generoso / Poma, 1.7.88: 1m (Holotyp), 1w (P); 30.10.88: 1m, 2w (P); 1.7.87: 3m (P); 1.7.88: 1m; Salorino, 30.10.88: 1w (alle leg. Hänggi, 5/1); I/BG: Cornalba est. 86: 2m (Valle, 2); Costa Serina, Trafficanti, est. 86: 7m (Valle, 2); I/BG: Rovetta, Baite di Papherola Ba., 7.9.85: 1m (Valle, 2); Serina: Valpiana, 1988: 3m (Becci, Pisoni, 2); Serina: Valpiana, 7.6.88: 1m (Valle, 2); I/CO, Moncodeno Grigna, 7.86: 3m (Pesarini / Pavesi, 3): Colzate, Baite Sedernello, 88 / 89: 1m, 3w (Valle, 2); Colzate, Baite Sedernello, 11.10.89: 2w (Valle, 2); Colzate, Baite Sedernello, 19.7.89: 7w (Buttarelli / Valle, 2); Colzate, P. Mte Alben trap. 88: 3w (Quirci /Valle, 2); Colzate, pend. Mte Alben, 31.8.88: 1w (Quirci /Valle, 2); Cornalba, 24.5.86: 1w (Valle, 2); Grotta di Val Asnina, 21.9.87: 2w (Pesarini /Zanon, 3); Oltre il Colle, Forca Larga, 21.9.89: 3w; Oltressenda Alta, P. Spinelli, 5.4.82: 1w (Valle, 2); Roncobello, 28.6.66: 1w (Bianchi, 2); Rovetta, Baite di Papherola Ba., 25.7.85: 1w (Pisoni /Valle, 2); Serina, Piano Palla, 9.7.89: 3w (Valle, 2); Serina, Valpiana, 7.6.88: 1w (Valle, 2); Taleggio, 9.7.89: 3w (Bonacina, 2); I/BS: Borno, Pizzo Moren, 12.8.87: 3w (Valle, 2); V. Brembana, Taleggio, 30.9.71: 3w (Thaler, 4); V. Canonica, P. Presolana, M. Scan. 29.9.71: 1w (Thaler, 4); I/CN: Giaveno, w Forno, 9.10.72: 1w (Thaler, 4); 9.10.72: 2w (Thaler, 4); Ormea, Pte di Nava, T. Negrone, 2.10.72: 1w (Thaler, 4); Terme di Valdieri,

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ABB. 1-17.

1-4, 13, 16: *Cybaeus montanus* n. sp. (1 männl. Taster von ventral, 2 von aussen, 3 Epigyne, 4 Vulva, 13 Patella des männl. Tasters, 16 Lage der Einführungsgänge der Epigyne; übrige Abbildungen in sinngemässer Ansicht). 5-8, 14: *Cybaeus intermedius* n. sp.. 9-12, 15, 17: *Cybaeus minor*. Massstab 0,5 mm.

6.10.72: 3w (Thaler, 4); V. Gesso, S. Anna di Valdieri, 6.10.72: 3w (Thaler, 4); V. Grana, Pradleves, 6.10.72: 1w (Thaler, 4); 7.10.72: 2w (Thaler, 4); V. Grande, 5.10.72: 1w (Thaler, 4); I/CO: Erba Bellagio, Lasnigo, 1.10.71: 2w (Thaler, 4); I/SV: C. Giovetti, 2.10.72: 2w (Thaler, 4); I/TO: Viu, C. Lis w Torino, 10.10.72: 1w (Thaler, 4); I/Toscana: P. Cerreto Sassalbo, 20.10.75: 2w (Thaler, 4); I/VA: Campo dei Fiori, 1.11.83: 3w (Pesarini/Sciaky, 3); I/VC: Mte di Mera, 7.83: 3w (Pesarini / Monguzzi, 3).

Taster / Epigyne / Vulva: s. Abbildung 1 - 4, 13, 16, 32.

Cybaeus intermedius n. sp.

Überprüftes Material (P = Paratypen):

CH/TI: Chiasso/V. Motta, 21.9.90: 1m, 1w (7); Lionza/Centovalli, 28.6.89: 1m, 1w; 10.9.89: 1w (P); 4.8.89: 1w (P); 20.7.89: 3 m; 20.6.89: 1m (Holotyp), 1w (P); 12.11.89: 1w; 5.7.89: 3m (P); 4.8.89: 1w; 12.11.89: 1w (P); 20.7.89: 3m; Melirolo / Morobbia, 12.8.89: 3m; Mte S. Giorgio / Bustorgna, 28.6.89: 5m; 17.7.89: 2m, Mte S. Giorgio / Cugnoli, 17.7.89: 2m; 28.6.89: 1m; Mte S. Giorgio / Dossi, 17.7.89: 3m; 28.6.89: 2m; Mte S. Giorgio / Forello, 29.6.88: 2m (P) (alle leg. Hänggi, 5/1); Pte Cremenasa (Tresa), 6.4.85: 1w (Gonseth); 7.6.84: 1w (Pedroli, 7); Val Morobbia / Melirolo, 15.7.87: 1m (P) (Hänggi, 5/1); Vergeletto, 7.7.88: 4m (Pronini, 6); V. Morobbia / Melirolo, 12.8.89: 3m; 1.8.88: 6m (P); V. Morobbia / Melirolo, 5.7.87: 2m (P) (alle leg. Hänggi, 5/1); I/TV, Mte Grappa, obh. Bassano, 28.9.77: 1w (Thaler, 4); 28.5.83: 1w (Pesarini / Pavesi, 3); I/TV, M. Grappa, Boscon, 24.6.85: 5w (Pesarini / Zanon, 3); I/VA, M. Scerré, 26.6.87: 1m (Pesarini / Baratelli, 3); Det. unsicher: CH/TI, Carecchio, 19.9.88: 3w; 7.8.88: 1w (alle leg. Pronini, 6); I/VA, Mte Piambello, 25.7.88: 1m (Pesarini / Baratelli, 3); I/NO, Valsesia, Alpi Pile, 3.10.71: 2w (Thaler, 4); I/VC, Biella / Oropa, 11.10.72: 1w (Thaler, 4); I/VA, M. Chiusarella, 23.6.88: 4m (Pesarini / Baratelli, 3).

Taster / Epigyne / Vulva: s. Abbildung 5-8, 14, 31.

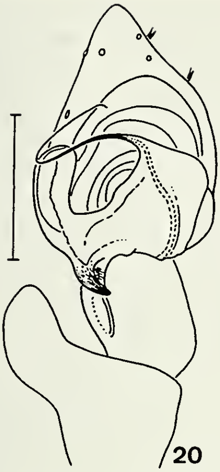
BESCHREIBUNG

Die drei Arten weisen eine ähnliche Färbung, Grösse und Zeichnung auf, allerdings mit breitem Schwankungsbereich. Somit werden vorerst die gemeinsamen Merkmale charakterisiert. Färbung im Auflicht des Stereomikroskopes: Cephalothorax im Mittel gelbbraun mit schwärzlich punktierter Netzstruktur (Extremwerte: weisslichgelb ohne jede Netzstruktur bis bräunlich mit schwärzlich überprägter Grundfarbe und ausgeprägt gezeichneter Netzstruktur); Augenfeld schwärzlich umrandet, bei hellen Tieren kaum sichtbar; Abdomen mittelgrau mit 4-8 hellen Fleckenpaaren, nach hinten als Winkelflecken ausgeprägt (Extremwerte: Abdomen hellgrau ohne Winkelflecken bis schwarzgrau mit stark kontrastierenden Fleckenpaaren). Masse: m und w von ungefähr gleicher Grösse, Gesamtlänge 4,5-8 mm, Durchschnittswerte 5,5-6,5 mm. *C. minor* eher im unteren, *C. montanus* eher im oberen Grössenbereich, *C. intermedius* von mittlerer Grösse. Cephalothorax 2,8 x 1,9 mm bis 3,2 x 2,2 mm.

Bestachelung der Beine variabel, für diagnostische Zwecke kaum zu verwenden. m Pedipalpen, Epigyne, Vulva s. Abbildungen.

ABB. 18-30.

18, 23, 24: *Cybaeus tetricus*. 19-22: *Cybaeus angustiarum*. 25-26, 29-30: *Cybaeus raymondi* (29/30: a/i = Ansicht von aussen/innen). 27-28: *Cybaeus brignolii* (Abb. nach BRIGNOLI, 1978b).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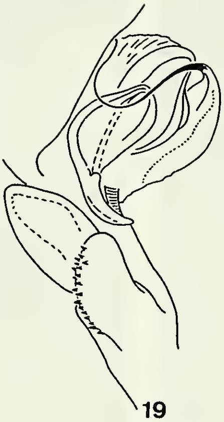
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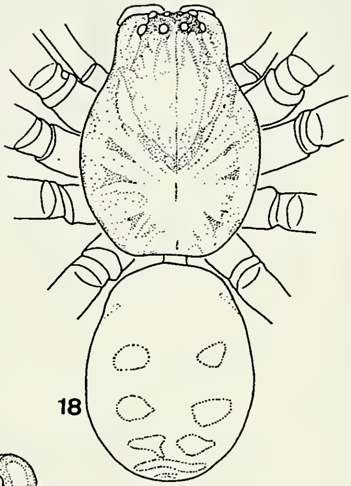
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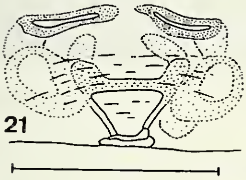
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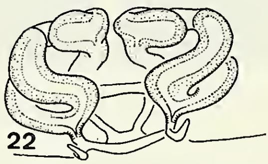
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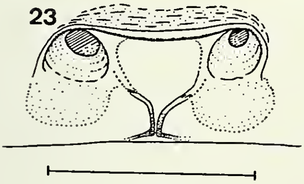
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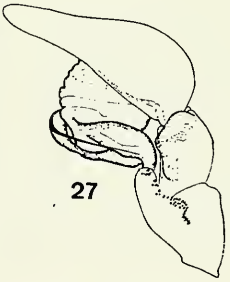
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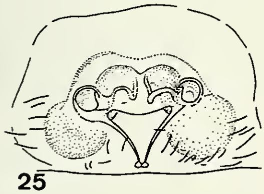
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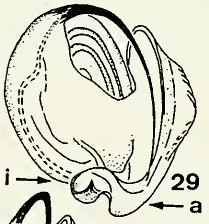
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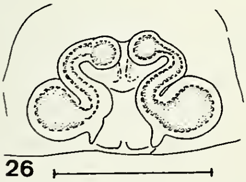
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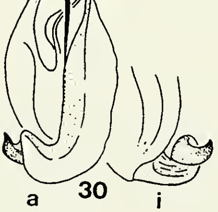
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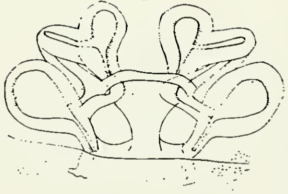
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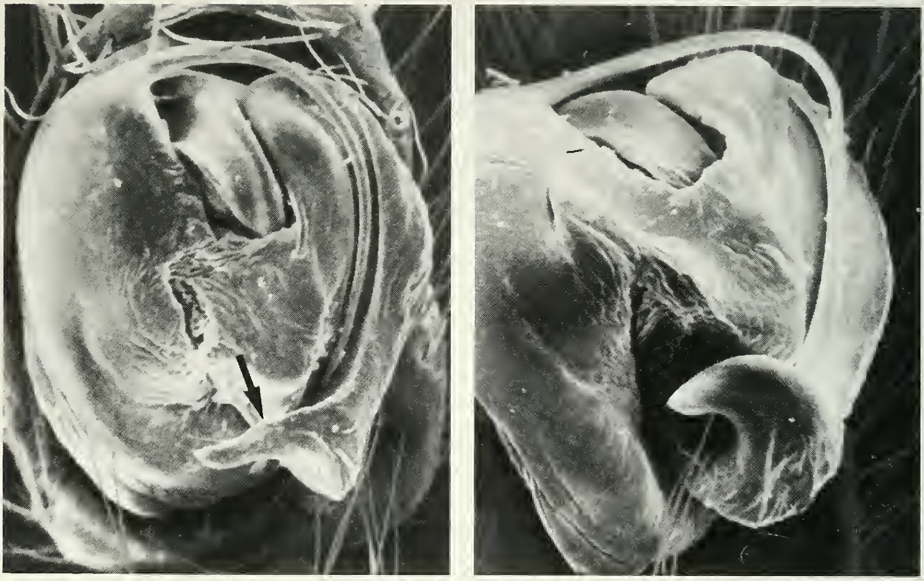


Abb. 31-32.

31: *Cybaeus intermedius*; 32: Cybaeus *montanus*.

Differentialdiagnostische Merkmale

Liegen männliche und weibliche Tiere gemeinsam vor, so ist die Unterscheidung zwischen den drei Arten weitgehend fehlerfrei möglich. Da die Männchen sommerstenochron sind, ist diese Voraussetzung jedoch bei vielen Belegen nicht erfüllt. Da sich die Merkmalskombinationen vor allem im weiblichen Geschlecht überlappen, sind Einzeltiere nicht unbedingt ohne Probleme zuzuordnen. Dies trifft vor allem für den Entscheid *montanus/intermedius* zu. Daher wäre es im Hinblick auf die Kenntnis der Verbreitung vordringlich, an kritischen Stellen zur Reifezeit Bodenfallen einzusetzen (Valsesia, Biella / Oropa, Mte Grappa / Bassano).

Tabelle 1 fasst die relevanten Merkmale zusammen.

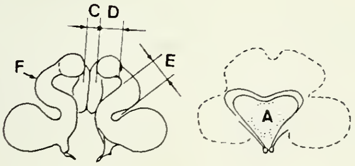
Höhenverbreitung, Reifezeit, Lebensraum

Höhenverbreitung: *minor* 850-1650 m; *montanus* 400-2200 m (Schwerpunkt bei 800-1600 m); *intermedius* 250-1600 m (Schwerpunkt bei 800-1200 m). Reifezeit: sommerstenochron; w werden während der ganzen Vegetationsperiode bis in den November gefunden. *minor* m (aufgrund der Literatur): Juli; *montanus* w: Funde von IV bis XI, m: VI 10 Ex., IX 1, X 1; *intermedius* w: VI-XI, m: VI 17, VII 24, VIII 12 Ex. Lebensraum: *minor* (gemäss Polenec): Buchenwald, Mischwald, Fichtenwald, Einzelfund in einer Höhle (Denis 1952). Für *montanus* und *intermedius* liegen aus dem Kanton Tessin genauere Angaben vor: *montanus*: Fagetum, Alnetum, Brachypodium-Brache sowie andere Brache-Typen. *intermedius*: verschiedene Waldtypen (Alnetum, Schluchtwald,

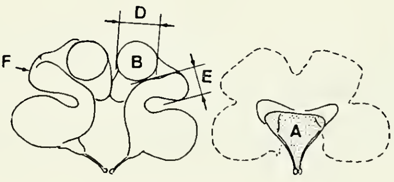
Merkmale von differenzialdiagnostischer Bedeutung innerhalb der minor - Gruppe

	minor	**intermedius**	**montanus**
Chelizerenbezahnung	6	5-6	(6-) 7-8 (-9)
Apophyse des männl. Tasters	kurz, leicht gebogen	s-förmig, schlank	hakenförmig, massiv
Epigyne/Vulva:			
Form der Epigynengrube (A)	dreieckig bis herzförmig	i. d. Regel herzförmig	dreieckig, ausnahmsweise herzförmig
apikales Ende des Vulvenganges	meist nur abgerundet	bulbös verdickt	bulbös verdickt
Distanz C	breit getrennt	1/3 - 1/10 B	1/3 - 1/10 B
D : E	ca. 1	< 1	> 1
Krümmung des vorderen Vulvenganges (F)	dorsad	laterad	dorsad
Verbreitung/Funde	Osteuropa, S-Alpen westl. bis Brescianer Alpen	Venet. Alpen bis Biellese, Schwerpunkt Tessiner Alpen	Brescianer A.- Piemont. A.- Ligur. Alpen

Bezeichnungen:



intermedius



montanus

Jungwald, lockeres Altholz mit Eichen, Buchen, Kastanien), Ginsterheide, Molinia-Brache mit Gebüsch, vereinzelt auch von Brachflächen in Magerwiesen (Nardetum) ausstrahlend. In Brachen wurden Tiere in Bodenfallen unter Gebüschen erbeutet.

DIE EUROPÄISCHEN ARTEN AUSSERHALB DER MINOR-GRUPPE

C. abchasicus Charitonov, 1947

1978 *Cybaeus abchasicus*, – Brignoli, *Revue suisse Zool.* 85: 508f.

Bemerkungen: Charitonov beschrieb seine Art aufgrund eines immaturen Weibchens. Es ist höchst zweifelhaft, dass das von Brignoli (1978b) aus der Türkei abgebildete weibliche Tier derselben Art zugehört. Sowohl die russischen wie auch die türkischen Vertreter der Gattung müssten umfassend untersucht werden.

C. angustiarum L. Koch, 1868

Roewer 1954, 2(a): 88.
Bonnet 1956, 2(2): 1300.
1868 *Cybaeus angustiarum*, – L. Koch, *Abh. Nat. Ges. Nürnberg* 4: 47.
1897 *Cybaeus angustiarum*, – Chyzer & Kulczynski, *Aran. Hungar.* 2(b): 153, T. 6 Fig. 7.
1931 *Cybaeus angustiarum*, – M. Dahl, in: Dahl, *Tierwelt Dtschl.*, 23: 11, Fig. 16, 17.
1973 *Cybaeus angustiarum*, – De Blauwe, *Bull. Inst. r. Sc. nat. Belg.* 49(2): 12, Fig. 9-11.

Hinweise: Die folgenden Literaturangaben beziehen sich *nicht* auf angustiarum: Simon (1937), Brignoli (1977), Denis (1963), De Blauwe (1972), Bosmans & De Keer (1985), Bosmans *et al.* (1986).

Taster, Epigyne / Vulva: Abbildungen 19-22.

C. brignolii n. sp.

1978b *Cybaeus* (?) *minor*, – Brignoli, Rev. suisse Zool. 85: 508f.

Brignoli bildete 1978a m und w eines *Cybaeus* aus der Türkei (Vil. Trabzon-Sümela) ab, den er – mit erheblichen Zweifeln – als *C.* (?) *minor* bezeichnete. Mit Sicherheit handelt es sich dabei nicht um *minor* Chyzer 1897, sondern um eine bisher nicht näher charakterisierte Art. Sie soll mit *C. brignolii* benannt werden. Ein identisches Männchen mit charakteristischer Patellarapophyse liegt aus Montenegro vor (leg. Polenec):

Überprüftes Material:
YU/Montenegro: Zljeb, Rozajà, 26.7.78: 1m (leg. Polenec, 4).
YU/Grenze zu Montenegro: Turjak, 27.7.78: 1 m (leg. Polenec, 4).

Taster, Epigyne/Vulva: Abbildung 27, 28 (aus Brignoli 1978).

C. pirini (Drensky, 1921)

von Roewer 1954 zu *Cybaeus*, von Bonnet 1957 zu *Hahnia* gestellt; nach Thaler 1980 *species inquirenda*, die nicht identisch ist mit *C. pirini sensu* Brignoli 1978b (= *Cryphoeca brignolii* Thaler 1980)].

C. raymondi (Simon, 1916) comb. nov. für *Cicurina raymondi*

Roewer 1954, 2(b): 48.
Bonnet 1956, 2(2): 1090.
1916 *Cicurina Raymondi*, – Simon, *Ann. Soc. Ent. Fr.* 85: 211.
1937 *Cicurina raymondi*, – Simon, *Arachn. de France* 6(5): 1019, 1043, Fig. 1585 (w).
1973 *Cicurina raymondi*, – De Blauwe, *Bull. Inst. r. Sc. nat. Belg.* 49(2): 23, Fig. 22.
1978 *Cybaeus angustiarum*, – Brignoli, *Revue suisse Zool.* 85: 282, Fig. 11.
1985 *Cybaeus angustiarum*, – Bosmans & De Keer, Catal. Araign. des Pyrénées: 38 (mit weiteren Literaturangaben/Nachweisen von Denis sowie Dresco).
1986 *Cybaeus angustiarum*, – Bosmans, Maelfait & De Kimpe, *Bull. Br. arachnol. Soc.* 7(3): 74.

Überprüftes Material:
F/Pyrenäen: Pierrefitte-Cauterets, 13.9.81: 1w; w Col du Tourmalet, 18.9.81: 2w (Thaler, 4).
F/Basses Pyrénées dans le bois au-dessus de Petite Nive, VI. 74: 1m (P. Haymoz, 8).
Epigyne / Vulva / Taster: Abbildungen 25, 26, 29, 30.

C. strandi Kolosvary, 1934

(nur 1 w: "Epigyne vom Typ des Genus abweichend"; Deutung offen, ev. kein *Cybaeus*: s. auch Brignoli 1977: 33)

C. tetricus (C.L. Koch, 1839)

Roewer 1954, 2(a): 88.
Bonnet 1956, 2(2): 1304.
1839 *Amaurobius tetricus*, – C.L. Koch, *Die Arachniden* 6: 43, Tf. 462.
1897 *Cybaeus tetricus*, – Chyzer & Kulczynski, *Aran. Hungar.* 2(b): 153, Tf. 6 Fig. 8.
1910 *Cybaeus tetricus*, – De Lessert, *Catal. Invert. Suisse, Araign.*, 3: 444.
1931 *Cybaeus tetricus*, – M. Dahl, in: Dahl, *Tierwelt Deustchl.* 23: 9, Fig. 11-15.
1937 *Cybaeus angustiarum*, – Simon, *Arachn. de France* 6(6): 980, Fig. 1506, 1507.
1977 *Cybaeus tetricus*, – Brignoli, *Quad. Circ. speleol. "V. Rivera"* 2(2): 31, Fig. 5, 7, 8.
1988 *Cybaeus tetricus*, – Maurer & Thaler, *Revue suisse Zool.* 95: 335/337, Abb. 3-5, 9.

C. vignai Brignoli, 1977

1977 *Cybaeus vignai*, – Brignoli, *Quad. Circ. speleol. "V. Rivera"* 2: 32, Fig. 11 (w).
1988 *Cybaeus vignai*?, – Maurer & Thaler, *Revue suisse Zool.* 95: 334, Abb. 6-8, 10 (m).

VERBREITUNG UND HERKUNFT VON CYBAEUS IN EUROPA

Die sicheren europäischen Arten der Gattung sind in folgenden Ländern nachgewiesen: *angustiarum*: D, YU, CS, H, RO, B, (BG?), PL; *brignolii*: YU, TR; *intermedius*: I, CH; *minor*: YU, H, I, (RO?); *montanus*: CH (Südalpen), I (Alpen,

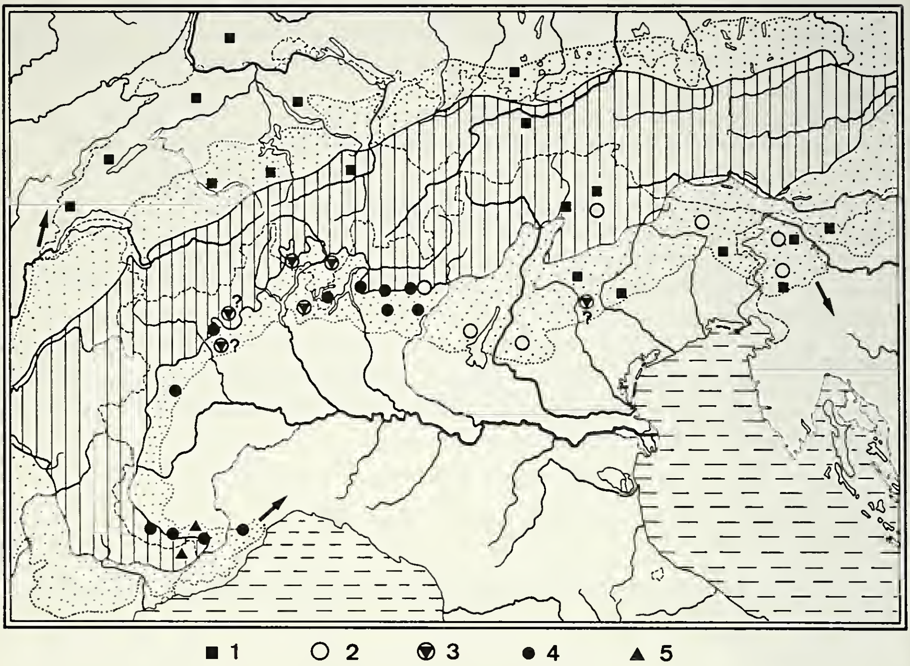


ABB. 33.

Fundorte von *Cybaeus* im Alpenraum: 1 *tetricus*; 2 *minor*; 3 *intermedius*; 4 *montanus*; 5 *vignai*. Vertikal schraffiert: Hochalpen; punktiert: Voralpen.

Apennin); *raymondi*: F (Pyrenäen); *tetricus*: F, CH, D, I, YU, CS, H, A; *vignai*: F/I (Meer-/Ligur. Alpen). Die Verbreitung der Arten des Alpenraumes nach den heutigen Kenntnissen ist in Abbildung 33 dargestellt. Für die folgenden Erwägungen ebenso wichtig ist jedoch auch die Frage, wo die Gattung nicht nachgewiesen ist: Gemäss den bisherigen Kenntnissen fehlt sie offenbar in Nordeuropa, England, den Niederlanden, in Spanien sowie auf den mediterranen Inseln.

Eine Reihe von Indizien fordert zur Frage heraus, woher und in welcher Abfolge Europa durch *Cybaeus* besiedelt worden ist. Die nachstehende Hypothese ergibt sich aus folgenden Beobachtungen, die sich mit vegetationskundlichen Fakten korrelieren lassen (s. KRAL 1979, OZENDA 1985, etc.):

— Es ist anzunehmen, dass die holarktische Gattung in Ostasien diversifizierter ist als in Europa; damit würde der Artenreichtum gegen Westen hin abnehmen.

— In Europa besiedelt sie nur das Festland, sie fehlt auf der iberischen Halbinsel, ebenso scheint sie neben mediterranen auch in subtropischen und tropischen Gebieten weitgehend zu fehlen.

— Die Arten weisen in Europa vorwiegend montane bis subalpine Verbreitung auf. Sie sind im Osten häufiger und weiter verbreitet als in Westeuropa.

— Die Gattung ist eng an Nadel- und Laubwälder mesophiler Ausprägung gebunden.

- Zwischen den südalpinen Arten bestehen enge Beziehungen; ausserdem stehen *vignai* und *raymondi* der *minor*-Gruppe nahe. Auf der Westseite des Alpenbogens fehlen bis heute Formen dieser Gruppe.
- Mit ihrer Bindung an Waldgesellschaften drängen sich Vergleiche mit der Einwanderungsgeschichte der wichtigsten Waldbäume auf, vor allem Tanne und Buche im Pleistozän und Postglazial. Für diese Baumarten sind vor allem die interglazialen Refugien im südwestlichen Europa sowie in den Südostalpen, welche auch für an Wald gebundene Tierarten Refugialgebiete gewesen sein können, von grossem Interesse.
- Ebenfalls könnte die mutmassliche Entwicklung der Temperaturverhältnisse im Alpenraum seit dem ausgehenden Pliozän Analogieschlüsse zur Einwanderung der Gattung aus Asien zulassen, ähnlich wie dies von zahlreichen Gebirgspflanzen der Alpen vermutet wird.

Aufgrund solcher Indizien lässt sich folgende Interpretation denken, die vergleichbar ist mit den Überlegungen, welche PROSZYNSKI (1986) für europäische Salticidae angestellt hat:

- Vorpleistozäne Entwicklung der Gattung in asiatischen Gebirgen.
- Ausbreitung expansiver Arten mit sinkender Temperatur zwischen neoalpiner Gebirgsbildungsphase und Pleistozän in Richtung Westen.
- Prä- oder interglaziale Besiedlung Europas und des Alpenraumes.
- Totalvernichtung der meisten Populationen während der Eiszeiten, Überdauern von *minor*- nahestehenden Reliktpopulationen in Waldrefugien SW- und SO-Europas während der Kaltzeiten.
- Postglaziale Besiedlung der Südalpen durch die *minor*-Gruppe von östlichen Refugien aus (expansive Arten! Ev. Herausbildung von *montanus* und intermedius aus Reliktpopulationen des Alpensüdrandes, wo interglaziale Waldrelikte, z.B. westlich Torino, bekannt geworden sind).
- Die heutige Verbreitung von *raymondi* und *vignai* muss sich aus den Interglazialrefugien südwestlich der Alpen ergeben haben. Es kann damit gerechnet werden, dass die Besiedlung W-Europas durch *Cybaeus* noch sehr jung und noch nicht abgeschlossen ist.

OFFENE PROBLEME

Die Vorstehenden Erwägungen und Interpretationen sind im Bewusstsein einer Reihe offener Probleme getroffen worden, die hier angefügt werden sollen:

- Ist der Artrang von *intermedius* richtig?
- Ist die Zuordnung der Männchen von *vignai* sensu MAURER & THALER (1988) korrekt?
- Die West- und Ostgrenzen von *montanus*, *intermedius* und *minor* sowie das Vorkommen von *montanus* im Apennin müssten geklärt werden.
- Das Fehlen von Vertretern der *minor*-Gruppe auf der Westabdachung der Alpen müsste besser abgesichert werden, ebenso das Fehlen der Gattung auf der iberischen Halbinsel.
- Hoher Untersuchungsbedarf besteht in Gebirgen Osteuropas, Südosteuropas sowie Asiens.

VERDANKUNGEN

Die Überlassung von Material zur Überprüfung der Verhältnisse verdanke ich in erster Linie A. Hänggi, Basel, K. Thaler, Innsbruck, M. Valle, Bergamo, C. Pesarini, Milano, P. Pronini, Mezzovico, Prof. A. Polenec, Kranj, B. Hauser, Genf, sowie Y. Gonseth, Neuchâtel. R. Foelix, Aarau bin ich verbunden für die Bereitstellung der REM-Aufnahmen an der Neuen Kantonsschule Aarau.

ZUSAMMENFASSUNG

Neue Funde von *Cybaeus* in den Südalpen führten zu einer Überprüfung der südeuropäischen Arten: *C. angustiarum* L. Koch ist auf Mittelreuropa nördlich der Alpen und Osteuropa beschränbkt. Der bisherige "*C. angustiarum*" der Südalpen zerfällt in *C. montanus* n. sp. und *C. intermedius* n. sp., die Tiere der französischen Pyrenäen sind als *C. raymondi* zur bezeicznen (von Simon anlässlich der Erstbeschreibung zu *Cicurina* gestellt). *C. minor* sensu Brignoli 1978a (Türkei) ist eine distinkte Art, die mit *C. brignolii* benannt wird. *C. minor*, *intermedius* und *montanus* bilden die *minor*-Gruppe, welcher *vignai* und *raymondi* nahestehen. Für *Cybaeus* als Gattung montaner Waldgesellschaften wird präglaziale Einwanderung aus Osten erwogen, für die südwestlichen und südlichen Arten interglaziale Überdauerung der Vorläufer in Reliktpopulationen.

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Revue suisse Zool.	Tome 99	Fasc. 1	p. 163-176	Genève, mars 1992

Wiederansiedlung und Ausbreitung des Luchses (*Lynx lynx*) im Schweizer Jura

von

Urs BREITENMOSER * und Marco BAETTIG **

Mit 3 Abbildungen

ABSTRACT

Re-introduction and expansion of the lynx (*Lynx lynx*) in the Swiss Jura Mountains. – The lynx was eradicated in Switzerland in the 19th century. From 1972 to 1975, 8 to 10 wild lynx from the Czechoslovakian Carpathian Mountains were released in the Swiss Jura Mountains. The re-introduction was not monitored in the following years. We gathered previous lynx observations from reports of the regional wildlife services and by interviewing game wardens and hunters, and describe the expansion of the re-established population from 350 reported sightings. The total range of the observations in the Swiss Jura Mountains until 1987 was 6095 km^2, but only two subareas of 2198 km^2 and 1292 km^2 respectively were occupied consistently. These two parts of the Swiss Jura Mountains are significantly more wooded (40%) than the rest of the mountain range (31%). The portion of the built-up area negatively influences the lynx distribution only in less wooded areas, whereas altitude alone has no significant affect on the lynx distribution. At present the re-introduction of lynx in the Jura Mountains may be considered a success.

EINLEITUNG

Umsiedlungen und Wiederansiedlungen als Instrument des Artenschutzes und zum Erhalten der biologischen Diversität gewinnen zunehmend an Bedeutung, und damit auch die Analyse von Translokationen zur Entwicklung erfolgversprechender Strategien (GRIFFITH *et al.* 1989). Neben der Wiederansiedlung des Luchses in den Schweizer Alpen (BREITENMOSER 1983, HALLER 1991) und in Slowenien (COP 1980) waren die Aussetzungen im Schweizer Jura der bisher erfolgreichste Versuch, diese Art in ihr historisches Areal zurückbringen (BREITENMOSER & BREITENMOSER-WÜRSTEN 1990), und gehören zu den wenigen erfolgversprechenden Rückführungen eines Raubsäugers

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* Dr. Urs Breitenmoser, Zoologisches Institut, Baltzerstrasse 3, CH-3012 Bern, Schweiz (gegenwärtige Adresse: Institute of Animal Resource Ecology, University of British Columbia, 2204 Main Mall, Vancouver B.C., V6T 1W5, Canada).

** Dr. Marco Baettig, Gros Clos, CH-2806 Mettembert, Suisse.

überhaupt. Leider ist das Experiment im Jura das am schlechtesten dokumentierte. Zwar sind die Aussetzungen in verschiedenen Veröffentlichungen erwähnt (u.a. KEMPF *et al.* 1979, FERNEX 1976, FESTETICS 1980, BREITENMOSER 1983), aber eine kritische Würdigung der Wiedereinbürgerung anhand der Entwicklung der Population und der Analyse ihrer Ausbreitung ist nie erfolgt. Das liegt daran, dass die Aussetzungen heimlich stattfanden, und die Initianten kein Programm zur Überwachung der freigelassenen Tiere oder zum systematischen Sammeln von Hinweisen verfolgten. Sowohl im schweizerischen als auch im französischen Jura wurden jedoch Beobachtungen gemacht, die die Entwicklung der Luchspopulation dokumentieren. Für den französischen Teil des Massivs haben HERRENSCHMIDT & LEGER (1987) 142 Zweithandbeobachtungen zur Verbreitung des Luchses gesammelt. Um die bestehende Lücke in der veröffentlichten Geschichte der Wiederansiedlung der grössten europäischen Katze zu schliessen, wollen wir hier für den Schweizer Jura vergleichbare Daten darstellen und uns dabei auf folgende Aspekte konzentrieren: 1. Aussetzungen der Luchse, 2. räumliche und zeitliche Ausbreitung der Population und 3. Verteilung der Beobachtungen in der Kulturlandschaft des Schweizer Juras. Wir diskutieren das Vorgehen bei den Aussetzungen und versuchen, eine vorläufige Bilanz der Wiederansiedlung im Jura zu ziehen.

UNTERSUCHUNGSGEBIET UND METHODEN

Der Jura ist ein Kalkgebirge in Mitteleuropa, das sich in einem 300 km langen Bogen von SW nach NE ausdehnt. Von Genf bis Basel bildet das Massiv die Grenze zwischen der Schweiz und Frankreich (Abb. 3). Das Untersuchungsgebiet – der gesamte schweizerische Teil des Gebirges – umfasst nach der Definition im Informationsraster (BUNDESAMT FÜR RAUMPLANUNG & BUNDESAMT FÜR STATISTIK 1980) 450 politische Gemeinden in den Kantonen Genf, Waadt, Neuenburg, Jura, Bern, Solothurn, Basel-Stadt, Basel-Landschaft und Aargau mit einer Fläche von 4405 km^2. Höchster Punkt im Schweizer Jura ist La Dôle mit 1677 Meter. Die klimatische Waldgrenze wird nirgends erreicht; die oft flachen Gebirgsrücken sind jedoch fast überall in Weideland umgewandelt. Der mittlere Waldanteil im Untersuchungsgebiet beträgt 39% und erreicht im Kanton Waadt sogar 53%. Der Jura ist als naturnahe Kulturlandschaft recht dicht bewohnt: Die mittlere Bevölkerungsdichte beträgt 218 Einwohner/km^2. Selbst ohne Berücksichtigung der 17 meist randlich gelegenen Gemeinden mit mehr als 10'000 Einwohnern erreicht die menschliche Bevölkerung eine Dichte von 117 E/km^2.

Als Vorbereitung für eine geplante radiotelemetrische Untersuchung haben wir im Sommer und Herbst 1987 Daten zum Auftreten des Luchses im Schweizer Jura erhoben. Analog dem Vorgehen bei einer früheren Arbeit über die Entwicklung der Luchspopulation im Alpenraum (BREITENMOSER 1983) sammelten wir aus dem ganzen Untersuchungsgebiet schriftlich festgehaltene Beobachtungen. Erste Quellen bildeten die Archive der kantonalen Jagdverwaltungen ab 1970. Danach konsultierten wir alle staatlichen Wildhüter in den Kantonen mit Patentjagd (Waadt, Neuenburg, Jura und Bern) bzw. einen gut informierten Pächter pro Revier in den Kantonen mit Revierjagd (Solothurn, Basel-Landschaft und Aargau). Die Wahl der Aufsichtsgebiete und Jagdreviere als Bezugsflächen gewährleistet – obwohl sie nicht alle gleich gross sind – die gleichmässigste Bearbeitung des Gebiets, da die Wildhüter bzw. Revierpächter gemeldete Beobachtungen normalerweise schriftlich festhalten. Aus den Unterlagen der Kontaktpersonen übernahmen wir die Luchsnachweise direkt oder erfuhren die Namen der Beobachter, die dann um weitere Auskunft gebeten wurden. Pro Nachweis notierten wir Ort (als Koordinatenwert), Datum und Zeit, die Art und den Verlauf der Beobachtung und

Angaben zum Informanten. Als Nachweis gilt eine Direktbeobachtung, ein vom Luchs gerissenes Tier (Riss), eine Luchsspur oder ein Hinweis wie Lautäusserung oder Exkremente. Kombinationen von Beobachtungen (z.B. Rissfund mit dazuführender Luchsspur) gelten nur als ein Nachweis, und zwar in der Hierarchie Direktbeobachtung – Riss – Spur – Hinweis. Für die Auswertung akzeptierten wir nur Nachweise, die einem bestimmten Quadratkilometer oder mindestens einer homogenen Geländestruktur (z.B. "im Wald zwischen A und B") zugeordnet werden konnten. Unsichere oder offensichtlich falsch interpretierte Beobachtungen wurden nicht berücksichtigt.

Geographische und demographische Daten über das Untersuchungsgebiet stammen aus einer Quadratkilometer-Datenbank, die uns das Bundesamt für Statistik aus dem Hektarraster (Bundesamt für Raumplanung & Bundesamt für Statistik 1980) kompilierte. Flächenberechnungen und Klumpungs – ("cluster" –) Analysen wurden mit Ranges IV (Kenward 1990) durchgeführt. Klumpungen werden dabei durch schrittweises Zusammenfassen der jeweils nächsten Nachbarn jedes Koordinatenpunkts ermittelt (Kenward 1987). Als statistisches Mass für die Diversität in der Verteilung der Beobachtungen und der einzelnen Klumpenflächen werden die Simpsons Indices berechnet (Kenward 1990). Um Verwirrung zu vermeiden, behalten wir die von Kenward (1990) verwendeten englischen Ausdrücke für die Indices bei. Für statistische Berechnungen und Graphiken verwendeten wir Systat (Wilkinson 1988a) bzw. Sygraph (Wilkinson 1988b).

RESULTATE

Geschichte der Aussetzungen

Der Luchs ist im Jura im Verlauf des 18. und 19. Jahrhunderts ausgerottet worden (Schauenberg 1969, Eiberle 1972, Herrenschmidt & Leger 1987 und Hainard 1987). Die letzte belegte Beobachtung erfolgte 1871 in der Nähe von Pontarlier (Schauenberg 1969). Am 8.7.1974 und am 5.7.1975 wurden im Creux-du-Van (Kanton Neuenburg, ausgefüllter Stern in Abb. 1a) je ein Paar Luchse freigelassen. Die vierTiere waren im Herbst/ Winter 1973 bzw. 1974 in den tschechoslowakischen Karpaten gefangen und an den Zoologischen Garten Basel geliefert worden, wo sie bis zur Aussetzung in Quarantäne blieben. Die Luchse wogen bei der Ankunft in Basel 18 kg und 20 kg (Männchen) bzw. 15 kg und 18 kg (Weibchen). Diese Aussetzungen wurden von der neuenburgischen Jagdverwaltung mit der notwendigen Einwilligung der zuständigen eidgenössischen Behörden durchgeführt.

Bereits vor der offiziellen Wiederansiedlung waren Luchse ohne behördliche Bewilligung im Jura freigelassen worden. Fernex (1976) erwähnt heimliche Aussetzungen sowohl nördlich als auch südlich des Creux-du-Van. Näheres zu den Aussetzungen ist nicht bekannt, aber Kempf (1979) berichtet von Aussetzungen im Risoux (Vallée de Joux, Kanton Waadt, südwestliches Untersuchungsgebiet) und zeichnet auf einer Karte im Jura insgesamt acht freigelassene Luchse ein. Nachweise vor 1974 (Appendix I) im südwestlichen und im nordöstlichen Schweizer Jura, weit enfernt vom Creux-du-Van (Abb. 1a), und die im folgenden beschriebene Bestandsentwicklung bestätigen diese Freilassungen. Aufgrund der schriftlichen Quellen und verschiedener früher Beobachtungen schliessen wir, dass 1972 im nördlichen Teil des Untersuchungsgebiets mindestens zwei und 1973 oder 1974 im Vallée de Joux vermutlich vier Luchse freigelassen wurden (leere Sterne in Abb. 1a), so dass bis Ende 1975 mit acht bis zehn ausgesetzten Individuen im Schweizer Jura gerechnet werden kann.

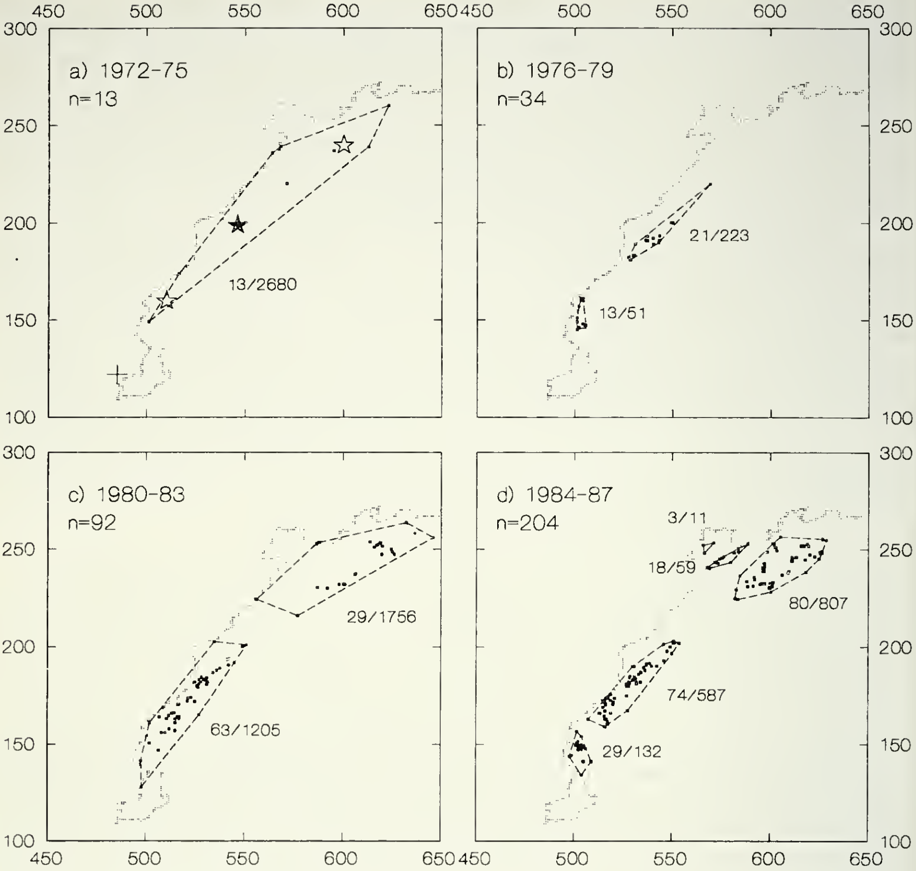

Abb. 1.

Luchsnachweise im Jura verteilt auf vier Vierjahresperioden. Die Skalen beziehen sich auf das schweizerische km-Koordinatennetz. Die unterbrochenen Linien stellen die 100%-Klumpungen dar. Die einzelnen Polygone sind mit Anzahl Nachweisen / Polygonfläche in km^2 beschriftet. Teilabbildung a): ausgefüllter Stern = offizieller Aussetzungsort Creux-du-Van, leere Sterne = Gebiete heimlicher Aussetzungen, Kreuz = Ort der Erlegung eines Luchses am 21.10.1974 bei Thoiry (Frankreich). Indices für die Klumpung: a): part-area = 1,00, S-fixes = 1,00, S-area = 1,00; b): pa = 0,40, Sf = 1,90, Sa = 1,39; c): pa = 0,55, Sf = 1,76, Sa = 1,94; d): pa = 0,32, Sf = 3,19, Sa = 2,52.

POPULATIONSGRÜNDUNG UND AUSBREITUNG

Wir konnten 350 Luchsnachweise aus dem Schweizer Jura erheben, die den Verlauf der Wiederbesiedlung dokumentieren. Die Beobachtungen sind detailliert in Appendix I und II aufgeführt. Um allfällige initiale Populationskerne zu erkennen, prüfen wir die Daten auf ihren räumlichen Zusammenhang (100%-"cluster"-Analyse, KENWARD 1990). Da die

Nachweise für eine jahrweise Analyse in den frühen Jahren nicht ausreichen, haben wir sie in vier Vierjahresperioden zusammengefasst (Abb. 1a-d). Danach untersuchen wir den quantitativen Zusammenhang von Luchsbeobachtungen und besiedelter Fläche (Abb 2).

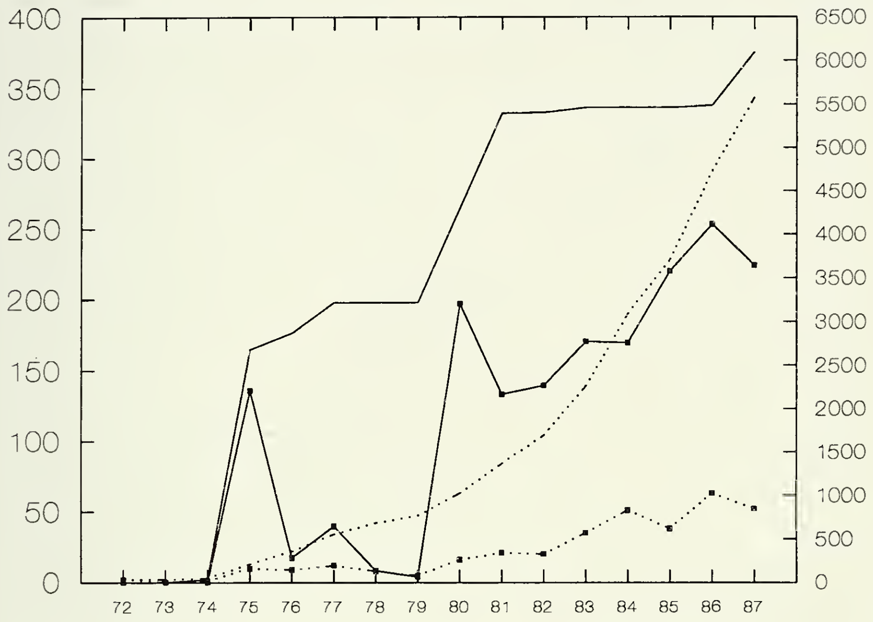

Abb. 2.

Anzahl Luchsnachweise (gestrichelte Linien, Skala links) und Fläche der Nachweise in km^2 (durchgehende Linien, Skala rechts) im Schweizer Jura von 1972 bis 1987. Linien mit Symbolen = Nachweise bzw. Fläche pro Jahr; Linien ohne Symbole = kumulierte Nachweise bzw. Fläche der kumulierten Nachweise. Die Flächen werden berechnet als die konvexen Polygone der äussersten Nachweise.

Zwei der drei Aussetzungen führten zur Gründung von Populationsnuclei: die offizielle im Creux-du-Van und die südwestliche im Vallée de Joux (Abb. 1a). Den ersten sicheren Nachweis von Jungluchsen protokollierten wir für das Jahr 1975 aus dem Vallée de Joux (Appendix I). Das ist auch eine Bestätigung für die heimlichen Freilassungen von mehr als zwei Luchsen in diesem Gebiet. Am 21.10.1974 schossen Jäger südwestlich des Vallée de Joux, in der französischen Gemeinde Thoiry (Abb. 1a), 100 km vom Creux-du-Van entfernt, einen Luchs. Das Tier wurde als 23 kg schweres Weibchen beschrieben; bei diesem Gewicht dürfte es sich jedoch um ein adultes Männchen gehandelt haben (vgl. Haller & Breitenmoser 1986). Die folgende Populationsentwicklung zeigt, dass 1974 auch nach diesem Verlust fortpflanzungsfähige Luchse im mittleren und südwestlichen Untersuchungsgebiet lebten.

Die Bestandsentwicklung im nordöstlichen Untersuchungsgebiet ist schwieriger nachzuvollziehen. Die wenigen Beobachtungen der frühen Jahre (Abb. 1a) verteilen sich fast über den gesamten Schweizer Jura. In der Periode 1976-79 erfolgte eine Arealreduktion vor allem im Nordosten. Die Nachweise des nordöstlicheren Klumpens in Abb.

1b sind auf den im Creux-du-Van entstandenen Populationskern zurückführen: Alle Beobachtungen unmittelbar südwestlich des Koordinatenpunkts 550/200 fallen sowohl in den folgenden beiden Zeitabschnitten (1980-83 bzw. 1984-87, Abb. 1c und 1d) als auch in der Gestamtdarstellung (Abb. 3) in die südwestliche Konzentration. Aufgrund der chronologischen Verteilung der Nachweise dürfen wir nicht schliessen, dass die beiden deutlich getrennten Verbreitungskonzentrationen (Abb. 3) durch unterschiedliche Populationsgründungen entstanden ist. Die im nordöstlichen Untersuchungsgebiet ausgesetzten Luchse konnten offenbar nicht Fuss fassen; dieser Teil des Juras scheint ab 1980 von Südwesten her nochmals besiedelt worden zu sein. Aufgrund der Abwanderung eines 1988 radiotelemetrisch überwachten subadulten Luchses wissen wir, dass Luchse vom südwestlichen ins nordöstliche Teilgebiet wechseln können (BREITENMOSER unpubl.). Der frühste Hinweis auf Nachwuchs für das nordöstliche Teilgebiet stammt erst aus dem Jahr 1985.

Die räumliche Ausdehnung des Luchsbestands steigt nicht parallel zur Zahl der Beobachtungen an. Die Nachweise nehmen linear zu (gepunktete Linie mit Symbolen in Abb. 2), während die Fläche pro Jahr, dargestellt als konvexe Polygone der äussersten jährlichen Nachweise, beträchtlich schwankt (ausgezogene Linie mit Symbolen in Abb. 2). Die auffälligsten Abweichungen sowohl nach oben (1975 und 1980) als auch nach unten (1976-79) hängen mit dem vorübergehenden Fehlen von Nachweisen im nordöstlichen Untersuchungsgebiet zusammen (vgl. auch Abb. 1a, b und c). Seit 1981 erfolgte eine Verdichtung der Beobachtungen: Während die kumulierten Nachweise fast exponentiell zunehmen (gepunktete Kurve ohne Symbole in Abb. 2), verläuft die Kurve der Fläche der kumulierten Nachweise annähernd asymptotisch (ausgezogene Linie ohne Symbole in Abb. 2). Die Grenzen des gegenwärtig besiedelten Raums im Schweizer Jura waren rascher erreicht als dieser Raum im Innern aufgefüllt. Die Fläche der Nachweise pro Jahr war 1987 nach einer konstanten Zuhnahme seit 1980 erstmals kleiner als im Vorjahr. Das könnte das Ende der Ausbreitung der Luchspopulation im Schweizer Jura andeuten, auch wenn die Fläche der kumulierten Nachweise 1987 nach sechs Jahren Stagnation nochmals anstieg (Abb. 2).

GEGENWÄRTIGE AUSDEHNUNG DER POPULATION

Alle 350 Nachweise zusammen verteilen sich über eine Fläche von 6095 km^2 (Abb. 3, Polygon aller Nachweise); der südöstliche Teil des Polygons liegt jedoch im schweizerischen Mittelland, wo nie Luchse beobachtet wurden. Die Analyse der Daten auf räumliche Konzentrationen ergibt einen nordöstlichen und einen südwestlichen Klumpen (Polygon nordost bzw. Polygon südwest, Abb. 3), die beide vollständig im Jura liegen. Die Summe der beiden Polygonflächen beträgt 3490 km^2. Die 100%-Konzentrationen für die Vierjahresperioden (Abb. 1) offenbaren einen zunehmenden Zerfall der Nachweise in einzelne Klumpen (vgl. die part-area-Werte). Die Summe der fünf Teilpolygone für die Periode 1984-87 (Abb. 1d) beträgt nur 1482 km^2.

Die zunehmende Aufsplitterung ist hauptsächlich abhängig von der Datenmenge und bedeutet kaum eine Reduktion der besiedelten Fläche. Die kleinere Gesamtfläche in der letzten Periode (Abb. 1d) ist eher auf eine Überbewertung der besiedelten Fläche für die Jahre 1980-83 durch einzelne randliche Beobachtungen vor allem im nordöstlichen Untersuchungsgebiet zurückzuführen (vgl. Abb. 1c und 1d). Die Tatsache, dass die Klumpungsanalyse aller 350 Nachweise (Abb. 3) nur zwei, die der Periode 1984-87 (204 Nachweise, Abb. 1d) hingegen fünf Konzentrationen ergibt, deutet jedoch an, dass die Nachweise der drei ersten Perioden nicht gleich verteilt sind wie die der Jahre 1984-87. Die Nachweisdichte ist von Periode zu Periode zunehmend, schwankt aber zwischen den

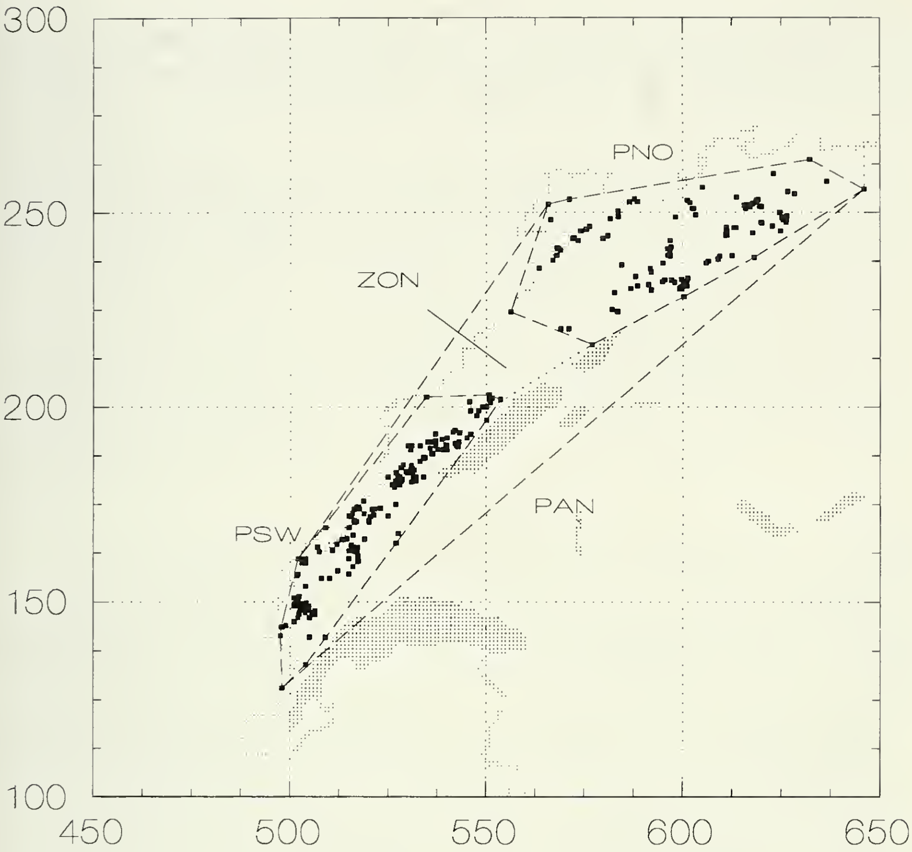

Abb. 3.

Verteilung von 350 Luchsnachweisen im Schweizer Jura von 1972-1987. Skalen wie in Abb. 1. Landesgrenze und grössere Seen gepunktet. Die unterbrochenen Linien umreissen das Polygon aller Nachweise (PAN = 6095 km^2) und die beiden 100%-Klumpungen (Polygon nordost = PNO = 2198 km^2, 139 Nachweise; Polygon südwest = PSW = 1292 km^2, 211 Nachweise). Die Fläche nördlich der gepunkteten Linie zwischen PNO und PSW bis zur Landesgrenze ist die Zone ohne Nachweise (ZON = 465 km^2). Indices für die Klumpung: part-area = 0,57, S-fixes = 1,92, S-area = 1,88.

Teilflächen und von Jahr zu Jahr. Die Dichte in den südwestlichen Klumpen ist in den beiden letzten Perioden etwa um den Faktor 1,5 höher als in den nordöstlichen (Abb. 1). Die Serie ist aber zu kurz, um in den verschiedenen Indices (Abb. 1 und 3) einen klaren Trend zu erkennen.

CHARAKTERISTIK DER BESIEDELTEN LANDSCHAFT

Die ungleichmässige Verteilung der Nachweise könnte auf eine nicht durchgehende Eignung des Juras als Luchshabitat zurückzuführen sein. Wir unterziehen die in Abb. 3

ausgeschiedenen Teilflächen im folgenden einer Analyse auf drei einfach messbare und für die Verteilung der Luchse potentiell wichtige Parameter: die Bewaldung (gemessen als Waldanteil pro km^2), den Zivilisationseinfluss (Anteil überbaute Fläche pro km^2) und die Höhe über Meer (mittlere Höhenstufe pro km^2 in 100-Meter-Klassen).

Tab. 1.

Statistische Masszahlen aller km-Quadrate sowie der km^2 mit bzw. ohne Luchsnachweise für das Polygon aller Nachweise (PAN), das Polygon nordost (PNO), das Polygon südwest (PSW) und die Zone ohne Nachweise (ZON, vgl. Abb. 3). WAL, ZIV = Waldanteil bzw. Anteil überbaute Fläche pro km^2 in Prozent; HKL = mittlere Höhenstufe in Meter; n = Anzahl km^2; x = Mittelwert; s = Standardabweichung.

		PAN			PNO			PSW			ZON		
		WAL	ZIV	HKL	WAL	ZIV	HKL	WAL	ZIV	HKL	WAL	ZIV	HKL
	n		6260			2101			1358			465	
alle km^2	x	32,5	5,31	665	39,5	3,62	687	42,5	2,27	911	31,3	3,52	961
	s	28,9	13,0	289	26,5	9,68	225	31,5	6,41	306	26,0	10,8	170
km^2 mit Nachweisen	n		238			95			143			0	
	x	58,8	1,61	878	56,9	1,12	701	60,0	1,94	995			
	s	25,5	5,65	282	23,6	4,33	208	26,7	6,38	264			
km^2 ohne Nachweise	n		6022			2006			1215			465	
	x	31,5	5,46	657	38,7	3,74	686	40,4	2,31	901	31,3	3,52	961
	s	28,5	13,1	286	26,3	9,85	226	31,4	6,41	309	26,0	10,8	170

Die 350 Nachweise verteilen sich auf 238 1-Kilometer-Quadrate (mittlere Belegung = 1,47, Standardabweichung = 1,33, Bereich = 1 - 14). Eine signifikante Korrelation zwischen der Anzahl Nachweise pro km^2 und den drei betrachteten Geländeparametern besteht nur für den Waldanteil ($r_s = 0,14$, $p < 0,05$). Wir unterscheiden deshalb nur noch zwischen belegten und unbelegten km-Quadraten, d.h. Rasterquadraten mit bzw. ohne Nachweise. Die Mittelwerte für die drei Parameter "Wald", "Zivilisation" und "Höhenklasse" pro Teilfläche für alle Rasterquadrate und aufgeteilt nach belegten und unbelegten km-Quadraten sind in Tab. 1 zusammengefasst. Im Nordwesten des Untersuchungsgebiets schliesst die Landesgrenze anstelle der Polygonseiten die Teilflächen ab, weil uns die Geländedaten für Frankreich nicht zur Verfügung stehen. Deshalb stimmen die Anzahl km^2 (n in Tab. 1) und die in Abb. 3 angegebenen Polygonflächen nicht genau überein.

Für alle drei Geländeparameter unterscheiden sich die Mittelwerte für die belegten und die unbelegten Quadrate für das Polygon sämtlicher Nachweise signifikant (alle $p < 0,001$; t-Test für unterschiedliche Varianzen). Die km-Quadrate mit Luchsnachweisen sind durchschnittlich fast doppelt so stark bewaldet, dreimal weniger überbaut und liegen mehr als 200 Meter höher. Der Vergleich von belegten und unbelegten km-Quadraten innerhalb der beiden Klumpungen nordost bzw. südwest ergibt für den mittleren Waldanteil ebenfalls signifikante Unterschiede ($p < 0,001$). Der Mittelwert der Höhenklasse unterscheidet sich im geringere Reliefenergie aufweisenden Polygon nordost – man beachte die tiefen Standardabweichungen in Tab. 1 – nicht eindeutig ($p = 0,51$); während im Polygon südwest der Zivilisationsanteil keine signifikante Differenz ergibt ($p = 0,52$). Ausgerechnet im Südwesten des Untersuchungsgebiets, wo die mittlere Überbauung pro km^2 mit 2,27% am geringsten ist, weisen die Quadrate mit Luchsnachweisen den höchsten Zivilisationsanteil auf (1,94%, Tab. 1).

Wie unterscheidet sich nun aber das Gelände der beiden Polygone mit Luchsbeobachtungen voneinander und gegenüber der dazwischen liegenden Zone ohne Nachweise? Die Mittelwerte der drei Geländeparameter für die Klumpen nordost und südwest sind alle signifikant verschieden (alle $p < 0{,}004$). Der Nordosten – der eine geringere Zahl und Dichte an Beobachtungen aufweist – ist weniger bewaldet, mehr überbaut und tiefer gelegen als der Südwesten (Tab. 1). Die offenbar für den Luchs wenig geeignete Zone ohne Nachweise ist signifikant weniger bewaldet als die beiden benachbarten Flächen ($p < 0{,}001$), liegt aber am höchsten aller Teilgebiete und ist etwas weniger überbaut als das Polygon nordost ($p = 0{,}85$). Das bedeutet, dass die Höhenklasse sich kaum auf die Verteilung der Nachweise auswirkt, wohl aber das Ausmass der Bewaldung. Ein hoher Zivilisationsanteil ist offenbar erst bei geringer Bewaldung ein negativer Faktor; in stark bewaldeten Teilgebieten darf jedoch die Überbauung recht hoch sein. Für die Verteilung der Luchsnachweise im Jura ist der Waldanteil der entscheidende Faktor: Die belegten – also für den Luchs geeigneten – km-Quadrate der Polygone nordost und südwest unterscheiden sich signifikant bezüglich der Höhenklasse, nicht aber bei der Bewaldung ($p = 0{,}34$) und dem Zivilisationsanteil ($p = 0{,}23$).

DISKUSSION

Die Aussetzungen in der Schweiz wurden dilettantisch durchgeführt; kaum eine der von Naturschutzorganisationen aufgestellten Richtlinien für das Vorgehen bei Wiederansiedlungen (JUNGIUS 1985, IUCN SPECIES SURVIVAL COMMISSION 1987) wurde berücksichtigt. Zwar ist das Beachten dieser Prozeduren für den Erfolg einer Wiederansiedlung nicht unabdingbar, das heimliche Vorgehen bei den Aussetzungen und die fehlende Überwachung der freigelassenen Tiere war jedoch politisch unklug – die Kontroverse um die Rückführung eines grossen Raubtiers wurde durch die ungenügende Information der Öffentlichkeit gefördert – und aus der Sicht einer objektiven Beurteilung des Experiments völlig unbefriedigend. Andererseits war die Wiederansiedlung des Luchses in der Schweiz eine Pioniertat; weder die Aussetzer noch die für Bewilligungen zuständigen Behörden konnten auf Erfahrungen zurückgreifen oder waren sich bewusst, welche ökologischen und politischen Konsequenzen die Rückführung eines Spitzenpredators haben würde (vgl. dazu HALLER 1991). Erst in jüngerer Zeit erschienen auch wissenschaftliche Arbeiten zum Thema Wiederansiedlungen und Translokationen (u.a. CAMPBELL 1980, JUNGIUS 1985, GRIFFITH *et al.* 1989, CLARK & WESTRUM 1989), aber oft sehen sich die Autoren mit mangelhaft dokumentierten Experimenten konfrontiert oder greifen gar auf zweifelhafte Versuche zurück (z. B. CAMPBELL 1980).

Für das langfristige und grossräumige Überwachen der Ausbreitung einer Art bei Wiederansiedlungen ist das Sammeln und Auswerten von Zufallsbeobachtungen die billigste (und damit oft die einzige realisierbare) Methode. Zweithandbeobachtungen sind aber, weil anthropogen verzerrt, nur bedingt repräsentativ für die Verteilung von Tieren. Weitergehende Analysen als z. B. die hier angestellten einfachen Geländeauswertungen müssen mit unabhängigen Daten durchgeführt werden. Die lückenhafte Dokumentation der Aussetzungen und das nachträgliche Erheben der Daten – Beobachtungen geraten mit der Zeit in Vergessenheit – gestatten uns nur noch eine grobe Beurteilung der Entwicklung des Luchsbestands im Schweizer Jura. Da wir jedoch als Ausgangspunkt nur schriftliche Quellen berücksichtigten und Luchsbeobachtungen in den frühen Jahren – weil noch spektakulär – eher gemeldet und notiert wurden, glauben wir, dass die gesammelten Nachweise mindestens tendenziell die Entwicklung der Population widerspiegelt und für ihre Ausdehnung repräsentativ sind. Folgende Punkte halten wir für erwähnenswert: 1. Wie im Alpen raum (BREITENMOSER 1983, HALLER 1991) waren "illegale" Luchse entscheidend an der Bestandsgründung beteiligt. Mit den vier offiziell ausgesetzten Tieren allein wäre die Wiederansiedlung des Luchses im Jura vermutlich gescheitert. 2. Anders als in den Schweizer Alpen (BREITENMOSER 1983, HALLER & BREITENMOSER 1986, HALLER 1991) und in Slowenien (COP 1980) steht den Luchsen im Jura kaum ein unberührtes Rückzugsgebiet offen. Der Jura ist relativ dicht besiedelt, landwirtschaftlich genutzt und ganzjährig einem gewaltigen Ausflugstourismus ausgesetzt. Der Luchs kann durchaus in Gebieten mit starker anthropogener Nutzung existieren, sofern das Habitat geeignet, d.h. grossflächige, zusammenhängende Bewaldung vorhanden ist (vgl. HALLER & BREITENMOSER 1986, HALLER 1991). 3. Eine weitere Voraussetzung ist eine ausreichende Nahrungsgrundlage. Die gesammelten Nachweise (Appendix I) zeigen, dass wie im Alpenraum (BREITENMOSER & HALLER 1987, HALLER 1991) das Reh (*Capreolus capreolus*) und die Gemse (*Rupicapra rupicapra*) bevorzugte Beuten sind. Leider stehen uns keine Daten zur Verfügung, die einen Vergleich der Verteilung der Luchsnachweise und der beiden Paarhuferarten gestatten. Grundsätzlich ist aber die Ungulatendichte im ganzen Untersuchungsgebiet hoch und vermutlich besser als in den meisten autochthonen Luchsgebieten.

Schweizer Luchse sind auch in den französischen Jura ausgewandert. Die Beobachtungen in Frankreich erstrecken sich über eine Fläche von etwa 3200 km^2 (geschätzt nach der Anzahl belegter Rechtecke in der Karte in HERRENSCHMIDT & LEGER 1987). Die Ausdehnung der gesamten Jurapopulation dürfte damit gegenwärtig 6500 bis 7000 km^2 betragen. Ist die Wiederansiedlung des Luchses im Jura damit gelungen? Der Bestand hat sich immerhin 15 Jahre lang halten und über eine beachtliche Fläche ausbreiten können. Andererseits lauern der jungen Population Gefahren, zu denen wir mit der Analyse von Verbreitungsdaten nicht Stellung nehmen können: 1. Wichtige Teile der Bevölkerung (Jäger, Landwirte) akzeptieren den Luchs nach wie vor nicht als erhaltenswerten Bestandteil unserer Fauna und fordern seine Ausrottung. Im Jura ist die Kontroverse im französischen Departement Ain besonders heftig (HERRENSCHMIDT & VANDEL 1989). 2. In von wenigen Individuen gegründeten Populationen können langfristig genetische Probleme auftreten (Inzuchtdepression, vgl. RADLER 1986). 3. Gemessen an der minimalen lebensfähigen Populationsgrösse – sowohl bezüglich der besiedelten Fläche als auch der Individuenzahl – wird die Luchspopulation im Jura immer "klein" sein (vgl. dazu die verschiedenen Berechnungsmethoden für "minimum viable population" in SOULÉ 1987), und läuft deshalb Gefahr, ohne Kontakt zu anderen Populationen oder menschliche Betreuung langfristig wieder zu erlöschen.

Im Schweizer Jura ist eine geringe weitere Ausbreitung noch nach Nordosten möglich. Bewaldung und Zivilisation im Teil des Juras östlich des östlichsten Nachweises in Abb. 3 (419 km^2) betragen 39% bzw. 4%. Die Besiedlung dieses Raumes könnte eine zukünftige Verbindung zum Schwarzwald ermöglichen, wo die Wiederansiedlung des Luchses diskutiert wird (GOSSMANN-KÖLLNER & EISFELD 1989). Weitere potentielle Kontakte zu benachbarten Populationen bestehen nach Süden zu den Alpen (Südwestlich von Genf sind Luchse aus dem Jura bereits bis an die Rhone vorgedrungen [HERRENSCHMIDT pers. Mitteilung]) und nach Norden über den Sundgau zu den Vogesen, wo ein Wiederansiedlungsprogramm läuft (HERRENSCHMIDT & LEGER 1987). Überall stellen sich aber dem Austausch von Individuen beträchtliche zivilisatorische Hindernisse entgegen.

Mit der Freilassung von Tieren ist eine Wiederansiedlung erst eingeleitet. Die Entwicklung kleiner Populationen ist (auch) ein stochastischer Vorgang, und nur durch regelmässige Überwachung können negative Tendenzen rechtzeitig erkannt und Massnahmen eingeleitet werden. Die hier dargestellten Daten sollen eine erste Standortbestimmung sein und die Grundlage für den Vergleich mit zukünftigen Bestandsaufnahmen bilden.

Dank

U. Breitenmoser wurde für die vorliegende Arbeit finanziell unterstützt durch den Schweizerischen Nationalfonds zur Förderung der wissenschaftlichen Forschung (Kredit Nr. 3100-008330), das Bundesamt für Umwelt, Wald und Landschaft und die Kantone Waadt und Bern. Die Mitarbeit von M. Baettig war möglich dank eines zusätzlichen finanziellen Beitrags des WWF-Schweiz und des Schweizerischen Bund für Naturschutz. Die kantonalen Jagdverwalter und Wildhüter, etliche Revierpächter und Privatpersonen liessen uns ihre Unterlagen auswerten. H. Zaugg vom Bundesamt für Statistik kompilierte für uns die km^2-Datenbank. Für wertvolle Diskussionen und Kritik am Manuskript danken wir Ch. Breitenmoser-Würsten, A. Kappeler und Ch. Rohner, für die Übersetzung des Résumé D. Gétaz.

Zusammenfassung

Der Luchs – seit dem 19. Jahrhundert in der ganzen Schweiz ausgerottet – wurde in den Jahren 1972 bis 1975 im Jura wieder angesiedelt. Acht bis zehn Tiere aus den tschechoslowakischen Karpaten wurden an drei verschiedenen Orten freigelassen. Eine Überwachung des Wiederansiedlungsversuchs erfolgte nicht. 1987 haben wir schriftlich festgehaltene Luchsnachweise gesammelt und stellen die Entwicklung der Luchspopulation im Schweizer Jura anhand von 350 Beobachtungen dar. Die Nachweise verteilen sich über eine Fläche von 6095 km^2, durchgehend besiedelt sind jedoch nur zwei Teilgebiete von 2198 km^2 bzw. 1292 km^2. Die besiedelten Teilflächen zeichnen sich im Vergleich zur der nicht besiedelten Zwischenzone vor allem durch einen hohen Waldanteil aus (39,5 und 42,5%). Ein grosser Zivilisationseinfluss (gemessen an der überbauten Fläche) scheint sich erst bei geringer Bewaldung negativ auszuwirken, während die Höhenlage nicht von Bedeutung ist. Unter Berücksichtigung von Nachweisen aus Frankreich dehnt sich die Population heute über eine Gesamtfläche von 6500 bis 7000 km^2 aus. Die Wiederansiedlung des Luchses im Jura scheint bisher ein Erfolg zu sein, allerdings sind Populationsgründungen grosser Raubsäuger so langfristige Ereignisse, dass nach 15 Jahren noch keine abschliessende Beurteilung möglich ist.

Résumé

Le Lynx – qui était éteint en Suisse depuis le 19ème siècle – fut réintroduit dans le Jura au cours des années 1972 à 1975. Huit à dix individus originaires des Carpates tchécoslovaques furent lâchés à trois endroits différents. Cette tentative de réintroduction ne bénéficia pas d'un suivi scientifique. En 1987, nous avons collectionné des témoignages écrits d'observations de lynx. Nous décrivons le développement de la population de Lynx dans le Jura suisse sur la base de 350 observations. Les informations se répartissent sur une surface totale de 6095 km^2, mais seuls deux territoires de resp. 2198 km^2 et 1292 km^2 présentent une colonisation régulière. Les régions colonisées se distinguent de la zone intermédiaire non colonisée essentiellement par leur taux de boisement élevé (39,5 et 42,5%). La civilisation (mesurée à la surface construite) ne semble avoir une influence négative importante que si le taux de boisement est faible. Quant à l'altitude, elle n'a pas d'importance. Si on tient compte des observations provenant de France, la population s'étend actuellement sur une surface totale de 6500 à 7000 km^2. Jusqu'à présent, la réacclimatation du Lynx dans le Jura semble être un succès. Toutefois, la fondation de

populations de grands prédateurs constitue un processus à si long terme qu'il n'est pas encore possible de tirer une conclusion définitive après quinze ans.

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APPENDIX I.

Luchsnachweise 1972-1987 aus dem Schweizer Jura nach Beobachtungskategorien. Direktbeobachtungen von 1-4 Luchsen, t = Totfunde; Risse: Cc = Rehe, Rr = Gemsen, Lc = Feldhasen, Ht = Haustiere, xx = Risse unbekannter Art; Spuren: Funde von 1, 2 oder n (= mehreren) Luchsspuren; Hinweise = Fund von Exkrementen, Lautäusserungen oder Nachweise unbekannter Art. Σ= Summe pro Kategorie.

Jahr	Nach-	Nachweise nach Kategorien																
	weise	Direktbeobachtung[1]						Risse[2]						Spuren				Hin-
	total	1	2	3	4	t	Σ	Cc	Rr	Lc	Ht	xx	Σ	1	2	n	Σ	weise
1972	2	2					2											
1973	0																	
1974	1		1				1											
1975	10	6	1	1			8		2				2					
1976	9	5	1				6							1			1	2
1977	12		1				1	7	1			1	9	1			1	1
1978	8	2					2	3					3	1	1		2	1
1979	5	2				1	3			1			1					1
1980	16	5				2	7	2					2	3	1	2	6	1
1981	21	9	2			1	12	1	1		1		3	5			5	1
1982	20	4					4	7	3		2		12	3			3	1
1983	35	4		1		2	7	12	3				15	9		3	12	1
1984	51	20			2	1	23	12	5				17	9			9	2
1985	38	9	3	1	2	2	17	9	1	1	2		13	6		1	7	1
1986	63	13				1	14	18	4	2	7		31	13	1	2	16	2
1987	52	17	1	1		3	22	9	1		4		14	12	2	1	15	1
undat	7	1					1					6	6					
Total	350	99	10	4	4	13	130	80	21	4	16	7	128	63	5	9	77	15

[1] Nur Spuren- oder Direktbeobachtungen von mehr als zwei Luchsen gelten als sicherer Hinweis auf Jungtiere. Die einzelgängerischen adulten Männchen und Weibchen treffen sich gelegentlich, vor allem im Winter (HALLER & BREITENMOSER 1986). In dieser Jahreszeit ist der Grössenunterschied zwischen Mutter und Jungtieren jedoch bereits kleiner als zwischen adulten Luchsen unterschiedlichen Geschlechts.

[2] Da gekoppelte Beobachtungen nur als ein Nachweis gelten, sind von total 118 protokollierten Wildtierrissen (85 Rehe, 22 Gemsen, 4 Hasen, 7 unbekannte) nur 112 aufgeführt. Haustiere: 13 Fälle von getöteten Schafen, 1 Damhirsch, 2 Aberdeen-Kälber.

Appendix II.

Ergänzende Angaben zu den in Appendix I aufgeführten toten Luchsen aus dem Schweizer Jura. W = Weibchen, M = Männchen, ad = adult, juv = juvenil, IGV = Bericht des veterinärmedizinischen Instituts Gallo-Valério Lausanne, NMNE = Beleg Naturmuseum Neuenburg.

Datum	Gemeinde Kanton	Luchs		Todesursache; Quelle
—.—.76	Gorgier NE	?		geschossen; "Bund" 14.4.76[1]
15.05.79	Mauborget NE	W		Auto (?); "Impartial" 23.5.79
29.01.80	Rances VD	M	juv	geschossen; IGV
14.11.80	Provences VD	?	ad	geschossen; IGV
21.11.81	Vaulion VD	?		Auto; Jagdverwaltung VD
18.03.83	La Brévine NE	W	ad	Auto; Kempf unpubl.
04.10.83	Boudry NE	?	juv	?; NMNE
20.10.84	Courrendlin JU	M	ad	Auto; Jagdverwaltung JU
30.08.85	L'Abbaye VD	M	ad	?; IGV
21.01.86	Céligny GE	?		Auto; Bericht Autobahnpolizei
17.08.86	Bevaix NE	M	juv	Krankheit; NMNE, Tierpark Bern
31.01.87	Vallorbe VD	?		?; Jagdverwaltung VD
04.06.87	Buttes NE	2	juv	Totfunde; NMNE
15.08.87	Mauborget VD	?		?; Jagdverwaltung VD

1) Als Nachweis nicht berücksichtigt, da von der Jagdverwaltung NE nicht bestätigt.

Revue suisse Zool.	Tome 99	Fasc. 1	p. 177-199	Genève, mars 1992

New Oncopodidae (Opiliones, Laniatores) from Southeast Asia

by

Peter J. SCHWENDINGER*

With 101 figures and 2 plates

ABSTRACT

Six new species of oncopodid opiliones are described, *Pelitnus lannaianus* (♂, ♀; Thailand), *P. thorelli* (♂, ♀; Brunei), *P. conigerus* (♂; Sabah) *P. sundaicus* (♂, ♀; Sarawak), *Oncopus cuspidatus* (♂; Sumatra) and *O. megachelis* (♂; Sabah). The penes of the new species, and of *P. segnipes* Loman and *P. laevis* Roewer, are illustrated; that of *O. cuspidatus* sp. n. differs considerably from the typical penis morphology of the family. Taxonomic characters are given for *P. drescoi* Silhavy, *P. segnipes*, *P. laevis*, *P. annulipes* Pocock, *O. acanthochelis* Roewer and *O. hosei* Pocock. Sexual dimorphism is shown in the shape of the carapace of *P. lannaianus* n. sp. and in the shape of the ventral scutum of *Pelitnus* spp. Penis morphology of *Pelitnus* and *Oncopus* and generic limits between *Pelitnus* and *Gnomulus* are discussed.

INTRODUCTION

Oncopodidae is a family of archaic opilionids, with hitherto 20 known species; the last one, *Gnomulus minor* Tsurusaki, described recently (TSURUSAKI 1990). Formerly a rare group, scantily represented in scientific collections and distinguished only by external characters, modern sampling techniques brought forth more extensive materials and penis morphology became increasingly important in taxonomic studies (SUZUKI 1969, 1977, 1982; MARTENS 1977).

When doing research on orthognathous spiders in northern Thailand in 1985-88 (SCHWENDINGER 1988), I was lucky to trap several of these interesting opilionids. Subsequently I received a large and superb collection of Oncopodidae from the Geneva Museum of Natural History for examination, taken by Drs Hauser and Lienhard in Southeast Asia during 5 expeditions between 1982 and 1988. This extensive material provided an opportunity to carry out a comprehensive taxonomic study, including also a comparison with specimens from collections in Frankfurt, Paris and London.

ABBREVIATIONS: BMNH Brisith Museum of Natural History; MHNG Muséum d'Histoire naturelle, Genève; MNHNP Museum national d'Histoire naturelle, Paris; NHMW Naturhistorisches Museum, Wien; SMF Senckenberg Museum, Frankfurt. All measurements are in mm.

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* Institute of Zoology, University of Innsbruck, Technikerstr. 25, A-6020 Innsbruck, Austria.

DESCRIPTIONS

Pelitnus lannaianus sp. n.

Figs 1-13

Material: THAILAND, Chiang Mai Province, Doi Inthanon, 2300 m alt., holotype ♂, 11.VI.-14.VII.1987 (MHNG); paratypes: 1 ♂, 14.VII.-20.VIII.-1987; 2530 m alt., 1 ♀, 23.X.-17.XII.1986; 1 ♀, 18.IV.-23.V.1987; 1 ♀, 23.V.-11.VI.1987; 2 ♀, 11.VI.-14.VII.1987; 1 ♀, 14.VII.-20.VIII.1987; 1 ♀, 20.VIII.-8.X.1987 (MHNG, NHMW). All specimens Schwendinger leg.

Etymology: The new species is named after Lan Na Thai, a former independent kingdom in northern Thailand.

Diagnosis: Closely related to *P. hyatti* Martens from Nepal, different by the presence of a small ventral process and the absence of a dorsal boss on basal palpal femur (Fig. 7), by a distally wide truncus penis and by truncate forceps apices of glans penis (Figs 8-13; cf. MARTENS 1977: Figs 1-8). Male with slightly swollen ventral scutal areas and with larger carapace and lower interocular area than female (Figs 1-4).

Description: *MALE* (holotype). Colour: Body generally dark brown. Carapace, chelicerae, palpi and leg coxae mottled with light brown, being lightest on prolateral cheliceral hand, on and behind eye tubercle. Leg tarsi and palpal claw yellow brown. Eyes surrounded by dark ring.

Cephalothorax and abdomen: Carapace long and plane; eyes small, interocular area developed as a low hump level with the thoracic part. Areas of dorsal scutum slightly elevated, bordered by shallow furrows, which also divide areas I-VI medially (Figs 1, 4). Ventral side of cephalothorax with small pro-basal processes on coxae II and with two median basal processes (one distinct, the other small) on coxa I. Here additionally an acute, prolateral process, which borders the large ventral process of palpal coxa. Genital operculum short (Fig. 5). Areas of ventral scutum pale and moderately swollen, separated by transverse furrows.

Chelicera (Fig. 6): Robust. Proximal joint with subbasal dorsal constriction. Dentated edges of forceps with a median elevation; an additional distal one on the movable finger.

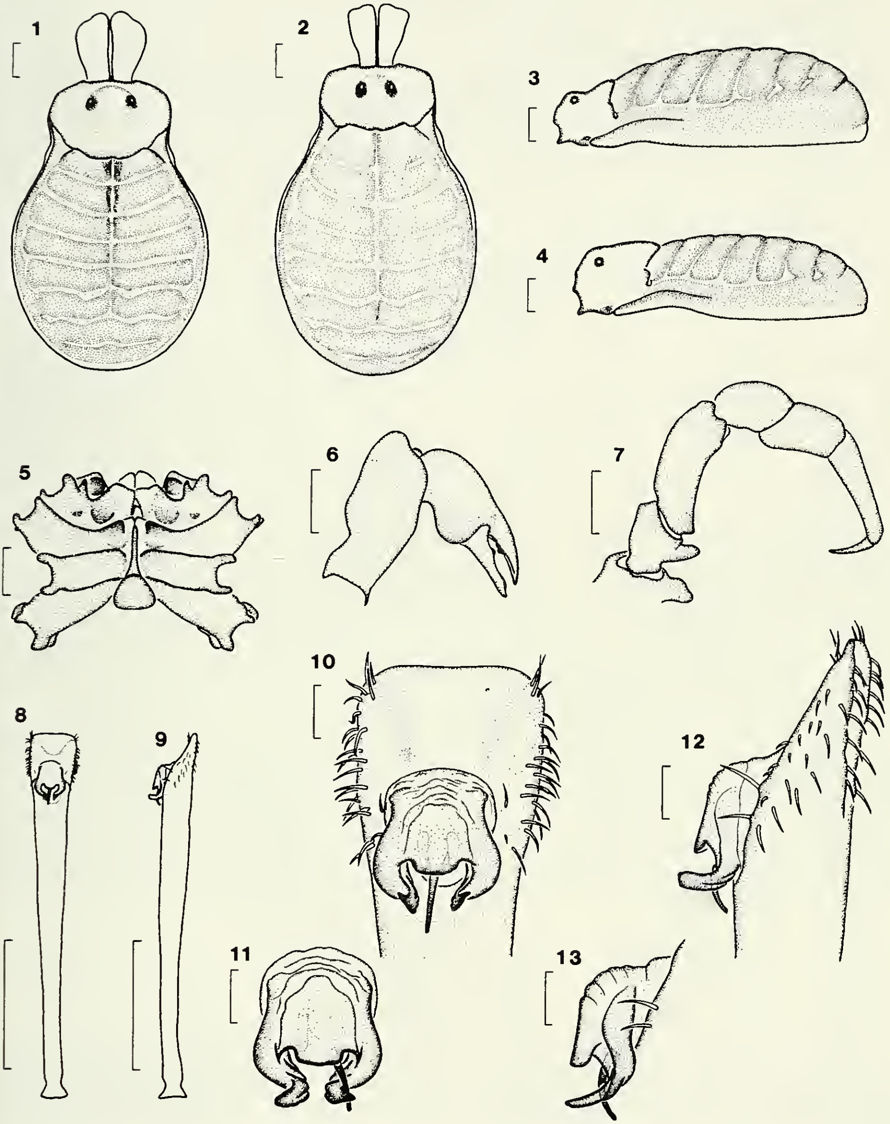
Palpus (Fig. 7): Ventral coxa and trochanter armed with a strong distal, femur with a small basal process.

Legs: Typical for the genus. Two basal processes on dorsal coxa II, none on dorsal coxa IV. Femora and tibiae with subterminal transverse suture, metatarsi with subbasal one. These sutures are, more or less distinct, found in all oncopodids examined.

Penis (Figs 8-13): Truncus penis slender, continually widening towards the apex, furnished with lateral setae between middle of glans and apex. Glans penis with sinuous, distally slightly divergent lateral forceps, terminating in more or less truncate, inclined apices. Interconnecting median plate with broadly rounded distal margin, overlapping long, slender and curved stylus.

Measurements: Cephalothorax and abdomen 7.9 long, 5.7 wide; carapace length 2.6, width 3.5. Palpus and leg measurements:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palpus	0.9	1.8	1.2	1.0	–	2.0	6.9
Leg I	1.0	2.9	1.4	1.6	2.6	1.1	10.6
Leg II	1.1	3.8	1.8	2.6	3.8	1.7	14.8
Leg III	0.9	2.6	1.4	1.5	2.9	0.9	10.2
Leg IV	1.1	3.3	1.8	2.4	4.2	1.0	13.8



FIGS 1-13.

Pelitnus lannaianus sp. n.; male (1, 4-13), female (2, 3), holotype (11, 13). Cephalothorax and abdomen, dorsal view (1, 2), lateral view (3, 4). Cephalothorax, ventral view (5). Chelicera, retrolateral view (6). Palpus, retrolateral view (7). Penis, dorsal view (8), lateral view (9); apex of penis with glans, dorsal view (10, 11), lateral view (12, 13). Scale lines 1.0 mm (1-9), 0.1 mm (10-13).

FEMALE. As the male, except for the following. Colour: Area on and behind eyes dark brown, not mottled with light brown.

Cephalothorax and abdomen (Figs 2, 3): Carapace short, lower than dorsal scutum. Interocular tubercle small and domed, separated from thoracic part by a saddle-shaped depression. Dorsal scutal area I longer than in the male; area VI with indistinct median furrow. Ventral scutal areas dark brown, not swollen.

Chelicera: Slightly more slender than in the male; dentated edges of forceps less pronounced.

Palpus and legs: As in the male.

Measurements: Cephalothorax and abdomen 9.0 long, 6.0 wide; carapace 1.8 long, 3.4 wide. Palpus and leg measurements:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palpus	1.1	1.6	1.0	0.8	–	1.8	6.3
Leg I	0.8	2.7	1.2	1.5	2.6	1.1	9.9
Leg II	1.0	3.6	1.8	2.6	3.7	1.6	14.3
Leg III	0.9	2.5	1.4	1.5	2.8	0.9	10.0
Leg IV	1.0	3.5	1.6	2.4	4.4	1.1	14.0

Variation: Body measurements range (♂ n=2/ ♀ n=7): cephalothorax and abdomen length 7.9-8.3/8.5-9.0, width 5.6-5.7/5.7-6.0, carapace length 2.5-2.6/1.7-1.9, width 3.5/3.3-3.4. In males the carapace is distinctly larger than in females, its length occupies 30-33% of body length and 71-74% of carapace width, whereas in females it is only 20-22% and 52-58% respectively. Posterior carapace margin with a small pair of more or less distinct paramedian lobes, overlapping scutal area I. Apices of glans forceps broadly (Fig. 12) or obliquely truncate (Fig. 13).

Natural history: *Pelitnus lannaianus* sp. n. was caught by pitfall traps in the "cloud forest" near the summit of Doi Inthanon (2565 m), the highest mountain of Thailand and a national park. This is the second record of the family Oncopodidae in Thailand, beside *Oncopus alticeps* Pocock (exact locality not known), providing a connecting link between the Nepalese *P. hyatti*, the eastern Indian *G. aborensis* (Roewer) and the representatives of the Sunda region. One specimen carried phoretic mites between the bases of its anterior limbs.

Pelitnus thorelli sp. n.

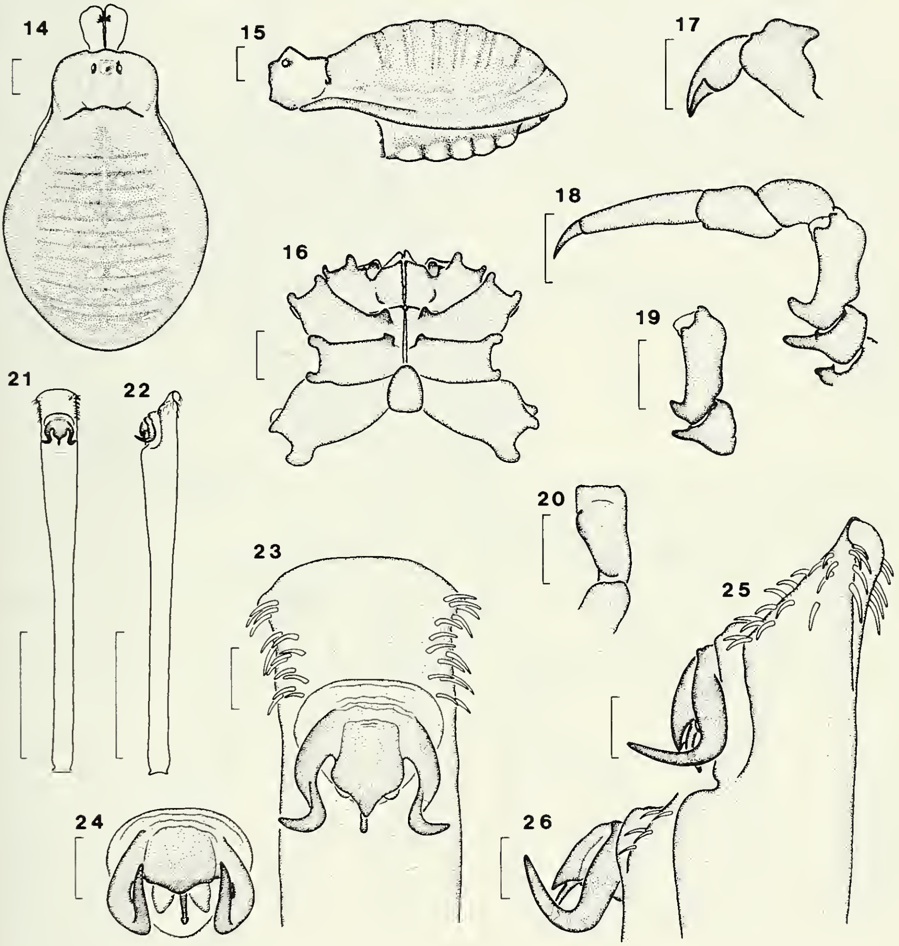
Figs 14-26, plate I

Material: BRUNEI, Belait District, Andulau Forest Reserve near Sungai Liang, 70 m alt., holotype ♂ and 1 ♀ paratype (MHNG Bru-88/46); Tutong District, 33 km out of Bandar Seri Begawan at the river Sungai Lubang Barus, 1 ♂ paratype and 1 juv. (MHNG Bru-88/12). All specimens extracted by means of a Berlese funnel; Hauser leg., 26.XI.1988 and 16.XI.1988 respectively.

Etymology: This species is named in honour of Prof. Dr. Tord Tamerlan Teodor Thorell (Uppsala; 1830-1901), a great expert on arachnids of tropical Asia.

Diagnosis: Similar to *P. palawanensis* Suzuki (cf. Suzuki 1982: Figs 1-7) but with a shorter and broader distal process on first cheliceral joint (Fig. 17) and without lateral tubercles on posterior carapace. Ventral processes on palpal trochanter and femur longer; palpal femur stouter, with a subapical dorsal boss (Figs 18-20). Dorsal scutal areas not distinctly divided by a median furrow (Fig. 14). Sexual dimorphism in the shape of ventral scutum. Penis slender, glans with strongly bent, tapering forceps and pentagonal median plate (Figs 21-26).

Description: *MALE* (holotype). Colour: Generally brown, mottled with dark on carapace, chelicera, palpus, leg coxae and trochanters. Dorsal scutal areas dark brown. Ventral cephalothorax and leg tarsi III, IV light brown; leg tarsi I, II light orange. Femora to metatarsi of legs dark brown.



Figs 14-26.

Pelitnus thorelli sp. n.; male (14, 15, 17, 18, 20-26), female (16, 19), holotype (14, 15, 20, 24, 26). Cephalothorax and abdomen, dorsal view (14), lateral view (15). Cephalothorax, ventral view (16). Chelicera, retrolateral view (17). Palpus, retrolateral view (18); trochanter and femur of palpus, retrolateral view (19), dorsal view (20). Penis, dorsal view (21), lateral view (22); apex of penis with glans, dorsal view (23, 24 partly expanded), lateral view (25, 26 partly expanded). Scale lines 1.0 mm (14-22), 0.1 mm (23-26).

Cephalothorax and abdomen: Conical eye tubercle rising from a short distance behind carapace front margin. Dorsal scutal areas only slightly elevated, median furrow in area I-III hardly discernible (Figs 14, 15). Ventral cephalothorax with small conical processes on probasal coxae II, III; genital operculum long (Fig. 16). Areas of ventral scutum swollen and pale (Fig. 15).

Chelicera (Fig. 17): Basal joint with a broad, posteriorly peaked dorsal boss.

Palpus (Figs 18, 20): Trochanter and femur with long ventral process; dorsal femur with low basal and subapical boss.

Legs: Typical. Dorsal coxa IV with basal tubercle, overlapped by scutal margin. Dorsal femur IV without basal tubercle.

Penis (Figs 21-26): Truncus penis slender, continually widening towards the apex. Lateral setae between upper part of glans and apex of truncus. Glans penis long; forceps bent and tapering, their apices parallel or divergent. Median plate pentagonal; stylus short.

Measurements: Cephalothorax and abdomen 8.6 (8.4 in ♂ paratype) long, 5.9 (5.7) wide; carapace 1.6 (1.6) long, 3.1 (3.0) wide. Palpus and leg measurements:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palpus	0.9	1.3	1.1	0.8	–	1.8	5.9
Leg I	0.9	2.7	1.4	1.7	2.4	1.1	10.2
Leg II	1.1	3.9	2.0	2.9	4.1	1.7	15.7
Leg III	1.0	2.9	1.5	1.9	3.2	1.0	11.5
Leg IV	1.1	4.0	2.0	2.7	5.1	1.1	16.0

FEMALE. As the male, except for the following. Colour: Dark dorsal scutal areas more distinctly bounded by brown stripes.

Cephalothorax and abdomen: Areas of ventral scutum dark and smooth, hardly protruding from surface.

Palpus (Fig. 19): Ventral process on trochanter and femur and dorsal boss on femur less developed than in the male.

Measurements: Cephalothorax and abdomen 8.8 long, 6.0 wide; carapace 1.5 long, 2.9 wide. Palpus and leg measurements:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palpus	0.9	1.3	1.0	0.8	–	1.7	5.7
Leg I	0.8	2.4	1.3	1.5	2.4	1.2	9.6
Leg II	1.0	3.4	1.8	2.6	3.6	1.5	13.9
Leg III	0.9	2.6	1.5	1.8	3.0	0.9	10.7
Leg IV	1.1	3.6	1.7	2.6	4.8	1.2	15.0

Variation: Apart from swollen ventral scutal areas, both males have longer processes on ventral palpal trochanter and femur (Fig. 18) than the female (Fig. 19). This, however, is possibly an individual variation and not sexual dimorphism. The glans forceps apices of the paratype are more divergent than in the holotype (Figs 23, 24); the other differences in both figures are due to different orientation, caused by a slight expansion of the glans.

Natural history: The specimens were extracted from soil at the bases of tall trees in primary forests.

Plate I: *Pelitnus thorelli* sp. n.; ♂ paratype from Brunei (Bru-88/12), habitus by A. Coray.

Pelitnus conigerus sp. n.

Figs 27-41

Material: SABAH, Sandakan Residency, Sepilok, Kabili-Sepilok Forest Reserve, 30 m alt., holotype ♂ (MHNG Pal-83/8) and 1 juv. paratype (MHNG Pal-83/8); Kolapis, 70 km out of Sandakan, on the road to Ranau, 60 m alt., 1 ♂ paratype (MHNG Pal-83/5). All specimens extracted by a Berlese funnel; Hauser leg., 12.III.1983.

Etymology: Latin: *conus* = cone, peg, *gere* = bear, carry; the species name refers to the peculiar dorsal process on the proximal cheliceral joint.

Diagnosis: Closely related to *P. thorelli* sp. n., distinguished by smaller size, by a larger dorsal boss on palpal femur (Figs 32-34), by a basal tubercle on dorsal femur IV (Fig. 35) and by a much stouter and distally narrowed penis, which has a shorter glans with more sinuous, basally wider forceps (Figs 36-41).

Description: *MALE* (holotype). Colour: As in *P. thorelli* sp. n. but generally lighter; dorsal scutal areas only a little darker than the undercoat. All tarsi light orange.

Cephalothorax and abdomen (Figs 27-29): Eye tubercle conical, remote from carapace front margin. Dorsal scutal areas slightly elevated, anterior median furrow indistinct. Small conical processes on ventral coxae II, III; genital operculum short. Areas of ventral scutum swollen and pale.

Chelicera (Figs 30, 31): First joint with broad, posteriorly peaked disto-dorsal process as in *P. thorelli* sp. n.

Palpus (Figs 32-34): Trochanter and femur with long ventral process; dorsal femur with strongly arched subapical boss.

Legs: Typical. Dorsal coxa IV with small basal tubercle, basal femur with retrodorsal process (Fig. 35).

Penis (Figs 36-41): Truncus penis stout, narrowed between glans and apex, where lateral setae are situated. Glans penis short, with short stylus, pentagonal median plate and tapering, strongly bent forceps; their apices more or less divergent, their bases wide and scoop-shaped.

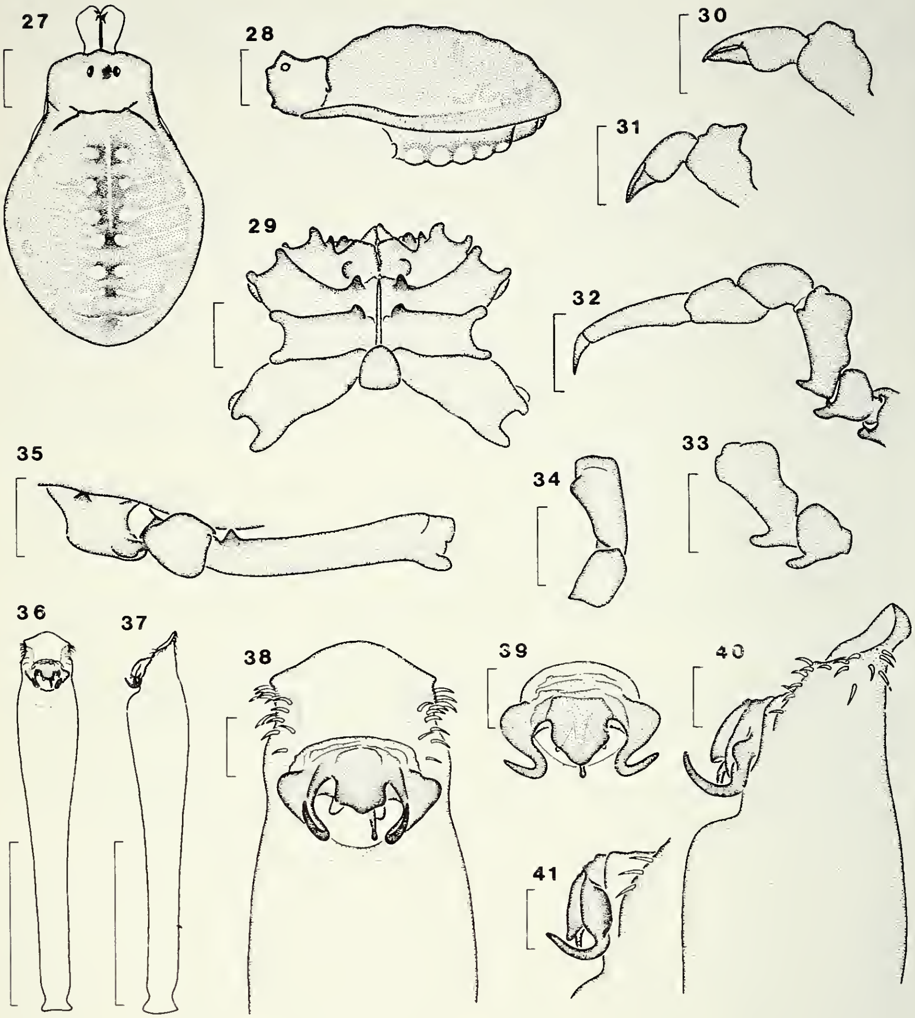
Measurements: Cephalothorax and abdomen 6.9 (6.5 in the ♂ paratype) long, 4.8 (4.7) wide; carapace 1.4 (1.4) long, 2.5 (2.5) wide. Palpus and leg measurements:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palpus	0.8	1.1	1.0	0.7	–	1.4	5.0
Leg I	0.7	2.2	1.1	1.3	2.0	1.0	8.3
Leg II	1.0	2.9	1.5	2.2	3.2	1.2	12.0
Leg III	0.7	2.2	1.3	1.5	2.5	0.8	9.0
Leg IV	1.0	3.1	1.6	2.2	3.9	0.9	12.7

FEMALE. Unknown.

Variation: Paratype (newly moulted) with lower cheliceral tubercle (Fig. 30), larger palpal femur process (Fig. 33) and more strongly divergent glans forceps (Fig. 39) than the holotype. The other differences between Figs 38, 40 and Figs 39, 41 are caused by a slight expansion of the holotype glans.

Natural history: The specimens were taken from the soil of a lowland dipterocarp forest and of a secondary forest.



FIGS 27-41.

Pelitnus conigerus sp. n., male; holotype (27-29, 31, 32, 34-38, 40). Cephalothorax and abdomen, dorsal view (27), lateral view (28). Cephalothorax, ventral view (29). Chelicera, retrolateral view (30, 31). Palpus, retrolateral view (32); trochanter and femur of palpus, retrolateral view (33), dorsal view (34). Base of leg IV, prodorsal view (35). Penis, dorsal view (36), lateral view (37); apex of penis with glans, dorsal view (38, 39), lateral view (40, 41). Scale lines 1.0 mm (27-37), 0.1 mm (38-41).

Pelitnus sundaicus sp. n.

Figs 42-53

Material: SARAWAK: Bau, environs of Puang (Pany) Cave, near Kampong Pelaman Sekiang, 10-30 m alt., holotype ♂, 1 ♂ and 1 ♀ paratypes, 1 juv. (MHNG Sar-87/51); Serian, Semengoh Forest Reserve, 20-50 m, 1 ♀ paratype (MHNG Sar-87/62); 18 km out of Kuching, on the road to Serian, near Kampong Kuap, 30 m alt., 1 ♂ paratype, 2 juv. (MHNG Sar-87/88); Serian, environs of Sirih (Sirah) Cave, near Kampong Pelaman Batang, 40 m alt., 1 juv. (MHNG Sar-87/48). All specimens Lienhard leg., 3.-13.XII.1987.

Diagnosis: Closely related to *P. drescoi* (cf. SILHAVY 1962, SUZUKI 1982), different only in truncus penis narrower at the height of glans; glans penis with distally paddle-shaped forceps bearing prominent lateral ledges, and with angular median plate (Figs 48-53). Sexual dimorphism in the shape of ventral scutal areas (Figs 44, 45).

Description: *MALE* (holotype). Colour: Body dark amber, except for light amber chelicerae, palpi and coxae, trochanters and tarsi of legs. Transverse ridges of dorsal scutum with dark bands, divided in first three areas (Fig. 42).

Cephalothorax and abdomen: Carapace with pointed eye tubercle rising from anterior carapace margin. Dorsal scutum with distinct transverse ridges, divided by a shallow depression in areas I-III (Fig. 42). Ventral cephalo-thorax with small conical pro-basal processes on coxae II and III; genital operculum short (Fig. 43). Areas of ventral scutum distinctly swollen and pale (Figs 43, 44).

Chelicera (Fig. 46); Slender, with prodorsal boss on first joint.

Palpus (Fig. 47): Small ventral process on distal coxa and trochanter and on basal femur.

Legs: Typical, without basal tubercle on dorsal coxa IV.

Penis (Figs 48-53): Truncus penis somewhat stout, compressed between glans and apex. Glans penis long; forceps sinuous, with acute medio-lateral ledges and paddle-shaped apices; interconnecting median plate with an angle above long stylus.

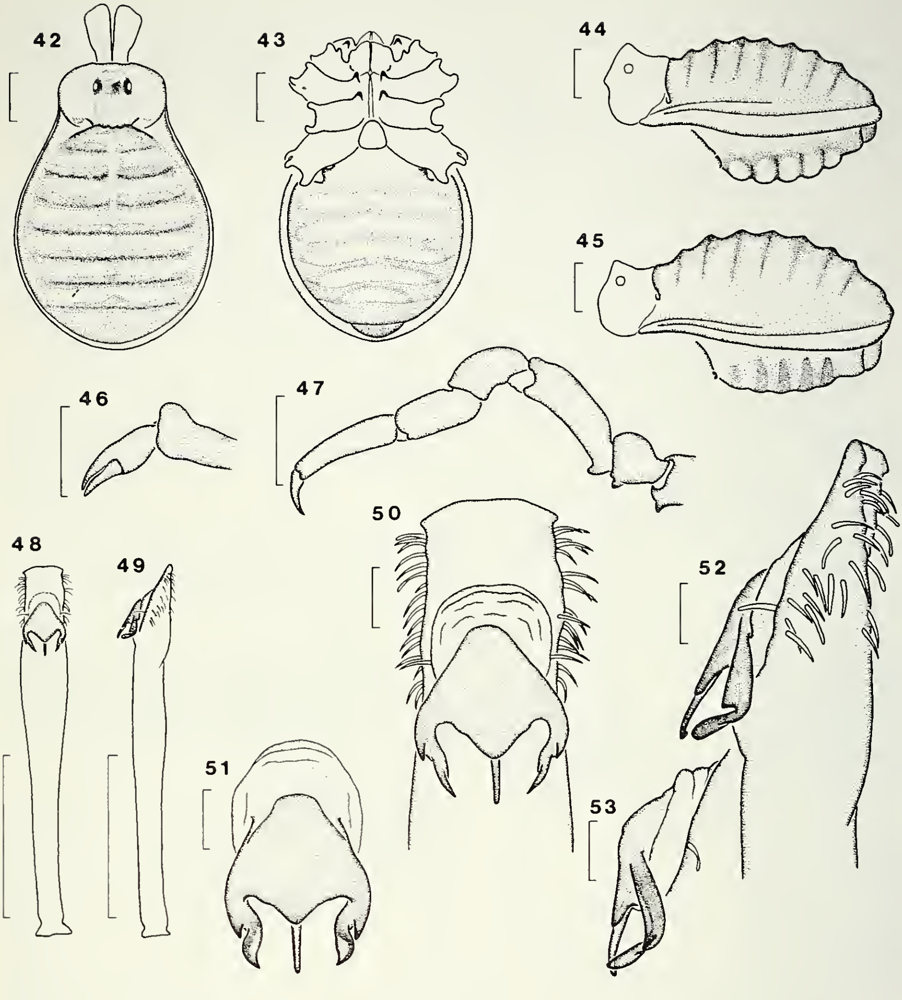
Measurements: Cephalothorax and abdomen 5.8 long, 4.0 wide; carapace 1.3 long, 2.2 wide. Palpus and leg measurements:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palpus	0.9	1.2	1.0	0.6	–	1.2	4.9
Leg I	0.6	2.4	1.1	1.3	1.9	0.9	8.2
Leg II	0.8	3.4	1.5	2.5	3.2	1.1	12.5
Leg III	0.6	2.4	1.2	1.6	2.5	1.1	9.4
Leg IV	1.0	3.3	1.5	2.4	3.9	1.1	13.2

FEMALE. As the male, except for areas of ventral scutum only slightly elevated and dark (Fig. 45).

Measurements: cephalothorax and abdomen 5.9 long, 4.1 wide; carapace 1.1 long, 2.2 wide. Palpus and leg measurements:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palpus	0.7	1.2	0.9	0.6	–	1.2	4.6
Leg I	0.6	2.2	1.0	1.3	1.8	0.9	7.8
Leg II	0.7	3.1	1.4	2.3	3.0	1.2	11.7
Leg III	0.6	2.2	1.1	1.5	2.3	1.0	8.7
Leg IV	1.0	3.1	1.4	2.2	3.7	1.1	12.5



FIGS 42-53.

Pelitnus sundaicus sp. n.; male (42-44, 46-53), female (45), holotype (42-44, 46-50, 52). Cephalothorax and abdomen, dorsal view (42), ventral view (43), lateral view (44, 45). Chelicera, retrolateral view (46). Palpus, retrolateral view (47). Penis, dorsal view (48), lateral view (49); apex of penis with glans, dorsal view (50, 51), lateral view (52, 53). Scale lines 1.0 mm (42-49), 0.1 mm (50-53).

Variation: Body measurements range, ♂ (n=3)/ ♀ (n=2): cephalothorax and abdomen length 5.6-5.8/5.8-5.9, width 3.9-4.2/4.1-4.3, carapace length 1.2-1.3/1.1-1.2, width 2.2-2.3/2.1-2.2. Apices of forceps of glans penis more or less sinuous, parallel or slightly convergent (Figs 50, 51).

Natural history: Apparently all specimens, except one which was possibly taken from a fallen tree, were collected by beating shrubs and low-hanging tree branches in primary and secondary forest. This is the first record of atmobiotic occurrence within a family regarded to be strictly edaphic. A biological study of this species in its biotope would be desirable. A great number of phoretic mites (Uropodidae) were attached to one of the opilionids.

Pelitnus segnipes Loman, 1892 (?)

Figs 57-61

Material: BORNEO, Bandjermasin, 1 ♂ (SMF 1259), leg. Suck.

Diagnosis: Characterized by low interocular cone, by small tubercles on posterior lateral carapace and by strong subbasal process on ventral palpal femur (Figs 57). Penis distally wide, with parallel lateral margins. Glans penis short, forceps sinuous and tapering, with low rounded dorso-median ledge and convergent apices; median plate broadly rounded (Figs 58-61).

Remarks: The penis closely resembles that of *P. drescoi* (SUZUKI 1982: Figs 11-14) and *P. sundaicus* sp. n. From the first it differs by more convex forceps of glans and by lateral setae on truncus reaching more basally, from the latter by forceps with pointed apices and rounded lateral ledges, from both by a broadly rounded median plate.

The specimen examined [body 6.0, leg II (measured in entirety) 10.2 long] has no distinct step between eye tubercle and anterior carapace margin, no distinct median furrow on scutal areas I-III and no characteristic spine on droso-distal coxa IV as given by ROEWER (1923: Fig. 66). The latter character could possibly be recognized in a pair of disto-lateral lobes, which occur on the coxae of all oncopodids examined. A distinctive character, however, is present in the small cones near the posterior corners of the carapace (Fig. 57), as in *P. palawanensis* (SUZUKI 1982: Figs 1, 2).

There is some doubt on the correct assignment of the specimen examined. The juvenile holotype (about 4.5 long; not examined) of *P. segnipes*, described from Sumatra, has no palpal processes: "Palpi ganz ohne jegliche Bewaffnung." (LOMAN 1892: 25). Later the author mentioned several other mature specimens from Sumatra, Java and Borneo, deposited in the museums of Amsterdam, Leyden, Berlin and Hamburg, but does not refer to their palpal femur armament (LOMAN 1902: 183, 184). ROEWER (1923: 63, Fig. 66b) *re-examined* the ones in Berlin and Hamburg (one now lodged in SMF; examined) and for the first time mentioned and illustrated the conspicuous large subbasal palpal femur process. In other species with a palpal femur process in adults, however, this character is indeed also present in juveniles: distinct in *P. conigerus* sp. n. (4.1 long), indistinct in *P. sundaicus* sp. n. (3.2-3.8 long). Thus the male from SMF, and may be also the other mature specimens examined by Roewer and Loman, are possibly not conspecific with the type.

Moreover, the distinctive character: palpi unarmed (THORELL 1891: 95), given for the only about 2 mm long type of *P. armillatus* Thorell, also from Sumatra, is most likely not applicable to mature specimens. *P. armillatus* could be identical with, and hence the senior synonym of *P. segnipes* or *P. drescoi* or both. Moreover, a wide distribution as given for this species [Sumatra, Penang (ROEWER 1927: 268)] is quite improbable for Oncopodidae.

Pelitnus drescoi Silhavy, 1962
Figs 54-55

Material: SUMATRA, Dolok Barol, holotype ♀ (MNHNP 24219); Northern Sumatra Province, Deli Serdang, primary forest in the Tinggi Raja Nature Reserve, near Tebingtingii, 400-440 m alt., 1 ♀ (MHNG Sum-85/32), Lienhard leg., 15.XI.1985.

Diagnosis: Characterized by a conical eye tubercle, rising from carapace front margin; by elevated dorsal scutal areas, separated by a narrow anterior furrow; and by a short basal process on ventral palpal femur, which bears no dorsal boss (Fig. 54; SILHAVY 1962). Truncus penis narrowed between glans and apex; forceps of glans penis slightly bent and convergent, apices tapering and sinuous (SUZUKI 1982: Figs 11-14).

Remarks: The female holotype cannot be clearly distinguished from females of *P. sundaicus* sp. n., only the penis provides a reliable taxonomic character. The other female examined (6.6 long) is larger than the type (5.9 long), has a more rounded eye tubercle and a peculiar ear-shaped ventral process on both palpal trochanters (Fig. 55). As it was collected in Sumatra, I consider it as a variation of *P. drescoi*.

Because of the immature and undifferentiated state of the *P. segnipes* and *P. armillatus* types from Sumatra (see above), *P. drescoi* could possibly be conspecific and thus a junior synonym.

Pelitnus annulipes Pocock, 1897
Fig. 56

Material: SARAWAK, Baram, holotype ♀ [BMNH 1895.6.16 (10)], Hose leg.

Diagnosis: Characterized by a long, strongly pointed, forwardly inclined eye tubercle; posterior carapace with a pair of lateral tubercles (larger on left side); palpal femur slender, with a small pointed ventro-basal process, a rounded one on palpal trochanter (Fig. 56).

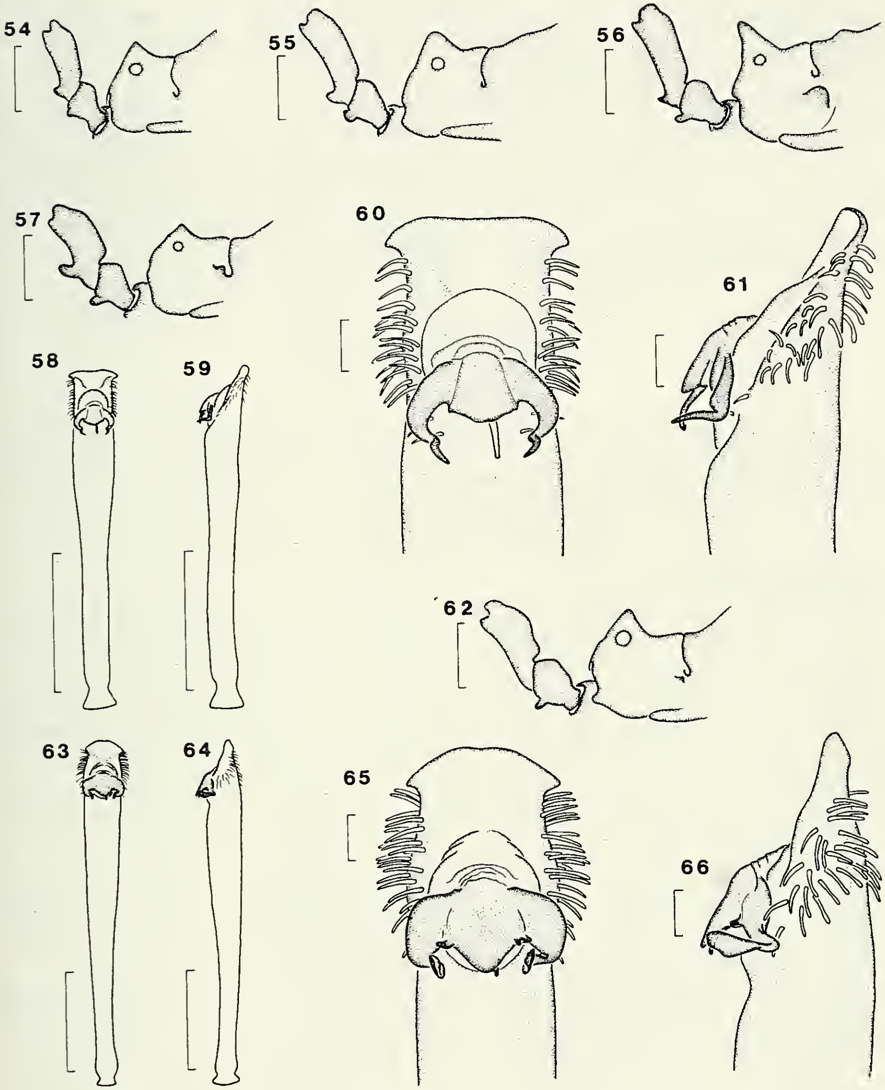
Remarks: ROEWER (1923: 62), who had apparently not seen specimens of *P. annulipes*, distinguishes this species from *P. segnipes* (?) only by its slightly larger size [body 7.0, leg II (measured in entirety) 14.9 long]. Differences are also found in the shape of eye tubercle and palpal femur (cf. Fig. 57).

Pelitnus laevis Roewer, 1915
Figs 62-66

Material: BORNEO, Mt. Tiloeng, 2 ♀ syntypes (SMF 1260); BORNEO, without exact (pinned specimen with printed label in old accession material, locality, 1 ♂ now transfered to alcohol) (MHNG).

Diagnosis: Characterized by conical eye tubercle, rising with an indistinct step from carapace front margin; posterior carapace with small lateral tubercles; dorsal palpal femur with a wide subterminal and an arched basal boss (as in *P. conigerus* sp. n., cf. Fig. 34), trochanter with short ventral process, femur without (Fig. 62); dorsal coxa IV with basal tubercle. Penis with dense setation, spade-like forceps with wide base, a pentagonal median plate and a short stylus (Figs 63-66).

Description: *MALE*. As in female (ROEWER 1915: 128) but with slightly larger tubercles at posterior lateral carapace, with more rounded posterior margin of abdomen and with more elevated dorsal scutal areas. Ventral scutal areas swollen and pale.



Figs 54-66.

Pelitnus drescoi Silhavy (54, 55), *Pelitnus annulipes* Pocock (56), *Pelitnus segnipes* Loman (57-61), *Pelitnus laevis* Roewer (62-66). Holotype (54, 56); syntype (62). Male (57-61, 63-66); female (54-56, 62). Cephalothorax and palpus, lateral view (54-57, 62). Penis, dorsal view (58, 63), lateral view (59, 64); apex of penis with glans, dorsal view (60, 65), lateral view (61, 66). Scale lines 1.0 mm (54-59, 62-64), 0.1 mm (60, 61, 65, 66).

Penis (Figs 63-66): Truncus penis slender, continually widening towards the apex; a dense lateral band of paddle-like setae between lower end of glans and apex. Glans penis with parallel, basally very wide, spade-like forceps, interconnected by angular median plate with lateral prominences. Stylus short.

Measurements, ♂/♀: body length 6.9/6.9-7.8, width 4.6/4.7-5.1; carapace length 1.5/1.3-1.4, width 2.6/2.4-2.5; leg II (measured in entirety) 13.8/13.3 long.

Remarks: A small juvenile (2.2 long) (MHNG Sab-82/17; Berlese extraction, Hauser leg., 28.IV.1982) from Sabah (West Coast Residency, Mt. Kinabalu, Bukit Ular Trail, 1850 m alt.) among the specimens examined cannot be attributed to a species. Due to the lack of any processes on chelicerae and palpi it could possibly be *P. laevis*.

Oncopus cuspidatus sp. n.

Figs 67-80

Material: SUMATRA, Northern Sumatra Province, Langkat, Bukit Lawang Nature Reserve, near Bohorok, 180 m alt., holotype ♂ and 3 juv. (MHNG Sum-85/49); Deli Serdang, near road Brastagi-Sibolangit, 1400 m alt., 1 ♂ paratype (MHNG Sum-85/47). All specimens extracted by means of a Berlese-funnel, Hauser leg., 8-20.XI.1985.

Etymology: Latin: *cuspis* – spear; noun in apposition. The species name refers to the long tapering glans penis.

Diagnosis: Distinguished from all other *Oncopus* spp. by small size, weak chelicerae (Fig. 72) and short domed tarsi (Fig. 73); from all other oncopodids by an exceptionally long glans penis with spiral tip and without forceps (Figs 74-80).

Description: *MALE* (holotype). Colour: Body generally light amber. Carapace with irregular dark reticulation and dark eye rings. Dorsal scutum with distinctly outlined pattern of dark transverse bands on scutal areas (Fig. 67). A similar pattern of dark lateral patches, not medially connected, also on ventral scutum (Fig. 69). Genital operculum, proximal portions of ventral coxae and legs, except tarsi and distal metatarsi, slightly mottled with dark.

Cephalothorax and abdomen: Carapace short; interocular area developed as a small rounded hump. Dorsal and ventral scutum without elevated areas or median furrow (Figs 67-69). Ventral cephalothorax with small, proventral basal processes on coxae II and a median basal process on coxa I; genital operculum relatively large (Fig. 70).

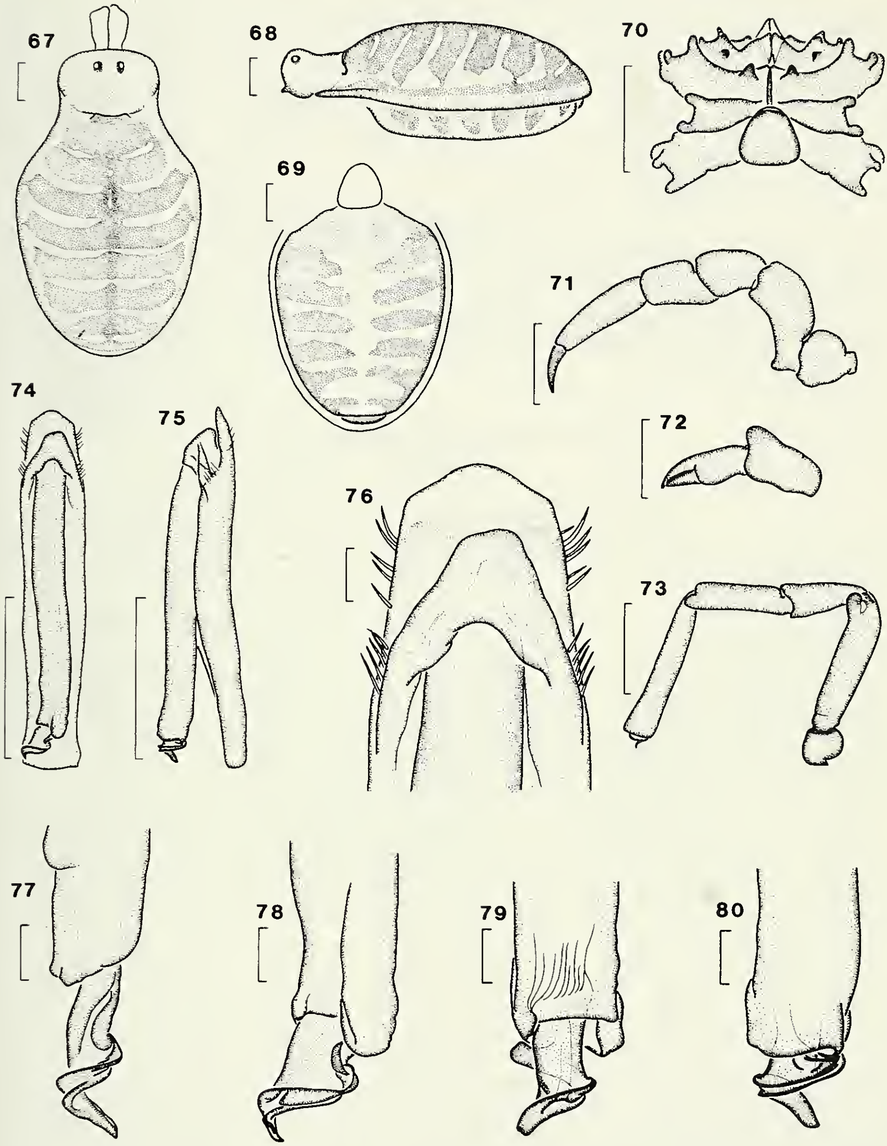
Chelicera (Fig. 72): Proximal joint with low dorso-distal boss; hand small, slender and unarmed, as in *Pelitnus* spp.

Palpus (Fig. 71): Femur short and bent, with ventro-basal process; other joints unarmed.

Legs: No distinct basal processes on either dorsal or ventral femora. Tarsi short and domed, not globular as in other *Oncopus* spp. examined (Fig. 73).

Penis (Figs 74-80): Truncus penis depressed, forming dorsal trench within which rests the glans. Apex of truncus with two lateral rows of pointed setae, one at the base of the glans and one terminally. Glans penis tube-like and as long as the truncus, folded onto its dorsal side like a jack-knife. Base of glans supported by two attachement bands; tip corkscrew-like, protruding from under the glans wall.

Measurements: Cephalothorax and abdomen 4.1 (3.6 in ♂ paratype) long, 2.4 (2.1) wide; carapace 0.8 (0.7) long, 1.3 (1.2) wide. Palpus and leg measurements:



Figs 67-80.

Oncopus cuspidatus sp. n., male. Holotype (67-76, 78-80). Cephalothorax and abdomen, dorsal view (67), lateral view (68). Abdomen, ventral view (69). Cephalothorax, ventral view (70). Palpus, retrolateral view (71). Chelicera, retrolateral view (72). Leg II, retrolateral view (73). Penis, dorsal view (74), lateral view (75); apex of truncus penis, dorsal view (76). Tip of glans penis, ventral view (77, 78), lateral view (79), contralateral view (80). Scale lines 1.0 mm (67-70, 73-75), 0.5 mm (71, 72), 0.1 mm (76-80).

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palpus	0.4	0.5	0.4	0.3	–	0.7	2.3
Leg I	0.4	1.0	0.7	0.6	1.1	0.1	3.9
Leg II	0.5	1.5	0.9	0.9	1.7	0.1	5.6
Leg III	0.4	0.9	0.7	0.6	1.2	0.1	3.9
Leg IV	0.5	1.4	0.9	1.0	1.6	0.1	5.5

FEMALE. Unknown.

JUVENILES: Paler than the adults but with the typical pattern of dark transverse stripes on dorsal and ventral scutum.

Natural history: The specimens were taken from soil and leaf-litter in a primary forest along a stream and in a pine forest.

Oncopus megachelis sp. n.

Figs 81-90

Material: SABAH, Sandakan Residency, Sepilok, Kabili-Sepilok Forest Reserve, 40 m alt., holotype ♂ and 1 juv. paratype (MHNG Sab-82/41). Extracted from leaf-litter by a Berlese funnel; Hauser leg., 10.V.1982.

Etymology: Greek: *mega* – large, *chela* –scissors. The specific name refers to the large chelicerae.

Diagnosis: Resembling *O. hosei* Pocock (Figs 98-101) but distinguished by interocular area broader and more rounded; posterior areas of dorsal scutum without processes (Figs 81, 82); genital operculum wider (Fig. 83). Penis stout, with wide apex bearing characteristic setation; glans with strongly divergent, blunt forceps, broadly rounded median plate and long stylus (Figs 87-90).

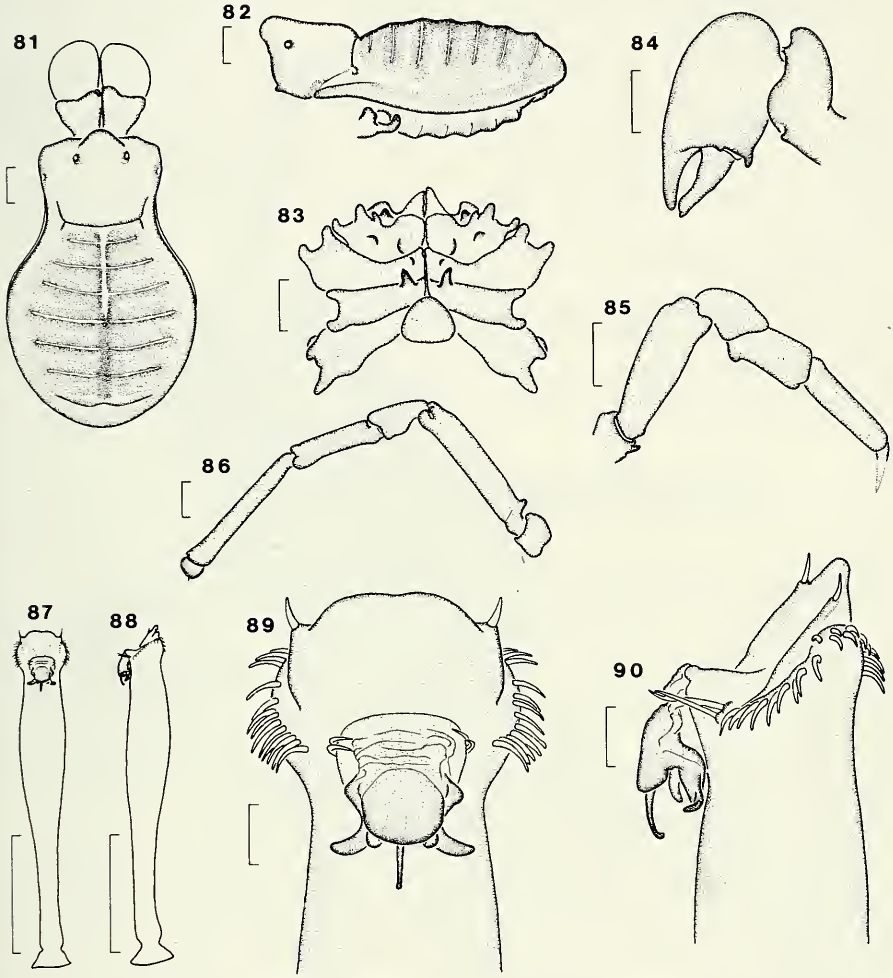
Description: *MALE* (holotype). Colour: Generally amber, with irregular dark reticulation on carapace and basal joint of chelicerae. Dorsal scutum with dark margin and interconnected dark lateral patches along transverse ridges, divided in areas I-IV (Fig. 81). Ridges on ventral scutum bearing yellow brown ledges. Ventral coxae and distal chelicerae light brown; leg tarsi yellow brown.

Cephalothorax and abdomen: Carapace long and elevated; interocular area protruding into distinct boss which overlaps base of chelicerae. Dorsal stucum with low transverse ridges, without a median furrow and with a pair of indistinct tubercles on area VII (Figs 81, 82). Ventral scutum with transverse ridges slightly higher than on dorsal scutum (Fig. 82). Ventral cephalothorax with a long horn-like process on pro-basal coxa III; a small knob-shaped process and a small scale-like endite at the probasal corner of coxa II; two low domed processes on coxa I. A prolateral process on coxa I borders conical tubercle on palpal coxa. Genital operculum short and unarmed (Fig. 83).

Chelicera (Fig. 84): Basal joint with dorso-distal boss and small retroventral tubercle. Second joint large and ovoid, with small ventral process near the base of movable finger. Forceps without dentated ledges.

Palpus (Fig. 85): Median coxa, distal trochanter and basal tibia with small but distinct ventral process; basal femur with indistinct ventral tubercle.

Legs: Typical. Dorsal femur II with basal process; ventral femora with low basal hump, bordered by subbasal suture. Tarsi globular (Fig. 86).



FIGS 81-90.

Oncopus megachelis sp. n., male holotype. Cephalothorax and abdomen, dorsal view (81), lateral view (82). Cephalothorax, ventral view (83). Chelicera, retrolateral view (84). Palpus, retrolateral view (85). Leg II, retrolateral view (86). Penis, dorsal view (87), lateral view (88); apex of penis with glans, dorsal view (89), lateral view (90). Scale lines 1.0 mm (81-88), 0.1 mm (89, 90).

Penis (Figs 87-90): Truncus penis stout, its apex widely biconvex, bearing a subapical, almost transverse row of lateral setae; a pair of lateral setae at both sides of glans, a single horn-like seta at anterior corners of truncus penis. Glans penis with blunt, strongly divergent forceps and a broadly rounded median plate, which overlaps long curved stylus.

Measurements: Cephalothorax and abdomen 8.1 long, 5.1 wide; carapace 2.6 long, 3.3 wide. Palpus and leg measurements:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palpus	1.0	2.1	1.1	0.8	–	1.5	6.5
Leg I	0.7	2.8	1.2	1.3	2.5	0.5	9.0
Leg II	1.0	3.7	1.6	2.2	3.8	0.3	12.6
Leg III	0.7	2.4	1.3	1.3	2.6	0.4	8.7
Leg IV	1.0	3.2	1.7	2.3	4.2	0.4	12.8

FEMALE. Unknown.

JUVENILE: 6.4 long. Carapace with anterior boss lower than in the adult; ventral scutal areas without transverse ridges.

Natural history: The specimens were taken from the leaf-litter of a secondary forest near a water reservoir.

Oncopus acanthochelis Roewer, 1915
Figs 91-97, plate II

Material: SINGAPORE: holotype ♀ (SMF 1256); Labrador Hill, 40 m alt., 1 ♀, 1 juv. (MHNG Sar-87/1). Berlese extraction in a dry forest; Hauser leg., 21.XI.1987.

Diagnosis: Amber to dark brown species, distinguished by ventral chelicerae with a short subbasal process on movable finger and a distal one on second joint; a strong blunt process on retroventral side of first joint (Figs 93, 94). Palpal tibiae very short, ventral side with a blunt subbasal and a pointed distal process; palpal femur with small subdistal ventral tubercle, basally a dorsal and a ventral one (Fig. 95). Dorsal femur II (Fig. 96) and ventral femur IV (Fig. 97) with distinct basal tubercle. Ventral coxa II and III with a small probasal process; a distinct scale-like endite on inner corner of coxa II. Genital operculum with a small anterior process (Fig. 91).

Remarks: The type (8.7 long; new specimen 7.7 long) is not a male as stated in the original description. Moreover, both specimens examined have a distinct ventral process also on the second cheliceral joint (Figs 93, 94). The cheliceral hands are stout and inflated (longer in the type), not slender and dorsally concave as illustrated by ROEWER (1915: Fig. 71).

MARTENS (1986: Figs 7a, b) illustrated an *Oncopus* penis, which probably belongs to *O. acanthochelis* (Martens pers. commun.); the male has so far not been described.

Oncopus hosei Pocock, 1897
Figs 98-101

Material: SARAWAK, Baram, holotype ♂ (BMNH 1895.10.15), Hose leg.

Diagnosis: Dull black species, characterized by triangular eye mound protruding over front margin of carapace. Dorsal scutum with distinct knob-shaped pair of processes on last area, indistinct ones on proceeding two areas (Fig. 99). Ventral coxa III with pointed, outwardly inclined process; genital operculum narrow (Fig. 98). Chelicera with large hand, bearing small ventral process near base of movable finger; proximal

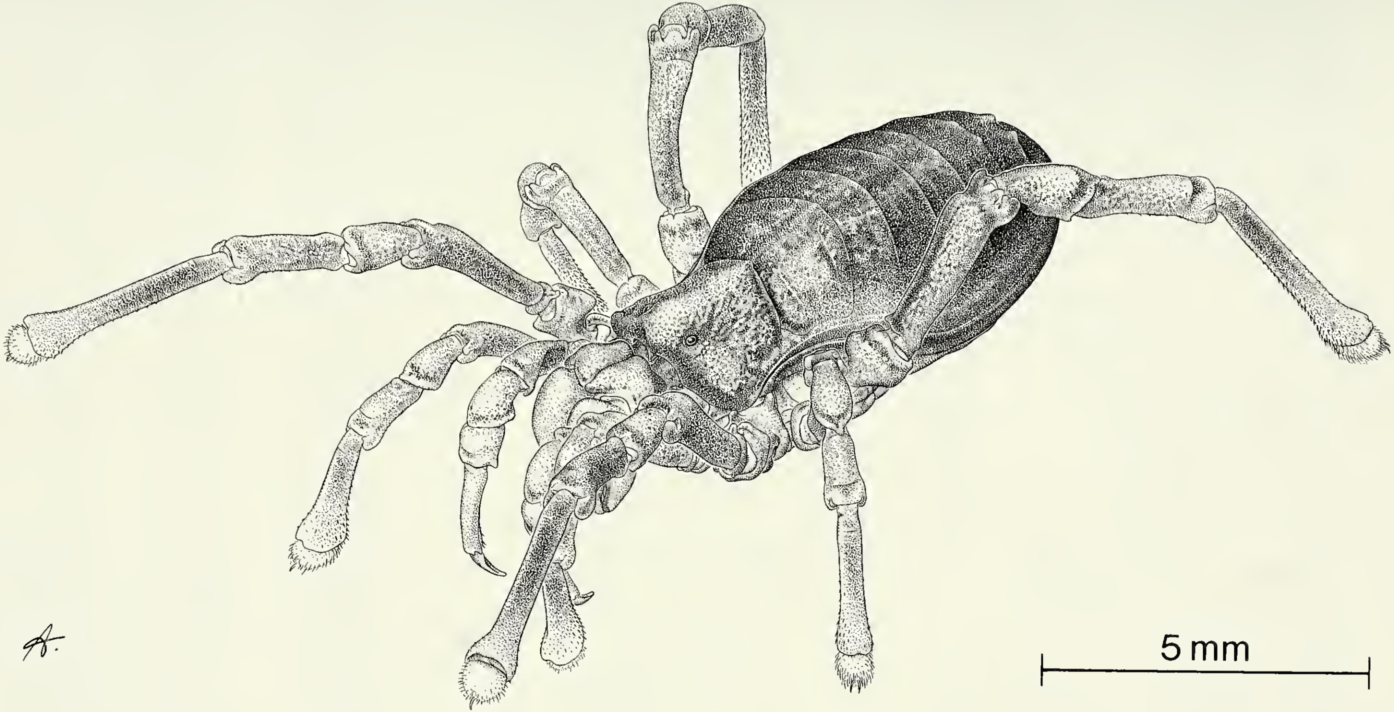
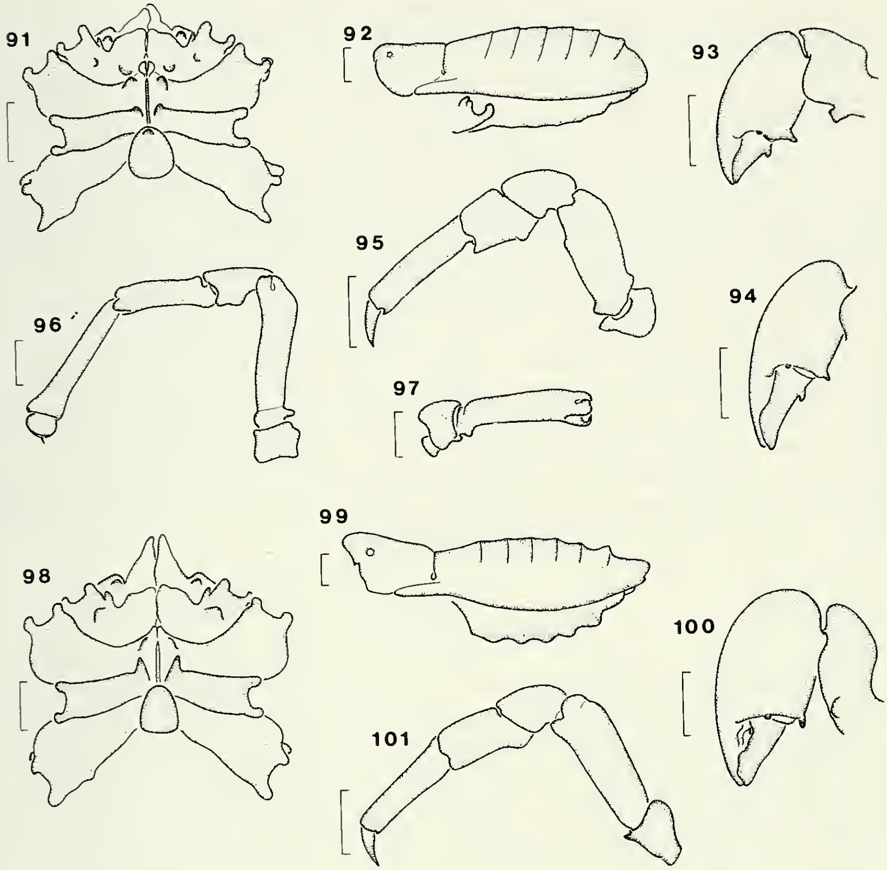


Plate II: *Oncopus acanthochelis* Roewer; ♀ from Singapore (Sar-87/1), habitus by A. Coray.



Figs 91-101.

Oncopus acanthochelis Roewer (91-97), *Oncopus hosei* Pocock (98-101). Holotype (94, 98-101). Cephalothorax, ventral view (91, 98). Cephalothorax and abdomen, lateral view (92, 99). Chelicera, retrolateral view (93, 94, 100). Palpus, retrolateral view (95, 101). Leg II, retrolateral view (96); trochanter and femur of leg IV, prolateral view (97). Scale lines 1.0 mm.

cheliceral joint with low retroventral mound (Fig. 100). Palpal femur without ventral process, tibia with a small baso-ventral one (Fig. 101). Dorsal femur II with basal tubercle. Distinguished from closely related *O. feae* Thorell and *O. doriae* Thorell by unarmed palpal femur (Roewer 1923: 57).

Remarks: In his redescription of *O. feae*, Bristowe distinguishes that species from *O. hosei* and *O. doriae* by: "... having only one instead of two or three strong blunt tubercles on the lower surface of the palpal coxa ..." (Bristowe 1967: 9). There is, however, only a low, indistinct prominence at this place in the type of *O. hosei* (9.4 long), as already given in the original description (Pocock 1897: 286).

As can be seen by looking under the genital operculum, the penis of *O. hosei* (not dissected) is of the same type as in *O. megachelis* sp. n. and *Pelitnus* spp.

Oncopus spp.

A small juvenile (3.4 long) (MHNG Sar-87/66; Hauser leg., 9.XII.1987) from Sarawak (primary forest at Gunung Serapi, road Kuching-Matang, 320 m alt.) probably belongs to *O. doriae*. It has distinct tubercle pairs (more widely spaced than in *O. hosei*) on the last three dorsal scutal areas, a small basal and an indistinct median tubercle on ventral palpal femur, and no processes on ventral leg coxae (cf. ROEWER 1923: 57, 58).

Another fairly large juvenile (4.8 long) (MHNG Sum-85/11; Hauser leg., 12.III. 1983) from Sumatra (Simalungun, Ainuli, 18 km from Prapat, on the road to Pematangsiantar, 980 m alt.) also with tubercle pairs on posterior dorsal scutal areas, cannot be assigned to any species. It has a conspicuous and unique pale longitudinal median stripe on carapace, continuing on the first three scutal areas; small rounded processes on ventral coxae III and small conical ones on coxae II; no processes on palpal femur. As no other *Oncopus* than the much smaller *O. cuspidatus* sp. n. is known from this island, it most likely belongs to an undescribed species.

DISCUSSION

SEXUAL DIMORPHISM: Secondary sexual characters of males, commonly found among opilionids, were hitherto not recorded for Oncopodidae, but are clearly exhibited in the specimens examined. Unlike in females (Fig. 45), all *Pelitnus* males have pale, swollen transverse folds on their ventral scutum (Figs 15, 28, 43, 44), best seen in lateral view. This character apparently also occurs in males of *P. drescoi* (SUZUKI 1982: Fig. 8) and *P. imadatei* Suzuki (SUZUKI 1969: Fig. 2) but possibly not in *P. goodnighti* (SUZUKI 1977: Fig. 1c). A similar dimorphism is indicated in *Oncopus*: males of *O. megachelis* sp. n. (Fig. 82) and *O. hosei* (Fig. 99) show such ventral folds, though narrower and less conspicuous than in *Pelitnus* spp. Females of *O. acanthochelis* lack them (Fig. 92). Unfortunately no conspecific *Oncopus* pairs were available for examination. Males of *P. lannaianus* sp. n. have less distinctly swollen ventral scutal areas than other males, but additionally differ from females in the shape of their carapace, which is long, slightly arched and has no elevated eye tubercle (Fig. 4).

GENITAL MORPHOLOGY: A common penis type can be recognized in *Pelitnus* and *Oncopus*: Truncus penis with sharply truncate distal edge. On its dorsal side, some distance from the apex, arises an expansible glans with sclerotised forceps-like side-pieces. They are connected by a median plate, which covers a cavity hosting the slender stylus and two expandable membranous lateral tubes (cf. MARTENS 1986: Figs 7a, b, the first illustration of an *Oncopus* penis). Between glans and apex there is a lateral band of tapering or paddle-like setae. When studying the penis, one has to consider that a slightly expanded glans (best recognized in lateral view) gives a different appearance in dorsal view (Figs 23, 25, cf. Figs 24, 26). Intraspecific variation in penis structure was found only in the alignment of the glans forceps (e.g. Figs 23, 24; 38, 39) and, to a lesser extent, in their shape.

The penis of *O. cuspidatus* sp. n., however, is quite different from the common type (Figs 74-80). Although its truncus is similar to other oncopodids, it bears a strongly elongated tube-like glans, which has a spiral tip, no lateral forceps and no recognizable stylus. At rest both parts are folded together like a jack-knife. A comparable penis structure in opilionids is not known (MARTENS 1976, 1986). This unique character, in addition to exceptionally small body size, domed leg tarsi and weak chelicerae, strongly suggests that a new genus may need to be established. However, as the genital morphology of Oncopodidae is insufficiently known, this would require examination of more material. In any case, the unusual penis of *O. cuspidatus* sp. n. demonstrates that genitalia of Oncopodidae are not as uniform as predicted by MARTENS (1976: 298, 1986: 297).

RELATIONSHIPS: Within *Pelitnus* spp. at least two groups can be distinguished: the species from the Sunda region, which accord with the typical *Pelitnus* by their distinct conical eye tubercle, and the geographically separated, *Gnomulus*-like northern representatives (*P. hyatti*, *P. lannaianus* sp. n.). The latter two species are distinguished by penes with short compact forceps and with a broadly rounded median plate (Figs 10-13); MARTENS 1977: Figs 3, 4). Their chelicerae are robust and fairly large in comparison with the palpi (Fig. 6; MARTENS 1977: Fig. 7). Within the first assemblage, species could further be grouped on the basis of external characters, as for example the process on the basal cheliceral joint, the process on the ventral palpal femur and trochanter, the tubercle on dorsal coxa IV, etc. This, however, leads to a phenetic grouping. At the present state of knowledge, penis morphology corroborates a close relationship only between *P. thorelli* sp. n. and *P. conigerus* sp. n. and indicates the same between *P. drescoi* and *P. segnipes* (?). Otherwhise it does not shed much additional light on taxonomic relationships among the genus *Pelitnus*. For the genera *Oncopus* and *Gnomulus* insufficient information on genital morphology is available.

GENERIC LIMITS: According to the delimitations of the genera *Gnomulus* Thorell, 1890 and *Pelitnus* Thorell, 1891, as laid down by THORELL (1891: 93) and slightly altered by POCOCK (1897), *P. hyatti* (MARTENS 1977: Fig. 5) and the male of *P. lannaianus* sp. n. (Fig. 4) should be placed under *Gnomulus*. Both do not possess a "triangularly spiniform erect interocular tubercle" (POCOCK 1897: 285). In the latter species, however, the female does indeed have a low eye tubercle (Fig. 3) and thus is clearly a *Pelitnus*. This overlap in generic characters gives reason for a re-evaluation and a possible fusion of both genera, as already proposed by LOMAN (1902: 183). Genital morphology, so far not known in *Gnomulus*, may provide further arguments hereto.

ZOOGEOGRAPHY: The now 26 known oncopodid species are distributed as follows:

Nepal: *P. hyatti*.

India – Assam: *G. aborensis*.

Thailand: *P. lannaianus* sp. n., *O. alticeps*.

West Malaysia – peninsula: *P. piliger* Pocock, *P. pulvillatus* Pocock, *O. feae*; – Penang Island: *P. insularis* Roewer, *P. armillatus* ?, *G. rostratus* Thorell, *O. alticeps* Pocock, *O. feae*.

Singapore Island: *O. acanthochelis*, *O. truncatus*.

Sumatra Island: *P. drescoi*, *P. segnipes*, *P. armillatus*, *G. sumatranus* Thorell, *O. cuspidatus* sp. n.

Java Island: *P. segnipes* ?.

Borneo Island: *P. laevis*; – Sabah: *P. conigerus* sp. n., *O. megachelis* sp. n.; – Brunei: *P. imadatei*, *P. thorelli* sp. n.; – Sarawak: *P. annulipes*, *P. sundaicus* sp. n., *O. doriae*, *O. hosei*; – Kalimantan: *P. segnipes* ?.

Philippines – Palawan Island: *P. palawanensis*; – Luzon Island: *G. minor*; – Mindanao Island: *P. goodnighti*.

Apart from the doubtful record of *P. segnipes* from Borneo and *P. armillatus* from Penang, all species seem to have restricted distributions, which is in accordance with their ground-dwelling habits and low mobility. On the other hand, the new records indicate that many more species exist than formerly presumed. There is no information whether oncopodid species occur syntopically. Vicariancy is known in many species of island opilionids. Zoogeography will be better understood when more information on species delimitations, relationships and distributions are available. Clearly the perhumid tropics contain the majority of species, but new discoveries can also be expected from mountainous areas further north, especially from Burma.

ACKNOWLEDGMENTS

I am grateful to Drs Bernd Hauser and Charles Lienhard for the opportunity to study the oncopodid material from the collection of the Museum of Geneva. Special thanks are due to Dr. B. Hauser for providing literature and for his initiative to produce the first lifelike habitus drawings of oncopodids by a distinguished artist. Armin Coray from Basle is congratulated for the fine result. I am obliged to the Director of the Geneva Museum, Professor Volker Mahnert, for the financial support for the drawings. The loan of additional material by Drs Manfred Graßhoff (SMF), Paul D. Hillyard (BMNH) and Christine Rollard (MNHNP) is highly acknowledged. Drs J. Gruber (NHMW) and K. Thaler (Innsbruck) kindly provided constructive criticism of the manuscript; Dr. Steven Elliott and Steven Mustowe (Chiang Mai) corrected the English text. Research in Thailand was carried out at the Biology Department of Chiang Mai University; permission to collect specimens in national parks was given by the Royal Forest Department.

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Revue suisse Zool.	Tome 99	Fasc. 1	p. 201-209	Genève, mars 1992

Agathidium raccolti in Thailandia dal Dr P. Schwendinger con descrizione di 4 nuove specie (Coleoptera, Leiodidae)

di

Fernando ANGELINI *

Con 19 figure

ABSTRACT

***Agathidium* collected in Thailand by Dr. P. Schwendinger with description of four new species (Coleoptera, Leiodidae).** – Descriptive and/or collecting data are reported on 14 species of *Agathidium* from Thailand.

New description: *Agathidium fraternum* n. sp., *A. schwendingeri* n. sp., *A. siamense* n. sp., *A. apocryphum* n. sp.

INTRODUZIONE

Grazie alla cortesia del Dr. Claude Besuchet e Ivan Löbl, ho avuto la possibilità di studiare gli *Agathidium* raccolti in Thailandia dal Dr. Peter Schwendinger (Innsbruk) e conservati nelle collezioni del Museo di Ginevra. Trattasi di 58 esemplari riferibili a 14 specie reperite in 8 diverse località; un ulteriore piccolo lotto di 3 esemplari (2 specie, 2 località) proviene dalle raccolte effettuate in Thailandia dai Dr. Löbl & Burckhardt nel 1985 e rimasti sinora non studiati.

Le seguenti specie sono risultate nuove: *Agathidium fraternum* n. sp., *A. schwendingeri* n. sp., *A. siamense* n. sp., *A. apocryphum* n. sp.

Considerando i nuovi dati sono attualmente note per la Thailandia 17 specie di *Agathidium.*

Gli esemplari sono conservati nelle Collezioni del Museo di Storia Naturale di Ginevra (MHNG) e in collezione Angelini (CAn).

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* S.S.7 per Latiano, Km. 0,500, 72021 Francavilla Fontana (Brindisi), Italy.

Mi é gradito, anche in questa sede, ringraziare i Dr. Claude Besuchet e Ivan Löbl per avermi dato la possibilità di studiare il suddetto materiale nonché l'amico Prof. Luigi De Marzo per l'assistenza nella redazione del lavoro.

RISULTATI

Agathidium (s. str.) **ducentesimum** Ang. & Dmz.

Agathidium (s. str.) ducentesimum Angelini & De Marzo, 1989: 461.

Materiale esaminato: Chiang Mai prov., Doi Inthanon, 2300 m, VI.1987, leg. Schwendinger, 1 ♀ in MHNG.

Distribuzione: Thailandia.

Agathidium (s. str.) **ilvense** Ang. & Dmz.

Agathidium (s. str.) ilvense Angelini & De Marzo, 1989: 463.

Materiale esaminato: Chiang Mai prov., Doi Inthanon, 1630 m, 25.II.1987, leg. Schwendinger, 1 ♀ in MHNG; stessa località, 2300 m, 23.V.1987, 1 ♂ e 1 ♀ in MHNG, 2 ♀ in CAn; stessa località e altitudine, VIII.1987, 1 ♀ in MHNG, in ♂ in CAn; stessa località ed altitudine, VI.1987, 1 ♀ in MHNG; Doi Angkhang, 10 Km W Fang, 1650 m, 22.IV.1987, leg. Schwendinger, 1 ♀ in MHNG.

Distribuzione: Thailandia.

Agathidium (s. str.) **incognitum** Ang. & Dmz.
Fig. 15

Agathidium (s. str.) incognitum Angelini & De Marzo, 1989: 465.

Materiale esaminato: Chiang Mai prov., Doi Inthanon, 2530 m, XI.1986, leg. Schwendinger, 1 ♀ in MHNG.

Note tassonomiche: la specie era sinora nota solo sulla base di 2 esemplari ♂♂; il nuovo esemplare, ♀ é lievemente più piccolo misurando 2,45 mm. Formula tarsale ♀ 4-4-4, spermateca come in fig. 15.

Distribuzione: Thailandia.

Agathidium (s. str.) **fungivorum** Ang. & Dmz.

Agathidium (s. str.) fungivorum Angelini & De Marzo, 1989: 466.

Materiale esaminato: Chiang Mai prov., 2500 m, 18.IV-23.V.1987, leg. Schwendinger, 1 ♀ in MHNG e 1 ♀ in CAn.

Distribuzione: Thailandia.

Agathidium (s. str.) **fraternum** n. sp.
Figg. 1, 3, 7, 11, 12, 16

Lunghezza 1,85-2,20 mm (holotypus ♂ 1,90 mm). Colorazione del dorso uniformemente rosso-bruno, parte inferiore più chiara; antenne testacee con 9° e 10° antennomero più scuro, zampe rosso-brune, tarsi testacei Microreticolazione assente, punteggiatura rada e microscopica sull'intero dorso.

Capo: punteggiatura costituita da punti molto piccoli e superficiali, distanti tra loro 3-5 volte il proprio diametro; mandibola sinistra dei maschi con dente più o meno sviluppato e rivolto verso l'alto, tranne che in un paratypus, femmine con mandibola sinistra semplice, simile alla destra; occhi suboblunghi e massima larghezza del capo al loro livello (fig. 1); clipeo poco incavato, linea clipeale assente; 3° antennomero lungo 1,15 volte il 2° e più corto del 4°+5°.

Pronoto: punteggiatura assente, solo radi microscopici punti poco visibili e distanti tra loro 4-10 volte il proprio diametro; 1,3 volte più largo del capo, poco trasverso (la/lu=1,36) e poco convesso (la/alt=1,82); margine anteriore poco curvo, profilo laterale molto largamente arrotondato (fig. 3). Misure holotypus: lungh. 0,68 mm, largh. 0,93 mm, alt. 0,51 mm.

Elitre: punteggiatura assente, solo microscopici punti come sul capo ma più radi; larghe quanto il pronoto, alquanto più larghe che lunghe (la/lu=1,12) e poco convesse (la/alt=1,95); profilo laterale con angolo omerale molto lieve e largamente arrotondato ed iniziante verso la metà delle elitre; strie suturali assenti. Misure holotypus: lungh. 0,82 mm, largh. 0,92 mm, alt. 0,47 mm.

Ali metatoraciche assenti. Meso e metasterno: carena mediana lieve, linee laterali complete, linee femorali assenti, meso e metacoxe a contatto, fra le metacoxe un lieve tubercolo prolungato posteriormente.

Zampe: metafemori del ♂ arrotondati al margine posteriore (fig. 7). Formula tarsale: ♂ 5-5-4, ♀ 4-4-4.

Armatura genitale maschile (fig. 11,12): edeago breve, parte prossimale tronca, margini laterali convergenti in punta; parameri slargati nei due terzi anteriori e fortemente bifidi.

Spermateca (fig. 16): a forma di S e di calibro costante.

Note comparative: *A. fraternum* n. sp. risulta molto simile ad *A. incognitum* Ang. & Dmz. (1989: 465, Thailandia) e *A. fungivorum* Ang. & Dmz (1989: 566, Thailandia) in quanto anch'esso presenta dorso non microreticolato e antenne non uniformemente testacee; da entrambe si differenzia per le minori dimensioni e la clava antennale con solo il 9° e 10° antennomero scuro; da *A. fungivorum* Ang. & Dmz. si differenzia anche per il maggiore rapporto 3°/2° antennomero; analogamente ad *A. fungivorum* Ang. & Dmz. la mandibola sinistra del ♂ presenta un dente più o meno sviluppato e rivolto verso l'alto; l'edeago é ugualmente simile mentre i parameri sono nettamente diversi.

Holotypus ♂: Chiang Mai prov., Doi Angkhang, 10 Km W Fang, 1650 m, 22.IV.1987, leg. Schwendinger, n. 6692 in MHNG.

Paratypi: stessi dati dell'holotypus, 2 ♂ n. 6693, 6694 in MHNG, 1 ♂ n. 6695 in CAn; stessa località, 1500 m, 30.X.1987, 2 ♂ n. 6696, 6697 in MHNG; Chiang Mai prov., Doi Shutep, 1450 m, 4.XI.1985, leg. Burckhardt & Löbl, 1 ♂ n. 6698 in MHNG; stessa località, 1400 m, 5.XI.1985, 1 ♂ n. 6699 in CAn; Chiang Mai prov., Doi Inthanon, 1780 m, 17.XII.1986, leg. Schwendinger, 1 ♀ n. 6700 in MHNG; stessa località, 1720 m, 7.XII.1985, leg. Burckhardt & Löbl, 1 ♀ n. 6701 in CAn.

Distribuzione: Thailandia.

Agathidium (s. str.) **newari** Ang. & Dmz.

Agathidium (s. str.) newari Angelini & De Marzo, 1985: 42; 1986b: 838; 1989: 468.

Materiale esaminato: Chiang Mai prov., Doi Angkhang, 10 Km W Fang, 1500 m, 20.III.1987, leg. Schwendinger, 1 ♀ in MHNG.

Distribuzione: Nepal, Thailandia.

Agathidium (s. str.) **schwendingeri** n. sp.

Figg. 2, 4, 8, 17

Lunghezza 2,90-3,15 mm (holotypus ♂ 2,90 mm). Colorazione del dorso di capo e pronoto rosso-bruno, elitre più scure, parte inferiore rosso-bruna, mesosterno testaceo; antenne uniformemente testacee, zampe rosso-brune. Microreticolazione assente, punteggiatura fine e rada sull'intero dorso.

Capo: punteggiatura costituita da punti piccoli e superficiali, distanti tra loro 1-6 volte il proprio diametro; capo anteriormente ribordato; fossette antero-laterali assenti; occhi tondeggianti e massima larghezza del capo al loro livello (fig. 2); clipeo discretamente incavato, linea clipeale assente; 3° antennomero lungo 1,5 volte il 2° e più lungo del 4°+5°.

Pronoto: punteggiatura simile a quella del capo, punti distanti 2-6 volte il proprio diametro; 1,67 volte più largo del capo, discretamente trasverso (la/lu=1,48) e molto convesso (la/alt=1,44); margine anteriore poco curvo, profilo laterale molto largamente arrotondato (fig. 4). Misure holotypus: lungh. 0,92 mm, largh. 1,37 mm, alt. 0,95 mm.

Elitre: dorso non microreticolato, solo vaghe tracce, punteggiatura costituita da punti più piccoli e superficiali di quelli del capo, distanti tra loro 3-10 volte il proprio diametro; appena più strette del pronoto, più lunghe che larghe (la/lu=0,97) e discretamente convesse (la/alt=1,55); profilo laterale con angolo omerale molto lieve e largamente arrotondato ed iniziante verso la metà delle elitre; strie suturali assenti. Misure holotypus: lungh. 1,35 mm, largh. 1,32 mm, alt. 0,85 mm.

Ali metatoraciche presenti. Meso e metasterno: carena mediana netta, linee laterali assenti, linee femorali incomplete e arrotondate al centro.

Zampe: metafemori del ♂ senza dente al margine posteriore (fig. 8). Formula tarsale: ♂ 5-5-4, ♀ 5-4-4.

Armatura genitale maschile: edeago di forma allungata, con parte prossimale ad uncino, margini laterali convergenti in una punta largamente arrotondata; parameri esili, appuntiti all'apice.

Spermateca (fig. 17): parte basale piriforme, parte apicale lunga ed esile, di calibro costante, dotto esile.

Note comparative: *A. schwendingeri* n. sp. risulta molto simile ad *A. brahmano* Ang. & Dmz. (1986: 430, Assam e Nepal) stante l'uguale colorazione dell'antenna, presenza di ali metatoraciche, rapporto 3°/2° antennomero; se ne differenzia per le maggiori dimensioni e il rapporto pronoto/capo nonché per la maggiore trasversalità del pronoto; l'edeago risulta nettamente diverso nelle due specie. Da *A. newari* Ang. & Dmz (1985: 42 e 1989: 468), *A. silvestre* Ang. & Dmz. (1989: 468) e *A. formosum* Ang. & Dmz. (1984: 32 e 1989: 468) già segnalati di Thailandia e presentanti ugualmente il capo ribordato anteriormente, si differenzia per la diversa colorazione dell'antenna (*A. formosum* e *A. silvestre*) o per la presenza di ali metatoraciche (*A. newari*) nonché per la diversa forma dell'edeago.

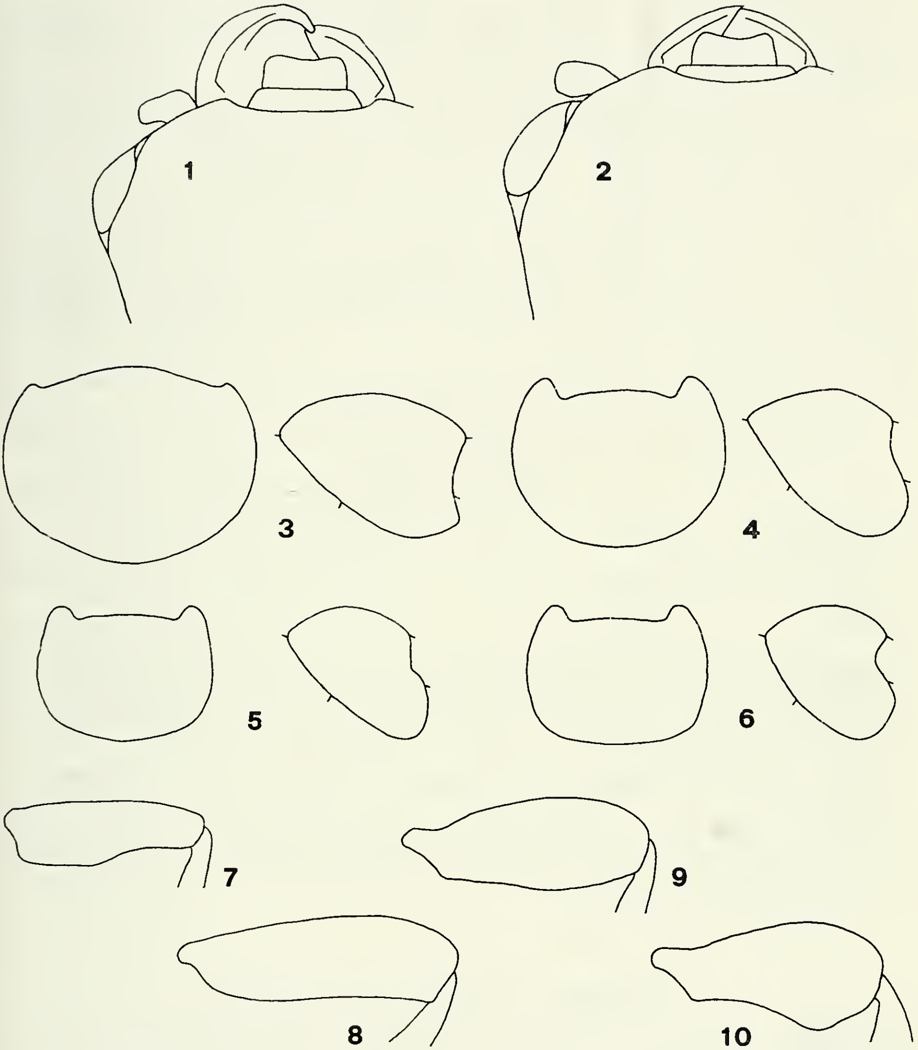
Holotypus ♂: Chiang Mai prov., Doi Suthep, 1150 m, 14.I.1987, leg. Schwendinger, n. 6682 in MHNG.

Paratypi: stessa località dell'holotypus, 1180 m, VI.1987, 1 ♂ n. 6683 in CAn; Chiang Mai prov., Doi Chiang Dao, 450 m, 7.V.1987, leg. Schwendinger, 1 ♀ n. 6684 in MHNG.

Agathidium (s. str.) **siamense** n. sp.

Figg. 5, 9, 13, 14, 18

Lunghezza 2,50-2,90 mm (holotypus ♂ 2,55 mm). Colorazione del dorso di capo e pronoto rosso-bruno, elitre più scure, parte inferiore rosso-bruna, mesosterno più chiaro;



FIGG. 1-10.

Capo in vista dorsale di: 1, *Agathidium fraternum* n. sp.; 2, *A. schwendingeri* n. sp. Profili dorsale e laterale del pronoto in: 3, *A fraternum* n. sp.; 4. *A. schwendingeri* n. sp.; 5, *A. siamense* n. sp.; 6, *A. apocryphum* n. sp. Metafemore del ♂ in: 7, *A. fraternum* n. sp.; 8, *A. schwendingeri* n. sp.; 9, *A. siamense* n. sp.; 10, *A. apocryphum* n. sp.

antenne uniformemente testacee, zampe testacee. Microreticolazione assente, punteggiatura uniforme ma rada sull'intero dorso.

Capo: punteggiatura costituita da punti piccoli ma impressi, distanti tra loro 2-6 volte il proprio diametro; capo anteriormente lievemente ribordato; occhi suboblunghi e massima larghezza del capo al loro livello; clipeo poco incavato, linea clipeale assente; 3° antennomero lungo 1,15 volte il 2° e più corto del 4°+5°.

Pronoto: punteggiatura simile a quella del capo; 1,5 volte più largo del capo; poco trasverso (la/lu=1,17) e molto convesso (la/alt=1,14); margine anteriore poco curvo, profilo laterale molto largamente arrotondato (fig. 5). Misure holotypus: lungh. 0,97 mm, largh. 1,14 mm, alt. 1,00 mm.

Elitre: non microreticolate, solo vaghe tracce; punteggiatura costituita da punti più piccoli e superficiali di quelli del capo, distanti tra loro 2-10 volte il proprio diametro; larghe quanto il pronoto, alquanto più lunghe che larghe (la/lu=0,9) e molto convesse (la/alt=1,31); profilo laterale con angolo omerale molto lieve e largamente arrotondato ed iniziante verso la metà delle elitre; strie suturali assenti. Misure holotypus: lungh. 1,25 mm, largh. 1,14 mm, alt. 0.87 mm.

Ali metatoraciche presenti. Meso e metasterno: carena mediana lieve, linee laterali assenti, linee femorali incomplete e arrotondate al centro.

Zampe: metafemori del ♂ senza dente al margine posteriore (fig. 9). Formula tarsale: ♂ 5-5-4, ♀ 5-4-4.

Armatura genitale maschile (figg. 13, 14): edeago robusto, parte prossimale tronca, margini laterali convergenti in una punta strettamente arrotondata; parameri esili e assottigliati verso l'apice.

Spermateca (fig. 18): parte basale globosa, parte apicale breve, ricurva e terminante in punta.

Note comparative: specie simile ad *A. darjeelingense* Ang. & Dmz (1981: 282, Darjeeling) per colorazione clava antennale, presenza di ali metatoraciche e rapporto 3°/2° antennomero; se ne differenzia unicamente per la minore trasversalità del pronoto e punteggiatura del dorso più netta; l'esame del fallo, nettamente diverso nelle due specie, é essenziale per differenziarle.

Holotypus ♂: Chiang Mai prov., Doi Shutep, 1090 m, 2.XII.1985, leg. Schwendinger, n. 6685 in MHNG.

Paratypi: stessa località dell'holotypus, 1320 m, 27.XII.1986, 1 ♂ n. 6687 in MHNG; stessa località, 960 m, III.1986, 1 ♂ n. 6686 in CAn; Chiang Mai prov., Doi Angkhang, 10 Km W Fang, 1650 m, 22.IV.1987, 1 ♀ n. 6688 in CAn.

Distribuzione: Thailandia.

Agathidium (s. str.) **formosum** Ang. & Dmz.

Agathidium (s. str.) formosum Angelini & De Marzo, 1984: 32; 1989: 468.

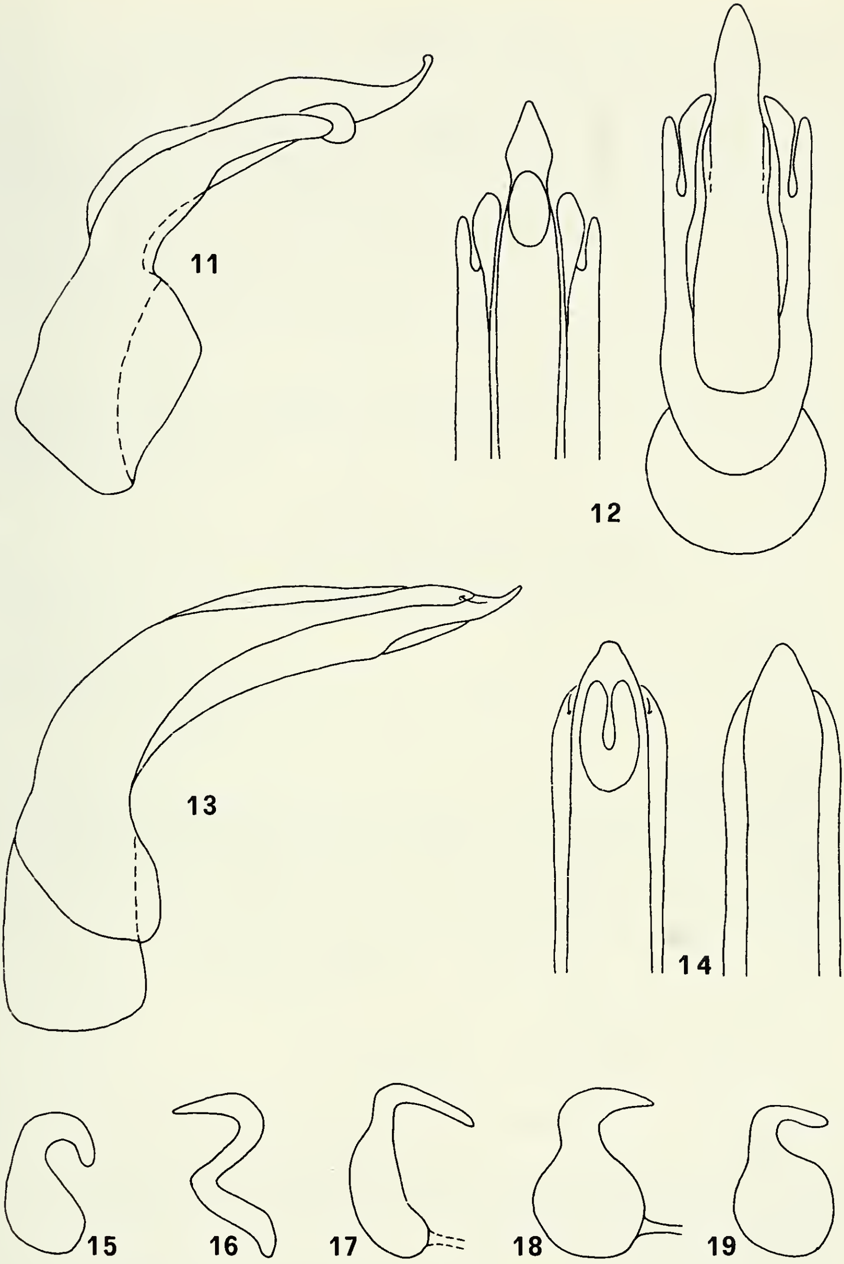
Materiale esaminato: Chiang Mai prov., Doi Angkhang, 10 Km W Fang, 1500 m, 20.III.1987, leg. Schwendinger, 1 ♂ in MHNG.

Distribuzione: Tai Wan, Thailandia.

Agathidium (s. str.) **apocryphum** n. sp.

Figg. 6, 10, 19

Lunghezza 2,55-2,60 mm (holotypus ♂ 2,60 mm). Colorazione del dorso di capo e pronoto rosso-bruno, elitre più scure, parte inferiore rosso-bruna; antenne testacee con



FIGG. 11-19.

Armatura genitale maschile (visione laterale e visione dell'apice dal ventre) di: 11-12, *Agathidium fraternum* n. sp.; 13-14, *A. siamense* n. sp. Spermateca di: 15, *A. incognitum* Ang. & Dmz.; 16, *A. fraternum* n. sp.; 17, *A. schwendingeri* n. sp.; 18, *A. siamense* n. sp.; 19, *A. apocryphum* n. sp.

antennomeri 9° e 10° più scuri, zampe rosso-brune. Microreticolazione assente, solo vaghe tracce sulle elitre, punteggiatura assente sul capo, microscopica sul pronoto, più netta sulle elitre.

Capo: punteggiatura assente, solo microscopici punti distanti tra loro 4-8 volte il proprio diametro; capo anteriorimente ribordato; occhi tondeggianti e massima larghezza del capo al loro livello; clipeo poco incavato, linea clipeale assente; 3° antennomero lungo 1,15 volte il 2° e più corto del 4°+5°.

Pronoto: punteggiatura costituita da punti molto piccoli e poco visibili, distanti tra loro 2-10 volte il proprio diametro; 1,64 volte più largo del capo, discretamente trasverso (la/lu=1,49) e molto convesso (la/alt=1,4); margine anteriore poco curvo, profilo laterale molto largamente arrotondato e a lati subparalleli (fig. 6). Misure holotypus: lungh. 0,77 mm, largh. 1,15 mm, alt. 0,82 mm.

Elitre: dorso non microreticolato, solo vaghe tracce; punteggiatura costituita da punti più grandi di quelli del pronoto ma superficiali, distanti tra loro 4-8 volte il proprio diametro; alquanto più larghe del pronoto, poco più lunghe che larghe (la/lu=0,98) e discretamente convesse (la/alt=1,6); profilo laterale con angolo omerale molto lieve e largamente arrotondato ed iniziante verso la metà delle elitre; strie suturali assenti. Misure holotypus: lungh. 1,22 mm, largh. 1,20 mm, alt. 0,75 mm.

Ali metatoraciche presenti. Meso e metasterno: carena mediana netta, linee laterali assenti, linee femorali incomplete e arrotondate al centro.

Zampe: metafemori del ♂ fortemente slargati al margine posteriore (fig. 10). Formula tarsale; ♂ 5-5-4, ♀ 5-4-4.

Armatura genitale maschile: Edeago di forma allungata, parte prossimale ad uncino, lati subparalleli e dolcemente convergenti in un apice uniformenente arrotondato; parameri esili e appuntiti.

Spermateca (fig. 19): parte basale globosa, parte apicale curva, breve ed esile, terminante in punta.

Note comparative: stante la colorazione scura della clava antennale, la presenza di ali metatoraciche e il mesosterno privo di linee laterali, *A. apocryphum* n. sp. si colloca fra *A. madurense* Port. (1937: 33, Tamil Nadu) e *A. varuna* Ang. & Dmz. (1984: 557, Darjeeling); da entrambi si differenzia per le minori dimensioni, rapporto 3°/2° antennomero e pronoto/capo; da *A. madurense* Port. anche per la diversa colorazione dell'antenna; l'edeago é nettamente diverso da quello delle su nominate specie.

Holotypus ♂: Mae Hong Son prov., Doi Chang, 20 Km E Pai, 1950 m, 10.IV.1987, leg. Schwendinger, n. 6689 in MHNG.

Paratypi: stessa località dell'holotypus, 1 ♂ n. 6690 in CAn, 1 ♀ n. 6691 in MHNG.

Distribuzione: Thailandia.

Agathidium (Microceble) laticorne Port.

Agathidium (Cyphoceble) laticorne Portevin, 1922: 58.

Agathidium (Microceble) laticorne: Angelini & De Marzo, 1986a: 442; 1989: 471.

Materiale esaminato: Chiang Mai prov., 10 Km W Wiang Pa Pao, Ban Huay Sal, 780 m, 28.I.1988, leg. Schwendinger, 1 ♀ in MHNG.

Note sistematiche: anche questo esemplare, come già quelli reperiti da Löbl & Burckhardt (Angelini & De Marzo, 1989: 471) presenta sul pronoto una microreticolazione molto superficiale e visibile a 100 X memtre tutti gli altri caratteri, spermateca inclusa, sono identici a quelli di *A. laticorne* Port.; sussistono, pertanto, le riserve circa l'opportunità di farne una sottospecie.

Distribuzione: Asia sudorientale dal Pakistan al Viet Nam e a sud sino a Sumatra.

Agathidium (Microceble) sp. prope **laticorne** Port.

Agathidium (Microceble) sp. prope *laticorne*; Angelini & De Marzo, 1989: 471.

Materiale esaminato: Chiang Mai prov., Doi Angkhang, 10 Km W Fang, 1500 m, 30.X.1987, leg. Schwendinger, 2 ♂ e 3 ♀ in MHNG, 1 ♂ e 1 ♀ in CAn.

Note sistematiche: i nuovi esemplari sono del tutto simili a quelli già reperiti in Thailandia dai Dr. Löbl & Burckhardt (Angelini & De Marzo, 1989: 471) per cui anche per essi valgono le stesse riserve e perplessità esposte in tale lavoro.

Distribuzione: Thailandia.

Agathidium (Microceble) silvarum Ang. & Dmz.

Agathidium (Microceble) silvarum Angelini & De Marzo 1989: 472.

Materiale esaminato: Chiang Mai prov., Khao Yai Nat. Park, 4-5.V.1987, leg. Schwendinger, 1 ♀ in MHNG e 1 ♀ in CAn.

Distribuzione: Thailandia.

Agathidium (Microceble) infuscatum Ang. & Dmz.

Agathidium (Microceble) infuscatum Angelini & De Marzo 1989: 473.

Materiale esaminato: Chiang Mai prov., Doi Inthanon, 1020 m, 17.II.1987, leg. Schwendinger, 1 ♂ in MHNG e 1 ♂ in CAn.

Distribuzione: Thailandia.

Agathidium (Microceble) manasicum Ang. & Dmz.

Agathidium (Microceble) manasicum Angelini & De Marzo, 1986a: 445; 1989: 477.

Materiale esaminato: Chiang Mai prov., Doi Shutep, 1100 m, I.1986 leg. Schwendinger, 1 ♀ in MHNG; stessa località e raccoglitore, 1180 m, VII.1986, 1 ♀ in MHNG; Doi Inthanon, 1080 m, 24.II.1987, leg. Schwendinger, 1 ♀ in MHNG; stessa località e raccoglitore, 1780 m, 3.III.1987, 2 ♀ in MHNG, 1 ♂ in CAn; stessa località, 7.XI.1985, leg. Burckhardt & Löbl, 1 ♂ in MHNG; Doi Angkhang, 10 Km W Fang, 1500 m, 20.III.1987, leg. Schwendinger, 2 ♂ in MHNG, 1 ♂ e 1 ♀ in CAn.

Distribuzione: India (Assam), Thailandia.

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Revue suisse Zool.	Tome 99	Fasc. 1	p. 211–217	Genève, mars 1992

Über weitere neue und bekannte Arten der Gattung *Periscolex* (Oligochaeta: Glossoscolecidae)

Regenwürmer aus Südamerika 16

Von

A. ZICSI *

Mit 4 Abbildungen

Abstract

Further contribution to new or already known species of the genus *Periscolex* (Oligochaeta: Glossoscolecidae). – The species of the genus *Periscolex* Cognetti, 1905 from various regions of South America are revised, based on original material and collections of the author. The new species *Periscolex ecuadoriensis* n. sp. is described, an identification key of species is proposed.

EINLEITUNG

Bei der Bearbeitung des aus verschiedenen Teilen Südamerikas stammenden reichen Regenwurm-Materials, welches im Rahmen der verschiedenen Ungarischen Bodenzoologischen Expeditionen der Jahre 1965/66, 1966/67 und von 1986-90 vom Autor gesammelt wurde, sind wir wiederholt auf Vertreter der Gattung *Periscolex* Cognetti, 1905 gestossen, die seit der Erstbeschreibung nicht wieder gesammelt wurden. Nach einer Revision der Typen aller erreichbaren Arten, die im Zoologischen Institut und Museum von Hamburg und im Museo ed Istituto die Zoologia Sistematica della Universitá in Torino eingesehen werden konnten, soll auch eine für die Wissenschaft neue Art *Periscolex ecuadoriensis* sp. n. im folgenden beschrieben werden.

Für die Ermöglichung, das Typenmaterial überprüfen zu können, spreche ich Herrn Prof. Dr. M. Dzwillo, Hamburg, und Herrn Dr. A. Rolando, Torino, sowie für einen Arbeitsplatz im Naturhistorischen Museum von Genf (wo das Material bearbeitet wurde) der Direktion und Herrn Dr. Cl. Vaucher auch an dieser Stelle meinen besten Dank aus.

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* Bodenzoologische Forschungsgruppe der Ungarischen Akademie der Wissenschaften, am Lehrstuhl für Tiersystematik und Ökologie der Eötvös-Loránd -Universität, H-1088 Budapest, Puskin utca 3, Ungarn.

BESCHREIBUNG DER ARTEN

Den Beschreibungen vorausgehend, sollen einige Beobachtungen beim Sammeln dieser Tiere gesondert hervorgehoben werden. Wie dies öfters festgestellt wurde, konnten die Arten dieser Gattung vorwiegend in der Laubstreu, und insbesondere in der Laubstreu von Galeriewäldern oder am Rand von Bächen und Flüssen erbeutet werden. Ob dies eine sekundäre Verbreitung der Arten ist, mag hingestellt bleiben. Eins jedoch steht fest, dass die nachstehend angeführten Fundorte meiner Ansicht nur einen bescheidenen Teil der Verbreitung widerspiegeln, da die Tiere nur mit Anwendung der Formol-Methode gefangen wurden, während sie beim Graben meistens übersehen werden. Da bei meinen Aufsammlungen in Südamerika die Formol-Methode wegen Fehlen von Wasser oder aus Zeitmangel nicht konsequent immer angewandt werden konnte, widerspiegeln die angeführten Fundorte auch nicht die wahrhaftige Häufigkeit dieser kleinen Arten. Auf diesen Umstand sind auch die Einzelexemplare der verschiedenen Arten zurückzuführen.

Wie in einer vorausgehenden Arbeit (Zicsi 1989) hervorgehoben wurde, sind von den 7 bzw. jetzt 8 bisher bekannt gewordenen Arten der Gattung *Periscolex* 5 (*P. mirus* Cognetti, 1905, *P. profugus* (Cognetti, 1904), *P. vialis* Michaelsen, 1913, *P. columbianus* (Michaelsen, 1900) und *P. yuya* Righi & Römbke, 1987) anhand eines Exemplares beschrieben worden. Der Umstand, dass es sich im allgemeinen um sehr kleine Tiere handelt, deren innere Organisation eine sehr sorgfältige Untersuchung erforderte, liess es voraus ahnen, dass von einer Nachbestimmung des einzigen Typus – Exemplares in meisten Fällen nicht viel zu erwarten ist.

Mit Ausnahme von *P. profugus* und *P. yuya* konnten alle anderen Typen ausfindig gemacht werden. Von diesen beiden Arten jedoch sind in den Aufsammlungen z.T. sehr zahlreiche Exemplare (*P. profugus*) angetroffen worden, die anhand der Beschreibungen auch identifiziert werden konnten. Da von der Typus-Art der Gattung, *Periscolex mirus*, in Torino unter Inv. Nr. OL 166 (Foresto Rio Cianari, Darien) nur ein Stück des Körperendes vorlag, liess sich eine Überprüfung des Tieres nicht durchführen. Eine Trennung der Arten *mirus* und *profugus* ist mit folgenden Merkmalen möglich: andersartige Lage der männlichen Poren (bei *mirus* auf Intersegmentalfurche 20/21, bei *profugus* in der Originalbeschreibung nicht angegeben, von mir auf Intersegmentalfurche 19/20 erkannt); Vorhandensein oder Fehlen der Pubertätsstreifen und (drittens) verschiedene Länge der nach hinten reichenden Samensäcke (Cognetti 1904, 1905, 1906; Zicsi 1989).

Periscolex profugus (Cognetti, 1904)

Eine Überprüfung sämtlicher von mir veröffentlichter Arten sowie die Bestimmung des neuen Materiales zeigten, dass bei allen Exemplaren Pubertätsstreifen vorhanden waren und sich auf die Segmente 19, 1/2 19 – 1/2 22, 22. erstreckten. Bei den geöffneten Exemplaren liessen sich z.T. auch mehr oder weniger starke drüsige Gebilde erkennen, die aber keine geschlossene Kammer bilden.

Fundorte: Ekuador. AF*/955-956 15 + 10 juv. Ex, G**/988145 3 Ex. Prov. Zamora-Chinchipe, zwischen Loja und Zamora, 30 km von Loja entfernt, 1300 m. 29.4.88. Zicsi + Csuzdi. – AF/2225 2 Ex. Prov. Napo 2 km hinter Muyuna 600 m. Urwald, 3.5.90. leg. Zicsi + Csuzdi + Paredes. – AF/2249 10 + 6 juv. Ex. Prov. Napo, 24 Km von Tena zwischen Puerto Napo und Ahuana 420 m.

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* Die Buchstaben AF beziehen sich auf die Sammlung des Zoosystematischen und Ökologischen Instituts der Eötvös L.-Univ., Budapest.

** Der Buchstabe G bezieht sich auf die Sammlung des Naturhistorischen Museums, Genf.

Urwald. 3.5.90 leg. Zicsi + Csuzdi + Paredes. – AF/2250 9 + 10 juv. Ex. G/990102 2 Ex. Prov. Napo, 44 km vor Loreto 1200 m, 2.5.90, leg. Zicsi + Csuzdi + Paredes. – AF/2251 + 4 juv. Ex. 19 km von Tena entfernt in Richtung Ahuana 430 m. Urwald. 3.5.90. leg. Zicsi + Csuzdi + Paredes. – AF/2253 3 Ex, G/988396 1 Ex. Prov. Napo, hinter Dureno am Rio Aguarico, Galeriewald, 200 m, 10.5.88. leg. Zicsi + Csuzdi. – AF/2254 2 Ex., G/990101 1 Ex. Prov. Manabi. 7 km hinter Flavio-Alfaro, Kakaoplantage, 300 m. 20.4.90 leg. Zicsi + Csuzdi + Gavilanes.

Periscolex yuya Righi und Römbke, 1987

Diese bisher nur aus Peru auf Grund eines Exemplares bekannt gewordene Art wurde von mir seinerzeit auch in Bolivien gesammelt. Da ich ein, vom Zweitautor der obigen Art in Peru gesammeltes, Exemplar ebenfalls besitze, das in allen wesentlichen Merkmalen mit der Originalbeschreibung übereinstimmt, glaube ich mit Sicherheit behaupten zu können, dass auch die in Bolivien gefundenen Tiere dieser Art angehören. Die aus Bolivien stammenden Tiere stimmen in der Zahl der perichätinen Borsten, in den abgesonderten Chylustaschen des 7. Segmentes, in der Form der Samentaschen und in den weit nach hinten gehenden Samensäcken mit der Originalbeschreibung überein. Es konnte allein das am Ende des Samenleiters in der Originalbeschreibung erwähnte Kämmerchen nicht erkannt werden.

Die Ähnlichkeit dieser Art mit *P. vialis* ist offensichtlich, doch unterscheiden sie sich in der Ausdehnung der Pubertätsstreifen und in der Zahl der Samentaschenpaare.

Fundorte: AF/1165 1 Ex. Peru, Panguana Regenwald 1986 leg. Römbke. – AF/2255 4 +1 Ex. G/966103 1 Ex. Bolivien. Prov. La Paz. Zwischen Teo Ponte und Alcoche 550 m. 19.12.66. leg. Zicsi. –

Periscolex vialis Michaelsen, 1913

In der Sammlung von Hamburg (Inv. Nr. 7745 Guaduas, Colombia, leg. O. Fuhrmann) liegt ein zerschnittenes und geöffnetes Exemplar vor; es ist einwandfrei als Holotypus zu bezeichnen. Interessant ist die Bemerkung in der Originalbeschreibung (p. 223), dass das vollständige Exemplar aus musealen Gründen geschont und deswegen nicht geöffnet werden soll. Wie erwähnt, liegt jetzt ein zerschnittenes und geöffnetes Tier vor, sodass Michaelsen im späteren sich noch einmal mit dieser Art befasst haben muss (MICHAELSEN 1918); dies geht aber aus der Literatur nicht einwandfrei hervor. Der Gürtel erstreckt sich beim Holotypus vom 14. – 22. Segment, die Pubertätsstreifen sind eigentlich deutlich auf einer Seite vom 1/2 18. – 20. Segment, auf der anderen Seite vom 15.- 21. Segment zu erkennen. In der Originalbeschreibung sind sie vom 18. – 22. Segment gelegen angegeben. Doch wird noch erwähnt, dass die Pubertätswälle sehr verschieden stark ausgebildet sind. Von den inneren Organen waren nur 2 Samentaschen der rechten Seite noch vorhanden, mit würstchenförmiger Form, die den sehr kennzeichnenden seitlichen Ausführungsgang erkennen liessen. Bei den vorausgehend als *P. yuya* bestimmten Tieren konnten nie seitliche Ausführungen der Samentaschen beobachtet werden.

Periscolex fuhrmanni Michaelsen, 1914

Von dieser Art liegen in der Museumssammlung von Hamburg 3 Exemplare unter Inv. Nr. V.7746 (Bogota, Colombia, leg. O. Fuhrmann) vor. Zwei Exemplare waren aufgeschnitten, eines davon ist in mehrere Teile zerschnitten und liegt gesondert in einer

Phiole. Es ist anzunehmen, dass die Beschreibung nach diesem Tier erfolgte, so dass es unter Inv. Nr. V. 7746/a als Lectotypus designiert wird, die beiden anderen Tiere werden als Paralectotypen festgelegt.

Bei den beiden geöffneten Tieren liessen sich von den inneren Organen nur die Samentaschen erkennen, es sind dies grosse würstchenförmige Gebilde. Von aussen verlaufen die Pubertätswälle am 18. - 22. Segment und sind auch von innen deutlich zu verfolgen, sie sind von birnenförmigen Drüsen dicht umgeben. Auch hier liessen sich bei der Ausführung der Samenleiter keine Kämmerchen erkennen. Beim dritten, von mir geöffnetem Tier zeigten die Chylustaschen im 7.-9. Segment eine leistensaumförmige Struktur, die des 7. Segmentes schien nicht gesondert zu sein und war auch nicht so auf den Muskelmagen aufgedrängt, wie dies bei den Arten mit perichätiner Borstenanordnung eindeutig beobachtet werden konnte. *P. fuhrmanni* bildet innerhalb der Gattung *Periscolex*, nur einen Übergang zu den Arten mit perichätiner Borstenanordnung, da bei ihr 2 Borstenreihen zur lumbricinen Anordnung dazukommen.

Periscolex brachycystis (Cognetti, 1905)

Von dieser Art liegen in der Sammlung von Torino (Inv. Nr. OL.370 Punta de Sabena leg. Festa) 3 Exemplare und mehrere Bruschstücke vor. Ein geöffnetes Tier wird unter Inv. Nr. OL 370/a als Lectotypus designiert. Die übrigen zwei sind als Paralectotypen zu betrachten.

Aus Panama sind jetzt 3 Tiere bestimmt worden, die die typische lumbricine Borstenanordnung zeigten und mit der Originalbestimmung vollständig übereinstimmten.

Fundorte AF/1166 2 Ex., G/965172 1 Ex. Panama Colon Cristobal, 12.9.1965. leg. Zicsi.

Periscolex columbianus (Michaelsen, 1900)

Von dem laut Originalbeschreibung einzigen vorzüglich konservierten Tier (Inv. Nr. V. 5456 Bogota leg. Burger) liegt in der Sammlung von Hamburg ein Bruchstück vor, an dem Teile der Samensäcke zu erkennen waren. Mehr liess sich vom Holotypus nicht nachbestimmen, obwohl diese Art mit der nachstehend zur Beschreibung gelangenden neuen Art nahe verwandt zu sein scheint.

Periscolex ecuadoriensis sp. n.

Es liegen von verschiedenen Fundorten aus Ekuador mehrere Exemplare vor, die in Grösse und Zahl der Segmente grosse Abweichungen zeigen.

Länge des Holotypus 20 mm, Dicke 1 mm, Segmentzahl 128. Bei den übrigen Tieren Länge 12-31 mm, Dicke 0,9-1,5 mm, Segmentzahl 55-152.

Farbe unpigmentiert, im Leben auf der Dorsalseite schwach blaugrau.

Kopf eingezogen, Kopflappen fingerförmig. 1. Segment durch eine schwache Intersegmentalfurche vom 2. Segment getrennt. Segmente ungeringelt, vor dem Gürtel Segmente etwas breiter als hinter dem Gürtel, insbesondere die Segmente 3-7. Borsten zu 8 an einem Segment, enggepaart. Borsten *cd* vor dem 6. Segment auseinandergerückt, gehen auf die Dorsalseite über (Abb. 1). Auch die Borstenreihe *ab* ist auf diesen Segmenten etwas auseinandergerückt, doch bleiben die Borsten noch weit gepaart. Vom 6. Segment bis zum Gürtel sind die Borsten *ab* etwas grösser als *cd*, *ab*=*bc*. Borstenverhältnis hinter dem Gürtel *aa*: *ab* : *bc* : *cd* : *dd* = 6,1 : 1,3 : 8 : 1,5 : 20. Keine

Abb. 1

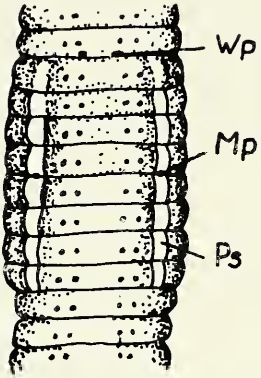

Abb. 2

Abb. 3

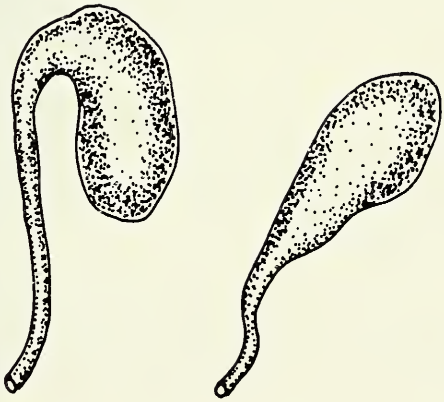

Abb. 4

Periscolex ecuadoriensis sp. n.

Abb. 1. Dorsalansicht mit Borstenanordnung der vorderen Segmente. Abb. 2. Ventralansicht mit den Gürtelorganen Wp = Weibliche Poren, Mp = Männliche Poren, Ps = Pubertätsstreifen. Abb. 3. Form der Normalborsten. Abb. 4. Form der Samentaschen.

Geschlechtsborsten erkannt. Normalborsten etwas S-förmig gebogen mit deutlichem Nodulus an der Spitze, ohne Härchen. (Abb. 3)

Nephridialporen verlaufen zwischen der Borstenlinie *cd*, insbesondere sind sie deutlich auf dem Gürtel zu erkennen.

Weibliche Poren auf dem 14. Segment innerhalb der Borstenlinie *aa*. Nicht bei allen Exemplaren deutlich zu sehen. Männliche Poren auf Intersegmentalfurche 18/19 auf Höhe der Pubertätsstreifen.

Gürtel ringförmig vom 15. – 22. Segment, Pubertätsstreifen vom 15. – 22. Segment, von den Intersegmenten deutlich unterbrochen. Bei einigen Exemplaren sind die Pubertätsstreifen vom 15. und 16. Segment nicht so kräftig ausgebildet. (Abb. 2)

2 Paar Samentaschenporen auf Intersegmentalfurche 7/8 und 8/9 in der Borstenlinie *cd*. Von aussen nicht immer sichtbar.

Innere Organisation. Vordere Dissepimente geschwunden, Dissepiment 8/9 sehr zart, 9/10 – 18/19 zart, aber deutlich ausgebildet. Grosser Schlundkopf mit traubigen Speicheldrüsenmassen, die bis zum Muskelmagen reichen. Grosse Peptonephridien beiderseits bis ins 9. Segment gehend. Ein grosser Muskelmagen im 6. Segment, tonnenförmig auch drei Segmente einnehmend. Hinter diesen, wahrscheinlich im 7. – 9. Segment, mehrteilige Kalkdrüsen, die durch tiefe Querschnitte geteilt sind. Eine vollkommen separierte Chylustasche im 7. Segment, die sich wie bei *P. profugus* auf den Muskelmagen aufdrängt und von den anderen Teilen des Ösophagus getrennt wäre, konnte nicht erkannt werden. Auch weiter nach hinten bildet der Ösophagus noch bis ins 12. Segment reichend eine gewisse Faltenbildung. Im 7.-9. Segment konnten leistenförmige Querfalten erkannt werden, die im 7. Segment dichter als in den dahinter liegenden Segmenten sind. Kleine Lateralherzen im 7.-9. Segment, grosse Intestinalherzen im 10. und 11. Segment. Perlschnurartiges Rückengefäss bis ins 18. Segment reichend. Typhlosolis im 19. Segment beginnend.

Männliche Geschlechtsorgane. 2 Paar Hoden und Samentrichter im 10. u. 11. Segment in ösophageale Testikelblasen eingeschlossen, die seitlich miteinander verschmolzen sind. Aus den hinteren Testikelblasen gehen ein Paar Samensäcke hervor, die zart dünn, später immer dicker werden und bis ins 33. - 35. Segment reichen können. Die Samensäcke sind in jedem Segment eingeschnürt und bilden quergestellte Anhänge. Verschmelzungen der Samenleiter nicht erkannt.

Ovarien im 13. Segment, fächerförmig, mit vielen Eiern traubenförmig besetzt.

Samentaschen im 8. und 9. Segment, kleine keulenförmige Gebilde, mit kürzerem Ausführungsgang und grösserer Ampulle, die oft geknickt sein kann (Abb. 4). Manchmal lassen sich auch im Ausführungsgang Samenmassen nachweisen. Oft hingegen ist selbst die Ampulle leer, insbesondere bei den sehr kleinen Exemplaren.

Die neue Art steht *P. columbianus* und *P. vialis* am nächsten. Von *columbianus* unterscheidet sie sich durch die Lage der Pubertätsstreifen und durch die Zahl und Form der Samentaschen. Von *P. vialis* unterscheidet sie sich vor allem in der lumbricinen Borstenanordnung.

Fundorte: Holotypus AF/2262 Prov. Napo. 2 km hinter Muyuno, Urwald 600 m. 3.5.90. leg. Zicsi + Csuzdi + Paredes. Paratypen. AF/2226. 12 + 2 juv. Ex., G/990/103 1 Ex. Fundort wie beim Holotypus. – AF/1555. 4 Ex. Prov. Pastaze. Zwischen Puyo und Macas, 870 m. Urwald 1.5.89. leg. Zicsi und Loksa. – AF/2223 1 Ex. Prov. Napo. Canelos 800 m. 1.5.89. leg. Zicsi und Loksa. – AF/2252. 2 Ex. Prov. Napo. 26 km vor Tena 900 m. 4.5.90. leg. Zicsi + Csuzdi + Paredes. –

Bestimmungsschlüssel der Gattung *Periscolex* Cognetti, 1905

1	Lumbricine Borstenanordnung	2
	Perichätine Borstenanordnung	4
2	Pubertätsstreifen entlang des ganzen Gürtels	*ecuadoriensis* sp. n.
	Pubertätsstreifen nur auf einem Teil des Gürtels	3
3	Ein oder zwei Paar Samentaschen vorhanden	*brachycystis*
	Drei Paar Samentaschen vorhanden	*columbianus*
4	Mehr als 10 Borsten an einem Segment	5
	10 Borsten an einem Segment	*fuhrmanni*
5	Pubertätstreifen vorhanden	6
	Pubertätsstreifen fehlen	*mirus*
6	Pubertätsstreifen auf den Gürtel beschränkt	7
	Pubertätsstreifen reichen über den Gürtel hinaus	*longituberculatus*
7	Ein Paar Samentaschen vorhanden	*profugus*
	Mehr als ein Paar Samentaschen vorhanden	8
8	Zwei Paar Samentaschen vorhanden	*vialis*
	Drei Paar Samentaschen vorhanden	*yuya*

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Tome 99 — Fascicule 1

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1889b. Note sur quelques Héliozoaires. *Archs. Sci. phys. nat. Genève* (3) 22:524-539.
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Catalogue of the Neritidae (Mollusca: Gastropoda) Described by Constant A. Récluz Including the Location of the Type Specimens.

by

Alan R. Kabat[1] & Yves Finet[2]

ABSTRACT

Récluz, a nineteenth-century French conchologist, described almost two hundred species of Neritidae (Gastropoda). This paper catalogues the neritids of Récluz, and provides information on the type specimens in the British Museum (Natural History), the Institut Royal des Sciences Naturelles de Belgique, Bruxelles, the Muséum National d'Histoire Naturelle, Paris, the Muséum d'Histoire Naturelle, Genève, and the Museum of Comparative Zoology. References to subsequent citations of these species (by Récluz and others) are given.

INTRODUCTION

Constant A. Récluz (1797 / 1798 ? - 11 July 1873), was a pharmacist in Vaugirard and an amateur conchologist. He described numerous species of prosobranch gastropods in several families, especially in the Neritidae (marine and freshwater), for which he authored over 190 species (including manuscript names subsequently validated by others). Some of these species were described from specimens in Récluz' own collection which was later acquired by Benjamin Delessert. The Delessert collection was subsequently [in 1869] obtained by the Muséum d'Histoire Naturelle, Genève, wherein many of the Récluz types are still extant (MERMOD, 1950), together with an unpublished manuscript that lists the species, the "Catalogue de la collection des familles des Néritides et Naticides du Cabinet de Mr. C. Récluz".

Some material from the Recluz' collection was also obtained, probably by exchange, by Philippe Dautzenberg. The Dautzenberg collection was transferred in 1935 to the

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[1] Division of Mollusks, NHB-118, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A.

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

Institut Royal des Sciences Naturelles de Belgique, Bruxelles (DUCHAMPS, 1989), with a few type specimens of Recluz' species; it also contains an unpublished manuscript, the "Catalogue des Nérites et Néritines exactement connues, disposé par ordre alphabétique et méthodique".

The types of some (but not all) species described in the "*Journal de Conchyliologie*" are in the collection of that journal, which is now housed in the Muséum National d'Histoire Naturelle, Paris. FISCHER-PIETTE (1950) studied many of these type specimens.

Other species were based on material from Hugh Cuming (1791 - 1865), the British shell collector who had one of the largest private collections of the nineteenth century (DANCE, 1986 : 110-131). Most of Cuming's collection, including many type specimens, is now housed in the British Museum (Natural History). Cuming also maintained an active exchange with other conchologists; hence some of his collection (including type material) is now in other museums, and has often been overlooked.

Cuming exchanged numerous lots of Neritidae with the American conchologist C. B. Adams (1814 - 1853), a professor at Amherst College (Massachusetts) who wrote extensively on the molluscan fauna of North America (CLENCH AND TURNER, 1950). Some of Cuming's exchanges included type specimens of Récluz' Neritidae which remained in the C. B. Adams collection. In 1942, this collection was transferred to the Mollusk Department of the Museum of Comparative Zoology at Harvard College.

This paper documents the neritid type material of Récluz, based on a comparison of the relevant specimens still in the Cuming collection in London; the "Journal de Conchyliologie" collection in Paris; the C. B. Adams collection in Cambridge; the Dautzenberg collection in Brussels; and in Récluz' own collection, in Genève. We have provided full documentation, including subsequent references of note, for all of Récluz' neritids, some of which no longer have extant type material. We have also made reference to the unpublished manuscript of Récluz, "Catalogue de la collection des familles des Néritides & Naticides du Cabinet de M. C. Récluz" [in the archives of the Muséum d'Histoire Naturelle, Genève], which indicated a number of changes in generic placement for his species. We also provide a complete bibliography of all of Récluz' publications which treat the Neritidae.

Récluz did not assist the research of subsequent investigators by his occasionally casual treatment of subgenera, varieties (over 30 listed for one species), and previously described species. First, he provided few illustrations for his new species; those from the Cuming collection, however, were usually figured by REEVE (1855-6) in the "Conchologia Iconica", volume 9. These illustrations have been indicated herein, and may be representative of type material. Second, he did not hesitate to describe new species based on material of unknown locality. Third, his use of the subgenus was rather inconsistent; sometimes he used pre-existing genera (e.g., *Theodoxus*, *Clithon*) in this context, and other times he used "group names" (such as "Auriculatae"). These latter invalid names have not been included in this paper. Fourth, when Récluz transferred a previously described species (of another author) to a different genus, he sometimes indicated it as "nobis"; this is not a new species, merely a new combination.

Finally, Récluz usually provided the size for the type specimen, but sometimes merely presented a broad range of sizes; in a few inexplicable cases, no sizes were given. It appears that some measurements may actually represent maximum dimensions rather than shell height (axis) and diameter (perpendicular to axis). Some papers gave the sizes in millimeters (mm), others in polls (1 poll = 1 inch); we have given the sizes as originally indicated (in mm or inches) to avoid subsequent confusion. Also, when Récluz indicated several type localities, we have noted the respective locality for each type lot. Otherwise, the locality for the type lots is the same as the published locality.

Sometimes, the locality was not originally mentioned, and it is uncertain as to whether some lots (especially in the Museum de Genève) are actually original syntype material. In such a case, the specimens are mentioned as "questionable type material".

Récluz was not the only person to write on the neritids in the Cuming collection; REEVE also described numerous new species in his "Conchologia Iconica" (1855a-1856b), as did G. B. SOWERBY in his "Thesaurus Conchyliorum" (1849-1883). The latter authors also described and illustrated a number of Récluz manuscript names, which are cited herein as "Récluz in Reeve" or "Récluz in Sowerby". It is not always possible to fully reconcile these various names, illustrations (often improved upon the original) and type material. Incidentally, Sowerby recognized 212 recent neritid species and Reeve 291 such; there are probably fewer than 200 valid recent species.

Several subsequent studies covering some of Récluz' neritids have been referred to in this paper. EDUARD VON MARTENS, in the "Systematischen Conchylien-Cabinet..." (1856-1889) was perhaps the first author to critically review the Neritidae, and synonymized numerous species of Récluz with older names. Nevertheless, von Martens recognized 215 recent neritid species, with an additional 102 species-names of uncertain status. The freshwater neritids of New Caledonia were reviewed by GASSIES (1863, 1871), CROSSE (1895) and FRANC (1957). BENTHEM JUTTING (1956, 1959, 1963) reviewed those of Java, Sumatra and western New Guinea [Irian Jaya], and provided partial synonymies, but few of the species were illustrated. PACE (1973) compiled a large number of "probable" or "potential" synonyms for the freshwater neritids of Taiwan, based primarily on the previous literature. STARMÜHLNER (1970-1976) has treated the freshwater gastropods of oceanic islands in a series of monographs; the emphasis was on the anatomy and less on the original nomenclatural details.

However, these and other authors have generally not referred to the original descriptions or type material of Récluz. It is obvious that a number of "mistakes" of von Martens (and others) have been repeated by subsequent authors who did not check the primary references. KOMATSU (1986) attempted an overall revision of the Neritidae, based on the type species of the genera, and figured several type specimens of Récluz and others.

ELDREDGE (1987) provided an uncritical compilation of species originally described in *Nerita*; this work includes a number of species no longer referred to the Neritidae (e.g., now in the Naticidae), has numerous incorrect dates, especially with reference to species described in the "*Proceedings of the Zoological Society of London*" (see DUNCAN, 1937), and there are problems with the attributions of authorship (e.g., taxa described in the 1798 "*Museum Boltenianum*" are attributed to Bolten rather than Röding). Eldredge's work is of some value in tracking down species of *Nerita*, although species described in other genera of the Neritidae are not included.

ABBREVIATIONS USED:

BMNH	British Museum (Natural History), London.
IRScNB	Institut Royal des Sciences Naturelles, Bruxelles.
MCZ	Museum of Comparative Zoology, Cambridge.
MHNG	Muséum d'Histoire Naturelle, Genève.
MNHN	Muséum National d'Histoire Naturelle, Paris.
JC	"Journal de Conchyliologie" (see WINCKWORTH (1936) and FISCHER-PIETTE (1937) for dates of publication)
PZSL	"Proceedings of the Zoological Society of London"
RMZ	"Revue et Magasin de Zoologie"
RZSC	"Revue Zoologique par la Société Cuvierienne"

ALPHABETICAL LIST OF RECLUZ' NERITIDAE

(each species is listed under the generic combination used by Récluz when he first described the species)

adansoniana, Nerita Récluz, 1841, *RZSC*, 4 : 313-4. Senegal. (12 mm x 10 mm).

Sowerby, 1849: 535, pl. 116, figs. 254-5; Récluz, 1850, *JC*, 1: 151; Reeve, 1856a: pl. 32, figs. 145a, 145b; Martens, 1877: 129-130, pl. 14, figs. 22-23; Mienis, 1983: 169-170. Récluz MS., listed under *Neritina* (sp. n° 173).

Lectotype MHNG 1108/38/1, herein selected; 22 paralectotypes MHNG 1108/38; 4 paralectotypes IRScNB 10591 (labelled "*adansoni*", in error).

adspersa, Nerita (Clithon) Récluz, 1853, *JC*, 4 : 319, pl. 7, fig. 6. Locality ? (16 mm x 15 mm). Error for *Neritina aspersa* Récluz in Sowerby, 1849 ?

1 syntype, MNHN : Fischer-Piette, 1950, as "possible holotype", but it is not the figured specimen (A. Tillier, pers. comm.).

affinis, Nerita Récluz, 1850, *JC*, 1 : 153. Hawaiian Islands.

Replacement name for *Neritina lugubris* Philippi, 1843, *non* Lamarck, 1822. (Martens, 1879: 274). *Non Nerita affinis* Gmelin, 1791 (now placed in the Naticidae) *nec Nerita affinis* Reeve, 1855! Récluz MS., listed under *Neritina* (sp. n° 220).

The labelled "type" (MHNG 15027) is in error as it is a replacement name, not a new species.

africana, Nerita (Neritina) Récluz, 1844, *PZSL* for 1843, 11 : 198-9. Fernando Po, Africa. (17-19 mm x 19-20 mm).

Martens, 1877: 78, = *Neritina afra* Sowerby, 1843.

ambigua, Navicella Récluz, 1850, *JC*, 1 : 376. Elevation to species level for *Navicella tessellata* Lamarck, 1822 *var*. E Récluz, 1841, *RZSC*, 4: 381. Sumatra. (size ?).

Martens, 1881: 37, and Starmühlner, 1974: 111, = *Septaria lineata* (Lamarck, 1816).

"analotica", Nerita Sowerby, 1849 : 531-2, pl. 116, figs. 225, 226. Error for *Nerita anatolica* Récluz, 1841.

anatensis, Neritina Récluz in Sowerby, 1849 : 535, pl. 116, figs. 247, 248. Portugal.

Récluz, 1850, *JC*, 1: 150; Reeve, 1856a: pl. 36, figs. 166a, 166b; Martens,1879: 231, = *Neritina guadianensis* Morelet, 1845.

anatolica, Nerita (Theodoxus) Récluz, 1841, *RZSC*, 4: 342-3. Smyrna, Aleppo, Sidon and Scio. (size ?).

Récluz, 1850, *JC*, 1: 146; Reeve, 1856a: pl. 33, figs. 148a, 148b; Martens, 1877: 86-8, pl. 3, figs. 4-5, pl. 13, figs. 17-19, 25-29; as "*analotica*": Sowerby, 1849: 531-2, pl. 116, figs. 225, 226, error. Récluz MS., listed under *Neritina* (sp. n° 95).

7 possible syntypes MNHN (Scio); 9 possible syntypes MHNG 15028 (Smyrne).

angulosa, Nerita (Clithon) Récluz, 1843, *PZSL* for 1842, 10 : 173. Casan, Misamis, Mindanao Island, Philippines. (0.72 inch x 0.92 inch).

Récluz, 1850, JC, 1: 148; Reeve, 1855b: pl. 11, figs. 51a, 51b; Martens, 1878: 158-9, pl. 17, figs. 5, 6, 10; Pace, 1973: 20-1, pl. 1, fig. 5; Komatsu, 1986: 15, pl. 9, figs. 6, 7 (captions reversed!), = *Clithon corona* (Linnaeus, 1758).

Lectotype MCZ 297233, herein selected; 2 paralectotypes MCZ 297234; 2 paralectotypes MNHN; 3 paralectotypes MHNG 15029 ("Cassar"); 3 paralectotypes MHNG 15030 (var. *spinosa*) ("Cassar").

antiquata, Nerita Récluz, 1841, *RZSC*, 4 : 106. Philippines. (27 mm x 21 mm).

Récluz, 1850, *JC*, 1: 283; Récluz, 1853, *JC*, 4: 317-9, pl. 8, fig. 8; Reeve, 1855a: pl. 2, figs. 5a, 5b; Sowerby, 1883: 105-6, pl. 463, fig. 4, pl. 467, fig. 92; Martens, 1888: 81-2, pl. 14, figs. 19-21.

antoni, Nerita Récluz, 1850, *JC*, 1 : 153. Germany, fossil. Replacement name for *Nerita rugosa* Anton, 1838, *non* Hoeninghaus, 1830.

apiata, Navicella "Le Guillou" Récluz, 1841, *RZSC*, 4 : 376. Noukahiva; Fiji. (25-28 mm x 19-21 mm].

Récluz, 1850, *JC*, 1: 375; Reeve, 1856b: pl. 5, figs. 22a, b; Martens, 1881: 36-7, pl. 7, figs. 1-4.

3 syntypes MNHN; 3 syntypes MHNG 15031; 2 syntypes MHNG 15032; 3 syntypes MHNG 15033; 1 syntype MHNG 15034 ("*var.*"); all from Noukahiva.

apiata, Nerita Récluz, 1843, *PZSL*, 11 : 72-3. Island of Negros, Philippines. (11 mm x 14.5 mm).

Sowerby, 1849: 518, pl. 114, fig. 165; Récluz, 1850, *JC*, 1: 153; Reeve, 1855b: pl. 22, figs. 98a, 98b; Martens, 1877: 139, pl. 12, fig. 13; Eldredge, 1987: 15 (misspelled as "*apita*"). Récluz MS., listed under *Neritina* (sp. n° 216).

Lectotype MCZ 297235, herein selected; 2 paralectotypes MCZ 297236; 5 paralectotypes MNHN; 3 paralectotypes MHNG 15035.

"apita", Nerita Eldredge, 1987 : 15. Error for *Nerita apiata* Récluz, 1843.

arata, Neritina Récluz, 1850, *JC*, 1 : 278-9. Fossil, Dax, France. (7.5 mm x 9 mm).

arctilineata, Neritina Récluz in Sowerby, 1849 : 531, pl. 116, figs. 223, 224. Locality unknown.

Reeve, 1856a: pl. 37, figs. 170a, 170b; Martens, 1877: 82, = ? *Neritina nilotica* Reeve, 1856.

argus, Nerita Récluz, 1841, *RZSC*, 4 : 150-1. Rio de Janeiro. (15 mm x 13 mm).

Récluz, 1850, *JC*, 1: 285; Reeve, 1855a: pl. 11, figs. 53a, 53b, from Masbate, Philippines and Fernando Po, Africa (erroneous locality?); Martens, 1888: 93-94, pl. 11, figs. 17-18 (from Polynesia?).

6 syntypes MHNG 1107/78 ("Rio"); 2 syntypes MHNG 1107/79 (no locality).

aspersa, Neritina Récluz in Sowerby, 1849 : 524, pl. 110, figs. 43, 44. Hawaiian Islands.

Récluz, 1850, *JC*, 1: 147; Reeve, 1855b: pl. 26, figs. 114a, 114b; Gassies, 1863: 313-4, pl. 8, fig. 16; Martens, 1878: 165, Crosse, 1895: 429, = *Neritina ruginosa* Récluz, 1841. (= *Nerita adspersa* Récluz, 1853, error ?).

4 syntypes BMNH 1982060.

asperulata, Nerita (Neritina) Récluz, 1843, *PZSL* for 1842, 10 : 169-170. Pasaguing, North Ilocos, Luzon, Philippines. (0.56 inch x 0.76 inch).

Sowerby, 1849: 512, pl. 114, figs. 160, 161; Récluz, 1850, *JC*, 1: 144; Reeve, 1855b : pl. 10, figs. 45a, 45b; Gassies, 1863: 304-5; Martens, 1877: 65-6, pl. 8, figs. 16-19; Crosse, 1895: 412-3;

Franc, 1957: 21, fig. 21; Starmühlner, 1970: 41-43, figs. 22-23; Starmühlner, 1976: 522-4, text-figs. 26-7, pl. 11, figs. 92- 3, pl. 12, figs. 113-4. Récluz MS., listed under *Neritina* (sp. n° 73).

2 syntypes MNHN; 4 syntypes MHNG 15038 ("Pasuguin").

atropurpurea, Nerita Récluz, 1841, *RZSC*, 4 : 107. Apia "iles Witi"; New Holland. (size ?).

Récluz, 1850, *JC*, 1: 285, pl. 11, fig. 3; Reeve, 1855a: pl. 8, figs. 38a, 38b, from Negros Island, Philippines; Sowerby, 1883: 110, pl. 464, fig. 29; Martens, 1887: 23, = *Nerita planospira* Anton, 1838.

1 syntype MNHN (Fiji) : Fischer-Piette, 1950, as "holotype (?)"; 4 syntypes MHNG 1297/19 ("Apia, île Fidji; Port de l'Astrolabe, Iles Salomon").

aurantia, Nerita Récluz, 1842, *RZSC*, 5 : 73. Philippines. (22 mm x 27 mm).

Récluz, 1850, *JC*, 1: 283, pl. 11, fig. 11 {not "f. 5"}; Reeve, 1855a: pl. 11, figs. 49a, 49b, from Bohol, Philippines; Sowerby, 1883: 117, pl. 466, fig. 81; Martens, 1887 : 37, = *Nerita striata* Burrow, 1815.

Holotype MHNG 1297/2.

avellana, Nerita (Clithon) Récluz, 1842, *RZSC*, 5 : 76. Manila, Philippines. (14 mm x 17 mm).

Sowerby, 1849: 527-8, pl. 109, figs. 9, 10; Récluz, 1850, *JC*, 1: 147; Reeve, 1855b: pl. 14, figs. 64a, 64b; Martens, 1878: 174-6, pl. 18, figs. 5-9, 11-12. Récluz MS., listed under *Neritina* (sp. n° 115).

Lectotype MCZ 297237, herein selected; 4 paralectotypes MCZ 297238; paralectotype MHNG 986.655 ("Isabela, Philippines"); 4 possible paralectotypes, MHNG 15042 ["Manille"].

bahiensis, Neritina Récluz, 1850, *JC*, 1 : 146, 154-5, pl. 7, fig. 10. Bahia. (16-17 mm x 18 mm).

Martens, 1877: 80.

Lectotype MNHN : Fischer-Piette, 1950, as "holotype"; this is the figured specimen and is considered to be a lectotype designation by Fischer-Piette (ICZN 74(b)); 7 paralectotypes MHNG 15043.

basterotii, Neritina Récluz, 1850, *JC*, 1 : 277, 286. Fossil, Gunandilose, Dax, France. (11 mm x 13 mm).

beaniana, Nerita Récluz, 1844, *PZSL* for 1843, 11 : 200-1. Isle of Corregidor, Manila, Philippines. (14-16 mm x 17-21 mm).

Reeve, 1855a: pl. 19, figs. 85a-85d; Sowerby, 1883: 112, pl. 465, fig. 50; Martens, 1887: 53, = *Nerita patula* Récluz, 1841.

beckii, Nerita (Neritina) Récluz, 1841, *RZSC*, 4 : 275-6. Locality ? (20 mm x 18 mm).

Sowerby, 1849: 512, pl. 109, fig. 13 (Sowerby's figure is *Neritina knorri* Récluz, 1841, *fide* Martens, 1875: 55); Récluz, 1850, *JC*, 1: 145; Reeve, 1855b: pl. 3, figs. 11a, 11b; Gassies, 1863: 304, pl. 6, fig. 17; Martens, 1875: 57-8; Crosse, 1895: 410; Franc, 1957: 25, = *Neritina squamipicta* (Récluz, 1843); Pace, 1973: 16, = *Neritina pulligera* (Linnaeus, 1767). Récluz MS., listed under *Neritina* (sp. n° 75).

2 syntypes MHNG 15044 (no locality).

bensoni, Neritina Récluz, 1850, *JC*, 1 : 150. A replacement name for *Neritina reticulata* Sowerby, 1833 *non* Cristofori & Jan, 1832.

Martens, 1877: 132; Komatsu, 1986: 13, 33, pl. 9, fig. 5.

The labelled "holotype" of *bensoni* (MHNG 15045) is in error as the real type specimens are those of Sowerby's name (BMNH 1842.5.10.599-601: 6 syntypes (Calcutta)).

bernhardi, Nerita Récluz, 1850, *JC*, 1 : 285. Panama. A nude name; later validated by Reeve, 1855a: pl. 12, figs. 57a, 57b (Peru).

Sowerby, 1883: 108, pl. 468, figs. 104, 105; Martens, 1887: 58-9, pl. 9, figs. 23, 24.

Syntype (not found, 1989), MNHN (*fide* Fischer-Piette, 1950: pl. 1, figs. 4-6); 3 syntypes MHNG 1297/26 (Reallejos); 20 syntypes MHNG 1297/27 (Panama); 10 syntypes MHNG 1297/28 (Reallejos).

"biauriculata", Nerita Récluz, 1850, *JC*, 1 : 145. Error for *Nerita bicanaliculata* Récluz, 1843.

bicanaliculata, Nerita (Neritina) Récluz, 1843, *PZSL* for 1842, 10 : 171-2. Island of Camiguing, Philippines. (size ?).

Sowerby, 1849: 509, pl. 113, figs. 135-7; Reeve, 1855b: pl. 17, figs. 79a, 79b, from small ponds, Luzon Island, Philippines; Martens, 1875: 35-6, pl. 9, figs. 3, 4; Benthem Jutting, 1956: 298-9, fig. 20; Benthem Jutting, 1959: 54.

Lectotype MCZ 297239, herein selected; 2 paralectotypes MCZ 297240; 3 paralectotypes MNHN; 2 paralectotypes MHNG 15049 ("Camaguing"); 3 paralectotypes MHNG 15050 ("Passaguin").

bicolor, Nerita (Clithon) Récluz, 1843, *PZSL*, 10, for 1842 : 172. Agoo, Pangasin, Luzon, Philippines. (1.04 inches x 1.20 inches).

Sowerby, 1849: 527, pl. 115, fig. 204; Récluz, 1850, *JC*, 1: 148; Reeve, 1856a: pl.1, figs. 5a, 5b; Gassies, 1871: 170; Martens, 1878: 181-2, pl. 18, figs. 18, 21; Crosse, 1895: 416; Benthem Jutting, 1956: 272-4, fig. 5; Franc, 1957: 17, fig. 7; Benthem Jutting, 1959: 52; Starmühlner, 1970: 28-29, fig. 3. Récluz MS., listed under *Neritina* (sp. n° 124).

Lectotype MCZ 125694, herein selected; 2 paralectotypes MCZ 297241; 5 paralectotypes MNHN; 3 paralectotypes MHNG 15051 ("Agoo"); 2 paralectotypes MHNG 15052 ("var.") (no locality).

bougainvillei, Navicella Récluz, 1841, *RZSC*, 4 : 374. Lebouka, Fiji. (15-20 mm x 11-13 mm).

Récluz, 1850, *JC*, 1: 375; Reeve, 1856b: pl. 7, figs. 30a - 30c, from New Ireland; Martens, 1881: 19-21, pl. 3, figs. 1-10; Crosse, 1895: 435-7; Franc, 1957: 26, = *Septaria borbonica depressa* (Lesson, 1832).

bougainvillei, Neritina Récluz, 1850, *JC*, 1 : 147, 159-160. Bougainville Archipelago. (11 mm x 12 mm).

Martens, 1879: 264-5.

bourguignati, Nerita Récluz, 1852, *JC*, 3 : 293-5. Vaige River, Mayenne, France. (7-8 mm x 9-10 mm).

Reeve, 1856a: pl. 33, figs. 149a, 149b; Martens, 1878: 207, = *Neritina fluviatilis* (Linnaeus, 1758).

8 syntypes MHNG 15053.

"brasiliana", Neritina Récluz, 1850, *JC*, 1 : 151.

Martens, 1877: 123, = *Neritina virginea* (Linnaeus, 1758). Error for *Neritina braziliana* "Récluz" Sowerby, 1849.

5 "syntypes" MHNG 15054 and 4 "syntypes" MHNG 15055 (both without locality); 3 questionable "syntypes" MHNG 15056 ("var.") (Pernambouc). These "syntypes" are actually of a species name that was never properly validated.

braziliana, Neritina "Récluz" Sowerby, 1849 : 533. Published in synonymy of *Neritina virginea* (Linnaeus, 1758). See also *Neritina leachii* "Récluz" Sowerby, 1849.

bruguierei, Nerita (Neritina) Récluz, 1841, *RZSC*, 4: 274-5. Philippines ? (22 mm x 16 mm).

Sowerby, 1849: 512, pl. 114, fig. 159; Récluz, 1850, *JC*, 1: 144, from New Caledonia; Reeve, 1855b: pl. 10, figs. 46a, 46b, from a rivulet, New Ireland; Gassies, 1863: 305-6; Martens, 1875: 59-61, pl. 9, figs. 11-13; Crosse, 1895 : 411-2. Récluz MS., listed under *Neritina* (sp. n° 71).

Lectotype IRScNB 10591, type n° 451, herein selected (Manille); 3 paralectotypes IRScNB 10591; 3 paralectotypes MHNG 15057 (no locality given).

burdigalensis, Nerita Récluz, 1850, *JC*, 1 : 286. Fossil, Dax, France. Replacement name for *Nerita intermedia* Grateloup, 1828, non Deshayes, 1832.

Récluz inadvertently renamed the older species. Not *Nerita burdigalensis* d'Orbigny, 1852.

caerulescens, Navicella Récluz in Sowerby, 1850 : 550-1, pl. 119, fig. 29; pl. 118 bis, figs. 36-38. Ganges River, Bengal, India.

Récluz, 1850, *JC*, 1: 376; Reeve, 1856b: pl. 7, figs. 29a-d; Martens, 1881: 42-44, pl. 8, figs. 22-30; Starmühlner, 1974: 111, = *Septaria lineata* (Lamarck, 1816).

6 possible syntypes MHNG 15058 ("Bengale (Westernam)") (labelled "coerulescens" or "corulescente").

celata, Nerita (Clithon) Récluz, 1846, *PZSL* for 1845, 13 : 120. Locality ? (17 mm x 20.5 mm).

Sowerby, 1849: 528, pl. 115, fig. 205; Récluz, 1850, *JC*, 1: 148; Martens, 1878: 181, = *Neritina bicolor* Récluz, 1843. (as *"caelata"*, Reeve, 1855b: pl. 14, figs. 67a, 67b, from South Seas).

ceylanensis, Nerita (Neritina) Récluz, 1851, *JC*, 2 : 202-3. Ceylon. (7-8 mm x 9.5-10 mm).

Martens, 1878: 193, = *Neritina oualaniensis* Lesson, 1830.

"ceylonensis", Nerita Eldredge, 1987 : 28. Error for *Nerita ceylanensis* Récluz,1851.

chemnitzii, Nerita Récluz, 1841, *RZSC*, 4 : 103-4. Port-du-Roi-Georges; New Holland; Timor. (Based on Chemnitz (1781), pl. 191, figs. 1960, 1961). (size ?)

Récluz, 1850, *JC*, 1: 284; Martens, 1887: 31, = *Nerita semirugosa* Récluz, 1841.

4 syntypes MHNG 1297/42 (New Holland; Timor); 3 syntypes MHNG 1297/43 (New Holland).

chrysostoma, Nerita Récluz, 1841, *RZSC*, 4 : 104. Philippines. (38 mm x 27 mm).

Récluz, 1850, *JC*, 1: 283, from New Guinea; Reeve, 1855a: pl. 4, figs. 18a, 18b, from Burias, Philippines; Sowerby, 1883: 116, pl. 464, fig. 35; Martens, 1887: 37, = *Nerita striata* Burrow, 1815. Non *Nerita chrysostoma* Röding, 1798!

2 syntypes MHNG 1297/53 (Philippines); 3 syntypes MHNG 1297/54 (Bombay; Philippines).

cincta, Neritina (Clithon) Récluz, 1850, *JC*, 1 : 148, 158. Islands of the South Seas. (8 mm x 8 mm).

Martens, 1879: 283, = *Neritina oualaniensis* Lesson, 1831.

circumvoluta, Nerita (Clithon) Récluz, 1843, *PZSL* for 1842, 10 : 173. Philippines. (0.72 inch x 0.84 inch).

Sowerby, 1849: 527, pl. 115, figs. 202, 203; Récluz, 1850, *JC*, 1: 148; Reeve, 1855b: pl. 8, figs. 35a, 35b, from a mountain stream, Negros Island, Philippines; Martens, 1879: 266.

clypeolum, Navicella Récluz, 1843, *PZSL* for 1842, 10 : 157-8. mountain stream, Pasuguing, North Ylocos, Luzon, Philippines. (0.80-1.32 inches x 0.76-0.92 inch).

Récluz, 1850, *JC*, 1: 376; Sowerby, 1850: 551, pl. 118, figs. 32-35; Reeve, 1856b: pl. 6, figs. 24a, 24b, 24c; Martens, 1881: 37, = *Navicella tessellata* Lamarck, 1822; Benthem Jutting, 1956: 317, = *Septaria lineata* (Lamarck, 1816); Benthem Jutting, 1963: 429-430, as a "forma" of *Septaria lineata*.

8 syntypes BMNH 1974121.

cochinsinae, Neritina Récluz, 1850, *JC*, 1 : 152, 159. Tourane, Cochinchine. (10 mm x 12.5 mm).

Martens, 1879: 268.

Holotype MHNG 15063.

colombaria, Nerita (Clithon) Récluz, 1846, *PZSL* for 1845, 13 : 121. Colombo, Ceylon. (9-10.5 mm x 10.75-11 mm).

Récluz, 1850, *JC*, 1: 150; Martens, 1879: 283, = *Neritina oualaniensis* Lesson, 1831. Récluz MS., listed under *Neritina* (sp. n° 167).

Holotype MHNG 15064.

cookii, Navicella Récluz, 1844, *PZSL* for 1843, 11 : 197-8. Johanna Island, Comores. (21.5-25 mm x 10-19 mm).

Récluz, 1850, *JC*, 1: 375; Sowerby, 1850: 551, pl. 118 bis, figs. 45- 47; Reeve, 1856b: pl. 4, figs. 14a, 14b, from Philippines; Gassies, 1871: 177-8; Martens, 1881: 11, = *Navicella borbonica* Bory St. Vincent, 1803; Crosse, 1895: 440.

coromandeliana, Neritina "Récluz" Sowerby, 1849 : 540.

Published in synonymy of *Neritina ziczac* (Lamarck).

4 questionable "syntypes" MHNG 15065 (Coromandel); with one specimen probably that figured by Sowerby (*Conchological Illustrations* [1836/1841], *Neritina*, fig. 52; and *Thesaurus Conchyliorum* [1849], pl. 112, fig.110).

corrosula, Nerita Récluz, 1842 : 177-8. New Guinea. (25 mm x 32 mm).

Récluz, 1850, JC, 1: 284; Martens, 1889: 136, "ganz zweifelhaft" (= "entirely doubtful").

cumingiana, Navicella Récluz, 1843, *PZSL* for 1842, 10 : 157. Mountain stream, Camaguing, Philippines. (1.00-1.20 inches x 0.84-0.92 inch).

Récluz, 1850, *JC*, 1: 375; Sowerby, 1850: 549, pl. 118, figs. 16-18; Reeve, 1856b: pl. 2, figs. 7a, 7b; Martens, 1881: 24-5, pl. 4, figs. 1-9; Riech, 1937: 67-8; Benthem Jutting, 1956: 313, = *Septaria borbonica* (Bory St. Vincent, 1803).

4 syntypes BMNH 1974120; 2 syntypes MNHN (figured, Komatsu, 1986: 24, pl. 10, fig. 10).

cumingiana, Nerita (Neritina) Récluz, 1842, *RZSC*, 5 : 74-5. Philippines; Moluccas. (30 mm x 20 mm).

Sowerby, 1849: 540, pl. 112, fig. 115; Récluz, 1850, *JC*, 1: 152, 164, pl. 3, fig. 9; Reeve, 1855b: pl. 9, figs. 41a, 41b, from mountain stream, Siquijor Island, Philippines; Martens, 1877: 105, = *Neritina turrita* (Gmelin, 1791); Benthem Jutting, 1963: 428, as a subspecies of *Neritina turrita*. Récluz, MS., listed under *Neritina* (sp. n° 194).

Lectotype and four paralectotypes, MNHN : selected by Fischer-Piette, 1950 (ICZN 74(b)); 2 paralectotypes MCZ 297242; 4 paralectotypes MHNG 15066 (no locality); 3 paralectotypes MHNG 15067 (no locality); 3 paralectotypes MHNG 15068 (from "Siguijor", Philippines?).

cuprina, Nerita Récluz, 1843, *PZSL*, 11 : 72. Locality ? (12 mm x 11 mm).

Récluz, 1850, *JC*, 1: 151; Reeve, 1855b: pl. 22, figs. 97a, 97b; Martens, 1877: 110, = *Neritina roissyana* Récluz, 1841. Récluz MS., listed under *Neritina* (sp. n° 185).

2 syntypes MHNG 15069 (no locality); 3 possible syntypes MHNG 15070 (no locality); 3 questionable syntypes MHNG 15071 (Wallis Islands). (syntypes labelled as *Nerita* "roissyi"; see also *Nerita roissyana* Récluz).

cuvieriana, Nerita Récluz, 1841, *RZSC*, 4 : 338-9. Guadeloupe. (19 mm x 18 mm).

Sowerby, 1849: 540, pl. 112, figs. 94, 95; Récluz, 1850, *JC*, 1: 151, from Tahiti ? ; Reeve, 1855b: pl. 18, figs. 87a, 87b, from New Ireland; Martens, 1879: 257. Récluz, MS., listed under *Neritina* (sp. n° 178).

2 syntypes MHNG 15072.

dacostae, Nerita (Clithon) Récluz, 1844, *PZSL* for 1843, 11 : 199. Negros Island, Philippines. (14 mm x 17.67 mm).

Récluz, 1850, *JC*, 1: 148; Martens, 1879: 267.

2 syntypes MNHN.

delessertii, Neritina Récluz, 1853, *JC*, 4 : 260-1, pl. 7, fig. 2. Locality ? (17 mm x 25 mm).

Martens, 1879: 277, = *Neritina iris* Mousson, 1849; Pace, 1973: 16, = *Neritina pulligera* (Linnaeus, 1767).

Holotype MHNG 15073 [no locality].

delestennei, Neritina Récluz, 1853, *JC*, 4 : 259-260, pl. 7, fig. 3. Locality ? (25 mm x 31 mm).

Martens, 1875: 62, = *Neritina squamaepicta* Récluz, 1843; Pace, 1973: 16, = *Neritina pulligera* (Linnaeus, 1758).

Holotype MHNG 15074 (no locality); two paratypes MNHN (Fischer-Piette, 1950).

deshayesii, Nerita Récluz, 1841, *RZSC*, 4 : 104. California; Realejo, Samblas. (size ?).

Récluz, 1850, *JC*, 1: 284; Reeve, 1855a: pl. 2, figs. 7a, 7b, from Panama; Sowerby, 1883: 113-4, pl. 463, fig. 19; Martens, 1887: 60, = *Nerita ornata* Sowerby, 1820.

2 syntypes MHNG 1297/59 ("La Californie, Reallejos, Semblas"); 2 possible syntypes MHNG 1297/61 (Realejos); 2 possible syntypes MHNG 1297/62 ("La Californie"); 2 possible syntypes MHNG 1297/63 ("Realejos"); 2 possible syntypes MHNG 1297/64 ("Realejos"); 3 possible syntypes MHNG 1297/66 ("Reallejos, Semblas"); 2 possible syntypes MHNG 1297/67 ("La Californie"); 3 possible syntypes MHNG 1297/68 ("Californie").

desmoulinsiana, Neritina Récluz, 1850, *JC*, 1 : 153, 162-3. Witi Islands; Noukahiva. (10 mm x 14.5 mm).

Reeve, 1856a: pl. 30, figs. 136a, 136b, from Tahiti; Martens, 1877: 132, = *Neritina reticulata* Sowerby, 1832.

10 syntypes MHNG 15085 (Noukahiva); 3 syntypes MHNG 15086 (Noukahiva).

diadema, Nerita (Clithon) Récluz, 1841, *RZSC*, 4 : 277-8. South Seas. (13 mm x 17 mm).

Sowerby, 1849: 525-6, pl. 110, figs. 41, 42; Récluz, 1850, *JC*, 1: 147, from New Ireland; Reeve, 1855b: pl. 5, figs. 22a, 22b, from a small stream, Philippines; Martens, 1878: 154-5, pl. 15, figs. 22-26; Crosse, 1895: 427; Benthem Jutting, 1956: 277-8, fig. 7; Benthem Jutting, 1959: 52; Benthem Jutting, 1963: 415-6.

dilatata, Nerita "Récluz" Martens, 1887 : 53. Published in synonymy of *Nerita patula* Récluz, 1841. *Non Nerita dilatata* Moquin-Tandon, 1855; France.

doingii, Nerita (Clithon) Récluz, 1846, *PZSL* for 1845, 13 : 121. Hanover Bay, Australia. (9.33 mm x 10 mm).

Récluz, 1850, *JC*, 1: 148. See "*Nerita dringii Récluz*" in Sowerby, 1849; error.

"dolium", Neritina Reeve, 1855b : pl. 3, figs. 15a, 15b. Error for *Nerita solium* Récluz, 1846.

dombeyi, Nerita Récluz, 1841, *RZSC*, 4 : 149. Bombay, India. (size ?).

Récluz, 1850, *JC*, 1: 285; Reeve, 1855a: pl. 17, figs. 71a, 71b; Sowerby, 1883: 109, pl. 468, fig. 109; Martens, 1887: 53, = *Nerita patula* Récluz, 1841.

3 syntypes MHNG 1108/36.

donovana, Nerita Récluz, 1843, *PZSL*, 11 : 73. Guimaras Island, Philippines. (12.5 mm x 15 mm).

Sowerby, 1849: 525, pl. 110, figs. 39, 40; Récluz, 1850, *JC*, 1: 147; Martens, 1878: 154, = *Neritina diadema* Récluz, 1841; Mienis, 1980: 95. Appears to be an inadvertent redescription of *Nerita donovani* Récluz, 1843, *q.v.*). Récluz MS., listed under *Neritina* (sp. n° 100).

donovani, Nerita (Clithon) Récluz, 1843, *PZSL* for 1842, 10 : 175. Guimaras Island, Philippines. (0.50 inch x 0.60 inch).

Reeve, 1855b: pl. 6, figs. 25a-25c, from a small rivulet, Guimaras Island, Philippines. (see the preceding species).

2 syntypes MNHN; 2 syntypes MHNG 15088 (including "var. B").

"dringii", Neritina Sowerby, 1849 : 521. Error for *Nerita doingii* Récluz, 1846. Published in synonymy of *Neritina tritonensis* Le Guillou, 1841.

As a full species, Récluz in Reeve, 1856a: pl. 29, figs. 132a, 132b; Martens, 1879: 257.

dunar, Nerita "Adanson" Récluz, 1850, *JC*, 1: 285. Senegal.

Martens, 1888: 96, = *Nerita atrata* Gmelin, 1791. *Nerita senegalensis* Gmelin, 1791 was also based on this Adanson reference; thus *Nerita dunar* is a junior objective synonym of *Nerita senegalensis.*

The Adanson collection in the MNHN contains 19 specimens of "*dunar*" (Fischer-Piette, 1942: 290); these are eligible for lectotype designation for this species.

durvillei, Navicella Récluz, 1841, *RZSC*, 4 : 378. Amboina. (30-36 mm x 23-25 mm).

Récluz, 1850, JC, 1: 376; as "*urvillei*": Martens, 1881: 31, = *Navicella suborbicularis* Sowerby, 1825.

Lectotype MHNG 15092, herein selected; paralectotype MHNG 15093 (from a probable syntype in the Delessert collection).

elleppenensis, Neritina "Récluz" Sowerby, 1849 : 531. Published in synonymy of *Neritina jordani* Sowerby, 1836.

entrecastauxi, Navicella Récluz, 1841, *RZSC*, 4 : 380. New Holland. (17 mm x 11-12 mm).

Also, Récluz, "1842" 1843, PZSL, 10: 159-160; from Philippines; Récluz, 1850, *JC*, 1: 375; Sowerby, 1850: 550, pl. 118 bis, fig. 34; Reeve, 1856b: pl. 8, figs. 32a, 32b, from Point Entrecastaux, King George's Harbor, Australia; Martens, 1881: 38, = *Navicella tessellata* Lamarck, 1822.

2 syntypes MHNG 15094.

erythrodon, Nerita Récluz, 1850, *JC*, 1 : 283. Antilles. Published in synonymy of *Nerita peloronta* Linnaeus, 1758.

essingtoni, Nerita Récluz, 1842, *RZSC*, 5 : 73-4. New Holland; Torres Strait; Essington Peninsula. (18 mm x 21 mm).

Récluz, 1850, *JC*, 1: 284, pl. 11, fig. 9; Reeve, 1855a: pl. 6, figs. 29a, 29b, from Port Essington, Australia (Reeve's figure is *Nerita striata* Burrow, 1815, *fide* Martens, 1887: 37); Sowerby, 1883: 116-7, pl. 465, fig. 42; Martens, 1889: 115.

Lectotype MNHN : selected by Fischer-Piette, 1950, as "holotype" (ICZN 74(b)); 3 paralectotypes MHNG 1297/74 ("La Pointe Essington, Nouvelle-Hollande").

exaltata, Neritina Récluz, 1850, *JC*, 1 : 65-6, pl. 3, fig. 3. Negros Island, Philippines. (14-16 mm x 19-20 mm).

Récluz, 1850, *JC*, 1: 144; Gassies, 1871: 163; Martens, 1875: 39, = *Neritina crepidularia* Lamarck, 1822; Crosse, 1895: 424-5; Benthem Jutting, 1956: 300, = *Neritina violacea* (Gmelin, 1791).

3 syntypes MNHN (figured, Komatsu, 1986: 21, 37, pl. 10, fig. 7); 3 syntypes MHNG 15096 ("var. major").

ferussaci, Nerita Récluz, 1850, *JC*, 1 : 154. Fossil, Dax, France. Replacement name for *Nerita picta* Ferussac, 1823, non Grateloup, 1828.

Récluz has inadvertently renamed the older species. See also *Nerita burdigalensis* Récluz, 1850.

flammulata, Nerita Récluz, 1841, *RZSC*, 4 : 180-1. Moluccas? (24 mm x 19-20 mm).

Récluz, 1850, *JC*, 1: 284, pl. 11, fig. 6 (not "f. 7"); Martens, 1887: 46-7, pl. 7, figs. 13-14.

2 questionable syntypes MHNG 1297/81 (no locality).

florida, Neritina Récluz, 1850, *JC*, 1 : 145, 160-161, pl. 7, figs. 6-7. Tahiti. (9-15.5 mm x 11-12.5 mm).

Martens, 1875: 29, = *Neritina dilatata* Broderip, 1832.

2 syntypes MNHN (Fischer-Piette, 1950); 6 syntypes MHNG 15098 (Tahiti?).

forskaelii, Nerita Récluz, 1841, *RZSC*, 4 : 1478. Red Sea. (size ?).

Récluz, 1850, *JC*, 1: 283; Martens, 1887: 28-9, pl. 8, figs. 3-6.

freycineti, Navicella Récluz, 1841, *RZSC*, 4: 375-6. Macassar Islands. (28 mm x 21 mm).

Récluz, 1850, *JC*, 1: 375, from Madagascar; Sowerby, 1850: 549-550, pl. 118, figs. 19, 20; Reeve, 1856b: pl. 1, figs. 4a, 4b, from New Hebrides; Martens, 1881: 21-23, pl. 3, figs. 11-26; Riech, 1937: 64, = *Septaria suffreni* (Récluz, 1841). However, as the first reviser, Martens had already chosen *freycineti* over *suffreni* (*q.v.*).

Holotype MHNG 15099 ("Les marais de Macassar").

gallicana, Nerita Récluz, 1850, *JC*, 1 : 143. Fossil, Houdan. Nude name.

georgina, Nerita Récluz, 1841, *RZSC*, 4 : 180. New Holland. (16 mm x 12 mm).

Récluz, 1850, *JC*, 1: 282, pl. 11, fig. 10; Souleyet, 1852: 566, pl. 34, figs. 5-7; Reeve, 1855a: pl. 17, figs. 74a, 74b, from King George's Island; Sowerby, 1883: 108, pl. 468, figs. 110, 111; Martens, 1888: 88, = *Nerita insculpta* Récluz, 1841.

3 syntypes MHNG 1297/90 (Le Port-du-Roi Georges, New Holland).

grayana, Nerita Récluz, 1844, *PZSL* for 1843, 11 : 200. Port Curimao, North Ilocos, Luzon Island, Philippines. (21-25 mm x 30 mm).

Reeve, 1855a: pl. 7, figs. 33a, 33b; Sowerby, 1883: 117, pl. 467, fig. 91; Martens, 1887: 44-5, pl. 7, figs. 8-10.

guerini, Nerita Récluz, 1841, *RZSC*, 4 : 314-5. Sumatra. (11 mm x 9 mm).

Récluz, 1850, *JC*, 1: 153; Martens, 1879: 261; Benthem Jutting, 1959: 54. Récluz MS., listed under *Neritina* (sp. n° 218). See "*Neritina guinerii* Récluz" Sowerby, 1849, error.

3 syntypes MHNG 15101; syntype MHNG 15102.

"guinerii", Neritina Sowerby, 1849 : 541, pl. 116, fig. 272. Error for *Nerita guerini* Récluz, 1841.

Reeve, 1856a: pl. 28, figs. 128a, 128b.

guttata, Nerita Récluz, 1841, *RZSC*, 4 : 316-7. New Guinea. (10 mm x 9 mm).

Récluz, 1850, *JC*, 1: 148; Martens, 1879: 270-1; Benthem Jutting, 1963: 419; Pace, 1973: 22, = *Clithon oualaniensis* (Lesson, 1831).

haneti, Nerita (? Neritina) Récluz, 1841, *RZSC*, 4 : 181-2. Marquesas Islands. (20.5 mm x 17 mm).

Récluz, 1850, *JC*, 1: 153; Martens, 1888: 104, = *Nerita morio* Sowerby, 1832.

4 syntypes MHNG 15103 ("var. A") (Marquesas Islands); questionable syntype MHNG 15104 ("var. B") (Sandwich Islands); 4 questionable syntypes MHNG 15105 ("I. Ducie, dans la Polynésie").

hindsii, Nerita Récluz, 1844, *PZSL* for 1843, 11 : 201. Ilo-Ilo, Panay Island, Philippines. (15-17 mm x 19.5-20 mm).

Reeve, 1855a: pl. 6, figs. 26a, 26b; Martens, 1887: 48- 9, pl. 7, figs. 17, 18.

inequidentata, Nerita Récluz, 1850, *JC*, 1 : 154. Fossil, Moulette, France. Replacement name for *Neritina lineolata* Deshayes, 1832, *non* Lamarck, 1816.

insculpta, Nerita Récluz, 1841, *RZSC*, 4 : 152. Timor. (15 mm x 11 mm).

Récluz, 1850, *JC*, 1: 282; Martens, 1888: 88- 91, pl. 11, figs. 1-4.

Possible type(s) MHNG 1297/93, not extant: one specimen was actually a syntype of *Nerita georgina* Récluz (MHNG 1297/90) and the other has the original label "*Nerita longii* Récluz, from Bombay" in the aperture and is possibly a syntype of the latter species (MHNG 15197).

interrupta, Nerita (Clithon) Récluz, 1843, *PZSL* for 1842, 10: 173. Yba, Zambales, Luzon Island, Philippines. (0.96 inch x 0.64 inch).

Sowerby, 1849: 526, pl. 109, figs. 11, 12; Récluz, 1850, *JC*, 1: 148; Reeve, 1855b: pl. 14, figs: 66a, 66b; Martens, 1878: 174, = *Neritina avellana* Récluz, 1842. Récluz MS., listed under *Neritina* (sp. n° 123).

Lectotype MCZ 125697, herein selected; 4 paralectotypes MCZ 297244; 2 paralectotypes MNHN; 3 paralectotypes MHNG 986.654 ("Ile Luçon").

janelli, Navicella Récluz, 1841, *RZSC*, 4 : 376-7. Umata River, Guam. (30 mm x 24 mm).

Also in Récluz, 1843, *PZSL* for 1842, 10: 154-5; Récluz, 1850, *JC*, 1: 375, from Philippines; Sowerby, 1850: 548-9, pl. 117, figs.11-13; Reeve, 1856b: pl.1, figs.1a,1b; Martens, 1881: 25-27, pl. 4, figs.16-19; Riech, 1937: 66-7; Pace, 1973: 13-4, pl.1, fig.1.

jayana, Neritina Récluz, 1850, *JC*, 1 : 150, 157-8, pl. 7, fig. 13. North America? (4.5 mm x 6 mm).

Martens, 1879: 273; Russell, 1941: 402, probably = *Theodoxus fluviatilis* (Linnaeus, 1758).

15 possible syntypes MHNG 15108 ("New York").

jovis, Nerita Récluz, 1843, *PZSL*, 11 : 72. Locality ? (size ?).

Récluz, 1850, JC, 1:152; Reeve, 1855b: pl. 26, figs. 117a, 117b; Martens, 1879: 258-9.

knorri, Nerita (Neritina) Récluz, 1841, *RZSC*, 4 : 274. Madagascar. (size ?). (based on Knorr, 6, pl. 13, fig. 3).

Récluz, 1850, *JC*, 1: 144, from Mindanao, Philippines; Martens, 1875: 55-7, pl. 8, fig. 6; Pace, 1973: 16, = *Neritina pulligera* (Linnaeus, 1767). Sowerby, 1849: 511, pl. 111, fig. 78; pl. 113, fig. 150, from Negros Island, Philippines (= *Neritina iris* Mousson, 1849, *fide* Martens, 1875: 52); Reeve, 1855b, pl. 2, figs. 6a, 6b, from Madagascar (= *Neritina beckii* Récluz, 1841, *fide* Martens, 1875: 57). Récluz MS., listed under *Neritina* (sp. n° 74).

Lectotype IRScNB 10591, type n° 452, herein selected (Madagascar); paralectotype MNHN; 2 questionable paralectotypes MHNG 15109 ("Sanboangam"); 4 questionable paralectotypes MHNG 15110 ("Sanboangam").

laperousei, Navicella Récluz, 1841, *RZSC*, 4 : 378-380. Guam; Fiji; Samoa. (33 mm x 24 mm).

Récluz, 1850, *JC*, 1: 376; Martens, 1881: 27-8, pl. 5, figs. 10-16; Franc, 1957: 26, = *Septaria borbonica depressa* (Lesson, 1832). See "*Navicella perousii* Récluz" Sowerby, 1850, error.

2 syntypes MNHN; syntype MHNG 15111; 2 syntypes MHNG 15112 ("var. b"); 3 syntypes MHNG 15113 ("var. c"); 2 syntypes MHNG 15114 ("var. d") (all from "Apia, Fidji").

leachii, Nerita (Clithon) Récluz, 1841, *RZSC*, 4 : 312. New Holland. (11 mm x 12 mm).

Also, Récluz, 1844, *PZSL* for 1843, 11: 199; Bohol, Philippines; Récluz, 1850, *JC*, 1: 148; Martens, 1879: 270]. Récluz MS., listed under *Neritina* (sp. n° 134).

Holotype MHNG 15115.

leachii, Neritina "Récluz" Sowerby, 1849 : 533. Published in synonymy of *Neritina virginea* (Linnaeus, 1758); from West Indies.

lecontei, Neritina Récluz, 1853, *JC*, 4 : 257-9, pl. 8, fig. 3. New Caledonia. (26 mm x 18 mm).

Gassies, 1863: 306-7, pl. 6, fig. 16; Martens, 1875: 36-7, pl. 9, figs. 20-23; Crosse, 1895: 406-7; Franc, 1957: 21, fig. 16; Starmühlner, 1970: 35-39, figs. 13-17.

7 syntypes MNHN (Fischer-Piette, 1950).

leguillouana, Nerita Récluz, 1842, *RZSC*, 5 : 178-9. Malaysia & Salomon Islands. (30 mm x 33 mm).

Récluz, 1850, *JC*, 1: 284; Reeve, 1855a: pl. 4, figs. 15a, 15b, from Philippines; Sowerby, 1883, p. 116; Martens, 1887: 34, = *Nerita undata* Linnaeus, 1758.

3 possible syntypes MHNG 1297/94 ("var. globoso-acuta") (Salomon Islands and Malaysia); 4 questionable syntypes MHNG 1297/95 ("Ternate").

lessonii, Nerita (Clithon) Récluz, 1841, *RZSC*, 4 : 311. Sicily. (6 mm x 5 mm).

Récluz, 1850, *JC*, 1: 148; Martens, 1879: 264. Récluz MS., listed under *Neritina* (sp. n° 141).

Holotype MHNG 15118 (Sicily?).

levesquei, Neritina Récluz, 1850, *JC*, 1 : 278. Fossil, Soissons, France. (8 mm x 7 mm).

listeri, Nerita Récluz, 1841, *RZSC*, 4 : 177-8. Pacific Ocean ? based on Lister, t. 576, f. 6. (size ?).

Reeve, 1855a: pl. 8, figs. 36a, 36b, from West Indies; Martens, 1888: 88, = *Nerita insculpta* Récluz, 1841. (*Non* Pfeiffer, 1840; based on Lister, t. 604, f. 26, 27; see *Nerita pacifica* Récluz, 1850).

Lectotype MHNG 1297/98/1 ("Antilles"), herein selected; 3 paralectotypes MHNG 1297/98/2-4 ("Antilles"); 4 paralectotypes MHNG 1297/97 (5 original syntypes, but 1 specimen was not conspecific) ("Antilles"); 2 paralectotypes MHNG 1297/96 ("var. unicolor") ("Antilles").

liturata, Nerita Récluz, 1841, *RZSC*, 4 : 315. Philippines? (21-22 mm x 19 mm).

Récluz, 1850, *JC*, 1: 151; Martens, 1877: 94, = *Neritina gagates* Lamarck, 1822. Récluz MS., listed under *Neritina* (sp. n° 190).

2 questionable syntypes MHNG 15194 (no locality); questionable syntype MHNG 15195 ("var. olivacea") (no locality).

longii, Nerita Récluz, 1842, *RZSC*, 5 : 178. Malabar, Bombay. (27 mm x 33 mm).

Récluz, 1850, *JC*, 1: 286, pl. 11, fig. 4; Reeve, 1855a: pl. 11, figs. 52a, 52b; Sowerby, 1883: 113, pl. 467, fig. 90; Martens, 1887: 49-50, pl. 9, figs. 1- 3.

3 syntypes MHNG 1296/67 (Bombay); possible syntype MHNG 15197 (Bombay) (ex MHNG 1297/93; see *Nerita insculpta* Récluz, 1841).

longispina, Nerita (Clithon) Récluz, 1841, *RZSC*, 4 : 312-3. Locality ? (21 mm x 32 mm).

Sowerby, 1849: 522, pl. 110, figs. 62, 63; Récluz, 1850, *JC*, 1: 147, from Ile Maurice; Reeve, 1855b: pl. 5, figs. 21a-21c, from small stream, Rodriguez Island; Martens, 1878: 147-9, pl. 15, figs. 16-17, 20-21; Benthem Jutting, 1956: 282-3, fig. 12. Récluz MS., listed under *Neritina* (sp. n° 98). As noted by Baker (1923: 156) and Wilkins (1957: 145, pl. 24, fig. 11), Récluz' name is not a new species, but a replacement name for *Clithon coronata* Leach, 1815 non *Nerita corona* Linnaeus, 1758. As this was an unnecessary replacement name, Baker as the first reviser re-established *coronata* Leach as the valid name for this species.

Hence the various labelled “syntypes” (MNHN (Ile Rodriguez), MHNG 15198 (no locality) and MHNG 15199 (“Ile Bourbon”)) are merely Récluz' own specimens.

luctuosa, Nerita Récluz, 1841, *RZSC*, 4 : 317-8. New Guinea. (9 mm x 7 mm).

Sowerby, 1849: 532, pl. 116, fig. 231; Récluz, 1850, *JC*, 1: 148; Reeve, 1856a: pl. 35, figs. 162a, 162b; Martens, 1878: 187-8, pl. 19, fig. 21; Riech, 1937: 85; Benthem Jutting,1963: 419.

luzonica, Navicella “Souleyet” Récluz, 1841, *RZSC*, 4 : 375. Manila, Luzon, Philippines. (18-20 mm x 14-15 mm).

Sowerby, 1850: 548, pl. 117, figs. 6, 7; Souleyet, 1852: 573, pl. 34, figs. 47-48; Reeve,1856b: pl. 3, figs. 11a, 11b; Martens, 1881: 16, pl. 2, figs. 9-18; Riech, 1937: 67; Franc, 1957: 27, fig. 28.

2 syntypes MNHN; 4 syntypes MHNG 15200 (“Luçon”).

macri, Neritina Récluz in Sowerby, 1849 : 531, pl. 116, fig. 222. Asia Minor.

Reeve, 1856a: pl. 31, figs. 139a, 139b; Martens, 1877: 88-90, pl. 4, figs. 11-13, pl. 13, figs. 13, 27-29.

macrocephala, Navicella “Le Guillou” Récluz, 1841, *RZSC*, 4: 374. Lebouka, Fiji. No size given.

Sowerby, 1850: 547-8, pl. 117, figs. 4-5; Reeve, 1856b: pl. 7, figs. 28a-c; Martens, 1881: 14-15, pl. 2, figs. 1-4; Crosse, 1895: 435; Riech, 1937: 68; Franc, 1957: 27, fig. 27; Starmühlner, 1976: 542-3, text-figs. 42-3, pl. 13, figs. 139-140, pl. 14, fig. 155; Haynes and Wawra, 1989: 34, figs. 1, 3.

3 syntypes MNHN; 2 questionable syntypes MHNG 15201 (no locality); 2 questionable syntypes MHNG 15202 (no locality).

mascareignar“.” [um], Nerita Récluz, 1850, *JC*, 1 : 285. Ile Rodrigue.

Martens, 1888: 99, = *Nerita punctata* Quoy & Gaimard, 1834.

2 syntypes MHNG 1298/1.

matoni, Vitta “Récluz” Mörch, 1852 : 167. Brasil. Not *Nerita matonia* Risso, 1826.

Martens, 1877: 123, = *Neritina virginea* (Linnaeus, 1758).

maura, Nerita Récluz, 1842, *RZSC*, 5 : 179-180. Polynesia; Saint-Pierre & Saint-Francis; Madagascar. (35-38 mm x 46-52 mm).

Récluz, 1850, *JC*, 1: 284; Reeve, 1855a: pl. 4, figs. 17a, 17b, from Australia; Sowerby, 1883: 106-7, pl. 464, fig. 37, pl. 465, fig. 55; Martens, 1887: 31, = *Nerita semirugosa* Récluz, 1841.

3 syntypes MNHN (St. Pierre); questionable syntype MHNG 1296/62 (“var.E”) (no locality).

mauritiae, Nerita Récluz, 1841, *RZSC*, 4 : 106-7. Maurice & Rodrigues Islands. (25 mm x 20 mm).

Récluz, 1850, JC, 1: 285; Martens, 1888: 99, = *Nerita punctata* Quoy & Gaimard, 1834.

3 syntypes MHNG 1297/100 (Maurice and Rodrigues Islands).

mauritii, Neritina "Récluz MS" Sowerby, 1849 : 508. Published in synonymy of *Neritina sandwichensis* Deshayes, 1838.

Fide Martens, 1875: 27, = *Neritina mauriiciae* Lesson, 1830.

4 questionable "syntypes" MHNG 15206 (Maurice Island); 2 questionable "syntypes" MHNG 15207 (Maurice Island).

menkeana, Nerita (Clithon) Récluz, 1842, *RZSC*, 5 : 183-4. Tahiti. (17 mm x 21 mm).

Récluz, 1850, *JC*, 1: 147; Martens, 1879: 265. Récluz MS., listed under *Neritina* (sp. n° 120).

Holotype MHNG 15208.

mertoniana, Nerita Récluz, 1843, *PZSL*, 11 : 71-72. Immimaylan, Philippines. (9-10 mm x 11-11.75 mm).

Reeve, 1856a: pl. 31, figs. 141a-141d, from a small stream, Negros Island, Philippines; Martens, 1878: 193, = *Neritina oualaniensis* Lesson, 1831.

michaudi, Nerita Récluz, 1841, *RZSC*, 4 : 315. Locality ? (11 mm x 12-13 mm).

Also, Récluz, 1843, *PZSL* for 1842, 10: 175; Récluz, 1843, *PZSL*, 11: 72, Bauang (Bunang ?), Pangasinan, Luzon Island, Philippines (as "*michaudiana*"); Sowerby, 1849: 529-530, pl. 112, figs. 108, 109, pl. 115, figs. 217, 218, from Panama; Souleyet, 1852: 566, pl. 34, figs. 20-23; Reeve, 1855b: pl. 25, figs. 109a, 109b, from Panama (latter locality incorrect, *fide* Martens, 1878: 191); Martens, 1878: 189, = *Neritina retifera* Benson, 1836, from India. Récluz MS., listed under *Neritina* as "*michaudiana*" (sp. n° 102).

8 questionable syntypes MHNG 15209 (Manila); 6 questionable syntypes MHNG 15210 ("var. spinosa") (Manila).

miliacea, Nerita Récluz, 1841, *RZSC*, 4: 316. Sicily. (4 mm x 5 mm).

Récluz, 1850, *JC*, 1: 150, Récluz, 1852, *JC*, 3: 284 and Martens, 1878: 252, all synonymized this with *Nerita matoniana* Risso, 1826.

mittreana, Nerita (Neritina) Récluz, 1842, *RZSC*, 5 : 181-2. Grasse & Provence, France. (5-6 mm x 8-9 mm).

Sowerby, 1849: 514, pl. 115, fig. 183; Récluz, 1850, *JC*, 1: 149; Récluz, 1852, *JC*, 3: 288-9; Martens, 1879: 215, = *Neritina fluviatilis* (Linnaeus, 1758).

montacuti, Nerita (Clithon) Récluz, 1843, *PZSL* for 1842, 10 : 174-5. Burias Island, Philippines. (0.76 inch x 0.80-0.88 inch).

As "montacuta", Sowerby, 1849: 523; Martens, 1878: 156, = *Neritina brevispina* Lamarck, 1822; Pace, 1973: 21, = *Clithon corona angulosa* (Récluz, 1843).

1 syntype MNHN.

montaguana, Nerita (Clithon) Récluz, 1850, *JC*, 1 : 147. Nude name; published in synonymy of *Nerita corona* Linnaeus, 1758.

moquiniana, Neritina Récluz, 1850, *JC*, 1 : 152, 156-7, pl. 7, fig. 9. Islands of the South Seas. (10 mm x 10.5 mm).

Martens, 1879: 258.

Syntype, MNHN (Fischer-Piette, 1950); 4 syntypes MHNG 15247 ("Malaisie").

moreleti, Nerita Récluz, 1845, *RZSC*, 8 : 311. New name for *Nerita violacea* Gmelin, 1791: 3636; *non* Meuschen, 1787: 270.

Martens, 1879: 37, = *Neritina crepidularia* Lamarck, 1822. As Meuschen's work is now considered to be non-binominal, this replacement name is no longer necessary.

"mortoniana", Nerita (Clithon) Récluz, 1850, *JC*, 1 : 152. Published in synonymy of *Nerita oualaniensis* Lesson, 1830. Error for *Neritina mertoniana* Sowerby, 1849.

nebulata, Nerita Récluz, 1843, *PZSL*, 11 : 71. Immimaylan, Philippines. (10 mm x 11 mm).

Récluz, 1850, *JC*, 1: 151; Martens, 1878: 193, = *Neritina oualaniensis* Lesson, 1831.

nigrita, Neritina (Theodoxus) "Ziegler" Récluz, 1850, *JC*, 1 : 149. Sicily. A nude name.

nouleti, Neritina Récluz, 1850, *JC*, 1 : 277-8. Fossil, Soissons, France. (12 mm x 9 mm).

numidica, Nerita (Theodoxus) Récluz, 1841, *RZSC*, 4: 342. Oran, Atlas, Tisi Valley. (5 mm x 7 mm).

Sowerby, 1849: 514, pl. 115, fig. 179; Récluz, 1850, *JC*, 1: 149; Reeve, 1856a: pl. 37, figs. 169a, 169b, from Numidia; Martens, 1879: 236-8, pl. 23, figs. 5-8; Kristensen, 1986: 330; figs. 1, 2. Récluz MS., listed under *Neritina* (sp. n° 145).

3 syntypes MHNG 15248 (Oran).

nuttalli, Nerita (Neripteron) Récluz, 1841, *RZSC*, 4: 276-7. Hawaiian Islands. (23-25.5 mm x 25-26 mm). A replacement name for *Nerita convexa* Nuttall in Jay, 1839: 66 (nude name).

Récluz, 1850, *JC*, 1: 146; Souleyet, 1852: 566, pl. 34, figs. 43-46; Martens, 1875: 26, = *Neritina cariosa* "Gray" Wood, 1828.

obatra, Nerita Récluz, 1851, *JC*, 2 : 203-5, pl. 5, figs. 4-5. Tahiti. (23-27 mm x 31-36 mm).

Martens, 1887: 30, = *Nerita maxima* Gmelin, 1791.

3 syntypes MHNG 1298/10.

obscurata, Nerita (Clithon) Récluz, 1842, *RZSC*, 5 : 183. Tahiti. (18 mm x 22 mm).

Sowerby, 1849: 525, pl. 109, figs. 28, 29; Récluz, 1850, *JC*, 1: 148; Reeve, 1855b: pl. 5, figs. 23a, 23b, from Mindanao Island, Philippines; Gassies, 1863: 313, pl. 8, fig. 4; Martens, 1879: 265; Crosse, 1895: 428-9; Franc, 1957: 17, = *Clithon brevispina* (Lamarck, 1822). Récluz MS., listed under *Neritina* (sp. n° 127).

2 syntypes MHNG 15252 (Tahiti); 3 questionable syntypes MHNG 15253 ("Philippines"); 3 questionable syntypes MHNG 15254 ("Philippines"); 3 questionable syntypes MHNG 15255 ("var.") ("Cagayan, Mindanao").

"oequinoxialis", Neritina Récluz, 1850, *JC*, 1 : 146. Error for *Neritina aequinoxialis* Morelet, 1848.

olivacea, Nerita (Clithon) Récluz, 1843, *PZSL* for 1842, 10 : 172. Agoo, Pangasinan, Luzon Island, Philippines. (1.12 inches x 1.36 inches).

Sowerby, 1849: 529, pl. 115, figs. 207-8; Récluz, 1850, *JC*, 1: 148; Reeve, 1856a: pl. 1, figs. 2a, 2b; Martens, 1878: 183-4, pl. 19, figs. 5-7; Riech, 1937: 84-5; Benthem Jutting, 1956: 283-

5, fig. 13; Benthem Jutting, 1959: 53; Benthem Jutting, 1963: 418; Starmühlner, 1976: 500-2, text-figs. 8- 9, pl. 7, figs. 37-40, pl. 8, figs. 54-5. Récluz MS., listed under *Neritina* (sp. n° 125).

Lectotype MCZ 125695, herein selected; 2 paralectotypes MCZ 297250; 3 paralectotypes MNHN; 2 paralectotypes MHNG 15256; 3 paralectotypes MHNG 15257.

orbignyana, Nerita Récluz, 1841, *RZSC*, 4 : 108-9. Red Sea, Yemen. (23 mm x 14 mm). *Non Nerita orbignyana* Cotteau, 1854 (fossil, France)!

Récluz, 1850, JC, 1: 282; Reeve, 1855a: pl. 13, figs. 58a, 58b; Sowerby, 1883: 106, pl. 465, figs. 48, 49; Martens, 1888: 74, = Nerita polita Linnaeus,1758.

3 syntypes MHNG 1298/11 (Red Sea); 5 syntypes MHNG 1298/12 (including varieties) (Red Sea).

"oryza", Nerita Sowerby, 1883 : 111, pl. 467, figs. 98-99. Error for Nerita *oryzarum* Récluz, 1841.

oryzarum, Nerita Récluz, 1841, *RZSC*, 4 : 178-180. Bombay. (13-18 mm x 10-23 mm).

Récluz, 1850, JC, 1: 286; Reeve, 1855a: pl. 10, figs. 46a, 46b, from Bombay and Malacca; Martens, 1887: 51-2, pl. 9, figs. 4-7.

2 syntypes MHNG 1296/58; 2 syntypes MHNG 1296/57; 4 questionable syntypes MHNG 1296/56 (no locality).

oualanensis, Neritina "Récluz" Reeve, 1856a : pl. 36, fig. 168. Is *Neritina oualaniensis* Lesson, 1831.

pacifica, Nerita Récluz, 1850, *JC*, 1 : 283. Pacific Ocean. Replacement name for *Nerita listeri* Récluz, 1841, non Pfeiffer, 1840.

Martens, 1888: 88, = *Nerita insculpta* Récluz, 1841.

panayana, Nerita (Neritina) Récluz, 1843, *PZSL* for 1842, 10 : 170. Dingle River, Ilo-Ilo, Panay, Philippines. (0.28 inch x 0.40 inch).

Sowerby, 1849: 517, pl. 115, fig. 191; Reeve, 1856a: p. 37, figs. 172a, 172b; Martens, 1879: 240-1, pl. 23, figs. 17-18. Récluz MS., listed under *Neritina* (sp. n° 163).

3 possible syntypes MHNG 15263 (Panay, Negros Island).

panayensis, Nerita Récluz, 1844, *PZSL*, 11 for 1843 : 200. Ilo-Ilo, Panay, Philippines. (13.5 mm x 15 mm).

Martens, 1889: 122.

papuana, Nerita Récluz, 1841, *RZSC*, 4 : 105-6. New Guinea. (34 mm x 29-30 mm).

Récluz, 1850, *JC*, 1: 284; Martens, 1887: 34, = *Nerita undata* Linnaeus, 1758.

4 syntypes MHNG 1298/15.

patula, Nerita Récluz, 1841, *RZSC*, 4 : 148-9. Locality ? (22 mm x 14 mm).

Récluz, 1850, *JC*, 1: 285, pl. 11, fig. 7 (not "f. 8"), from Amboina; Reeve, 1855a: pl. 19, figs. 84a, 84b, from Dumaguete, Negros Island, Philippines; Sowerby, 1883: 112, pl. 464, fig. 23; Martens, 1887: 52-4, pl. 9, figs. 8-13; Subba Rao, 1980: 71-4.

5 syntypes MHNG 1108/37 (no locality); 6 questionable syntypes MHNG 1298/16 ("Amboine").

peloponensis, Nerita Récluz, 1841, *RZSC*, 4 : 342. Replacement name for *Nerita boetica* Deshayes, 1833, *non* Lamarck, 1822.

Récluz, 1850, *JC*, 1: 149; Reeve, 1856a: pl. 34, figs. 159a, 159b, from Morea, Greece; Martens, 1879: 236, pl. 3, figs. 13-15 (as "*peloponnesia*", error).

Deshayes' 12 syntypes are in the MNHN. Recluz' material (non-types): MHNG 15267-8 ("Morée").

"perotetiana", Nerita Récluz, 1850, *JC*, 1 : 150. Error for *Nerita perottetiana* Récluz, 1841.

perottetiana, Nerita Récluz, 1841, *RZSC*, 4 : 337. Rivers of the Nilghir Mountains, India. (11 mm x 9 mm).

Martens, 1877: 91-2, pl. 4, figs. 1-3. See also "*Nerita perrotettiana* Récluz" Sowerby, 1849, error. Récluz MS., listed under *Neritina* (sp. n° 160).

Lectotype MHNG 15269/1, herein selected ("Les rivières des Monts Noolgherries dans le Gates (Pirotet)"); 4 paralectotypes MHNG 15269; 8 possible paralectotypes MHNG 15270 ("Les Gattes"); 8 paralectotypes IRScNB 10591 ("Les Gattes").

"perousii", Navicella Sowerby, 1850 : 547. Published in synonymy of *Navicella porcellana* (Linnaeus, 1758). Error for *Navicella laperousii* Récluz, 1841.

"perrotettiana", Nerita Sowerby, 1849 : 522, pl. 115, figs. 200, 201.

Reeve, 1856a: pl. 28, figs. 124a, 124b, from Ceylon. Error for *Nerita perottetiana* Récluz, 1841.

petitii, Nerita (Neritina) Récluz, 1841, *RZSC*, 4 : 273-4. Saint-Domingue. (29 mm x 38 mm).

Sowerby, 1849: 511, pl. 111, fig. 77; as "*petiti*" ; Récluz, "1842" 1843, *PZSL*, 10: 169; from Cagayan, Misamis, Mindanao Island, Philippines; Récluz, 1850, *JC*, 1: 144; Reeve, 1855b: pl. 2, figs. 8a, 8b, from a deep river, Mindanao, Philippines; Gassies, 1863: 303-4, pl. 6, fig. 20; Martens, 1875: 58-9, pl. 8, figs. 1-3; Crosse, 1895: 411; Riech, 1937: 72-73, fig. 17; Franc, 1957: 24, fig. 22; Benthem Jutting, 1959: 55; Starmühlner, 1970: 43, fig. 24; Pace, 1973: 16, = *Neritina pulligera* (Linnaeus, 1767); Starmühlner, 1976: 526-9, text-figs. 30-31, pl. 11, figs. 96-7, 100-103; pl. 12, figs. 117-120.

Holotype MNHN.

pfeifferiana, Nerita Récluz, 1843, *PZSL*, 11 : 72. New Ireland. (8 mm x 7 mm).

Récluz, 1850, JC, 1: 151; Martens, 1879: 269.

phasiana, Nerita (Neritina) Récluz, 1842, *RZSC*, 5 : 75. Saint-Domingue. (10 mm x 14 mm).

Récluz, 1850, *JC*, 1: 152, from New Ireland; Martens, 1879: 259-260.

philippi, Nerita (Theodoxus) Récluz, 1841, *RZSC*, 4 : 341-2. Sicily. (5 mm x 5 mm).

Récluz, 1850, *JC*, 1: 149; Martens, 1879: 227, = *Neritina meridionalis* (Philippi, 1836).

4 syntypes MHNG 15271 (Catane, Sicily).

picea, Nerita Récluz, 1841, *RZSC*, 4 : 151-2. Hawaiian Islands. (18 mm x 14 mm).

Récluz, 1850, *JC*, 1: 282; Souleyet, 1852: 566, pl. 34, figs. 8-11; Reeve, 1855a: pl. 5, figs. 20a, 20b, from Hawaii; Sowerby, 1883: 110, pl. 463, fig. 15; Martens, 1888: 102-3, pl. 12, figs. 12-14.

2 possible syntypes MNHN; 4 syntypes MHNG 1107/80; 5 syntypes MHNG 1107/81; 3 syntypes MHNG 1107/82 (all from "Iles Sandwich").

pileolus, Neritina Récluz, 1850, *JC*, 1 : 66-7. Replacement name for *Nerita intermedia* Deshayes, 1834, *non* Grateloup, 1828 *nec* Sowerby, 1832.

Récluz, 1850, *JC*, 1: 144; Martens, 1887: 39, = *Neritina crepidularia* Lamarck, 1822; Pace, 1973: 18, = *Neritina violacea* (Gmelin, 1791).

Deshayes' 4 syntypes are in MNHN; Récluz' material (non-types): MHNG 15275 ("les eaux saumâtres"), MHNG 15276 ("Malaisie"); MHNG 15277 (no locality).

pisiformis, Nerita (Neritina) Récluz, 1842, *RZSC*, 5 : 181. Polynesia; Tahiti ? (6-7 mm x 8 mm). *Non Nerita pisiformis* Férussac, 1823.

Récluz, 1850, *JC*, 1: 148; Reeve, 1856a: pl. 33, figs. 152a, 152b, Tahiti ?; Martens, 1878: 186, = *Neritina siderea* Gould, 1847.

plumbea, Neritina Récluz in Sowerby, 1849 : 538, pl. 112, figs. 119-120. Bohol Island, Philippines.

Récluz, 1850, *JC*, 1: 151; Reeve, 1855b: pl. 7, figs. 30a, 30b; Martens, 1877: 109, pl. 11, figs. 12-13.

podolina, Nerita Récluz, 1850, *JC*, 1 : 154. Fossil, Podolie. A nude name.

polaponensis, Neritina "Récluz MS." Sowerby, 1849 : 514, pl. 115, fig. 184.

Published in synonymy of *Neritina fluviatilis* (Linnaeus, 1758). Error for *Nerita peloponensis* Récluz, 1841?

powisiana, Nerita Récluz, 1843, *PZSL*, 11 : 71. New Ireland. (19 mm x 14 mm).

Sowerby, 1849: 511, pl. 113, fig. 149; Récluz, 1850, *JC*, 1: 145; Reeve, 1855b: pl. 16, figs. 76a, 76b, from mountain stream, New Ireland; Martens, 1875: 48; Riech, 1937: 74-75, fig. 19; Pace, 1973; 16, = *Neritina pulligera* (Linnaeus, 1767).

pulchella, Nerita (Clithon) Récluz, 1843, *PZSL* for 1842, 10 : 175-6. Saul, Pangasinan, Luzon Island, Philippines. (0.36-0.40 inch x 0.44-0.48 inch).

Sowerby, 1849: 539, pl. 115, figs. 209-211; Récluz, 1850, *JC*, 1: 148; Reeve, 1855b: pl. 21, figs. 91a-c; Martens, 1878: 172, = *Neritina sowerbiana* Récluz, 1843. Récluz MS., listed under *Neritina* (sp. n° 131).

12 syntypes MHNG 986.653 (Pangasinan).

radiata, Nerita Récluz, 1841, *RZSC*, 4 : 149-150. Locality ? (23 mm x 20 mm).

Récluz, 1850, JC, 1: 282, from Red Sea; Martens, 1889: 114-5.

2 questionable syntypes MHNG 1299/7 ("Amboine").

rangiana, Nerita Récluz, 1841, *RZSC*, 4 : 339-340. Madagascar. New name for *Nerita viridis* Linné *var. major* Rang, 1827.

Also, Récluz, 1843, *PZSL* for 1842, 10: 170-171, from Dumaguete, Negros Island, Philippines; Sowerby, 1849: 532, pl. 116, figs. 227, 228; Récluz, 1850, *JC*, 1: 150; Reeve, 1856a: pl. 31, figs. 142a, 142b, from small stream, Dumaguete, Negros Island, Philippines; Gassies, 1871: 166; Martens, 1879: 249-251, pl. 23, figs. 27-28; Crosse, 1895: 434; Komatsu, 1986: 25-27, pl. 5, fig. 5, pl. 8, fig. 7.

31 "syntypes" IRScNB 10591, labelled in error (as it is a new name, they are merely Recluz' own specimens).

rarispina, Nerita (Clithon) Récluz, 1841, *RZSC*, 4 : 311-2. Sicily. (size ?).
Récluz, 1850, *JC*, 1: 148; Martens, 1879: 263-4.

roissyana, Nerita Récluz, 1841 : 338. New Guinea. (19 mm x 20 mm).
Récluz, 1850, *JC*, 1: 151 {as "*royssyi*"}; Martens, 1877: 109-111, pl. 11, figs. 14, 17; Crosse, 1895: 414-5; Riech, 1937: 78; Franc, 1957: 22-3, fig. 18; Benthem Jutting, 1963: 427-8, = *Neritina turrita* (Gmelin, 1791). *Neritina "royssiana* Récluz" Sowerby, 1849: 539, error. Récluz MS., listed under *Neritina* (sp. n° 185).

Type material possibly represented by the syntypes of *Nerita cuprina* Récluz, 1841 (*q.v.*).

rossmassleriana, Nerita Récluz, 1846, *PZSL* for 1845, 13: 119. Locality ? (10 mm x 18 mm).
Récluz, 1850, JC, 1: 145; Martens, 1877: 67; Pace, 1973, = *Neritina pulligera* (Linnaeus, 1767). Récluz MS., listed under *Neritina* (sp. n° 226).

Possible holotype MHNG 15280 (no locality).

"royssiana", Neritina Sowerby, 1849 : 539. Error for *Nerita roissyana* Récluz, 1841.

rugata, Nerita (Clithon) Récluz, 1842, *RZSC*, 5 : 75-6. Philippines. (17 mm x 20.5 mm).
Sowerby, 1849: 528, pl. 109, figs. 3, 4; Récluz, 1850, *JC*, 1: 147; Souleyet, 1852: 566, pl. 34, figs. 24-27; Reeve, 1855b: pl. 15, figs. 69a, 69b, from mountain stream, Negros Island, Philippines; Gassies, 1863: 314, pl. 8, fig. 3; Martens, 1878: 164-5, pl. 16, figs. 9-10, 27-29; Crosse, 1895: 428; Franc, 1957: 17, = *Clithon brevispina* (Lamarck,1822); Pace, 1973: 21, = *Clithon corona angulosa* (Récluz, 1843); Mienis, 1980: 95.

Lectotype MCZ 297246, herein selected; 2 paralectotypes MCZ 297247; 4 paralectotypes MNHN.

ruginosa, Nerita (Clithon) Récluz, 1841, *RZSC*, 4 : 310-1. Hawaiian Islands. (size ?).
Récluz, 1850, *JC*, 1: 147; Martens, 1878: 165-6, pl. 16, figs. 19-20, 22-23; Crosse, 1895: 429; Franc, 1957: 17, = *Clithon brevispina* (Lamarck, 1822). Récluz MS., listed under *Neritina* (sp. n° 110).

4 syntypes MHNG 15281 ("var. c") ("Iles Sandwich"); questionable syntype MHNG 15282 ("var. f") ("Lebouka (Witi)").

rumphii, Nerita Récluz, 1841, *RZSC*, 4 : 147. Ternate, Moluccas, Amboina; New Holland. (27-30 mm x 18-19 mm).
Récluz, 1844, *PZSL* for 1843, 11: 201-4; from Ilo-Ilo, Panay Island, Philippines; Récluz, 1850, JC, 1: 282; Reeve, 1855a: pl. 14, figs. 62a-62k, from Philippines; Sowerby, 1883: 106, pl. 463, figs. 8-11; Martens, 1888: 74, = *Nerita polita* Linnaeus, 1758.

3 questionable syntypes MHNG 1296/29 (no locality).

sandalina, Nerita (Clithon) Récluz, 1842, *RZSC*, 5 : 76. Iles-Viti, Sandal Bay, Lebouka, Society & Tahiti islands. (18 mm x 21 mm).
Sowerby, 1849: 522, pl. 115, fig. 199, from Sandal Bay, in mountain stream; Récluz, 1850, *JC*, 1: 148; Reeve, 1855b: pl. 12, figs. 58a, 58b; Martens, 1879: 266. Récluz MS., listed under *Neritina* (sp. n° 128).

5 possible syntypes MHNG 15299 ("Sandal Bay, Lebouka, Tahiti") (Lebouka is in Fiji, not Tahiti); possible syntype MHNG 15300 ("var.") ("Lebouka").

sanguidens, Nerita Récluz, 1850, *JC*, 1 : 283. Red Sea. Published in synonymy of *Nerita peloronta* Linnaeus, 1758.

savieana, Nerita Récluz in Reeve, 1855a : pl. 8, figs. 37a, 37b. New Ireland. (size ?).

Sowerby, 1883: 116, pl. 465, fig. 47; Martens, 1887: 34, = *Nerita undata* Linnaeus, 1758.

sayana, Nerita (Neritina) Récluz, 1844, *PZSL* for 1843, 11 : 199. Guimaras Island, Philippines. (14-18 mm x 16-21 mm).

Récluz, 1850, *JC*, 1: 151; Martens, 1879: 259. Récluz MS., listed under Neritina (sp. n° 180).

4 syntypes MHNG 1108/9.

selot, Nerita "Adanson" Récluz, 1850, *JC*, 1 : 284. Senegal, Antilles.

Martens, 1888: 67, = *Nerita versicolor* Gmelin, 1791.

semirugosa, Nerita Récluz, 1841, *RZSC*, 4 : 102-3. Ile-de-France; Timor; New Holland. (35 - 40 mm ?).

Récluz, 1850, *JC*, 1: 283; Reeve, 1855a: pl. 4, figs. 19a, 19b, from Ternate, Moluccas; Sowerby, 1883: 108, pl. 463, fig. 1; Martens, 1887: 31-4, pl. 1, figs. 5-6, pl. 6, figs. 6-9.

5 syntypes MNHN; syntype MHNG 1296/52 ("var. b") (Timor); 3 syntypes MHNG 1296/53 ("Timor, la Nouvelle-Hollande"); 2 syntypes MHNG 1296/54 ("La Nouvelle-Hollande & Timor"); 2 syntypes MHNG 1296/55 ("Timor et Nouvelle-Hollande (Péron), Ile de France (Favanne)").

serrulata, Nerita (Neritina) Récluz, 1842, *RZSC*, 5 : 76-7. Sumatra. (20 mm x 22 mm).

Sowerby, 1849: 518, pl. 114, fig. 164; Récluz, 1850, *JC*, 1: 153; Reeve, 1855b: pl. 12, figs. 55a, 55b, from a river, Cape Palmas, Sumatra; Martens, 1877: 101, = *Neritina ziczac* Lamarck, 1822. Récluz MS., listed under *Neritina* (sp. n° 214).

2 syntypes MHNG 15306 ("var. unicolor"); syntype MHNG 15307 ("var. lineis arcuatis"); 3 syntypes MHNG 15308 ("var. maculata").

"siguijorensis", Neritina Gassies, 1871 : 165. Error for *Nerita siquijorensis* Récluz, 1844.

siquijorensis, Nerita (Neritina) Récluz, 1844, *PZSL* for 1843, 11 : 198. Siquijor Island, Philippines. (7-7.5 mm x 10-11 mm).

Sowerby, 1849: 510, pl. 113, figs. 145, 146; Récluz, 1850, *JC*, 1: 150; Reeve, 1856a: pl. 27, figs. 119a, 119b, from a small stream, Siquijor Island, Philippines; Martens, 1875: 38, = *Neritina crepidularia* Lamarck 1822; Crosse, 1895: 425; Franc, 1957: 22; Benthem Jutting, 1963: 423-4; = *Neritina violacea* (Gmelin, 1791).

sobrina, Nerita Récluz, 1846, *PZSL* for 1845, 13 : 119-120. Cayenne ? (20 mm x 23 mm).

Récluz, 1850, JC, 1: 152, from Chile; Reeve, 1855b: pl. 9, figs. 40a, 40b; Martens, 1877: 117, = *Neritina zebra* (Bruguière, 1797).

"solida", Neritina Sowerby, 1849: 529. Published in synonymy of *Neritina olivacea* Guillou, 1841.

Martens, 1889: 267, error for *Neritina solium* Récluz, 1846.

solium, Nerita (Clithon) Récluz, 1846, *PZSL* for 1845, 13 : 120. Bencoonet, Sumatra. (22 mm x 26.5 mm).

Récluz, 1850, *JC*, 1: 148; Martens, 1879: 267; Benthem Jutting, 1959: 58. *Neritina* "*dolium* Récluz" Reeve, 1855 and "*solida* Récluz" Sowerby, 1849, errors.

souleyetana, Nerita (Clithon) Récluz, 1842, *RZSC*, 5 : 182-3. Locality : Récluz stated that this species lives with *Neritina pisiformis*, which was from "Polynésie? O-Tahiti?". (10-12 mm x 12.5-14.75 mm).

Sowerby, 1849: 525, pl.110, figs. 59, 60; Récluz, 1850, *JC*, 1: 147, from Marquesas; Reeve, 1855b: pl. 26, figs. 115a, 115b; Martens, 1878: 152-4, pl. 15, figs. 27-30; Riech, 1937: 81-2, fig. 23; Starmühlner, 1976: 498-9, pl. 7, figs. 34-6, pl. 8, figs. 52-3. Récluz MS., listed under *Neritina* (sp. n° 104).

2 possible syntypes MNHN (Marquesas); 4 probable syntypes MHNG 15309 (Marquesas); 5 probable syntypes MHNG 15310 ("var. mutica") (Noukahiva); 2 probable syntypes MHNG 15311 ("var. mutica") (Noukahiva); 4 possible syntypes MHNG 15312 (3 varieties) ("Taïti").

"soverbiana", Nerita Sowerby, 1849 : 528, pl. 109, figs. 5-8. Error for *Nerita sowerbiana* Récluz, 1843.

"soverbii", Nerita Reeve, 1855b : pl. 20, figs. 89a-89d. Error for *Nerita sowerbiana* Récluz, 1843.

sowerbiana, Nerita (Clithon) Récluz, 1843, *PZSL* for 1842, 10 : 174. Sinait, North Ylocos, Luzon Island, Philippines. (0.56-0.60 inch x 0.64-0.72 inch).

Récluz, 1850, *JC*, 1: 147; Martens, 1878: 171-4, pl. 18, figs. 1-4, 10; Benthem Jutting, 1959: 55; Benthem Jutting, 1963: 416; Pace, 1973: 22, pl. 1, fig. 7; Komatsu, 1986: 15, 34, pl. 9, figs. 8, 9 (captions reversed!), = *Clithon faba* (Sowerby, 1836). Récluz MS., listed under *Neritina* (sp. n° 114). See also "*soverbiana*" and "*soverbii*".

3 syntypes MNHN; 5 questionable syntypes MHNG 15313 ("var.") (Guimaras (Cuming)); 1 questionable syntype IRScNB 10591 ("Ile Guimard").

spengleriana, Nerita Récluz, 1844, *PZSL* for 1843, 11 : 201. Ilo-Ilo, Panay Island, Philippines. (16 mm x 18 mm).

Reeve, 1855a: pl. 17, figs. 73a, 73b; Sowerby, 1883: 118, pl. 468, fig. 121; Martens, 1887: 39-40, pl. 7, figs. 6, 7.

spinifera, Nerita (Clithon) Récluz, 1842, *RZSC*, 5 : 183. Guam. (17 mm x 19 mm).

Sowerby, 1849: 526, pl. 110, figs. 53, 54; Récluz, 1850, *JC*, 1: 147; Reeve, 1855b: pl. 11, figs. 49a, 49b, from a small stream, Philippines; Gassies, 1871: 167; Martens, 1878: 154, Crosse, 1895: 427, = *Neritina diadema* Récluz, 1841. Récluz MS., listed under *Neritina* (sp. n° 121).

Possible holotype MHNG 15314.

"squamapicta", Nerita Sowerby, 1849 : 513, pl. 111, fig. 79. Error for *Nerita squamaepicta* Récluz, 1843.

squamaepicta, Nerita (Neritina) Récluz, 1843, *PZSL* for 1842, 10 : 169. Agoo, Pangasinan, Luzon Island, Philippines. (1.16 inches x 1.44 inches).

Récluz, 1850, *JC*, 1: 145; Reeve, 1856a: pl. 1, figs. 4a, 4b; Benthem Jutting, 1956: 309-310, fig. 27; Benthem Jutting, 1959: 55; Pace, 1973: 16, = *Neritina pulligera* (Linnaeus, 1767). See also "*squamapicta*" and "*squamipicta*". Récluz MS., listed under *Neritina* (sp. n° 76).

Lectotype MCZ 125695, herein selected; 2 paralectotypes MCZ 297248; 2 paralectotypes MNHN; 3 paralectotypes MHNG 15315.

"squamipicta", Nerita Martens, 1875 : 62-3, pl. 5, figs. 9-11.

Franc, 1957: 25, fig. 24; Starmühlner, 1976: 534-5, text-fig. 36, pl. 11, figs. 111-2.

Error for *Nerita squamaepicta* Récluz, 1843.

"squamosa", Neritina Sowerby, 1849 : 527, pl. 109, figs. 26, 27.

Reeve, 1855b: pl. 12, figs. 56a, 56b.

Error for *Nerita squarrosa* Récluz, 1843.

squarrosa, Nerita (Clithon) Récluz, 1843, *PZSL* for 1842, 10 : 174. Jimamailan, Negros Island, Philippines. (0.80-0.84 inch x 1.04-1.08 inches).

Récluz, 1850, *JC*, 1: 147; Martens, 1878: 162-4, pl. 16, figs. 13-18; Riech, 1937: 83; Benthem Jutting, 1956: 289-290, fig. 8; Benthem Jutting, 1963: 416-7; Pace, 1973: 21, = *Clithon corona angulosa* (Récluz, 1843); Starmühlner, 1976: 502-4, text-figs. 10-11, pl. 7, figs. 41-2, pl. 8, figs. 56-7. "*Neritina squamosa Récluz*" Sowerby, 1849; error. Récluz MS., listed under *Neritina* (sp. n° 119).

Lectotype MCZ 125693, herein selected; paralectotype MCZ 297249; 3 paralectotypes MNHN; 3 paralectotypes MHNG 15316 ("Isle of Negros").

striolata, Nerita Récluz, 1841, *RZSC*, 4 : 337-8. Antilles ? (15 mm x 17 mm).

Récluz, 1850, *JC*, 1: 151, from Philippines; Reeve, 1855b: pl. 23, figs. 100a, 100b; Martens, 1877: 120, = *Neritina reclivata* Say, 1822; Russell, 1941: 403, = *Neritina smithi* Wood, 1828. Récluz MS., listed under *Neritina* (sp. n° 189). .

4 questionable syntypes MHNG 15317 (no locality).

subalata, Neritina "Récluz, 1862" Martens, 1875 : 30, error for *Neritina subalata* Souleyet, 1842.

Also, Starmühlner, 1974: 108.

subauriculata, Nerita (Neritina) Récluz, 1843, *PZSL* for 1842, 10 : 171. Jaimamailan, Negros Island, Philippines. (0.54-0.65 inch x 0.68-0.72 inch).

Sowerby, 1849: 510, pl. 113, fig. 138; Récluz, 1850, *JC*, 1: 145; Reeve, 1855b: pl. 17, figs. 80a, 80b, palm trunks in estuary, Negros Island, Philippines; Martens, 1875: 30, = *Neritina auriculata* Lamarck, 1822.

subpunctata, Nerita (Clithon) Récluz, 1844, *PZSL* for 1843, 11 : 199-200. Sinait, North Ilocos, Luzon Island, Philippines. (11 mm x 13 mm).

Sowerby, 1849: 528-9, pl. 115, fig. 206; Récluz, 1850, *JC*, 1: 147; Reeve, 1855b: pl. 6, figs. 26a, 26b; Martens, 1878: 179-180, pl. 18, figs. 19-20, 22-24; Benthem Jutting, 1956: 272, = *Clithon bicolor* (Récluz, 1843). Récluz MS., listed under *Neritina* (sp. n° 122).

4 syntypes MHNG 15318.

succinea, Nerita (Theodoxus) Récluz, 1841, *RZSC*, 4 : 343. Madagascar, La Guadeloupe. (4 mm x 6 mm).

Sowerby, 1849: 515, pl. 114, figs. 153, 154; Récluz, 1850, *JC*, 1: 150; Reeve, 1856a: pl. 35, figs. 158a, 158b, from Guadeloupe; Martens, 1879: 242-3, pl. 23, figs. 23, 24; Russell, 1941: 398-401, pl. 4, figs. 7, 8. Récluz MS., listed under *Neritina* (sp. n° 162).

2 syntypes MNHN (Guadeloupe); 16 syntypes MHNG 15319 (Madagascar).

suffreni, Navicella Récluz, 1841, *RZSC*, 4 : 374-5. Lebouka, Fiji. (17 mm x 11 mm).

Martens, 1881: 21, = *Navicella freycineti* Récluz, 1841; Riech, 1937: 64-5; Starmühlner, 1976: 543-4, text-fig. 44, pl. 13, figs. 141-3, pl. 14, fig. 156.

1 probable syntype MHNG 16385 ("var. a"); 1 probable syntype MHNG 16386 ("var. b"); 1 probable syntype MHNG 16387 ("var. c"); these specimens, all from "Lebouka, îles Viti", were labelled in the MHNG collection under the Récluz MS name of *Navicella uvula* (original label of Récluz).

"sufreni", Navicella Récluz, 1850, *JC*, 1 : 375. Error for *Navicella suffreni* Récluz, 1841.

tadin, Nerita "Adanson" Récluz, 1850, *JC*, 1 : 285. Senegal.

Martens, 1887: 55, = *Nerita tesselata* Gmelin, 1791. There are two specimens of "*tadin*" in the Adanson collection of the MNHN (Fischer-Piette, 1942: 290-291). Gmelin's reference to "*tadin*" under *N. tesselata* is with a "?" only.

tenebrosa, Nerita Récluz, 1842, *RZSC*, 5 : 180-1. Solo Island, north of Borneo. (15 mm x 17 mm).

Récluz, 1850, *JC*, 1: 282; Martens, 1889: 120-1.

5 syntypes MHNG 1299/27.

tingitana, Neritina "Récluz, 1898" Kristensen, 1986 : 330. Error for *Neritina tingitana* Pallary, 1899.

troschelii, Neritina (Clithon) Récluz, 1850, *JC*, 1 : 147, 155-6. Locality ? (10-11 mm x 12-13 mm).

Martens, 1879: 268. Récluz, MS., listed under *Neritina* (sp. n° 103).

11 possible syntypes MHNG 15321 (no locality).

turtoni, Nerita Récluz, 1843, *PZSL*, 11 : 71. Locality ? (15.5 mm x 13-14 mm).

Récluz, 1850, *JC*, 1: 151; Martens, 1877: 111-3, pl. 13, figs. 1, 2, 5; Riech, 1937: 79; Starmühlner, 1976: 517-9, text-figs. 22-3, pl. 9, figs. 71- 2, pl. 10, figs. 88-9.

unidentata, Neritina (Clithon) Récluz, 1850, *JC*, 1 : 147, 158-9, pl. 7, fig. 8. Tahiti. (11-12 mm x 12 mm).

Martens, 1879: 267-8. Récluz MS., listed under Neritina (sp n° 105).

2 syntypes, MNHN (Fischer-Piette, 1950; the "holotype (?)" is probably the figured specimen); 3 syntypes MHNG 15322.

"urvillei", Navicella Martens, 1881 : 31. Error for *Navicella durvillei* Récluz, 1841.

variabilis, Navicella Récluz, 1843, *PZSL* for 1842, 10 : 155. Cagayan, Misamis, Mindanao Island, Philippines. (1.16-1.28 inches x 0.80-0.84 inch).

Récluz, 1850, *JC*, 1: 375; Sowerby, 1850: 551, pl. 118 bis, figs. 40-42; Reeve, 1856b, pl. 2, figs 8a-c; Martens, 1881: 34-6, pl. 6, figs. 15-17; Riech, 1937: 67; Franc, 1957: 27, = *Septaria luzonica* ("Souleyet" Récluz, 1841).

10 syntypes BMNH 1974122; 3 questionable syntypes MHNG 15323 (no locality).

vasconiensis, Nerita Récluz, 1850, *JC*, 1 : 154. Fossil, England. Replacement name for *Nerita virginea* Grateloup, 1840; non Linnaeus, 1758.

wallisiarum, Neritina Récluz, 1850, *JC*, 1 : 151, 161, pl. 7, figs. 11, 12. New Caledonia; Wallis Islands. (20 mm x 20 mm).

Gassies, 1871: 172-3; Martens, 1877: 100-1; Crosse, 1895: 413-4; Franc, 1957: 23, Pace, 1973: 20, = *Neritina variegata* Lesson, 1830.

Lectotype and paralectotype MNHN : selected by Fischer-Piette, 1950, as "holotype and paratype" (ICZN 74(b)) (New Caledonia); 3 paralectotypes MHNG 15324 (Wallis Island).

webbei, Nerita (Neritina) Récluz, 1849, *RMZ*, (2) 1 : 70-1. Grand-Bassam River, Ivory Coast. (6-8 mm x 7 mm).

Récluz, 1850, *JC*, 1: 151; Martens, 1878: 253, = *Neritina glabrata* Sowerby, 1849. Récluz MS., listed under *Neritina* (sp. n° 172).

16 questionable syntypes MCZ 154123 (Senegal); 6 questionable syntypes MHNG 15325 (Senegal); 14 questionable syntypes MHNG 15326 (Senegal).

yoldii, Nerita Récluz, 1841, *RZSC*, 4 : 151. Brazil. (16 mm x 12 mm).

Récluz, 1850, *JC*, 1: 286, from Philippines; Souleyet, 1852: 566, pl. 34, figs. 1-4; Reeve, 1855a: pl. 19, figs. 82a, 82b, from Red Sea; Sowerby, 1883: 112, pl. 466, fig. 70; Martens, 1888: 91-3, pl. 11, figs. 7-11.

2 syntypes MHNG 1296/49 (no locality); 6 syntypes MHNG 1296/50 ("Brazil"); 9 syntypes MHNG 1296/51 ("Macao"). Récluz' original locality is in error; in 1850, he changed this to "Philippines". Furthermore, the syntypes agree with the figures in Souleyet and with museum specimens (MHNG) from the China Sea and this species-name is considered to represent the Asian taxon.

zebrina, Nerita (Theodoxus) Récluz, 1841, *RZSC*, 4 : 341. Montpellier, France. (8 mm x 7 mm).

Sowerby, 1849: 514, pl. 115, fig. 178; Récluz, 1850, *JC*, 1: 149; Récluz, 1852, *JC*, 3: 297-8; Reeve, 1856a: pl. 36, fig. 163; Martens, 1879: 215, = *Neritina fluviatilis* (Linnaeus, 1758).

zelandica, Nerita Récluz, 1846, *PZSL* for 1845, 13: 120. New Zealand. (19-20 mm x 18-19 mm).

Récluz, 1850, JC, 1: 151; Martens, 1877: 111, = *Neritina turtoni* Récluz, 1843. Récluz MS., listed under *Neritina* (sp. n° 183).

4 syntypes MHNG 15330; syntype MHNG 15331.

ACKNOWLEDGEMENTS.

The senior author (Kabat) gratefully acknowledges the curators who allowed him to examine the neritid collections under their care: Prof. Kenneth J. Boss, MCZ; Dr. Philippe Bouchet, MNHN and Dr. John D. Taylor, BM(NH). Richard I. Johnson (MCZ) first brought the Récluz material to our attention and provided helpful discussion on their provenance. The second author (Finet) thanks Dr. J. van Goethem and A. Lievrouw for allowing him to examine the material in the IRScNB, and R. Duchamps (Société Belge de Malacologie) who brought the material of the Dautzenberg collection to his attention. Annie Tillier (MNHN) re-examined the neritid types at the MNHN and carefully checked the determinations in our manuscript; Philippe Bouchet further clarified the status of certain type lots therein. Alison Haynes (The University of the South Pacific, Fiji) previously identified the type specimens of *Navicella suffreni* in the MHNG collections.

RÉSUMÉ

Récluz, conchyliologue français du dix-neuvième siècle, a décrit près de deux cents espèces de Neritidae (Gastropoda), toutes cataloguées dans le présent article; ce catalogue renseigne sur la localisation des spécimens-types au British Museum (Natural History), à l'Institut Royal des Sciences Naturelles de Belgique, Bruxelles, au Muséum National d'Histoire Naturelle, Paris, au Muséum d'Histoire Naturelle, Genève, et au Museum of Comparative Zoology (Harvard, Cambridge). Les références bibliographiques des citations ultérieures (par Récluz lui-même ou par d'autres auteurs) de ces espèces sont également données.

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Revue suisse Zool.	Tome 99	Fasc. 2	p. 255-262	Genève, juin 1992

Prostomidae (Coleoptera) aus Südost-Asien

von

Wolfgang SCHAWALLER*

mit 19 Abbildungen

ABSTRACT

Prostomidae (Coleoptera) from southeastern Asia – *Prostomis* species from southeastern Asia are treated and summerized in a map. New species: *P. cameronica* n.sp. from Malaysia, *P. kinabaluca* n.sp. from Borneo (Sabah), *P. luzonica* n.sp. from the Philippines (Luzon). New records: *P. mordax* from Japan (Hokkaido), *P. latoris* from Taiwan. The shape of the ventral head processes is considered an important diagnostic species character.

EINLEITUNG

Nach meinem ersten Beitrag über die Familie Prostomidae mit Arten aus dem Himalaya und Nord-Thailand (SCHAWALLER 1991) erhielt ich weitere Tiere aus Sri Lanka, Malaysia, Sabah, Luzon, Taiwan und Japan (Karte Abb. 1). Die in diesem Material enthaltenen 6 Arten der Gattung *Prostomis* Latreille 1825, darunter 3 neue Arten, werden hier behandelt. Im Museum Genf befinden sich weiterhin Exemplare aus Neu Guinea, deren Bearbeitung aber ohne Revision der aus Australien und Tasmanien beschriebenen Arten zurückgestellt werden muß.

Wie im ersten Beitrag betrachte ich auch jetzt die Form der ventralen Kopffortsätze als wichtigstes Artkriterium. Andere Merkmale (Proportionen der Mandibeln und des Pronotum, Punktierung der Ober- und Unterseite) variieren innerhalb einer Population sehr stark und sind kaum taxonomisch verwertbar. Aus diesem Grunde beschränken sich die Artdiagnosen auf die wesentlichen Merkmale. Der Aedoeagus ist innerhalb der Gattung, wie der Körperbau, sehr einheitlich und für eine Artentrennung offensichtlich nicht geeignet, zudem ist das Organ extrem klein und schwach sklerotisiert.

Noch ungeklärt sind die verwandtschaftlichen Beziehungen der Arten untereinander, jedenfalls lassen sich die unterschiedlich geformten ventralen Kopffortsätze noch nicht in ein Evolutionsschema einfügen. Dazu sollte auch die biologische Bedeutung dieser Strukturen bekannt sein.

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* Staatliches Museum für Naturkunde, Rosenstein 1, D-7000 Stuttgart 1.

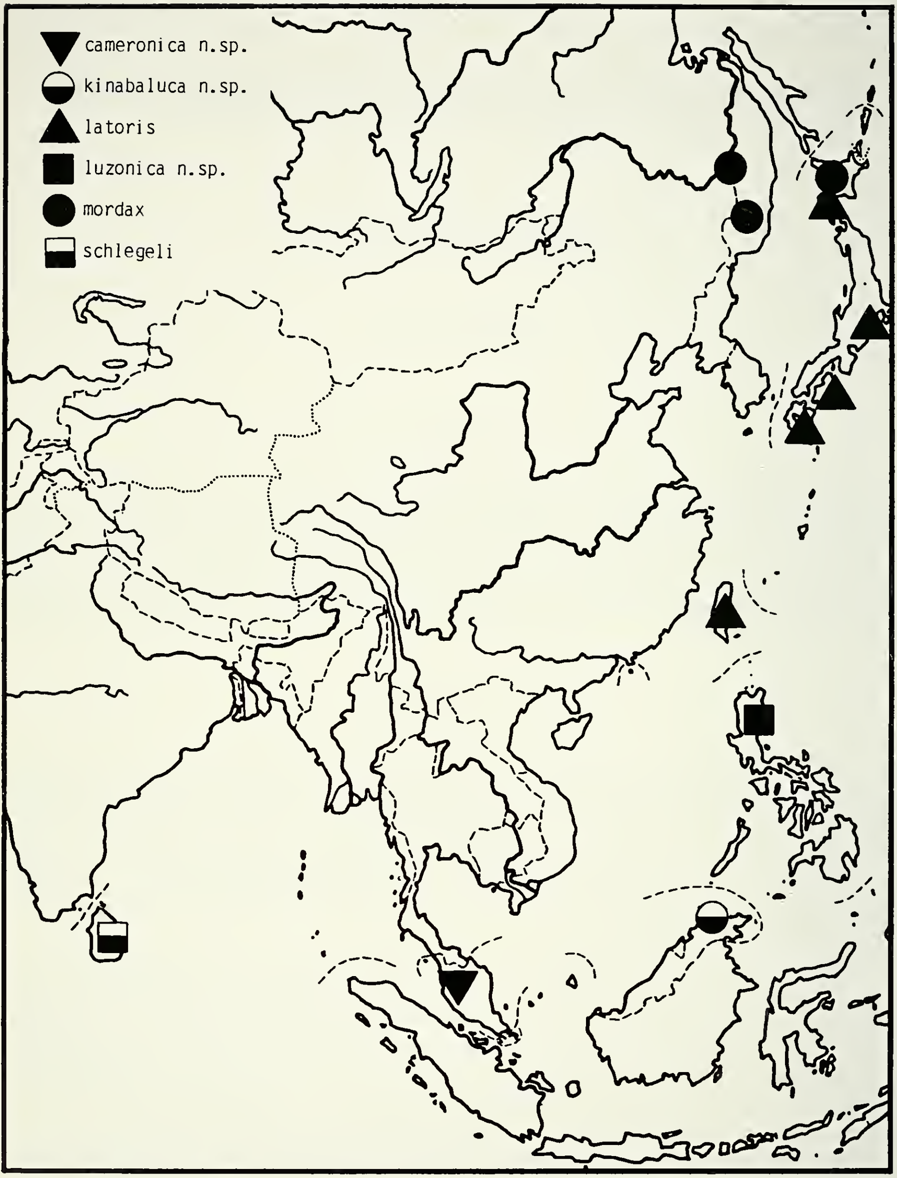


ABB. 1.

Fundorte von *Prostomis*-Arten in Südost-Asien. Nicht dargestellt sind die bereits früher behandelten Arten aus dem Himalaya und Nord-Thailand.

Material

ANIC	Australian National Insect Collection, Canberra.
BRIO	Biosystematics Research Institute, Ottawa.
CMSE	Collection M. Sakai, Ehime.
ELEU	Entomological Laboratory, College of Agriculture, Ehime University.
MHNG	Muséum d'Histoire Naturelle, Genève.
SMNS	Staatliches Museum für Naturkunde, Stuttgart.

Dank

Dr. J.F. Lawrence (Canberra), Dr. I. Löbl (Genf), M. Sakai (Shigenobu/Ehime) und Dr. A. Smetana (Ottawa) vertrauten mir die seltenen Tiere zur Bearbeitung an, wofür ich recht herzlich danke.

DIE ARTEN

Prostomis cameronica n.sp. (Abb. 2, 12-15)

Holotypus (♂): Malaysia, Cameron Highlands, Tanah Rata, Pahang, 2.VIII. 1978 leg. H. Mochizuka & K. Sugiyama (ELEU).

Paratypen: Zusammen mit Holotypus, 1 Expl. ELEU, 1 Expl. SMNS. – Malaysia, Cameron Highlands, 1500 m, 24.III.1984 leg. K. Fujita, 2 Expl. ELEU.

Diagnose: Ventrale Kopffortsätze symmetrisch, kurz und breit; ihre Enden spitz und etwas nach außen geschwungen; Innenrand beider Fortsätze etwas geschwungen; Außenrand ohne Fortsätze oder Zähne (Abb. 12, 14). Mandibeln schlank, rechte Mandibel außen etwas verbreitert (Abb. 13, 15). Körperlänge: 6.0-8.5 mm.

Anmerkung: Die Form der ventralen Kopffortsätze ist sehr ähnlich denen bei *katrinae* Schawaller 1991 aus Nord-Thailand. Jedoch besitzt *katrinae*, auch bei kleinen Exemplaren, stets einen kleinen seitlichen Zahn an der Spitze des rechten Kopffortsatzes, der *cameronica* n.sp., auch großen Exemplaren, stets fehlt. Ich habe mich daher entschlossen, die Funde aus Malaysia als eigene Art zu behandeln, beide Typenlokalitäten liegen rund 1600 km voneinander entfernt. Es ist aber nicht auszuschließen, daß möglicherweise Übergänge im dazwischen liegenden Gebiet noch nachgewiesen werden, womit dann nur eine einzige valide Art begründet werden könnte. Aedoeagus siehe Abb. 2.

Prostomis kinabaluca n. sp. (Abb. 16-17)

Holotypus (♀): Borneo, Sabah, Kinabalu National Park, Silau-Silau, 1540 m, 14.VIII.-1.IX.1988 leg. A. Smetana (MHNG).

Paratypen: Borneo, Sabah, Kinabalu National Park, 1560 m, 15.-24.V.1987 leg. A. Smetana, 1 Expl. SMNS. – Borneo, Sabah, Kinabalu National Park, 2600 m, 1.V.1987 leg. D. Burckhardt & I. Löbl, 1 Expl. MHNG.

Diagnose: Ventrale Kopffortsätze etwas asymmetrisch, linker Fortsatz etwas länger als rechter; ihre Enden spitz und etwas nach außen gebogen; Innenrand beider Fortsätze leicht geschwungen; Außenrand ohne Fortsätze oder Zähne (Abb. 16). Mandibeln schlank, ohne oder mit leichter Verbreiterung (Abb. 17). Körperlänge: 7.0-8.0 mm.

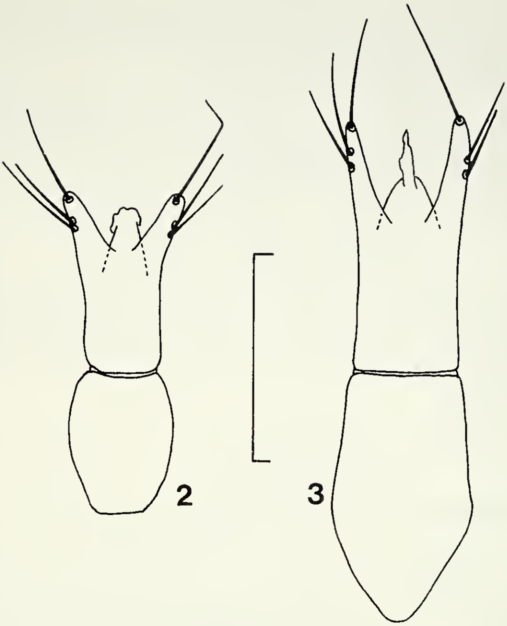


Abb. 2-3.

Aedoeagus von *P. cameronica* n. sp. (Holotypus) und *P. luzonica* n. sp. (Holotypus). – Maßstrich 0.2 mm.

Anmerkung: Die ventralen Kopffortsätze sind denen von *mordax* Reitter 1887 aus Ostsibirien und Nord-Japan am ähnlichsten. Bei jener Art sind sie jedoch gleichlang und die Spitzen sind deutlich nach außen geschwungen, dadurch ist auch deren Innenrand stärker S-förmig gebogen als bei *kinabaluca* n. sp. Aedoeagus unbekannt, es liegen nur ♀ vor.

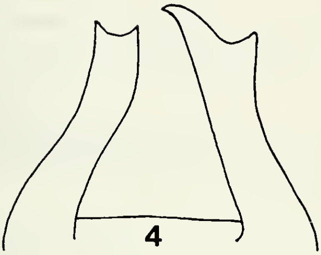
Prostomis latoris Reitter 1889 (Abb. 4-9)

Material: Japan, Is. Shikoku, Ehime Prefecture, Mt. Shiratsue, 9.XI.1975 leg. T. Ishihara, 1 Expl. SMNS, 1 Expl. MHNG. – Japan, Is. Shikoku, Ehime Prefecture, Mt. Narabara, 25.III.1977 leg. S. Nagai, 1 Expl. SMNS. – Taiwan, Fenchhu, 1400 m, 30.IV.1977 leg. J. & S. Klapperich, 1 Expl. SMNS. – S-Taiwan, Shyk Shan, near Liu Kui, 28.VI.1986 leg. K. Baba, 2 Expl. ELEU. – M-Taiwan, Sun Kang, Nan Tow Hsien, 2200 m, 6.IX.1986 leg. K. Baba, 1 Expl. SMNS. – Taiwan, Mt. Alishan, 2200 m, 22.V.1981 leg. K. Sasagawa, 1 Expl. ELEU. – Taiwan, Hualien, Hsien, Taroko National Park, Nanhushi Hut, 2200 m, 8.V.1990 leg. A. Smetana, 1 Expl. BRIO.

Diagnose: Ventrale Kopffortsätze deutlich asymmetrisch, linker Fortsatz mit einer leicht nach innen (Abb. 4) oder nach vorne gerichteten Spitze (Abb. 6, 8) und außen mit

Abb. 4-11.

Ventrale Kopffortsätze und Mandibeln von dorsal. – 4-5: *P. latoris* aus Japan/Shiratsue; 6-7: *P. latoris* aus Taiwan/Liu Kui; 8-9: *P. latoris* aus Taiwan/Sun Kang; 10-11: *P. luzonica* n. sp. Holotypus. – Maßstrich 1 mm.



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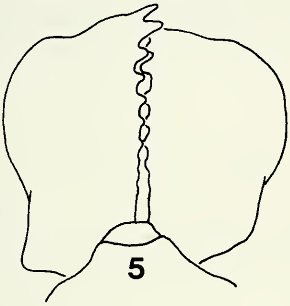

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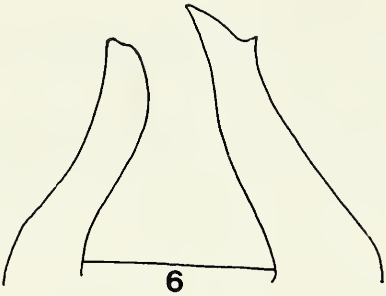

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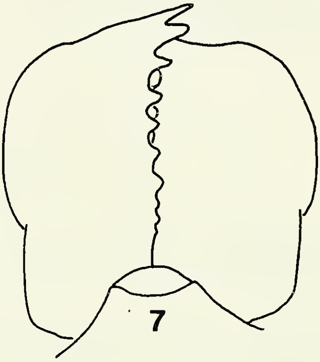

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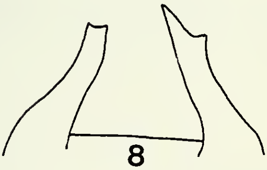

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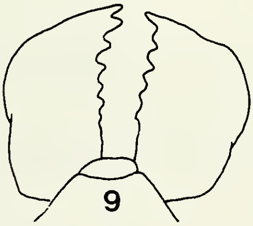

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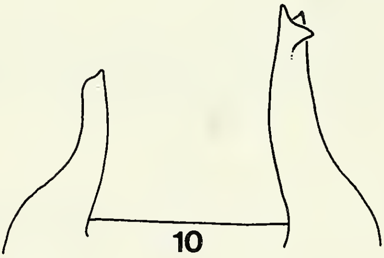

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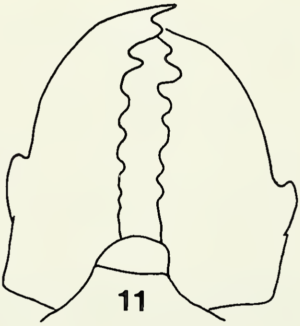

11

Zahn, rechter Fortsatz kürzer und zweispitzig (Abb. 4, 8), manchmal nur abgestumpft (Abb. 6); Innenrand beider Fortsätze etwas geschwungen. Mandibeln seitlich verbreitert (Abb. 5, 7, 9). Körperlänge: 5.0-7.5 mm.

ANMERKUNG: Die Form der ventralen Kopffortsätze ist am ähnlichsten bei *edithae* Schawaller 1991 aus dem Himalaya ausgeprägt. Dort ist jedoch die Spitze des linken Fortsatzes immer deutlich nach außen gebogen, auch bei Kümmerformen – bei *latoris* zeigt diese Spitze meist nach innen, selten gerade nach vorne.

VERBREITUNG: Die Typenserie (REITTER 1889) stammt von verschiedenen Fundorten in Japan, die alle auf der Reiseroute von G. Lewis liegen (Karte in BATES 1883, SAKAI in litt.): Junsai auf Hokkaido nördlich Hadokate, Kiga und Miyanoshita auf Honshu bei Nakone/Kanagawa Prefecture sowie Yuyama auf Kyushu südöstlich Kumamoto. Die Art ist also offensichtlich in ganz Japan verbreitet und kommt nach den neuen Funden auch auf Taiwan vor.

Prostomis luzonica n. sp. (Abb. 3, 10-11)

HOLOTYPUS (♂): Philippinen, Is. Luzon, Mount Data Lodge, 2200-2300 m, 22.-23.XII.1979 leg. L. Deharveng & J. Orousset (MHNG).

PARATYPUS: Philippinen, ls. Luzon, Mt. Pr., 4000-7400 ft., VI.-IX.1945 leg PJD (ANIC).

DIAGNOSE: Ventrale Kopffortsätze deutlich asymmetrisch, linker Fortsatz länger und mit dreizackiger Spitze, rechter Fortsatz stumpf endend; Innenrand beider Fortsätze etwas geschwungen (Abb. 10). Mandibeln außen mit ohrenförmiger Verbreiterung (Abb. 11). Körperlänge: 8.5 mm.

ANMERKUNG: Mit der Form der ventralen Kopffortsätze steht diese Art relativ isoliert in der Gattung, jedenfalls besitzt keine der bislang von mir untersuchten Arten ähnlich ausgebildete Strukturen. Aedoeagus siehe Abb. 3.

Prostomis mordax Reitter 1887

MATERIAL: Japan, Is. Hokkaido, Aizan-kei, 21.VII.1970 leg. M. Sakai, 1 Expl. CMSE. – Ostsibirische Funde bei SCHAWALLER (1991).

DIAGNOSE: Ventrale Kopffortsätze symmetrisch, lang und schlank; ihre Enden spitz und nach außen gebogen; Innenrand stark S-förmig geschwungen; Außenrand ohne Fortsätze. Mandibeln seitlich verbreitert. Körperlänge: 5.0-7.0 mm.

ANMERKUNG: Die Form der ventralen Kopffortsätze und der Mandibeln ist bereits bei SCHAWALLER (1991) abgebildet an Hand von ostsibirischem Material. Der neue Fund von Hokkaido stimmt damit völlig überein.

VERBREITUNG: Der Neunachweis für Japan auf der nördlichen Insel Hokkaido macht das Vorkommen auf Sakhalin und den südlichen Kurilen-Inseln wahrscheinlich. Ansonsten ist *mordax* in der ostsibirischen Küstenprovinz verbreitet (*locus typicus*: Wladiwostok), das genaue Areal ist allerdings unbekannt.

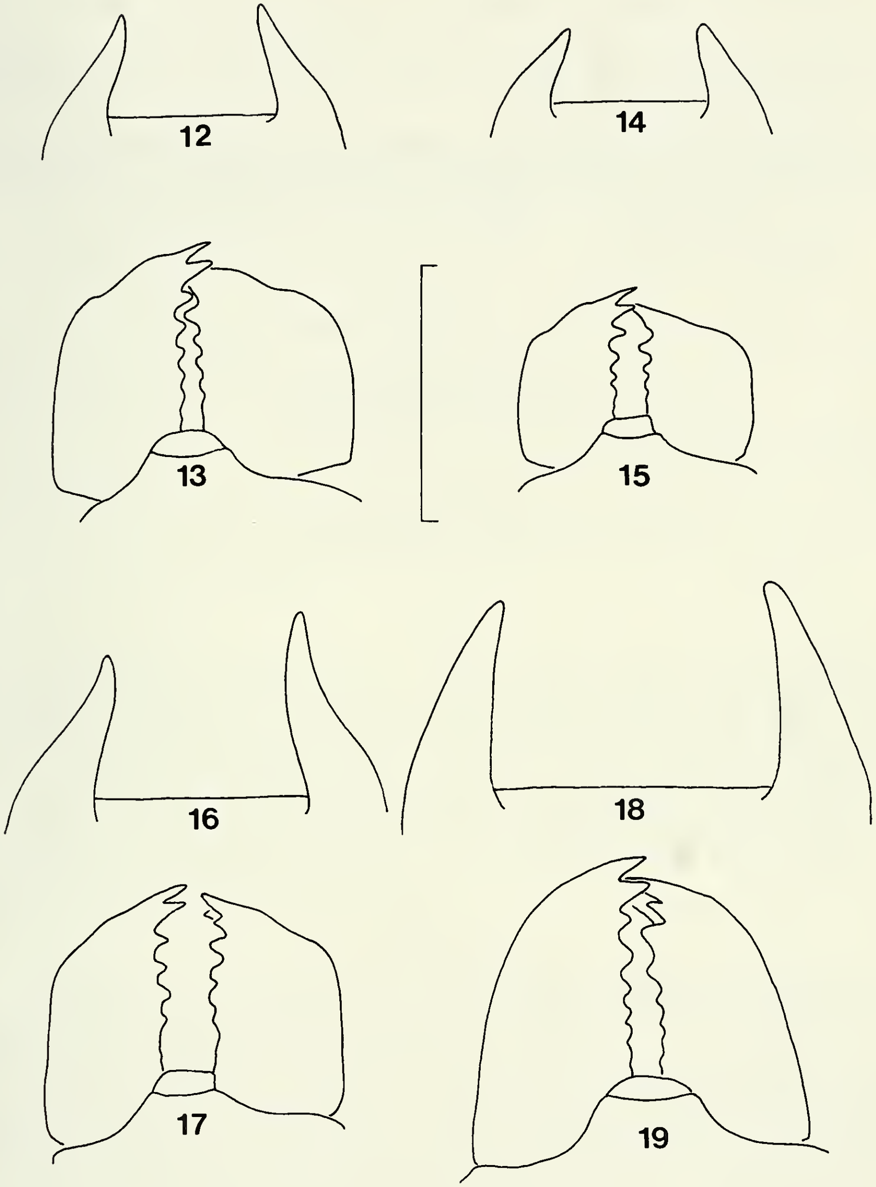

ABB. 12-19.

Ventrale Kopffortsätze und Mandibeln von dorsal. – 12-13: *P. cameronica* n. sp. Paratypus; 14-15: *P. cameronica* n. sp. Holotypus; 16-17: *P. kinabaluca* n. sp. Holotypus; 18-19: *P. schlegeli* aus Sri Lanka. – Maßstrich 1 mm.

Prostomis schlegeli Olliff 1884 (Abb. 18-19)

MATERIAL: Sri Lanka, Pidurutalagala, 2200-2500 m, 29.I.1970 leg. R. Mussard, C. Besuchet & I. Löbl, 3 Expl. MHNG, 1 Expl. SMNS.

DIAGNOSE: Ventrale Kopffortsätze symmetrisch, lang; ihre Enden abgerundet und nach innen gebogen; Innenrand fast gerade; Außenrand ohne Fortsätze oder Zähne (Abb. 18). Mandibeln schlank, ohne Verbreiterung (Abb. 19). Körperlänge: 10.5-11.0 mm.

VERBREITUNG: Bislang nur von Sri Lanka bekannt, wohl nur im inneren Bergland.

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Revue suisse Zool.	Tome 99	Fasc. 2	p. 263-342	Genève, juin 1992

Aleocharinae nepalesi del Museo di Ginevra Parte VII (conclusione): Oxypodini e Aleocharini (Coleoptera, Staphylinidae) (115° Contributo alla conoscenza delle Aleocharinae)

di

Roberto PACE*

Con 295 figure

ABSTRACT

Aleocharinae from Nepal in the Geneva Museum. Part VII (conclusion): Oxypodini and Aleocharini (Coleoptera, Staphylinidae). (115th Contribution to the knowledge of Aleocharinae). – The last collection of the Nepalian Aleocharinae in the Geneva Museum is studied. The collection comprises 119 species which were collected in recent years mainly by Dr. I. Löbl and Dr. A. Smetana, and includes 91 species which are described as new. The new genus *Smetanaetha* is described, based on a new species. Its relationship is with *Oxypoda* Mannerheim. The genus *Blepharhymenus* Solier is recorded for the first time as occurring also in Nepal.

INTRODUZIONE

Si conclude con il presente lavoro la pubblicazione delle specie di Aleocharinae raccolte dal Dr. Ivan Löbl del Museo di Storia Naturale di Ginevra e dal Dr. Ales Smetana dell'Istituto di Ricerche Biosistematiche di Ottawa.

La prima pubblicazione di questa serie risale al 1989. Nel corso di questo studio ho pubblicato anche alcune revisioni, grazie all'importante apporto di nuovo materiale del Museo di Ginevra. Esse riguardavano il genere *Masuria* Cameron e il sottogenere *Microdota* Mulsant & Rey, di *Atheta* Thomson.

Avrei voluto presentare una revisione anche per il sottogenere *Acrotona* Thomson di *Atheta* e del genere *Oxypoda* Mannerheim, tuttavia ho constatato prematuro condurre a termine ampie revisioni di generi o sottogeneri la cui sistematica a livello sottogenerico o di gruppi di specie, è ancora incerta o caotica anche per le più studiate specie europee di questo sottogenere e genere. Perciò nel presente lavoro mi limito a pubblicare le sole

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* Via Vittorio Veneto, 13. 37032 Monteforte d'Alpone (Verona), Italia.

descrizioni di specie nuove e una revisione del genere *Franzidota* Pace, dato che comprende poche specie.

Al materiale del Museo di Ginevra ho aggiunto qualche specie affidatami in studio dal Prof. H. Franz, dal British Museum (Natural History), dal francese J. Orousset e da G. de Rougemont di Londra.

Gli holotypi si conservano nel Museo di Storia Naturale di Ginevra (MHNG), nel British Museum (BM), nel Museo Nazionale di Storia Naturale di Parigi (MHNP), nel Museo Civico di Storia Naturale di Verona (MV), in collezione Franz (CFR) e dell'autore (CPA).

ELENCO DELLE SPECIE

OXYPODINI

Ocalea (s. str.) *himalayica* Cameron, 1939 (Figg. 1-2)

Ocalea (s. str.) *himalayica* Cameron, 1939: 578

1♂ e 2 ♀♀, Kathmandu distr., Phulcoki, 2600 m, 20-21.IV. 1982 (A. & Z. Smetana leg., MHNG); 14 es., Lalitpur distr., Phulcoki, 2550 m, 15.X.1983 (Smetana & Löbl leg., MHNG, CPA); 1 ♀, Manang distr., For. W Bagarchhap, 2200 m, 24.IX.1983 (Smetana & Löbl leg., MHNG).

Esemplari comparati con i tipi di Gahan, Simla Hills.

Specie finora nota di una sola località dell'India settentrionale.

Ocalea (s. str.) *glaciei* sp. n. (Figg. 3 e 7-10)
Ocalea (s. str.) *morvani* sp. n. (Figg. 11-14)
Ocalea (Tetrocalea) gibbula sp. n. (figg. 4-6)

Blapharhymenus nepalensis sp. n. (Figg. 15-16)

Franzidota virgula (Fauvel, 1905), comb. n.

Atheta (Amischa) virgula Fauvel, 1905: 84
Amischa virgula: Bernhauer & Scheerpeltz, 1926: 594
Atheta (Parameotica) nigrorufa Cameron, 1939: 305, **syn. n.**
Franzidota franzi Pace, 1982: 93, **syn. n.**

2 ♂♂, Khandbari distr., for. above Ahale, 2400 m, 25.III.1982 (A. & Z. Smetana leg., MHNG, CPA); 1 ♂, Prov. Bagmati, Gokana, for. nr. Kathmandu, 1400 m, 1.IV.1981 (Löbl & Smetana leg., MHNG).

Esemplari comparati con i tipi (2 ♂♂) di Buitenzorg, Giava.

Specie di Giava già nota dell'India settentrionale e del Nepal, ma con nomi specifici differenti (*Atheta (Parameotica) nigrorufa* Cameron, *Franzidota franzi* Pace).

Franzidota newar sp. n. (Figg. 17-19)
Franzidota smetanaorum sp. n. (Figg. 20-23)
Franzidota smetanai sp. n. (Figg. 24-27)
Franzidota bagmatiensis sp. n. (Figg. 28-29)
Franzidota kuwapanicola sp. n. (Figg. 30-31)
Franzidota gokanica sp. n. (Figg. 32-33)

Apimela pallescens (Cameron, 1939), **comb. n.**

Atheta (Dralica) pallescens Cameron, 1939: 307

1♂, Prov. Bagmati, Phulcoki nr. Kathmandu, 1700 m, 20. V. 1981 (Löbl leg., MHNG).

Esemplare comparato con l'holotypus ♂ di Nakraunda, Siwaliks raccolto da Cameron il 22.X.1922.

Specie nuova per il Nepal.

Apimela aptera sp. n. (Figg. 34-36)
Apimela newarica sp. n. (Figg. 37-38)
Apimela lucidula sp. n. (Figg. 39-41)
Apimela consors sp. n. (Figg. 42-43)

Meotica orousseti sp. n. (Figg. 44-46)

Parapimela morvani sp. n. (Figg. 47-48)

Amarochara (Lasiochara) smetanai sp. n. (Figg. 49-52)
Amarochara, (s. str.) *loebli* sp. n. (Figg. 53-55)

Pachycephalopisalia raraensis sp. n. (Figg. 56-57)
Pachycephalopisalia smetanai sp. n. (Figg. 58-60)
Pachycephalopisalia loebli sp. n. (Figg. 61-65)

Hygropetrophila athetoides sp. n. (Figg. 66-67)
Hygropetrophila smetanai sp. n. (Figg. 68-71)
Hygropetrophila bifurcata sp. n. (Figg. 72-75)
Hygropetrophila ghoropanica sp. n. (Figg. 76-77)

Cousya nepalensis Pace, 1987

Cousya nepalensis Pace, 1987: 429

1 ♂ e 1 ♀, Prov. Bagmati, Yangri Ridge, 4150-4500 m, 23-24. IV.1981 (Löbl & Smetana leg., MHNG).

Specie endemica del Nepal.

Cousya smetanai sp. n. (Figg. 76 bis- 78)

Cousya quadrisulcata Bernhauer, 1934 (Figg. 79-82)

Ocyusa (Cousya) quadrisulcata Bernhauer, 1934: 87; Cameron, 1939: 586

2 ♂♂ e 3 ♀♀, Naltartal, Umg. Jagot, 1-4.VIII.1976 (F. Gartner leg., Karakorumexpedition, Leiter Helmut Linzbichler, CFR, CPA).

Esemplari comparati con i tipi ♂ e ♀ di Baltoro Mundu 3.VI.1929 (Caporiacco leg.), Kashmir.

Specie non ancora nota del Nepal.

Smetanaetha tuberculicollis gen. n., sp. n. (Figg. 83-90)

Oxypoda (s. str.) *hymalayica* Cameron, 1939

Oxypoda (s. str.) *himalayica* Cameron, 1939: 596

1 ♂, Khandbari distr., for. NE Kuwapani, 2550 m, 14.IV.1982 (A. & Z. Smetana leg., MHNG); 1 ♀, Khandbari distr., below Sheduwa, 3000 m, 31.III-1.IV.1982 (A. & Z. Smetana leg., CPA).

Esemplari comparati con i tipi del Chakrata e Mussooree della località Bodyar, 3-12.V.1922 (Cameron leg.) e Woodstock Falls, 27.III.1921 (Cameron leg.); Jadi Gad, 9.V.1922 (Cameron leg.).

Specie nuova per il Nepal.

Oxypoda (s. str.) *sirdar* Pace, 1985

Oxypoda (s. str.) *sirdar* Pace, 1985: 186

5 es., Kathmandu distr., Phulcoki, 2600 m, 20.IV.1982 (A. & Z. Smetana leg., MHNG, CPA); 1 ♂ e 3 ♀♀, Khandbari distr., for. above Ahale, 2300-2400 m, 25-26.III.1982 (A. & Z. Smetana leg., MHNG, CPA).

Probabilmente è specie endemica del Nepal.

Oxypoda (s. str.) *ingens* sp. n. (Figg. 91-94)
Oxypoda (s. str.) *cameroni* sp. n. (Figg. 95-97)
Oxypoda (s. str.) *monticola* sp. n. (Figg. 99-100)
Oxypoda (s. str.) *ulterior* sp. n. (Figg. 101-104)

Oxypoda (Podoxya) nigrolucens Cameron, 1939

Oxypoda (Podoxya) nigrolucens Cemeron, 1939: 601

1 ♂, Prov. Bagmati, Pokhare NE Barahbise, 3000 m, 7.V.1981 (Löbl & Smetana leg., MHNG).

Esemplare comparato con l'holotypus ♂ di Tiger Hills, Ghum distr., V-VI.1931 (Cameron leg.).

Specie nuova per il Nepal.

Oxypoda (Podoxya) nigrita Cameron, 1939

Oxypoda (Podoxya) nigrita Cameron, 1939: 602; Scheerpeltz, 1976: 69

17 es., Prov. Bagmati, Below Thare Pati, 3300 m, 9-10-11-12. IV.1981 (Löbl & Smetana leg., MHNG, CPA); 2 es., Prov. Bagmati, Yardang Ridge, NE Barhabise, 3250 m, 5.V.1981 (Löbl & Smetana leg., MHNG); 1 ♀, Prov. Bagmati, Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG); 2 ♀♀; Prov. Bagmati, Tarke Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♂ e 2 ♀♀, Lalitpur distr., Phulcoki, 2550-2650 m, 13-15.X.1983 (Smetana & Löbl leg., MHNG); 1 ♀, Khandbari distr., above Sheduwa, 3050 m, 2.IV.1982 (A. & Z. Smetana leg., MHNG); 2 es., Mustang distr., Lete, 2550 m, 2.X.1983 (Smetana & Löbl leg., MHNG, CPA).

Esemplari comparati con i tipi.

Specie diffusa un po' ovunque nell'India settentrionale. Già nota del Nepal (Scheerpeltz, 1976).

Oxypoda (Podoxya) proxima Cameron, 1939

Oxypoda (Podoxya) proxima Cameron, 1939: 603 20 es., Kathmandu distr., Phulcoki, 2600-2650 m, 20-21-22.IV.1982 (A. & Z. Smetana leg., MHNG, CPA); 5 es., Prov. Bagmati, below Thare Pati, 3300 m, 9-11-13.IV.1981 (Löbl & Smetana leg., MHNG, CPA).

Esemplari comparati con il lectotypo ♀ di Gulmarg, Kashmir, VI-VII.1931 (Cameron leg.).

Specie del Kashmir e del Punjab, nuova per il Nepal.

Oxypoda (Podoxya) subsericea subsericea Cameron, 1939 (Figg. 105-107)

Oxypoda (Podoxya) subsericea Cameron, 1939: 603

2 ♂♂ e 2 ♀♀, Khandbari distr., Kuwapani, 2100 m, 15.IV.1982, (A. & Z. Smetana leg., MHNG, CPA); 1 ♂, Khandbari distr, for. NE Kuwapani, 2100 m, 28.III.82 (A. & Z. Smetana leg., MHNG); 1 es., Khandbari distr., for. NE Kuwapani, 2500 m, 12.IV.1982 (A. & Z. Smetana leg., MHNG); 3 es., Khandbari distr., Khandbari, 1700 m, 23.III.1982 (A. & Z. Smetana leg., MHNG, CPA); 1 ♂, Khandbari distr., for. above Ahale, 2400 m, 25.III.1982, (A. & Z. Smetana leg., MHNG); 1 ♂, Nepal, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♂, Prov. Bagmati, Gokana, for. nr. Kathmandu, 1400 m, 31.III.1981 (Löbl & Smetana leg., MHNG); 1 ♀, Nepal, Gurjakhan, 83° 14' E-28° 37'N, 30.VI.1954 (Hyatt leg., litter under trees, BM).

Esemplari comparati con quelli della serie tipica di Dehra Dun (1 ♂ e 3 ♀♀), 17.III.1922 (Cameron leg.).

Specie diffusa nell'India settentrionale e ora anche nel Nepal.

Oxypoda (Podoxya) subsericea chakratiensis Pace, 1987

Oxypoda (Podoxya) subsericea chakratiensis Pace, 1987: 431

1 ♂ e 1 ♀, Prov. Bagmati, Malemchi, 14-16.IV.1981, 2800 m (Löbl & Smetana leg., MHNG, CPA).

Sottospecie dell'India settentrionale, già nota del Nepal del distretto di Ilam, Mai Pokhari (Pace, 1987).

Oxypoda (Podoxya) kashmirica Cameron, 1939

Oxypoda (Podoxya) subsericea var. *kashmirica* Cameron, 1939: 603

1 ♂, Khandbari distr., above Sheduwa, 3000 m, 2.IV.1982 (A. & Z. Smetana leg., MHNG); 4 es., Khandbari distr., for. NE Kuwapani, 2500 m, 14.IV.1982 (A. & Z. Smetana leg., MHNG, CPA); 3 es., Khandbari distr., above Tashigaon, 3100 m, 8.IV.1982 (A. & Z. Smetana leg., MHNG, CPA); 1 ♂, Prov. Bagmati, Tarke Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana leg. MHNG); 1 ♂, Prov. Bagmati, above Shermathang, 2900 m, 26.IV.1981 (Löbl & Smetana leg., MHNG); 2 ♀♀, Prov. Bagmati, above Sundarijal, 2000 m, 4.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 10 es., Prov. Bagmati, above Shermathang, 2900 m, 26.IV.1981 (Löbl & Smetana leg., MHNG, CPA); Prov. Bagmati, Mere Dara, 7.IV.1981 (Löbl & Smetana leg., MHNG, CPA).

Esemplari comparati con l'holotypus ♂ di Gulmarg, Kashmir, VI-VII.1931 (Cameron leg.).

Specie finora nota solo del Kashmir.

Oxypoda (Podoxya) subconformis Cameron, 1939

Oxypoda (Podoxya) subconformis Cameron, 1939: 607

1 ♂ e 1 ♀, Khandbari distr., for. NE Kuwapani, 2450 m, 13.IV.1982 (A. & Z. Smetana leg., MHNG); 2 ♂♂ e 2 ♀♀, Khandbari distr., for. above Ahale, 2300 m, 26.III.1982 (A. & Z. Smetana leg., MHNG, CPA).

Esemplari comparati con l'holotypus ♂ etichettato: Ghum distr., V-VI.1931, moos (Cameron leg.).

Specie nuova per il Nepal.

Oxypoda (Podoxya) sericata Pace, 1985

Oxypoda (Podoxya) sericata Pace, 1985: 188

2 ♀♀, Prov. Bagmati, Malemachi, 2800 m, 17.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♀, Prov. Bagmati, Kutumsang, 2200-2400 m, 6.IV.1981 (Löbl & Smetana leg., MHNG).

Specie già nota del Nepal.

Oxypoda (Podoxya) ahalensis sp. n. (Figg. 108-109)
Oxypoda (Podoxya) shastrana sp. n. (Figg. 110-111)
Oxypoda (Podoxya) mixtoides sp. n. (Figg. 112-113)
Oxypoda (Podoxya) smetanaiana sp. n. (Figg. 114-116)
Oxypoda (Podoxya) clavata sp. n. (Figg. 117-119)
Oxypoda (Podoxya) kirata sp. n. (Figg. 120-123)
Oxypoda (Podoxya) shermathangana sp. n. (Figg. 124-127)
Oxypoda (Podoxya) decessa sp. n. (Figg. 128-131)
Oxypoda (Podoxya) dilatata sp. n. (Figg. 132-135)
Oxypoda (Podoxya) gosainthanensis sp. n. (Figg. 136-139)
Oxypoda (Podoxya) elata sp. n. (Figg. 140-143)
Oxypoda (Podoxya) remansa sp. n. (Figg. 144-145)
Oxypoda (Podoxya) remota sp. n. (Figg. 146-147)
Oxypoda (Podoxya) bhairava sp. n. (Figg. 148-149)
Oxypoda (Podoxya) rufomarginella sp. n. (Figg. 150-153)
Oxypoda (Podoxya) burlangana sp. n. (Figg. 154-157)
Oxypoda (Podoxya) yakorum sp. n. (Figg. 158-161)
Oxypoda (Podoxya) specifica sp. n. (Figg. 162-163)
Oxypoda (Podoxya) durga sp. n. (Figg. 164-165)
Oxypoda (Podoxya) dama sp. n. (Figg. 166-168)
Oxypoda (Podoxya) decorella sp. n. (Figg. 169-170)
Oxypoda (Podoxya) pusilla sp. n. (Figg. 171-174)
Oxypoda (Podoxya) chetra sp. n. (Figg. 175-178)
Oxypoda (Podoxya) svetana sp. n. (Figg. 179-180)
Oxypoda (Podoxya) sudra sp. n. (Figg. 181-182)
Oxypoda (Podoxya) ganeshica sp. n. (Figg. 183-186)
Oxypoda (Podoxya) manjushrica sp. n. (Figg. 187-190)
Oxypoda (Podoxya) bissica sp. n. (Figg. 191-194)
Oxypoda (Podoxya) limbu sp. n. (Figg. 195-196)
Oxypoda (Podoxya) personata sp. n. (Figg. 197-198)
Oxypoda (Podoxya) kuwapanensis sp. n. (Figg. 199-200)
Oxypoda (Podoxya) suturalis sp. n. (Figg. 201-205)
Oxypoda (Podoxya) gupta sp. n. (Figg. 206-208)
Oxypoda (Podoxya) gokanica sp. n. (Figg. 209-213)
Oxypoda (Podoxya) bahaliana sp. n. (Figg. 214-218)

Oxypoda (Podoxya) brendelli sp. n. (Figg. 219-221)
Oxypoda (Podoxya) iuvenca sp. n. (Figg. 222-224)
Oxypoda (Podoxya) notaticollis sp. n. (Figg. 225-226)
Oxypoda (Podoxya) smetanaorum sp. n. (Figg. 227-228)
Oxypoda (Podoxya) kumariae sp. n. (Figg. 229-230)
Oxypoda (Podoxya) haesitans sp. n. (Figg. 231-232)
Oxypoda (Podoxya) expeditionis sp. n. (Figg. 233-236)
Oxypoda (Podoxya) orousseti sp. n. (Figg. 237-239)

Oxypoda (Demosoma) rubra Cameron, 1939
Oxypoda (Demosoma) rubra Cameron, 1939: 616
1 ♂, Kathmandu distr., Gokarna forest, 1300 m, 10.IX.1983 (Smetana & Löbl leg., MHNG); 1 ♀, Kathmandu distr., Phulcoki, 2650 m, 22.IV.1982 (A. & Z. Smetana leg., MHNG); 1 ♀ Khandbari distr., Arun river at Num, 10.IV.1982, 1500-1600 m, 10.IV.1982, (A. & Z. Smetana leg., MHNG); 1 ♂ e 2 ♀♀, Khandbari distr., for. above Ahale, 2300 m, 26.III.1982 (A. & Z. Smetana leg., MHNG, CPA); 4 es., Prov. Bagmati, Malemchi, 2800 m, 14.IV.1981 (Löbl leg., MHNG, CPA).

Esemplari comparati con i tipi di Fagu, Simla Hills (♂ e ♀).

Specie finora nota solo dell'India settentrionale.

Oxypoda (Demosoma) franziana Pace, 1984
Oxypoda (Demosoma) franziana Pace, 1984: 158
1 ♂ e 2 ♀♀, Prov. Bagmati, Pokhare, NE Barahbise, 2700-2800 m, 2.V.1984 (Löbl & Smetana leg., MHNG, CPA); 5 es., Prov. Bagmati, Dobate Ridge NE Barahbise, 2700 m, 2.V.1981 (Löbl & Smetana leg., MHNG, CPA); 3 ♀♀, Lalitpur distr., Phulcoki, 2650 m, 13.X.1983 (Löbl & Smetana leg., MHNG); 1 ♂, Manang distr., for. W Bagarchhap, 2200 m, 29.IX.1983 (Smetana & Löbl leg., MHNG); 1 es., Parbat distr., Ghoropani pass, N slope, 2700 m, 6.X.1983 (Smetana & Löbl leg., MHNG).

Specie nota solo del Nepal.

Oxypoda (Demosoma) neutra sp. n. (Figg. 240-241)
Oxypoda (Demosoma) newari sp. n. (Figg. 242-245)
Oxypoda (Demosoma) monasterii sp. n. (Figg. 248-249)
Oxypoda (Demosoma) parbatensis sp. n. (Figg. 250-253)

Oxypoda (Sphenoma) vagans Pace, 1984
Oxypoda (Sphenoma) vagans Pace, 1984: 337
2 ♂♂ e 3 ♀♀, Prov. Bagmati, below Thare Pati, 3300-3500 m, 9-10-12.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♀, Prov. Bagmati, above Shermathang, 2100 m, 26.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♂, Prov. Bagmati, Yardang Ridge, NE Barahbise, 3250 m, 5.V.1981 (Löbl & Smetana leg., MHNG); 3 es. Lalitpur distr., Phulcoki, 2650 m, 14-15-16.X.1985 (Smetana & Löbl leg., MHNG, CPA); 1 ♂, Khandbari distr., "Bakan" W of Tashigaon, 3200 m, 4.IV.1982 (A. & Z. Smetana leg., MHNG).

Specie endemica del Nepal.

Oxypoda (Sphenoma) connexa Cameron, 1939
Oxypoda (Sphenoma) connexa Cameron, 1939: 615
16 es., Lalitpur distr., Phulcoki, 2550-2700 m, 15-16.X.1984 (Smetana & Löbl leg., MHNG, CPA); 50 es., Kathmandu distr., Phulcoki, 2600 m, 20-21-22.IV.1982 (A. & Z. Smetana leg., MHNG, CPA); 7 es., Prov. Bagmati, Phulcoki, 2500 m, 10.V.1981 (Löbl leg., MHNG, CPA); 41 es., Prov. Bagmati, below Thare Pati, 3300 m, 9-10-11.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 23 es., Prov. Bagmati, Malemchi, 16.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 26 es., Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 10 es., Prov. Bagmati, above Shermathang, 2900 m, 26.IV.1981 (Löbl & Smetana leg., MHNG); 9 es., Prov. Bagmati, Tarke Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana leg., MHNG); 7 es., Prov. Bagmati, Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG); 10 es., Prov. Bagmati, Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 6 es., Prov. Bagmati, Yangri Ridge, 4200 m,

21.IV.1981 (Löbl & Smetana leg., MHNG); 22 es., Khandbari distr., "Bakan" W of Tashigaon, 3250 m, 4.IV.1982 (A. & Z. Smetana leg., MHNG, CPA); 2 es., Khandbari distr., for. above Ahale, 2400 m, 25.III.1982 (A. & Z. Smetana leg., MHNG); 1 ♂ e 4 es., Kandbari distr., above Sheduwa, 3000 m, 2.IV.1982 (A. & Z. Smetana leg., MHNG); 30 es., Khandbari distr., for. NE Kuwapani, 2500 m, 28.III-11-12.IV.1982 (A. & Z. Smetana leg., MHNG, CPA); 19 es., Parbat distr., Ghoropani pass, N slope, 2700 m, 6.X.1983 (Smetana & Löbl leg., MHNG, CPA).

Esemplari comparati con l'holotypus ♀ di Mangpu, Ghum distr., V.1931 (Cameron leg.).

Specie finora nota solo sull'holotypus, sembra la più comune *Oxypoda* del Nepal.

Oxypoda (Sphenoma) annapurnensis Pace, 1984

Oxypoda (Sphenoma) annapurnensis Pace, 1984: 161

2 ♀♀, Parbat distr., Ghoropani pass, 2850 m, 9.X.1983 (Smetana & Löbl leg., MHNG, CPA); 1 ♀, Prov. Bagmati, Malemchi, 2800 m, 17.IV.1981 (Löbl & Smetana leg., MHNG).

Specie endemica del Nepal.

Oxypoda (Sphenoma) aulica Pace, 1984

Oxypoda (Sphenoma) aulica Pace, 1984: 158

5 es., Manang distr., 4 Km SE Pisang, 3050 m, 26.IX.1983 (Smetana & Löbl leg., MHNG, CPA).

Specie endemica del Nepal.

Oxypoda (Sphenoma) peregrina Pace, 1984

Oxypoda (Sphenoma) peregrina Pace, 1984: 161

1 ♂, Prov. Bagmati, Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana leg., MHNG).

Specie endemica del Nepal.

Oxypoda (Sphenoma) franzi sp. n. (Figg. 254-256)
Oxypoda (Sphenoma) breviantennata sp. n. (Figg. 257-259)
Oxypoda (Sphenoma) loebli sp. n. (Figg. 260-262)
Oxypoda (Sphenoma) crassiuscula sp. n. (263-265)
Oxypoda (Sphenoma) nagaidana sp. n. (Figg. 266-269)
Oxypoda (Sphenoma) cephalina sp. n. (Figg. 270-273)

Oxypoda (Mycetodrepa) marginalis Cameron, 1939

Oxypoda (Mycetodrepa) marginalis Cameron, 1939: 613

1 ♂ e 1 ♀, Lalitpur distr., Phulcoki, 2650-2700 m, 14-16.X.1983 (Smetana & Löbl leg., MHNG, CPA).

Specie finora nota solo dell'India settentrionale.

Oxypoda (Mycetodrepa) ustulata Pace,1984

Oxypoda (Mycetodrepa) ustulata Pace, 1984: 463

1 ♀, Prov. Bagmati, near Mere Dara, 8.IV.1981 (Löbl & Smetana leg., MHNG).

Specie finora nota solo dellaThailandia settentrionale.

Oxypoda (Mycetodrepa) nepaliella sp. n. (Figg. 274-275)
Oxypoda (Mycetodrepa) minicephala sp. n. (Figg. 276-278)

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Gonionycha smetanai sp. n. (Figg. 279-281)

Pseudoplandria beesoni Cameron, 1939

Pseudoplandria beesoni Cameron, 1939: 672

1 ♂, Prov. Bagmati, Nagarjung, for. nr. Kathmandu, 1650 m, 2.IV.1981 (Löbl & Smetana leg. MHNG); 1 ♀, Prov. Bagmati, Gokana, for. nr. Kathmandu, 1400 m, 1.IV.1981 (Löbl & Smetana leg., MHNG).

Specie finora nota solo del distretto di Ghum, India.

Pseudoplandria umbonata Pace, 1987

Pseudoplandria umbonata Pace, 1987: 434

14 ♂♂ e 3 ♀♀, Prov. Bagmati, Pokhare, NE Barahbise 2700-3000 m, 2-7.V.1981 (Löbl & Smetana leg., MHNG, CPA); 2 ♂♂ e 1 ♀, Prov. Bagmati, Dobate Ridge, NE Barahbise, 2700 m, 2.V.1981 (Löbl & Smetana leg., MHNG); 2 ♀♀, Prov. Bagmati, above Shermathang, 2400 m, 26.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♂, Khandbari distr., above Tashigaon, 3500 m, 6.IV.1982 (A. & Z. Smetana leg., MHNG).

Specie finora nota solo del Nepal.

Pseudoplandria vaga Pace, 1984

Pseudoplandria vaga Pace, 1984: 163

2 ♂♂ e 2 ♀♀, Prov. Bagmati, Malemchi, 2800 m, 14-16.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♂, Prov. Bagmati, Tarche Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana leg., MHNG); 2 ♂♂, Prov. Bagmati, Phulcoki nr. Kathmandu, 1700-2300 m, 10.V.1981 (Löbl leg., MHNG, CPA); 1 ♂ Kathmandu distr., for. above Ahale, 2400 m, 25.III.1982 (A. & Z. Smetana leg., MHNG); 1 ♀, Prov. Bagmati, Dobate Ridge, NE Barahbise, 2700 m, 2.V.1981 (Löbl & Smetana leg., MHNG); 11 es., Khandbari distr., for. NE Kuwapani, 2550 m, 11-12-13.IV.1982 (A. & Z. Smetana leg., MHNG, CPA) ; 2 ♀♀, Khandbari distr., above Tashigaon, 3100 m, 8.IV.1982 (A. & Z. Smetana leg., MHNG); 1 ♂ e 2 ♀♀, Khandbari distr., for. above Ahale, 2300 m, 26.III.1982 (A. & Z. Smetana leg., MHNG); 1 ♂ e 2 ♀♀, Khandbari distr., above Sheduwa, 2.IV.1982 (A. & Z. Smetana leg., MHNG); 1 ♀, Manang distr., for. W Bagarchhap, 22.IX.1983 (Smetana & Löbl leg. MHNG).

Specie nota solo del Nepal.

Pseudoplandria loebli sp. n. (Figg. 282-285)
Pseudoplandria smetanai sp. n. (Figg. 286-289)
Pseudoplandria praesens sp. n. (Figg. 290-291)
Pseudoplandria convergens sp. n. (Figg. 292-295)

Aleochara (Xenochara) himalayica Cameron, 1939

Aleochara (Polychara) himalayica Cameron, 1939: 646

1 ♂, Nepal, Budhanilkantha, 2000 m, 1.VI.1986 (Orousset leg., CPA).

Specie finora nota solo dell'India settentrionale.

Aleochara (Coprochara) bipustulata (Linné, 1761)

Staphylinus bipustulatus Linné, 1761: 232

Aleochara (Coprochara) bipustulata: Cameron, 1939: 650

11 es., Lalitpur distr., Phulcoki, 2550 m, 14-16.X.1984 (Smetana & Löbl leg., MHNG, CPA); 4 es., Parbat distr., Ghoropani pass, 2850 m, 9.X.1983 (Smetana & Löbl leg., MHNG).

Specie cosmopolita.

DESCRIZIONI

Ocalea (s. str.) **glaciei** sp. n. (Figg. 3 e 7-10)

TIPO. Holotypus ♂, Naltartal, ob. Naltar (Karakorumexpedition 1974, Leiter Helmut Linzbichler, CFR).

Paratypi: 9 es., stessa provenienza (CFR, CPA); 1 ♀, Westnepal, Gebiet von Jumla (Franz leg., CFR); 1 es., Nichinai Tal 3100-3200 m, 9.VI.1976 (Martens & Schawaller leg., CFR).

DESCRIZIONE. Lung. 3,9 mm. Corpo lucidissimo e nero-bruno; elitre brune; addome nero con estremità distale bruno-rossiccia; antenne bruno-rossicce con i due antennomeri basali appena schiariti. Il corpo è privo di distinta microreticolazione. La punteggiatura del capo e del pronoto è molto superficiale, quella delle elitre è distinta. Edeago figg. 8-10; spermateca fig. 3.

COMPARAZIONI. Specie affine a *O. himalayica* Cameron, 1939, del Kashmir e regioni vicine, ma le elitre della nuova specie sono nettamente meno larghe in rapporto alla larghezza del pronoto, gli occhi sono più ridotti e l'edeago più profondamente ricurvo al lato ventrale, con lunga e larga lama apicale de sacco interno (tozza in *himalayica*, fig. 2).

Ocalea (s. str.) **morvani** sp. n. (Figg. 11-14)

TIPI. Holotypus ♂, Nepal, Janga Pass-River, 1200-700 m, X.1987 (Morvan leg., MV). Paratypi: 4 es., stessa provenienza (MV, coll. De Rougemont).

DESCRIZIONE. Lungh. 4,7 mm. Capo e pronoto neri, elitre brune, addome nero con base bruna, antenne nere con primo antennomero e base del secondo giallo-rossicci, zampe gialle. Corpo lucido privo di distinta microreticolazione. La punteggiatura dell'avancorpo è molto superficiale, quella dell'addome è distinta. Edeago figg. 12-14; spermateca fig. 13.

COMPARAZIONI. Dato che la nuova specie presenta tutti gli antennomeri molto più lunghi che larghi e pronoto lungo quanto largo, essa è nettamente distinta dalle varie specie geograficamente vicine: *O. championi* Cameron, 1939, *O. simlaensis* Cameron, 1939, *O. submetallica* Cameron, 1939 e *O. himalayica* Cameron, 1939.

Ocalea (Tetrocalea) gibbula sp. n. (Figg. 4-6)

TYPO. Holotypus ♂, Nepal, Gurjakhani, 83° 14' E – 28° 37' N, 8500 ft., 30.IV.1954 (K. H. Hyatt leg., litter under tree; B. M. Nepal Expedition, BM).

DESCRIZIONE. Lungh. 3,7 mm. Corpo lucido e bruno-rossiccio; capo e base degli uriti bruni; antenne rossicce, con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. Tra gli occhi sulla fronte a metà è presente un tubercolo; la punteggiatura e la reticolazione del capo sono svanite; due netti e robusti punti stanno sulla parte posteriore del capo. Il pronoto presenta punteggiatura e reticolazione svanite e un'impressione trasversa posteriore. Punteggiatura netta e reticolazione superficiale coprono la superficie delle elitre. Edeago figg. 5-6; femmina sconosciuta.

COMPARAZIONI. Specie distinta da *O. rufobrunnea* Cameron, 1939 del distretto di Ghum, India, per avere tra l'altro i penultimi antennomeri trasversi e il pronoto nettamente trasverso.

Blepharhymenus nepalensis sp. n. (Figg. 15-16)

TIPO. Holotypus ♀, Khandbari distr., for. above Ahale, 2400 m, 25.III.1982 (A. & Z. Smetana leg., MHNG).

DESCRIZIONE. Lungh. 4,2 mm. Capo opaco. resto del corpo lucido. Corpo bruno-rossiccio; addome bruno con i tre uriti basali bruno-giallicci; antenne rossicce con i 5 antennomeri basali gialli; zampe gialle con femori medi e posteriori macchiati di bruno dalla metà fino verso le ginocchia, senza toccarle all'estremità. La reticolazione del capo è vigorossissima, quella del pronoto svanita e quella delle elitre appena distinta. La punteggiatura del capo è appena distinta, quella del pronoto è profonda e netta e quella delle elitre è netta sulla metà basale e superficiale e fine sulla metà posteriore. Spermateca fig. 16; maschio sconosciuto.

Comparazioni. Il genere *Blepharhymenus* Solier, 1849, comprende specie piuttosto localizzate e finora non era noto del Nepal, nè del resto dell'Himalaya. Era noto solo della Cina nord-occidentale con la sola specie *B. chinensis* Bernhauer, 1939 che ha elitre molto corte (e perciò appartiene al sottogenere *Syntomenus* Bernhauer, 1939) e pronoto profondamente solcato sulla linea mediana e finemente punteggiato: ciò non si osserva affatto sulla nuova specie. Per avere i penultimi antennomeri trasversi e le elitre posteriormente non incavate, la nuova specie è nettamente distinta anche dal centro-europeo *B. mirandus* Fauvel, 1899.

Franzidota newar sp. n. (Figg. 17-19)

Tipo. Holotypus ♂, Prov. Bagmati, Gokana, for. nr. Kathmandu, 1400 m, 31.III.1981 (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 1,8 mm. Corpo lucido e giallo-rossiccio; quarto urite e base del quinto bruno-rossicci; antenne rossicce con i tre antennomeri basali gialli; zampe gialle. La reticolazione del capo è svanita, quella del pronoto e delle elitre è assente, quella dell'addome molto superficiale. La punteggiatura del capo è indistinta. Tubercoletti fini e fitti coprono il pronoto e le elitre. Una fossetta sta sulla fronte tra gli occhi. Edeago figg. 18-19; femmina sconosciuta.

Comparazioni. Rinvio alla chiave delle specie del genere *Franzidota* data sotto.

Etimologia. Dai Newar, antico gruppo etnico della Valle di Kathmandu.

Franzidota smetanaorum sp. n. (Figg. 20-23)

Tipi. Holotypus ♂, Khandbari distr., Arun River at Num, 1500-1600 m, 10.IV.1982 (A. & Z. Smetana leg., MHNG).

Paratypi: 5 es., stessa provenienza (MHNG, CPA).

Descrizione. Lungh. 1,1 mm. Corpo lucido e giallo-rossiccio; elitre e uriti terzo e quarto rossicci scuri; antenne bruno-rossicce con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. Il capo presenta punteggiatura fittissima e finissima. Tubercoletti poco salienti e fitti coprono la superficie del pronoto e delle elitre. Edeago figg. 21-22; spermateca fig. 23.

Comparazioni. Si veda oltre la chiave delle specie del genere *Franzidota*.

Etimologia. Specie dedicata ai suoi raccoglitori, il Dr. Ales Smetana e a sua moglie signora Zdena.

Franzidota smetanai sp. n. (Figg. 24-27)

Tipi. Holotypus ♂, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg. MHNG).

Paratypi: 13 es., stessa provenienza (MHNG, CPA); 6 es., Prov. Bagmati, Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♀, Khandbari distr., for. NE Kuwapani, 2500 m, 11.IV.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 1,5 mm. Corpo lucido e giallo-rossiccio, comprese antenne e zampe; elitre e quarto urite rossicci. Specie attera. Il capo e il pronoto presentano punteggiatura distinta e molto fitta. Le elitre sono coperte di tubercoletti fitti e poco salienti. Edeago figg. 25-26; spermateca fig. 27.

Comparazioni. Si veda la chiave data oltre.

Etimologia. Specie dedicata a uno dei suoi raccoglitori, il Dr. A. Smetana, noto studioso specialista di Staphylinidae.

Franzidota bagmatiensis sp. n. (Figg. 28-29)

Tipo. Holotypus ♀, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 1,6 mm. Corpo lucido e giallo-rossiccio; elitre e quarto urite rossicci; antenne rossicce con i due antennomeri basali giallo-rossicci; zampe gialle. Il capo e il pronoto presentano reticolazione svanita e indistinta punteggiatura. Sulle elitre tubercoletti distinti stanno su una superficie non reticolata. Spermateca fig. 29; maschio sconosciuto.

Comparazioni. Si veda oltre la chiave delle specie del genere *Franzidota*.

Franzidota kuwapanicola sp. n. (Figg. 30-31)

Tipo. Holotypus ♀, Khandbari distr., for. NE Kuwapani, 2500 m, 11.IV.1982 (A. & Z. Smetana leg. MHNG).

Descrizione. Lungh. 1,6 mm. Corpo lucido. Capo e pronoto rossicci, elitre bruno-rossicce; addome giallo-rossiccio con quarto urite bruno-rossiccio; antenne rossicce con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. Il capo mostra reticolazione distinta ed è privo di punteggiatura. I tubercoletti del pronoto e delle elitre sono superficiali e stanno su un fondo non reticolato. Spermateca fig. 31; maschio sconosciuto.

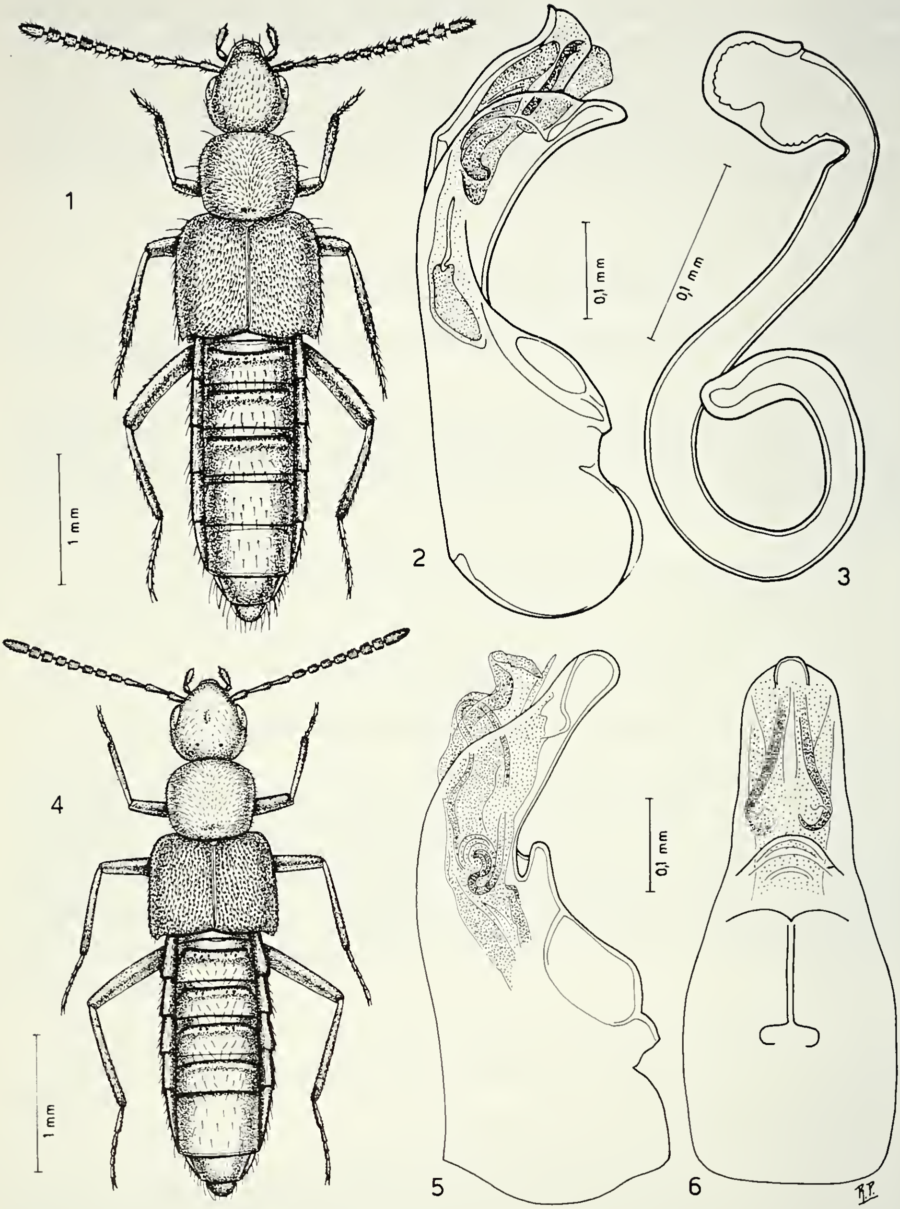
Comparazioni. Si veda sotto la chiave delle specie del genere *Franzidota*.

Franzidota gokanica sp. n. (Figg. 32-33)

Tipo. Holotypus ♀, Prov. Bagmati, Gokana, for. nr. Kathmandu, 1400 m, 31.III.1981 (Löbl & Smetana leg., MHNG).

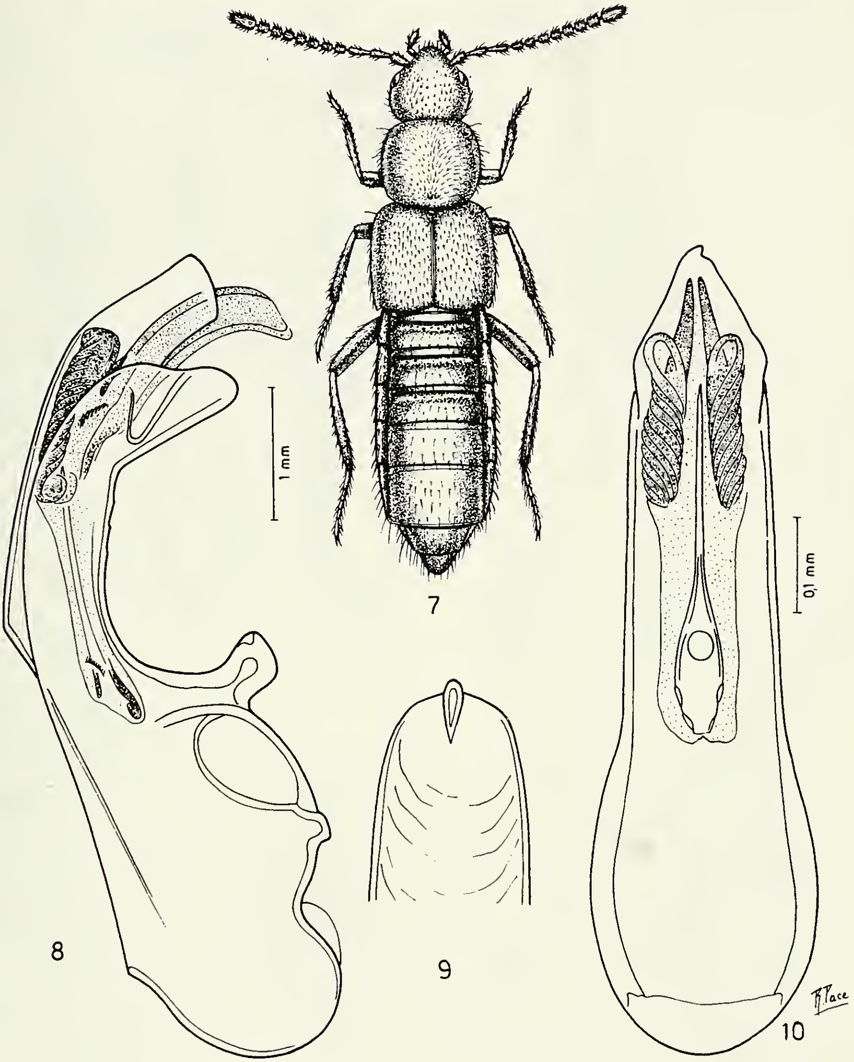
Descrizione. Lungh. 1,4 mm. Corpo lucido e giallo-rossiccio; elitre e uriti terzo, quarto e base del quinto bruno-rossicci; antenne brune con i due antennomeri basali giallo-rossicci; zampe gialle. Il capo e il pronoto sono coperti di reticolazione svanita e di punteggiatura pressoché indistinta. Tubercoletti poco salienti stanno sulle elitre. Spermateca fig. 32; maschio sconosciuto.

Comparazioni. Si veda sotto la chiave delle specie del genere *Franzidota*.



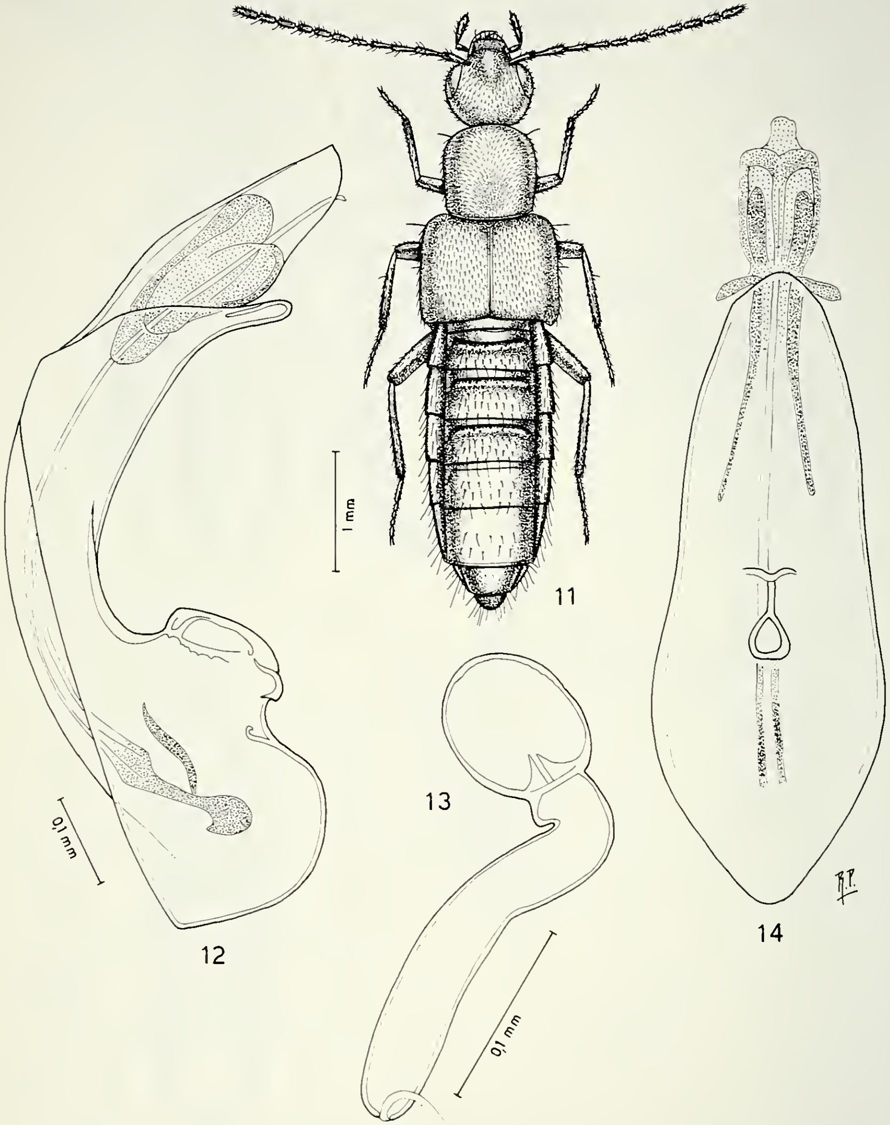
FIGG. 1-6.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 1-2: *Ocalea* (s. str.) *himalayica* Cameron, lecrotypus. Fig. 3: *Ocalea* (s. str.) *glaciei* sp. n. Figg. 4-6: *Ocalea (Tetrocalea) gibbula* sp. n.



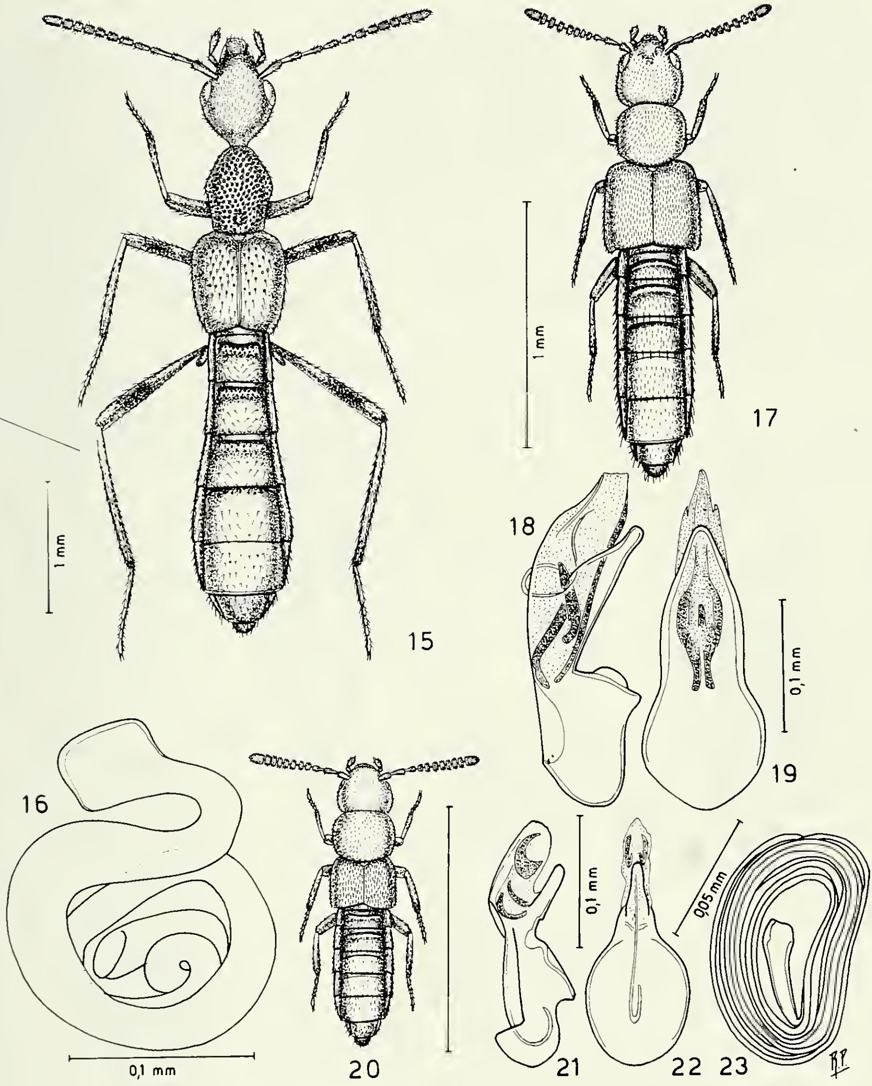
FIGG. 7-10.

Habitus ed edeago in visione laterale, ventrale (solo l'apice) e dorsale.
Figg. 7-10: *Ocalea* (s. str.) *glaciei* sp. n.



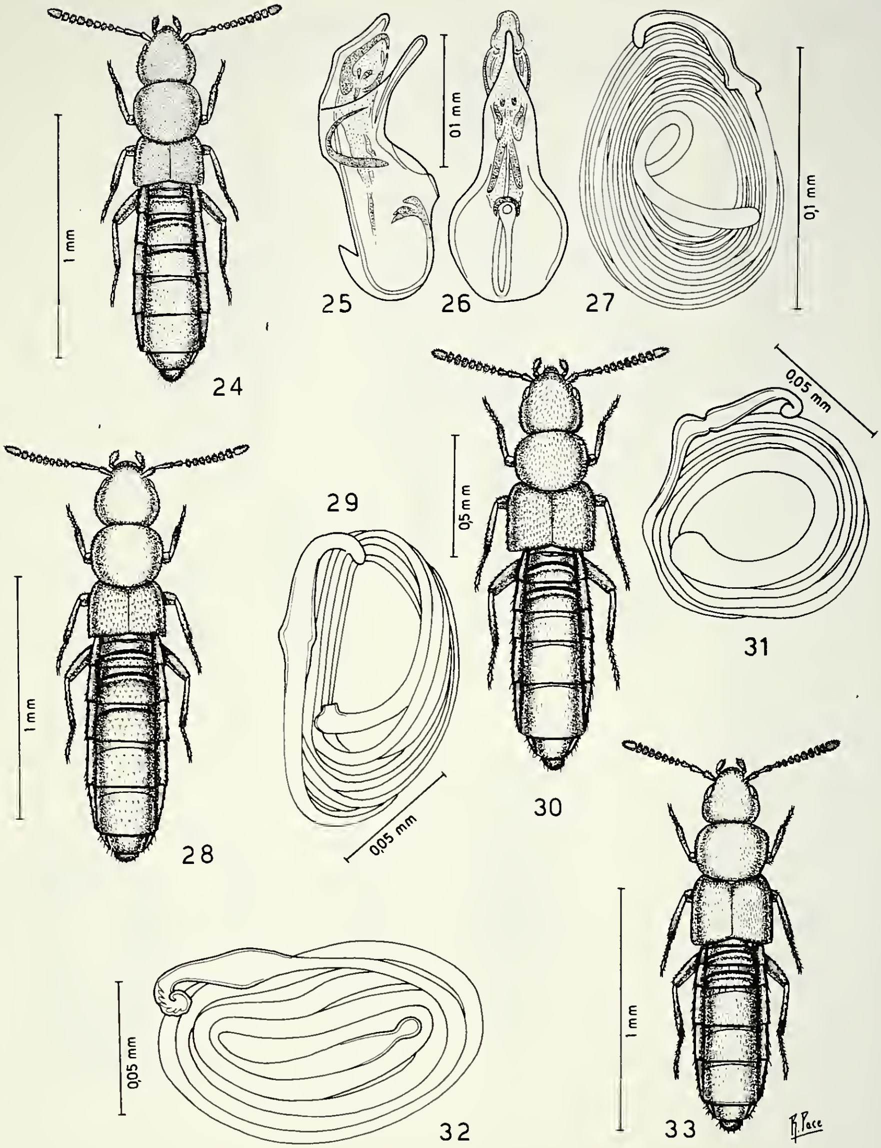
FIGG. 11-14.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 11-14: *Ocalea* (s. str.) *morvani* sp. n.



FIGG. 15-23.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 15-16: *Blepharhymenus nepalensis* sp. n. Figg. 17-19: *Franzidota newar* sp. n. Figg. 20-23: *Franzidota smetanaorum* sp. n.



FIGG. 24-33.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 24-27: Franzidota smetanai sp. n. Figg. 28-29: *Franzidota bagmatiensis* sp. n. Figg. 30-31: *Franzidota kuwapanicola* sp. n. Figg. 32-33: *Franzidota gokanica* sp. n.

Il genere **Franzidota** Pace, 1982

Il genere *Franzidota* Pace, 1982, è stato descritto su un solo esemplare femmina e apparentemente la formula tarsale era 4-4-5. L'esame del maschio in fase successiva alla pubblicazione della descrizione del genere *Franzidota* e l'esame dei tipi di *Amischa virgula* Fauvel, 1905, di Giava, mi hanno permesso di accertare che la formula tarsale di *Franzidota* è 4-5-5 e non 4-4-5 come appare nella descrizione originale, e che la specie *virgula* non può appartenere al genere *Amischa* Thomson, 1858, che è caratterizzato da ligula larga e intera, cioè non divisa a metà, mentre *virgula* presenta ligula larga profondamente divisa a metà, come nel genere *Franzidota*. Inoltre la spermateca a matassa di virgula non è simile a quella delle specie di *Amischa* che hanno generalmente spermateca tubuliforme molto allungata e mai avvolta a matassa.

La collocazione tribale di *Franzidota*, nonostante la formula tarsale 4-5-5 è pertanto tra gli Oxypodini, accanto ad alcuni generi di questa tribù che presentano spermateca avvolta a matassa, l'edeago privo di bretelle preapicali e l'esiguità del corpo, permettono di collocare *Franzidota* vicino al genere *Apimela* Mulsant & Rey, 1874, che pure presenta specie a spermateca avvolta a matassa, ligula larga e divisa, ma la formula tarsale è 5-5-5.

La collocazione tribale di *Franzidota* tra gli Athetini sarebbe una forzatura. In questa tribù *Franzidota* potrebbe essere posto presso i generi *Aloconota* Thomson, 1858 o *Pelioptera* Kraatz, 1857. Ma in questi due generi l'edeago presenta generalmente due bretelle preapicali dorsali, assenti nell'edeago di *Franzidota* o di *Apimela*, spermateca non avvolta a matassa, corpo molto grande, con tubercoli o carene o sulle elitre o sugli uroterghi del maschio, assenti nelle specie dei generi *Franzidota* e *Apimela*. Pertanto la collocazione del genere *Franzidota* presso *Aloconota* o *Pelioptera*, sarebbe in stridente contrasto. Ciò non si verifica se si colloca *Franzidota* presso *Apimela*, nonostante la formula tarsale 4-5-5, invece di 5-5-5.

D'altronde la tendenza a svalutare il carattere diagnostico tribale della formula tarsale, al fine di formare gruppi di generi effettivamente affini, è stata già attuata per altri generi delle Aleocharinae: *Paraleptusa* Peyerimhoff, 1901, nonostante la formula tarsale 4-4-5, è vicino sistematicamente al genre *Geostiba* Thomson, 1858, se si osserva la forma della spermateca e quella dell'edeago. La tribù Gymnusini comprende generi a formula tarsale 2-2-2, 3-3-3 e 5-5-5. La tribù Diglottini comprende generi a formula tarsale sia 4-4-4 (*Diglotta* Champion, 1887) sia 4-4-5 (*Bryothinusa* Casey, 1904).

A seguito della mia insufficiente osservazione, (dovuta a scarsità di materiale disponibile da esaminare) cioè di aver notato in *Franzidota* formula tarsale 4-4-5 invece di 4-5-5, nel 1984 descrivevo il genere *Loeblistiba* Pace che presentava formula tarsale 4-5-5. L'attuale constatazione è che è sinonimo di *Franzidota*.

Alle sinonimie già date nell'elenco delle specie, sono da aggiungere le seguenti nuove sinonimie, insieme a nuove combinazioni.

Franzidota Pace, 1982
    Franzidota Pace, 1982: 91
    Loeblistiba Pace, 1984: 896, **syn. n.**

Franzidota colorata (Cameron, 1939), **comb. n.**
    Amischa colorata Cam., 1939: 275

Franzidota loebli (Pace, 1984), **comb. n.**
    Loeblistiba loebli Pace, 1984: 897

Chiave delle specie

1. Elitre più lunghe o lunghe quanto il pronoto 2
— Elitre più corte del pronoto 6
2. Elitre nettamente più lunghe del pronoto; fronte con una fossetta triangolare, figg. 17-19. Lungh. 1,8 mm. Nepal. .... *newar* sp. n.
— Elitre lunghe quanto il pronoto o appena più lunghe 3
3. Apice del bulbo distale della spermateca descrivente una spira, figg. 31-32 4
— Apice del bulbo distale della spermateca semplice, senza volute a spira 5
4. Pronoto più trasverso; bulbo prossimale della spermateca nettamente distinto per larghezza dalla matassa del tubulo mediano; maschio aconosciuto, fig. 31. Lungh. 1,6 mm. Nepal. .... *kuwapanicola* sp. n.
— Pronoto meno trasverso; bulbo prossimale della spermateca non distinto per larghezza dalla matassa del tubulo mediano, fig. 32; maschio sconosciuto. Lungh. 1,4 mm. Nepal. .... *gokanica* sp. n.
5. Elitre nettamente più larghe del pronoto; bulbo prossimale e distale della spermateca meno sviluppati; maschio sconosciuto. Lungh. 1,7 mm. India. ....*colorata* (Cameron)
— Elitre poco più larghe del pronoto; bulbo prossimale e distale della spermateca, più sviluppati. Lungh. 1,6 mm. Giava, Nepal. .... *virgula* (Fauvel)
6. Elitre molto più corte del pronoto. 7
— Elitre più corte del pronoto. 8
7. Spermateca più piccola; apice del bulbo distale della spermateca foggiato a spirale; bulbo prossimale della spermateca larghissimo; matassa composta di tubulo largo: Lungh. 1,3 mm. India. .... *loebli* (Pace)
— Spermateca grande; apice del bulbo distale della spermateca debolmente ricurvo; bulbo prossimale della spermateca stretto; matassa composta di tubulo estremamente sottile. Lungh. 1,5 mm. Nepal. .... *smetanai* sp. n.
8. Corpo piccolo (1,1 mm); pronoto nettamente trasverso; spermateca a matassa composta di tubulo sottile. Nepal. .... *smetanaorum* sp. n.
— Corpo meno piccolo (1,6 mm); pronoto poco trasverso; spermateca a matassa composta di tubulo largo. Nepal. .... *bagmatiensis* sp. n.

Apimela aptera sp. n. (Figg. 34-36)

Tipo. Holotypus ♂, Khandbari distr., "Bakan" W of Tashigaon, 3250 m, 4.IV.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 1,9 mm. Specie attera. Corpo lucido e bruno; antenne bruno-rossicce con i due antennomeri basali giallo-rossicci; zampe gialle. Il capo e il pronoto presentano punteggiatura fine e distinta, posta su un fondo non microreticolato. I tubercoletti che coprono le elitre sono molto superficiali. Edeago figg. 35-36; femmina sconosciuta.

Comparazioni. Poiché ha occhi molto ridotti ed elitre molto più corte del pronoto, la nuova specie è distinta da quelle note che non sono attere. La sola specie dell'Himalaya, descritta come *Atheta (Dralica) pallescens* Cameron 1939: 307 e ora da nominare *Apimela pallescens* (Cameron, 1939), **comb. n.**, oltre ad avere elitre più lunghe del pronoto, ha occhi più sviluppati ed edeago a profilo ventrale molto arcuato.

Apimela newarica sp. n. (Figg. 37-38)

TIPO. Holotypus ♀, Nepal, Mt. Phulchoki, 2400 m, 7.V.1986 (Orousset leg., litière et argile dans un canal de drainage, MHNP).

DESCRIZIONE. Lungh. 2,0 mm. Corpo lucido e bruno-rossiccio; capo e uriti terzo, quarto e base del quinto, bruni; estremità addominale giallo-rossiccia; antenne brune con i due antennomeri basali giallo-rossicci; zampe gialle. La superficie del corpo non è microreticolata. La punteggiatura del capo e del pronoto è fitta e fine. Le elitre sono coperte di tubercoletti fini, fitti e svaniti. Spermateca fig. 38; maschio sconosciuto.

COMPARAZIONI. Specie distinta da *A. pallescens* (Cameron, 1939), dell'India, per il pronoto più trasverso, per le tempie più allargate all'indietro e per la spermateca che ha matassa composta di numerosissime spire di tubulo sottile e non composta di 4-5 spire di tubulo molto largo come in *pallescens*.

ETIMOLOGIA. Dai Newar, antico gruppo etnico della Valle di Kathmandu.

Apimela lucidula sp. n. (Figg. 39-41)

TIPO. Holotypus ♂, Manang distr., for. W Bagarchhap, 2200 m, 21.IX.1983 (Smetana & Löbl leg., MHNG).

DESCRIZIONE. Lungh. 2,5 mm. Corpo lucidissimo e bruno-rossiccio; antenne brune con i tre antennomeri basali bruno-rossicci; zampe gialle. La reticolazione del capo è svanita, quella del pronoto quasi indistinta. La punteggiatura del capo e del pronoto è quasi indistinta. Le elitre presentano tubercoletti estremamente svaniti. Edeago figg. 40.41; femmina sconosciuta.

COMPARAZIONI. Per avere il pronoto molto trasverso, gli occhi lunghi quanto le tempie e l'edeago molto largo, in visione ventrale, la nuova specie è nettamente distinta da *A. pallescens* (Cameron, 1939) dell'India e da altre specie orientali.

Apimela consors sp. n. (Figg. 42-43)

TIPO. Holotypus ♀, Nepal, Kathmandu Valley, Sundarijal, 2000 m, 5.VI.1986 (Orousset leg., forêt de pins dans des gorges; cascades, tas de débris d'inondations, MHNP).

DESCRIZIONE. Lungh. 2,0 mm. Corpo lucido e bruno-rossiccio; capo bruno; elitre giallicce; uriti quarto e metà basale del quinto bruni; antenne nere con i due antennomeri basali giallo-rossicci; zampe gialle. L'avancorpo presenta punteggiatura fine, fitta e molto svanita e superficie non microreticolata. Spermateca fig. 43; maschio sconosciuto.

COMPARAZIONI. Specie simile ad *A. newarica* sp. n. sopra descritta. Se ne distingue per il maggiore sviluppo della parte foggiata a matassa della spermateca e per il bulbo prossimale della stessa esile.

Parapimela morvani sp. n. (Figg. 47-48)

TIPO. Holotypus ♀, Nepal, Roukoum, 1500 m, X.1987 (P. Morvan leg., MV).

DESCRIZIONE. Lungh. 2,6 mm. Corpo lucido e rossiccio; capo e metà posteriore delle elitre bruno-rossicci; antenne brune con i due antennomeri basali giallo-rossicci; zampe gialle. L'avancorpo è corperto di punteggiatura fine, fitta e distinta. Il pronoto ha una depressione posteriore mediana larga. Spermateca fig. 48; maschio sconosciuto.

COMPARAZIONI. Specie distinta da *P. assamensis* Cameron, 1939, dell'Assam, per la minore taglia, per gli occhi meno sviluppati e per la larga depressione mediana posteriore del pronoto.

Meotica orousseti sp. n. (Figg. 44-46)

TIPO. Holotypus ♂, Nepal, Royal Chitwan National Park, Sauraha, 100 m, 24.V.1986 (Orousset leg., forêt de savane, près de rivière, tamisage et lavage de bois pourri et sable, MHNP).

DESCRIZIONE. Lungh. 1,6 mm. Corpo lucido e rossiccio. Capo bruno; antenne giallo-brunicce con i 5 antennomeri basali gialli; zampe gialle. I tubercoletti del capo e del pronoto sono distinti e salienti, quelli delle elitre sono svaniti. Edeago figg. 45-46; femmina sconosciuta.

COMPARAZIONI. Specie distinta dalla specie geograficamente vicina cioè *M. zoiai* Pace, 1985 del Pakistan, per la minore taglia, per gli occhi più sviluppati, per il pronoto più trasverso, per le elitre più lunghe e per l'edeago molto più largo, in visione ventrale. Il genere *Meotica* è nuovo per il Nepal.

Amarochara (Lasiochara) smetanai sp. n. (Figg. 49-52)

TIPI. Holotypus ♂, Khandbari distr., Kuwapani, 2100 m, 15.IV.1982 (A. & Z. Smetana leg., MHNG).
Paratypi: 2 es., stessa provenienza (MHNG, CPA).

DESCRIZIONE. Lungh. 2,5 mm. Corpo lucido e bruno; antenne brune con antennomero basale bruno-rossiccio; zampe brunicce. Solo il capo presenta reticolazione molto svanita: il resto del corpo è privo di microreticolazione. Il capo e il pronoto sono coperti di punteggiatura superficiale. Le elitre presentano tubercoletti salienti a raspa. Edeago figg. 50-51; spermateca fig. 52.

COMPARAZIONI. La nuovo specie è distinta dalle affini *A. simlaensis* Cameron, 1939 e *A. heterogaster* Cameron, 1939, entrambe dell'India, per avere il primo antennomero bruno-rossiccio, per il terzo antennomero più corto del secondo, per le elitre nettamente più larghe del pronoto.

ETIMOLOGIA. Specie dedicata a uno dei suoi raccoglitori, il Dr. A. Smetana, noto studioso di Staphylinidae.

Amarochara (s. str.) **loebli** sp. n. (Figg. 53-55)

TIPO. Holotypus ♂, Prov. Bagmati, Tarke Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana leg., MHNG).

DESCRIZIONE. Lungh. 2,7 mm. Corpo lucido e bruno-rossiccio; antenne brune con i due antennomeri basali rossicci; zampe rossicce. Il capo e il pronoto presentano punteggiature fine poco distinta. Le elitre purtroppo sono mancanti, probabilmente perdute nelle fasi di raccolta. Edeago figg. 54-55; femmina sconosciuta.

COMPARAZIONI. Specie distinta dall'olartica *A. umbrosa* Erichson, 1839, per avere il terzo antennomero non distintamente più corto del secondo e per la forma dell'edeago.

ETIMOLOGIA. Specie dedicata a uno dei suoi raccoglitori, il Dr. I. Löbl del Museo di Storia Naturale di Ginevra, noto studioso di Pselaphidae.

Pachycephalopisalia raraensis sp. n. (Figg. 56-57)

TIPO. Holotypus ♀, W Nepal, Gebiet des Rarasee (Franz leg., MHNP).

DESCRIZIONE. Lungh. 1,9 mm. Corpo debolmente lucido e nero bruno; antenne brune con i due antennomeri basali rossicci; zampe rossicce. La reticolazione del capo è indistinta, quella del pronoto appena distinta, quella delle elitre e dell'addome netta. Il capo e il pronoto presnetano punteggiatura fine e superficiale. Le elitre sono coperte di tubercoletti fini, fitti e distinti. Spermateca fig. 57; maschio sconosciuto.

COMPARAZIONI. Specie simile a *P. raldurjiensis* Scheerpeltz, 1976, nota solo sul maschio, ma distinta per il pronoto meno ristretto all'indietro e per gli occhi maggiormente sviluppati, nonostante la minore taglia.

Pachycephalopisalia smetanai sp. n. (Figg. 58-60)

TIPO. Holotypus ♂, Kathmandu distr., Phulcoki, 2800 m, 20.IV.1982 (A. & Z. Smetana leg., MHNG).

DESCRIZIONE. Lungh. 3,8 mm. Corpo lucido e nero-bruno; margine posteriore degli uriti ed estremità addominale rossicci; antenne bruno-rossicce con i due antennomeri basali rossicci; zampe anteriori e medie giallo-rossicce, zampe posteriori bruno-rossicce con tarsi rossicci. L'avancorpo è coperto di reticolazione svanita. La punteggiatura del capo è ombelicata e distinta, quella del pronoto e delle elitre pure distinta. Edeago figg. 59-60; femmina sconosciuta.

COMPARAZIONI. La specie già nota del genere *Pachycephalopisalia* avente elitre più lunghe del pronoto è *P. monachorum* Pace, 1984. La nuova se ne distingue per il pronoto non largamente solcato sulla linea mediana, per il quinto urotergo del maschio coperto di granuli e per la robusta armatura del sacco interno dell'edeago.

ETIMOLOGIA. Specie dedicata a uno dei raccoglitori, il Dr. A. Smetana, noto studioso di Staphylinidae.

Pachycephalopisalia loebli sp. n. (Figg. 61-65)

TIPI. Holotypus ♀, Prov. Bagmati, Gokana, for. nr. Kathmandu, 1400 m, 31.III.1981 (Löbl & Smetana leg., MHNG).

Parytypi: 1 ♀, Prov. Bagmati, Mere Dara, 3200 m, 8.IV.1981 (Löbl & Smetana leg., CPA); 1 ♀, Prov. Bagmati, below Thare Pati, 3300 m, 10.IV.1981 (Löbl & Smetana leg., MHNG); 2 ♀♀, Khandbari distr., "Bakan" W of Tashigaon, 3200 m, 4-6.IV.1982 'A. & Z. Smetana leg., MHNG, CPA).

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucido e giallo con capo, elitre e una fascia addominale giallo-bruni (nell'holotypus), oppure corpo nero, con elitre ed estremità addominale brune (nei paratipi); antenne brune con i due antennomeri basali giallo-bruni; zampe giallo-rossicce. La reticolazione del capo e del pronoto è molto svanita, quella delle elitre è distinta. Il capo e il pronoto presentano punteggiatura superficiale. Tubercoletti distinti coprono il pronoto. Spermateca figg. 62, 63, 65; maschio sconosciuto.

COMPARAZIONI. Specie distinta da *P. smetanai* sp. n. sopra descritta, per la taglia molto minore e per il capo privo di punteggiatura ombelicata.

ETIMOLOGIA. Specie dedicata al Dr. I. Löbl, uno dei suoi raccoglitori, noto studioso di Pselaphydae.

Hygropetrophila athetoides sp. n. (Figg. 66-67)

TIPO. Holotypus ♀, Prov. Bagmati, Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana leg., MHNG).

DESCRIZIONE. Lungh. 2,5 mm. Corpo lucido e bruno; estremità addominale giallo-bruna; antenne nere con i tre antennomeri basali giallo-rossicci; zampe rossicce. La reticolazione del capo e del pronoto è svanita, quella delle elitre è netta. La punteggiatura del capo e del pronoto è fitta e superficiale, quella delle elitre è netta. Spermateca fig. 67; maschio sconosciuto.

COMPARAZIONI. Specie distinta da *H. festiva* Pace, 1987, pure del Nepal, per il differente colore del corpo, per il pronoto molto piü trasverso e per la forma della spermateca, con bulbo distale privo di introflessione apicale.

Hygropetrophila smetanai sp. n. (Figg. 68-71)

TIPI. Holotypus ♂, Prov. Bagmati, Yangri Ridge, 4350 m, 22.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 45 es., stessa provenienza, ma 4150-4200-4500-4700-4800 m, 21-22-23-24.IV.1981 (MHNG, CPA); 1 ♀, Prov. Bagmati, above Shermathang, 2900 m, 26.IV.1981 (Löbl & Smetana leg., MHNG).

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucido e nero, comprese le antenne; zampe nero-brune. La reticolazione del capo è distinta, quella del pronoto e delle elitre è svanita, quella dell'addome è netta. La punteggiatura del capo è distinta. Il pronoto e le elitre sono coperti di tubercoletti salienti distinti. Edeago figg. 70-71; spermateca fig. 69.

COMPARAZIONI. Dato che è la prima specie attera del genere, con elitre più corte del pronoto, la nuova specie è nettamente distinta dalle altre specie note del genere.

ETIMOLOGIA. Specie dedicata a uno dei raccoglitori, il Dr. A. Smetana, noto studioso di Staphylinidae.

Hygropetrophila bifurcata sp. n. (Figg. 72-75)

TIPI. Holotypus ♂, Manang distr., for. W Bagarchhap, 2250 m, 22.IX.1983 (Smetana & Löbl leg., MHNG).

Paratypi: 4 ♀♀, stessa provenienza (MHNG, CPA); 1 ♀, Parbat distr., Ghoropani pass, N slope, 5.X.1983 (Smetana & Löbl leg., MHNG).

Descrizione. Lungh. 3,0 mm. Corpo lucido e nero pece; antenne e zampe giallo-rossicce. Il capo e il pronoto sono coperti di reticolazione estremamente svanita; le elitre sono prive di reticolazione. Il capo e le elitre presentano fitti tubercoletti salienti a raspa. La punteggiatura del pronoto è fine e distinta. Edeago figg. 73-74; spermateca fig. 75.

Comparazioni. Il pronoto della nuova specie, non chiaramente trasverso e la forma della spermateca, distinguono nettamente la nuova specie da *H. festiva* Pace,, 1987, pure del Nepal.

Hygropetrophila ghoropanica sp. n. (Figg. 76-77)

Tipo. Holotypus ♀, Parbat distr., Ghoropani pass, N slope, 6.X.1983 (Smetana & Löbl leg., MHNG).

Descrizione. Lungh. 2,7 mm. Corpo lucido con pronoto debolmente opaco. Corpo nero pece con estremità addominale giallo-rossiccia; antenne bruno-rossicce con i tre antennomeri basali giallo-rossicci; zampe giallo-rossicce. L'avancorpo è coperto da punteggiatura fitta e netta. Spermateca fig. 77; maschio sconosciuto.

Comparazioni. A motivo del colore del corpo e della forma della spermateca, come per la netta punteggiatura dell'avancorpo, la nuova specie è nettamente distinta da *H. festiva* del Nepal e dalle altre specie qui descritte.

Cousya smetanai sp. n. (Figg. 76bis-78)

Tipi. Holotypus ♂, Khandbari distr., "Bakan" W of Tashigaon, 3250 m, (A. & Z. Smetana leg., MHNG).

Paratypus: 1 ♂, Khandbari distr., above Sheduwa, 3000 m, 2.IV.1982 (A. & Z. Smetana leg., CPA).

Descrizione. Lungh. 2,1 mm. Corpo lucido e bruno castano; antenne brune con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. L'avancorpo è coperto di reticolazione svanita e di punteggiatura distinta. L'addome presenta tubercoletti assai fini e fitti e reticolazione poco distinta. Edeago figg. 77bis-78; femmina sconosciuta.

Comparazioni. Specie distinta da *C. ajmonis* Bernhauer, 1934 del Kashmir, per avere il pronoto nettamente meno trasverso. *C. ajmonis* è nota sul solo holotypus ♀.

Etimologia. Specie dedicata a uno dei suoi raccoglitori, il Dr. A. Smetana di Ottawa, noto studioso di Staphylinidae.

Gen. **Smetanaetha** n. (Figg. 83-90)

Diagnosi. Per la ligula molto lunga e slanciata e per la forma della spermateca assai differente, è genere distinto da *Oxypoda* Mannerheim, 1831, nonostante l'habitus molto simile.

Descrizione. Corpo fusiforme, fig. 86; tampie marginate; palpi labiali di 3 articoli; ligula lunga, stretta e bifida fig. 87; palpi mascellari di 4 articoli, galea più lunga della lacinia fig. 90; mento incavato al margine anteriore fig. 88; processo mesosternale acuto, insinuato fino a metà delle mesocoxe che sono tra loro contigue; formula tarsale 5-5-5;

primo tarsomero posteriore lungo quanto i due seguenti compresi insieme; spermateca corta, più simile a quella delle specie del genere *Leptusa* Kraatz e generi affini che alle specie del genere *Oxypoda*.

Typus generis: *Smetanaetha tuberculicollis* sp. n.

ETIMOLOGIA. Il nome del nuovo genere significa "Insolita di Smetana". Genere dedicato al Dr. A. Smetana di Ottawa.

Smetanaetha tuberculicollis gen. n., sp. n. (Figg. 83-90)

TIPI. Holotypus ♂, Prov. Bagmati, Malemchi, 2800 m, 17.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 3 ♂♂, e 1 ♀, stessa provenienza (MHNG, CPA); 1 ♀, Manang distr., Latha Manang W Bagarchhap, 2400 m, 24.IX.1983 (Smetana &Löbl leg., MHNG); 1 ♀, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1961 (Löbl & Smetana leg., MHNG); 2 es., Prov. Bagmati, Burlang Bhanjyang, 2000 m, 5.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 2 es., Kathmandu distr., Phulcoki, 2600 m, 20.IV.1982 (A. & Z. Smetana leg., MHNG, CPA); 3 es., Lalitpur distr., Phulcoki, 2550 m, 15.X.1983 (Smetana & Löbl leg., MHNG); 1 ♂, W Nepal, Gebiet von Jumla, Umg. Uthu, 25.IX.1972 (Franz leg., CFR).

DESCRIZIONE. Lungh. 2,8 mm. Corpo lucido e giallo-bruniccio; antenne brune con il primo antennomero basale giallo-rossiccio; zampe gialle. L'avancorpo è coperto di tubercoletti a raspa molto salienti. L'addome è coperto di pubescenza sericea e ha robuste setole laterali. Edeago figg. 83-84; spermateca fig. 85.

Oxypoda (s. str.) **ingens** sp. n. (Figg. 91-94)

TIPI. Holotypus ♂, Khandbari distr., above Tashigaon, 3500 m, 6.IV.1982 (A. & Z. Smetana leg., MHNG).

Paratypus: 1 ♀, stessa provenienza, ma 7.IV.1982 (CPA).

DESCRIZIONE. Lungh. 4,0 mm. Corpo lucido e bruno; antenne nero-brune con i due antennomeri basali e la base del terzo giallo-rossicci; zampe giallo-rossicce. La reticolazione del capo e delle elitre è distinta, quella del pronoto è netta. Tutto il corpo è coperto di tubercoletti fitti e distinti. Edeago figg. 93-94; spermateca fig. 92.

COMPARAZIONI. Specie simile a *O. himalayica* Cameron, 1939, dell'India settentrionale, ma distinta per il pronoto meno trasverso, per gli occhi più sviluppati, per l'edeago di 1/3 più sviluppato (nonostante la minore taglia), con parte preapicale della lama sternale ristretta e per la spermateca meno sviluppata, con introflessione apicale del bulbo distale larga (assai stretta in *himalayica*).

Oxypoda (s. str.) **cameroni** sp. n. (Figg. 95-98)

TIPI. Holotypus ♂, Chakrata distr., Dodora Khud, 2000, 13.V.1922 (Cameron leg., BM).

Paratypi: 2 ♂♂ e 4 ♀♀, stessa provenienza (BM, CPA); 3 ♂♂, Khandbari distr., below Sheduwa, 2550 m, 30.III.1982 (A. & Z. Smetana leg., MHNG, CPA).

DESCRIZIONE. Lungh. 4,2 mm. Corpo bruno-rossiccio; capo bruno; uriti nero-bruni con margine posteriore giallo rossiccio; antenne brune con i tre antennomeri basali rossicci; zampe rossicce. La reticolazione è distinta solo sulle elitre. Il corpo è coperto di tubercoletti fitti poco salienti. Edeago figg. 95-96; spermateca fig. 98.

Comparazioni. Specie determinata da Cameron come *O. himalayica* Cameron, 1939, ma per gli occhi più sviluppati e per la presenza di due dentini ventrali dell'edeago e di uno stiletto mediano presso la "crista apicalis", è specie ben distinta.

Etimologia. Specie dedicata alla memoria del Dr. M. Cameron che l'ha raccolta e che è l'autore della "Fauna of British India", Staphylinidae.

Oxypoda (s. str.) **monticola** sp. n. (Figg. 99-100)

Tipo. Holotypus ♀, India, Himachal Pradesh, Rohtangpass, S-Hang, 2500-3500 m. (Franz leg., CFR).

Descrizione. Lungh. 3,2 mm. Corpo debolmente lucido e nero; antenne nero-brune con i tre antennomeri basali rossicci; zampe rossicce. Il corpo è coperto di reticolazione molto svanita e di tubercoletti fini, fitti e netti. Spermateca fig. 100; maschio sconosciuto.

Comparazioni. La caratteristica forma della spermateca, terminante nella parte prossimale a punta, distingue la nuova specie sia da *O. himalayica* Cameron, 1939, che da *O. sirdar* Pace, 1985 del Nepal.

Oxypoda (s. str.) **ulterior** sp. n. (Figg. 101-104)

Tipi. Holotypus ♂, Kathmandu distr., Phulcoki, 2650 m, 22.IV.1982 (A. & Z. Smetana leg., MHNG).

Paratypi: 1 ♀, stessa provenienza (CPA); 1 ♂, Khandbari distr., for. above Ahale, 2400 m, 25.III.1982 (A. & Z. Smetana leg. MHNG); 1 ♂ e 1 ♂, Prov. Bagmati, Malemchi, 2800 m, 14-16.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♂ e 2 ♀♀, Khandbari distr., for. NE Kuwapani, 2500 m, 11-28.IV.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 3,8 mm. Corpo debolmente opaco e bruno-rossiccio; margini laterali e posteriore del pronoto giallo-rossicci; omeri delle elitre, margine posteriore degli uriti ed estremità addominale roccicci; antenne brune con i due antennomeri basali giallo-rossicci; zampe gialle. Tutto il corpo è coperto di pubescenza sericea e di tubercoletti fitti, fini e superficiali. Edeago figg. 102-103; spermateca fig. 104.

Comparazioni. Specie charamente distinta per l'edeago accentuatamente bisinuato al lato ventrale, con due denti laterali al livello dell'incavatura mediana. Tali denti in *O. cameroni* sp. n. sopra descritta, sono situati al lato ventrale e non lateralmente come nella nuova specie.

Oxypoda (Podoxya) ahalensis sp. n. (Figg. 108-109)

Tipi. Holotypus ♀, Khandbari distr., for. above Ahale, 2300 m, 26.III.1982 (A. & Z. Smetana leg., MHNG).

Paratypus: 1 ♀, stessa provenienza (CPA).

Descrizione. Lungh. 3,0 mm. Corpo lucido e bruno-rossiccio; margini del pronoto, omeri, margine posteriore degli uriti e apice dell'addome rossicci; antenne bruno-rossicce con i due antennomeri basali e l'undicesimo giallo-rossicci; zampe giallo-rossicce. Su un fondo lucido, non reticolato il corpo è coperto di fini tubercoletti fitti e netti. Spermateca fig. 109; maschio sconosciuto.

Comparazioni. Il capo molto allungato e la forma della spermateca distinguono questa nuova specie da *O. nigrita* Cameron, 1939, presente pure nel Nepal. Questa specie ha introflessione apicale della spermateca cortissima e non lunga come nella nuova specie.

Oxypoda (Podoxya) shastrana sp. n. (Figg. 110-111)

Tipo. Holotypus ♀, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 2,8 mm. Corpo debolmente lucido e bruno-rossiccio; capo, elitre e quarto urite bruni; margine posteriore degli uroterghi rossiccio; antenne brune con i due antennomeri basali e la base del terzo giallo-rossicci; zampe giallo-rossicce. Il capo e il pronoto presentano tubercoletti svaniti; le elitre e l'addome sono coperti di tubercoletti salienti. Spermateca fig. 111; maschio sconosciuto.

Comparazioni. Specie di *Oxypoda* con bulbo distale della spermateca privo della minima traccia di introflessione apicale, come nella nuova specie, sono una specie della Cina ancora da descrivere e *O. sudra* sp. n. sotto descritta. Tuttavia queste specie hanno la parte prossimale della spermateca diversamente conformata.

Etimologia. Dai "Shastra", sacre scritture dei Bramini.

Oxypoda (Podoxya) mixtoides sp. n. (Figg. 112-113)

Tipo. Holotypus ♀, Prov. Bagmati, Phulcoki nr. Kathmandu, 2300 m, 10.V.1981 (Löbl leg., MHNG).

Descrizione. Lungh. 4,0 mm. Corpo lucido e bruno-rossiccio; pronoto e addome rossicci; antenne brune con i quattro antennomeri basali giallo-rossicci; zampe giallo-rossicce. Il capo presenta reticolazione svanita, le elitre reticolazione distinta. Il pronoto, privo di reticolazione, è coperto di tubercoletti fini e netti. Il resto del corpo presenta tubercoletti fitti e svaniti. Spermateca fig. 113; maschio sconosciuto.

Comparazioni. Per la caratteristica forma della spermateca, la nuova specie è sicuramente affine a *O. mixta* Cameron, 1939, del distretto di Ghum. La nuova specie è da essa distinta per la poco dilatata introflessione apicale del bulbo distale della spermateca e per la parte prossimale della spermateca più lunga e più larga, tanto da raggiungere il livello della curvatura distale, mentre in *mixta* questa medesima parte prossimale raggiunge il livello della strozzatura mediana della spermateca.

Oxypoda (Podoxya) smetanaiana sp. n. (Figg. 114-116)

Tipo. Holotypus ♂, Khandbari distr., for. NE Kuwapani, 2500 m, 28.III.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 3,6 mm. Corpo lucido e bruno; pronoto bruno-rossiccio; due uriti basali e apice addominale giallo-brunicci; antenne brune con i tre antennomeri basali gialli; zampe giallo-rossicce. Il capo presenta tubercoletti salienti a raspa svaniti, mentre pronoto ed elitre sono coperti di tubercoletti salienti distinti. Edeago figg. 115-116; femmina sconosciuta.

COMPARAZIONI. La nuova specie, per i caratteri dell'edeago potrebbe essere sistematicamente affine a *O. nigrolucens* Cameron, 1939, dell'India, ma il quarto antennomero della nuova specie non è trasverso come in *nigrolucens*. Inoltre l'edeago della nuova specie è tozzo, con "crista apicalis" esigua, mentre l'edeago di *nigrolucens* è slanciato, con "crista apicalis" molto sviluppata.

ETIMOLOGIA. Specie dedicata a uno dei raccoglitori, il Dr. A. Smetana, noto studioso di Staphylinidae.

Oxypoda (Podoxya) clavata sp. n. (Figg. 117-119)

TIPO. Holotypus ♂, Phulcoki, 2650 m, 22.IV.1982, Kathmandu distr. (A. & Z. Smetana leg., MHNG).

DESCRIZIONE. Lungh. 3,0 mm. Corpo lucidissimo e bruno-rossiccio; capo, elitre e addome bruni; margine posteriore degli uriti rossiccio; antenne bruno-rossicce con i tre antennomeri basali giallo-rossicci; zampe rossicce. La punteggiatura del capo è svanita, quella del pronoto distinta. Le elitre sono coperte di tubercoletti salienti a raspa. Edeago figg. 118-119; femmina sconosciuta.

COMPARAZIONI. Questa specie, in base alla forma dell'edeago, si colloca agevolmente nel gruppo di specie a cui fa capo *O. subconformis* Cameron, 1939, del distretto di Ghum, ma presente anche in Nepal. La nuova specie è nettamente differente da *O. subconformis* e da altre specie affini qui sotto descritte, per avere edeago robusto, con dentini ventrali poco salienti.

Oxypoda (Podoxya) kirata sp. n. (Figg. 120-123)

TIPI. Holotypus ♂, Prov. Bagmati, Pokhare NE Barahbise, 2800 m, 2.V.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 23 es., stessa provenienza, ma anche 7.IV.1981 (MHNG, CPA); 11 es., Prov. Bagmati, Dobate Ridge NE Barahbise, 2700 m, 2.V.1981 (Löbl & Smetana leg., MHNG, CPA); 2 es., Prov. Bagmati, Gul Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♂, Nepal, Sikha, 83° 40' E 28° 26' N, 8500 ft., 24-26.V.1954 (Hyatt leg, BM),

DESCRIZIONE. Lungh. 2,9 mm. Corpo lucido e bruno; estremità addominale giallo-rossiccia; antenne brune con i due antennomeri basali giallo-rossicci; zampe gialle. La punteggiatura del capo è distinta, quella del pronoto è svanita. Tubercoletti distinti e poco fitti coprono le elitre, su un fondo a superficie nettamente reticolata. Edeago figg. 121-122; spermateca fig. 123.

COMPARAZIONI. Specie distinta dall'affine *O. subconformis* Cameron, 1939, per l'edeago 1/3 più lungo, per l'incavatura ventrale dell'edeago meno profonda e per la "crista apicalis" grande, ma non proiettata verso l'apice dell'edeago, come in *subconformis*.

ETIMOLOGIA. Dai "Kirata" primi abitatori del Nepal.

Oxypoda (Podoxya) shermathangana sp. n. (Figg. 124-127)

TIPI. Holotypus ♂, Prov. Bagmati, above Shermathang, 2900 m, 26.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 1 ♂ e 3 ♀♀, stessa provenienza (MHNG, CPA); 1 ♂, Prov. Bagmati, Tarke Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♂ e 1 ♀, Prov. Bagmati, Gul Bhanjyang, 6.IV.1981 (Löbl & Smetana leg., MHNG, CPA).

Descrizione. Lungh. 2,7 mm. Corpo lucido e bruno; antenne brune con i due antennomeri basali rossicci; zampe rossicce. Una reticolazione distinta è presente solamente sul pronoto. La punteggiatura del capo è svanita. Il pronoto e le elitre sono coperti da tubercoletti fini salienti a raspa. Edeago figg. 125-126; spermateca fig. 127.

Comparazioni. Specie assai affine a *O. subconformis* Cameron, 1939, ma l'edeago è più profondamente ricurvo al lato ventrale e i dentini ventrali hanno subito una migrazione verso la "crista apicalis" che ha sviluppo dimezzato rispetto quello di *subconformis.*

Oxypoda (Podoxya) decessa sp. n. (Figg. 128-131)

Tipi. Holotypus ♂, Zentralnepal, Kali-Gandaki Tal, zw. Ghasa u. Lete, 3-6.XII.1969, 2600-2750 m (Franz leg., CFR); 1 ♂, Umg. Dhumpus b. Pokhara (Franz leg., CPA); 1 ♀, Zentralnepal, Dinguari Kola Tal, Duinga u. Kapchimo (Franz leg., CFR); 1 ♀, Kathmandu distr., Phulcoki, 2650 m, 22.IV.1982 (A. & Z. Smetana leg., MHNG); 26 es., Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♀, Prov. Bagmati, Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 2,4 mm. Corpo giallo-rossiccio; antenne rossicce con i quattro antennomeri basali e l'undicesimo gialli; zampe gialle. La punteggiatura o i tubercoletti dell'avancorpo sono svaniti. L'addome è coperto di fitti tubercoletti multo robusti e salienti. Edeago figg. 128-129; spermateca fig. 130.

Comparazioni. Specie simile a *O. subconfornis* Cameron, 1939, tuttavia l'incavatura ventrale del suo edeago è nettamente stretta, la "crista apicalis" è meno sviluppata e la parte apicale dell'edeago, in visione ventrale, è stretta nella nuova specie e larga in *subconformis.*

Oxypoda (Podoxya) dilatata sp. n. (Figg. 132-135)

Tipi. Holotypus ♂, Khandbari distr., for. NE Kuwapani, 2500 m, 14.IV.1982 (A. & Z. Smetana leg., MHNG).

Paratypi: 5 es., stessa provenienza, (MHNG, CPA).

Descrizione. Lungh. 2,1 mm. Corpo bruno; pronoto, elitre, margine posteriore degli uriti ed estremità addominale bruno-rossicci; antenne brune con i due antennomeri basali e la base del terzo, giallo-rossicci; zampe giallo-rossicce. L'intero corpo è coperto di tubercoletti poco salienti. Edeago figg. 133-134; spermateca fig. 135.

Comparazioni. La nuova specie è sistematicamente vicina a *O. subconformis* Cameron, 1939, e altre specie simili qui descritte; ciò in base alla forma dell'edeago. Per l'ampia concavità ventrale e l'accentuata convessità preapicale dell'edeago, come per la forma della "crista apicalis", è specie ben distinta da *O. subconformis* e specie affini.

Oxypoda (Podoxya) gosainthanensis sp. n. (Figg. 136-139)

Tipi. Holotypus ♂, Zw. Tare-Pati u. Gosaikunde (Franz leg., CFR).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza (CFR, CPA); 13 es., Prov. Bagmati, Mere Dara, 3000-3200 m, 7-8.IV.1981 (Löbl & Smetana leg., MHNG, CPA).

Descrizione. Lungh. 2,2 mm. Corpo rossiccio; addome bruno-rossiccio tranne l'estremità apicale; antenne rossicce con i tre antennomeri basali gialli; zampe giallo-rossicce. L'avancorpo è coperto di tubercoletti svaniti; l'addome presenta tubercoletti multo evidenti perché robusti. Edeago figg. 137-138; spermateca fig. 139.

Nota. In base ai caratteri esterni (elitre più corte del pronoto e questo allargato lateralmente) questa nuova specie si collocherebbe nel sottogenere *Sphenoma* Mannerheim, 1831. Ma non vi sono dubbi che in base alla forma dell'edeago, così caratteristica (due dentini ventrali), questa nuova specie appartiene al gruppo di specie a cui fa capo *O. subconformis* Cameron, 1939, che è compresa nel sottogener *Podoxya* Mulsant & Rey, 1875. Ciò indica che una nuova naturale sistematica sottogenerica del genere *Oxypoda* è ancora tutta da costruire. Attualmente specie affini sono sparpagliate in più sottogeneri anche per la fauna europea.

Comparazioni. Specie distinta da tutte le specie del gruppo di *O. subconformis* Cameron, 1939, oltre che per le elitre più corte del pronoto, per la presenza di una "crista apicalis" molto ridotta.

Oxypoda (Podoxya) elata sp. n. (Figg. 140-143)

Tipi. Holotypus ♂; Umg. Dhumpus b. Pokhara (Franz leg., CFR).
Paratypi: 14 es., stessa provenienza (CFR, CPA); 1 ♂, Parbat distr., Ridge E Ghoropani pass, 50 m, .X.1983 (Smetana & Löbl leg., MHNG).

Descrizione. Lungh. 3,1 mm. Corpo bruno-rossiccio; capo nero-bruno; margine posteriore degli uriti rossiccio; antenne bruno-rossicce con i tre antennomeri basali rossicci; zampe rossicce. La punteggiatura del capo e del pronoto è fine, fitta e poco profonda. Le elitre sono coperte di tubercoletti fini, fitti e poco salienti. Edeago figg. 141-142; spermateca fig. 143.

Comparazioni. In questa nuova specie i due dentini ventrali presenti sull'edeago delle specie del gruppo di *O. subconformis*, si sono trasformati in bozze salienti. Per questo carattere e per le strette incavature ventrali dell'edeago, la nuova specie differisce sia da *O. subconformis*, che dalle altre specie affini qui descritte.

Oxypoda (Podoxya) remansa sp. n. (Figg. 144-145)

Tipi. Holotypus ♀, Prov. Bagmati, Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG).
Paratypi: 2 ♀♀, stessa provenienza (MHNG, CPA).

Descrizione. Lungh. 3,1 mm. Corpo lucido e bruno-rossiccio; estremità addominale rossiccia; antenne bruno-rossicce con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. La punteggiatura del capo e del pronoto è svanita. Distinti tubercoletti salienti a raspa coprono le elitre. Spermateca fig. 145: maschio sconosciuto.

Comparazioni. In base alla forma della spermateca, la nuova specie appare affine a *O. kashmirica* Cameron, 1939, che pure potrebbe essere compresa nel gruppo di *O. subconformis* Cameron, 1939, anche se l'edeago di *kashmirica* ha subito, nel corso dell'evoluzione, accentuate trasformazioni (per esempio i dentini ventrali dell'edeago sono diventati affilate carene). La parte prossimale della spermateca della nuova specie descrive un'ampia spira, non osservabile in *kashmirica*, e l'introflessione apicale del bulbo distale della spermateca della nuova specie è stretta e lunga, mentre è larga e corta in *kashmirica*. Inoltre il pronoto della nuova specie è nettamente trasverso, mentre quello di *kashmirica* è appena trasverso.

Oxypoda (Podoxya) remota sp. n. (Figg. 146-147)

TIPI. Holotypus ♀, Prov. Bagmati, Chipling, 2300 m, 5.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypus: 1 ♀, stessa provenienza (CPA).

DESCRIZIONE. Lungh. 3,2 mm. Corpo lucido e bruno-rossiccio; capo e addome bruni; margine posteriore degli uriti ed estremità addominale rossicci; antenne brune con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. La punteggiatura su capo e pronoto e i tubercoletti sulle elitre sono assai svaniti. Spermateca fig. 146; maschio sconosciuto.

COMPARAZIONI. Per la forma della spermateca, la nuova specie sembra affine a *O. nigrita* Cameron, 1939, presente pure nel Nepal, ma la spermateca della nuova specie ha sviluppo nettamente maggiore ed è priva di lunga appendice prossimale. Inoltre l'introflessione apicale del bulbo distale della spermateca della nuova specie, è lunga, mentre è corta in *nigrita*.

Oxypoda (Podoxya) bhairava sp. n. (Figg. 148-149)

TIPO. Holotypus ♀, Parbat distr., Ghoropani pass, N slope, 2800 m, 5.X.1983 (Smetana & Löbl leg., MHNG).

DESCRIZIONE. Lungh. 2,5 mm. Corpo lucido e bruno; antenne brune con i due antennomeri basali bruno-rossicci; zampe brune con tarsi rossicci. I tubercoletti del capo e del pronoto sono fini e svaniti, quelli delle elitre sono distinti anche se altrettanto fini. Spermateca fig. 149; maschio sconosciuto.

COMPARAZIONI. A motivo dell'asimmetricità del bulbo distale della spermateca, la nuova specie è affine a *O. proxima* Cameron, 1939 del Kashmir, che pure ha bulbo distale della spermateca asimmetrico. Tuttavia la nuova specie presenta profonda introflessione apicale del bulbo distale della spermateca, mentre *O. proxima* ha introflessione meno profonda e a lati convergenti e non a lati paralleli come nella nuova specie.

ETIMOLOGIA. Da Bhairava, divinità induista dalle molte braccia.

Oxypoda (Podoxya) rufomarginella sp. n. (Figg. 150-153)

TIPI. Holotypus ♂, Westnepal, Umg. Maharigaon, Gebiet von Jumnla, 3000-3500 m, (Franz leg., CFR).

Paratypi: 33 es., Kathmandu distr., Phulcoki, 2600 m, 20-21.IV.1982 (A. & Z. Smetana leg., MHNG, CPA); 2 es., Khandbari distr., "Bakan" W of Tashigaon, 3100-3200 m, 4-8.IV.1982 (A. & Z. Smetana leg., MHNG); 1 ♀, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♂, Prov. Bagmati, below Thare Pati, 3300 m, 12.IV.1981 (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 2,8 mm. Corpo lucido e bruno-rossiccio; base delle elitre, margine posteriore degli uriti e apice dell'addome rossicci; antenne bruno-rossicce con i tre antennomeri basali rossicci; zampe rossicce. La punteggiatura del capo e del pronoto è molto svanita. I tubercoletti che coprono le elitre sono debolmente salienti a raspa. Edeago figg. 151-152; spermateca fig. 153.

Comparazioni. La nuova specie è distinta da *O. subsericea* Cameron, 1939, per l'edeago molto stretto all'apice se visto ventralmente, e con pezzi copulatori del sacco interno esili, mentre l'edeago di *subsericea* ha pezzi copulatori robusti.

Oxypoda (Podoxya) burlangana sp. n. (Figg. 154-157)

Tipi. Holotypus ♂, Prov. Bagmati, Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 1 ♂ e 2 ♀♀, Prov. Bagmati, Malemchi, 2800 m, 17.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 5 ♂♂, Prov. Bagmati, Tarke Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana leg., MHNG, CPA).

Descrizione. Lungh. 2,9 mm. Corpo lucido e bruno-rossiccio; capo e uriti terzo e quarto bruni; margine posteriore degli uriti rossiccio; antenne brune con i due antennomeri basali rossicci; zampe giallo-rossicce. Tutto il corpo è coperto di tubercoletti fitti debolmente salienti a raspa. Edeago figg. 155-156; spermateca fig. 157.

Comparazioni. Specie distinta da *O. subsericea* Cameron, 1939, per avere l'edeago molto più profondamente ricurvo al lato ventrale e per la strettissima parte apicale della lama sternale dell'edeago (larga in *subsericea*).

Oxypoda (Podoxya) yakorum sp. n. (Figg. 158-161)

Tipi. Holotypus ♂, Prov. Bagmati, Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza (MHNG, CPA): 3 ♀♀, Prov. Bagmati, Tarke Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♀, Khandbari distr., Khandbari, 1700 m, 23.III.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 2,3 mm. Corpo debolmente lucido e bruno; estremità addominale rossiccia; antenne brune con i due antennomeri basali giallo-bruni; zampe gialle. Tutto il corpo è coperto di tubercoletti molto fitti e fini. Edeago figg. 159-160; spermateca fig. 161.

Comparazioni. Specie distinta da *O. subsericea* Cameron, 1939, per l'edeago più esile, con bulbo basale meno sviluppato della parte distale (di sviluppo uguale in *subsericea*), per la presenza di un lungo ed esile pezzo copulatore del sacco interno (largo e robusto in *subsericea*) e per la spermateca che non presenta come in subsericea una profonda e larghissima introflessione apicale del bulbo distale.

Oxypoda (Podoxya) specifica sp. n. (Figg. 162-163)

Tipo. Holotypus ♀, Khandbari distr., for. above Ahale, 2400 m, 25.III.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 2,4 mm. Corpo debolmente lucido e bruno; apice addominale rossiccio; antenne brune con i due antennomeri basali giallo-bruni; zampe giallo-rossicce. I tubercoletti che coprono la superficie del capo sono svaniti, quelli del pronoto e delle elitre sono distinti e poco salienti. Spermateca fig. 163; maschio sconosciuto.

Comparazioni. Specie affine a *O. subsericea* Cameron, 1939, in base alla struttura generale della spermateca. La nuova specie però presenta quest'organo nettamente più breve e introflessione apicale del bulbo distale nettamente meno profonda e meno larga.

Oxypoda (Podoxya) durga sp. n. (Figg. 164-165)

Tipo. Holotypus ♀, Parbat distr., Ghoropani pass, N slope, 2700 m, 6.X.1983 (Smetana & Löbl leg., MHNG).

Descrizione. Lungh. 2,7 mm. Corpo lucido e bruno; antenne brune con i due antennomeri basali bruno-rossicci; zampe bruno-rossicce, con tarsi giallo-rossicci. L'intero corpo è coperto di tubercoletti fitti e svaniti. Spermatece fig. 164; maschio sconosciuto.

Comparazioni. Specie affine a *O. proxima* Cameron, 1939, del Kashmir, per l'evidente asimmetricità del bulbo distale della spermateca. Ne è distinta perché il bulbo distale di quest'organo è molto meno sviluppato, con introflessione non assottigliata all'apice e che divide lo spazio interno in parti disuguali (in parti uguali in *proxima*).

Etimologia. Dalla divinità induista "Durga".

Oxypoda (Podoxya) dama sp. n. (Figg. 166-168)

Tipo. Holotypus ♂, Westnepal, Gebiet von Jumla, Umg. Uthu, 17-25.IX.1972 (Franz leg., CFR).

Descrizione. Lungh. 2,7 mm. Corpo lucido e bruno rossiccio; capo bruno; antenne bruno-rossicce con i tre antennomeri basali rossicci; zampe rossicce. I tubercoletti che coprono il capo sono poco salienti, quelli del pronoto e delle elitre sono fini e netti. Edeago figg. 167-168; femmina sconosciuta.

Comparazioni. La nuova specie è differente da *O. nigrita* Cameron, 1939, per l'edeago non esile, con "crista apicalis" poco sviluppata (molto sviluppata in *nigrita*) e per il flagello del sacco interno sinuato e non rettilineo come in *nigrita*.

Oxypoda (Podoxya) decorella sp. n. (Figg. 169-170)

Tipo. Holotypus ♀, Parbat distr., Ghoropani pass, N slope, 2800 m, 5.X.1983 (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 2,8 mm. Corpo lucidissimo e bruno; elitre rossicce con una macchia esterna bruna; estremità addominale rossiccia; antenne bruno-rossicce con i tre antennomeri basali e l'undicesimo giallo-rossicci; zampe giallo-rossicce con femori bruno-rossicci. La punteggiatura del capo è distinta. Il pronoto e le elitre sono coperti di tubercoletti distinti. Spermateca fig. 170; maschio sconosciuto.

Comparazioni. La nuova specie ha spermateca di forma simile a quella di *O. subsericea* Cameron, 1929, tuttavia è 1/4 meno sviluppata e con introflessione apicale del bulbo distale poco profonda e poco larga (profondissima e larghissima in *subsericea*).

Oxypoda (Podoxya) pusilla sp. n. (Figg. 171-174)

TIPI. Holotypus ♂; Kashmir, Pahalgam, X.1977 (Franz leg., CFR).

Paratypi: 6 es., Prov. Bagmati, Yangri Ridge, 4150-4350 m, 21-22-24.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♂, Pakistan settentrionale, Hazara-Kaghan Valley, Malkaudi, 1350 m, 20.IV.1984 (Zoia leg., CPA).

DESCRIZIONE. Lungh. 1,8 mm. Corpo lucido e rossiccio; capo bruno-rossiccio; uriti terzo e quarto bruni; estremità addominale giallo-rossiccia; antenne giallo-brunicce con i tre antennomeri basali gialli; zampe gialle. La punteggiatura del capo è poco distinta. I tubercoletti del pronoto sono assai svaniti, quelli delle elitre sono ben salienti. Edeago figg. 172-173; spermateca fig. 174.

COMPARAZIONI. Per la taglia ridotta e per avere l'edeago inciso all'apice, la nuova specie non ha forme simili con cui confrontarsi. L'edeago diviso all'apice si osserva anche nelle specie del sottogenere *Oxypoda* s. str., ma tutte hanno taglia molto maggiore di quella della nuova specie e antenne allungate. Inoltre il tipo di spermateca è anomalo nel genere *Oxypoda*, ma la ligula e del tipo proprio al genere a cui è stata attribuita la nuova specie.

Oxypoda (Podoxya) chetra sp. n. (Figg. 175-178)

TIPI. Holotypus ♂, Prov. Bagmati, Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 1 ♀, stessa provenienza (CPA); 1 ♀ Khandbari distr., above Tashigaon, 3500 m, 6.IV.1982 (A. & Z. Smetana leg., MHNG).

DESCRIZIONE. Lungh. 2,4 mm. Corpo lucido e bruno; margine posteriore degli uriti e estremità addominale rossicci; antenne brune con i due antennomeri basali giallo-bruni; zampe gialle. Il capo e il pronoto sono coperti di tubercoletti salienti a raspa. Le elitre presentano tubercoletti svaniti. Edeago figg. 175-176; spermateca fig. 177.

COMPARAZIONI. Anche questa nuova specie, come la precedente *O. pusilla* sp. n. presenta una tipologia della spermateca finora unica nel genere *Oxypoda*. Per i caratteri della ligula, la nuova specie non può che essere attribuita al genere *Oxypoda*. Questo carattere unico della spermateca consiste nell'enorme sviluppo del bulbo prossimale, molto più sviluppato del distale; normalmente questo bulbo prossimale non è distinto nelle specie finora note del genere *Oxypoda*.

ETIMOLOGIA. Dal gruppo etnico nepalese dei Chetri.

Oxypoda (Podoxya) svetana sp. n. (Figg. 179-180)

TIPO. Holotypus ♀, Prov. Bagmati, Pokhare NE Barahbise, 3000 m, 7.V.1981 (Löbl & Smetana leg., MHNG).

DESCRIZIONE. Lungh. 2,8 mm. Corpo lucido e bruno-rossiccio; capo e i quattro antennomeri basali, margine posteriore del quarto urite e apice dell'addome rossicci; antenne bruno-rossicce con i due antennomeri basali giallo-bruni; zampe giallo-rossicce. I tubercoletti del capo e del pronoto sono fini e distinti quelli delle elitre sono svaniti. Spermateca fig. 180; maschio sconosciuto.

Comparazioni. Specie affine alla precedente *O. chetra* sp. n., per la forma della spermateca. Differisce per il bulbo distale con introflessione apicale charamente più robusta.

Etimologia. Dal fiume Svetá Gandakí che scorre presso Pokhare, località tipica della nuova specie.

Oxypoda (Podoxya) sudra sp. n. (Figg. 181-182)

Tipo. Holotypus ♀, Prov. Bagmati, Malemchi, 2800 m, 17.IV.1981 (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 2,0 mm. Corpo lucido e bruno; estremità addominale bruno-rossiccia; antenne brune con primo antennomero rossiccio e secondo bruno-rossiccio; zampe giallo-rossicce. I tubercoletti del capo e delle elitre sono poco salienti, quelli del pronoto sono molto salienti. Spermateca fig. 182; maschio sconosciuto.

Comparazioni. Non sono note specie del genere *Oxypoda* che mostrano bulbo distale della spermateca privo di introflessione apicale, tranne che per *O. shastrana* sp. n. sopra descritta e una specie della Cina non ancora descritta. Tuttavia queste specie hanno la parte restante della spermateca di struttura molto differente.

Etimologia. Da Sudra, classe dei servi in Nepal.

Oxypoda (Podoxya) ganeshica sp. n. (Figg. 183-186)

Tipi. Holotypus ♂, Prov. Bagmati, Tarke Ghyang, 2650 m, 19.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 1 ♂ e 2 ♀♀, Prov. Bagmati, Pokhare NE Barahbise, 3000 m, 7.V.1981 (Löbl & Smetana leg., MHNG, CPA).

Descrizione. Lungh. 2,4 mm. Corpo lucido e bruno; base e margine posteriore delle elitre e apice dell'addome rossicci; antenne brune con i due antennomeri basali giallo-rossicci e l'undicesimo rossiccio; zampe gialle con femori bruno-rossicci. I tubercoletti del capo sono svaniti, quelli del pronoto e delle elitre sono distinti. Edeago figg. 184-185; spermateca fig. 186.

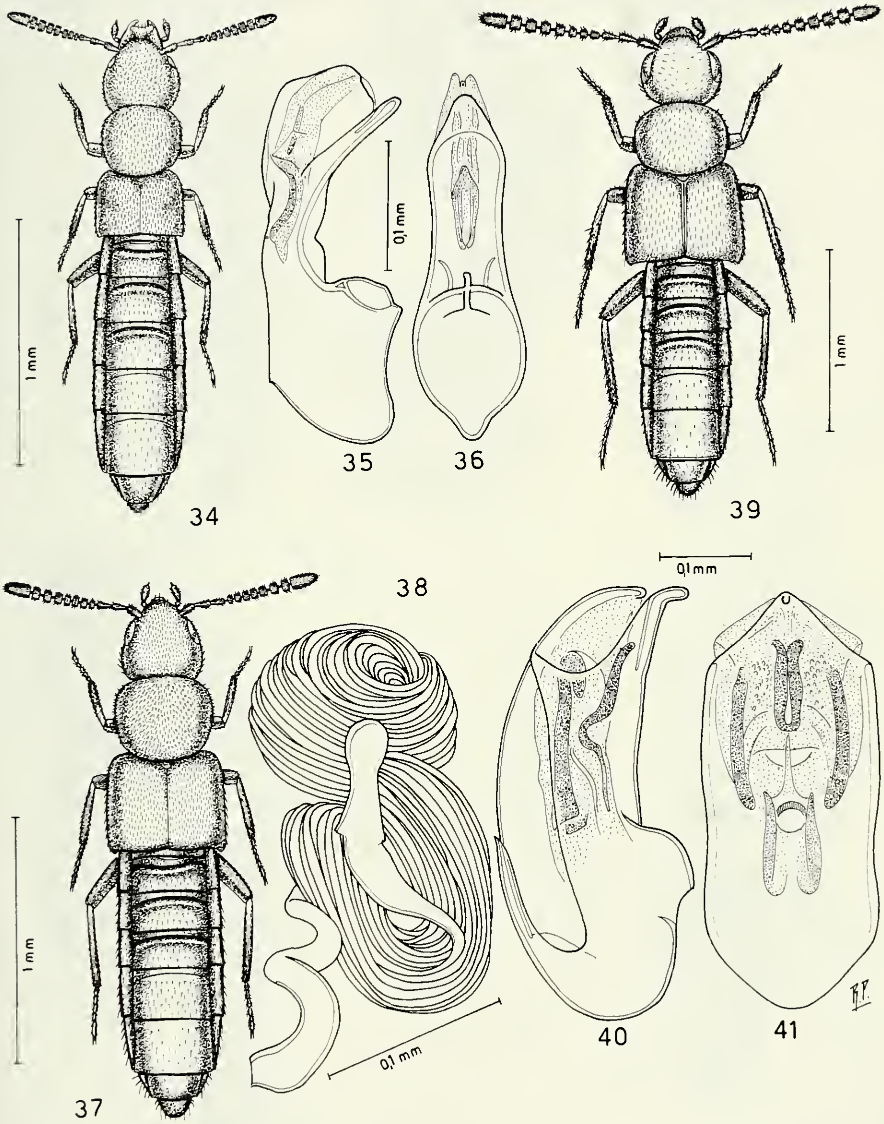
Comparazioni. L'apice dell'edeago della nuova specie è diviso in due lobi largamente separati. Tra le specie che possiedono simile carattere dell'edeago, *O. pusilla* sp. n. e *O. chetra* sp. n. sopra descritte, presentano però edeago privo di profonda incavatura ventrale. Inoltre il profilo della parte apicale dell'edeago della nuova specie è nettamente sinuato, non così è il profilo ventrale dell'edeago delle due specie citate.

Etimologia. Da "Ganesh" dio con testa di elefante, figlio di Shiva e Parvati.

Oxypoda (Podoxya) manjushrica sp. n. (Figg. 187-190)

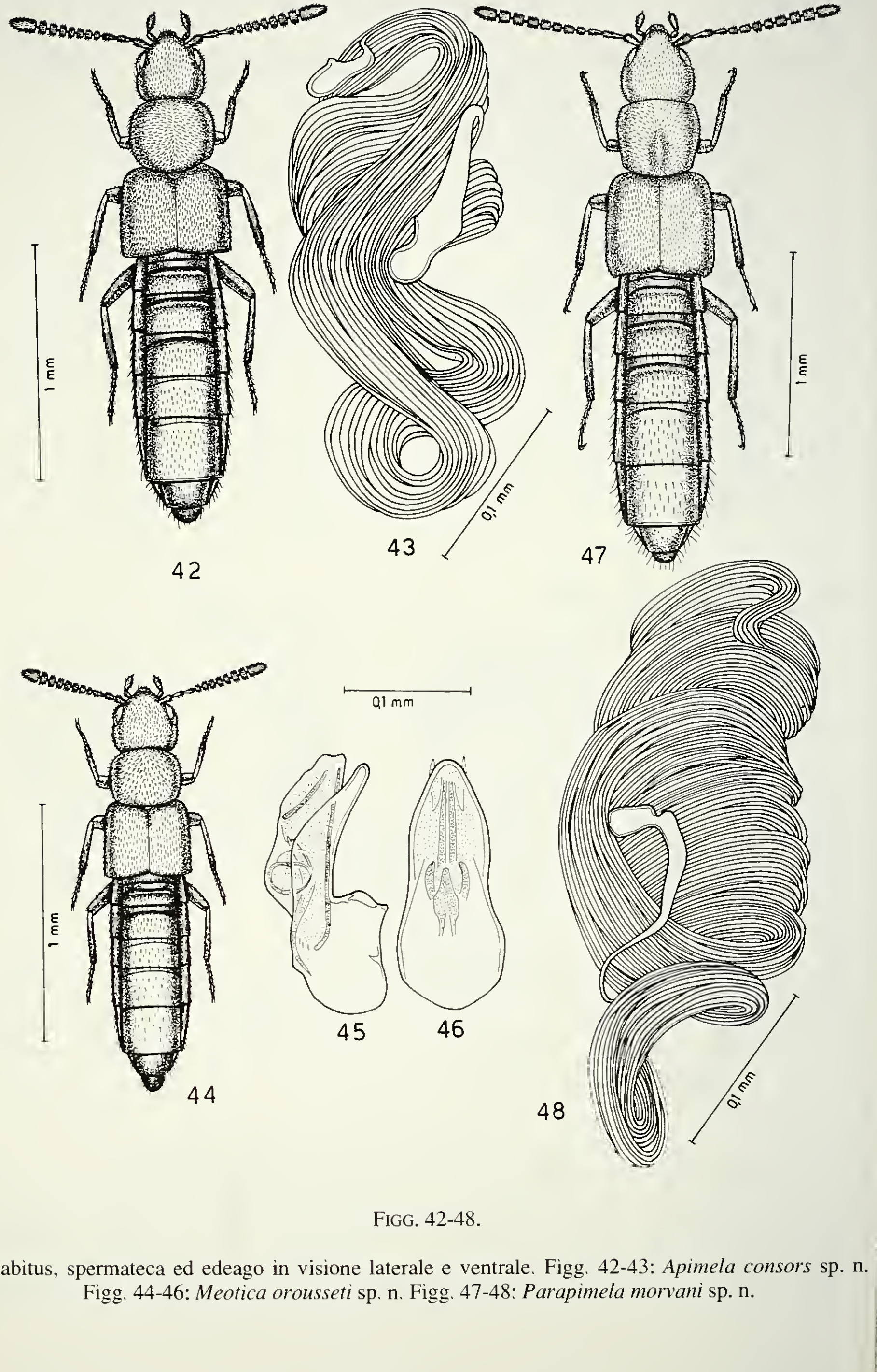
Tipi. Holotypus ♂, Prov. Bagmati, Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 1 ♀, Prov. Bagmati, Burlang Bhanjyang, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♀, Prov. Bagmati, Malemchi, 2800 m, 16.IV.1981 (Löbl & Smetana leg., CPA).



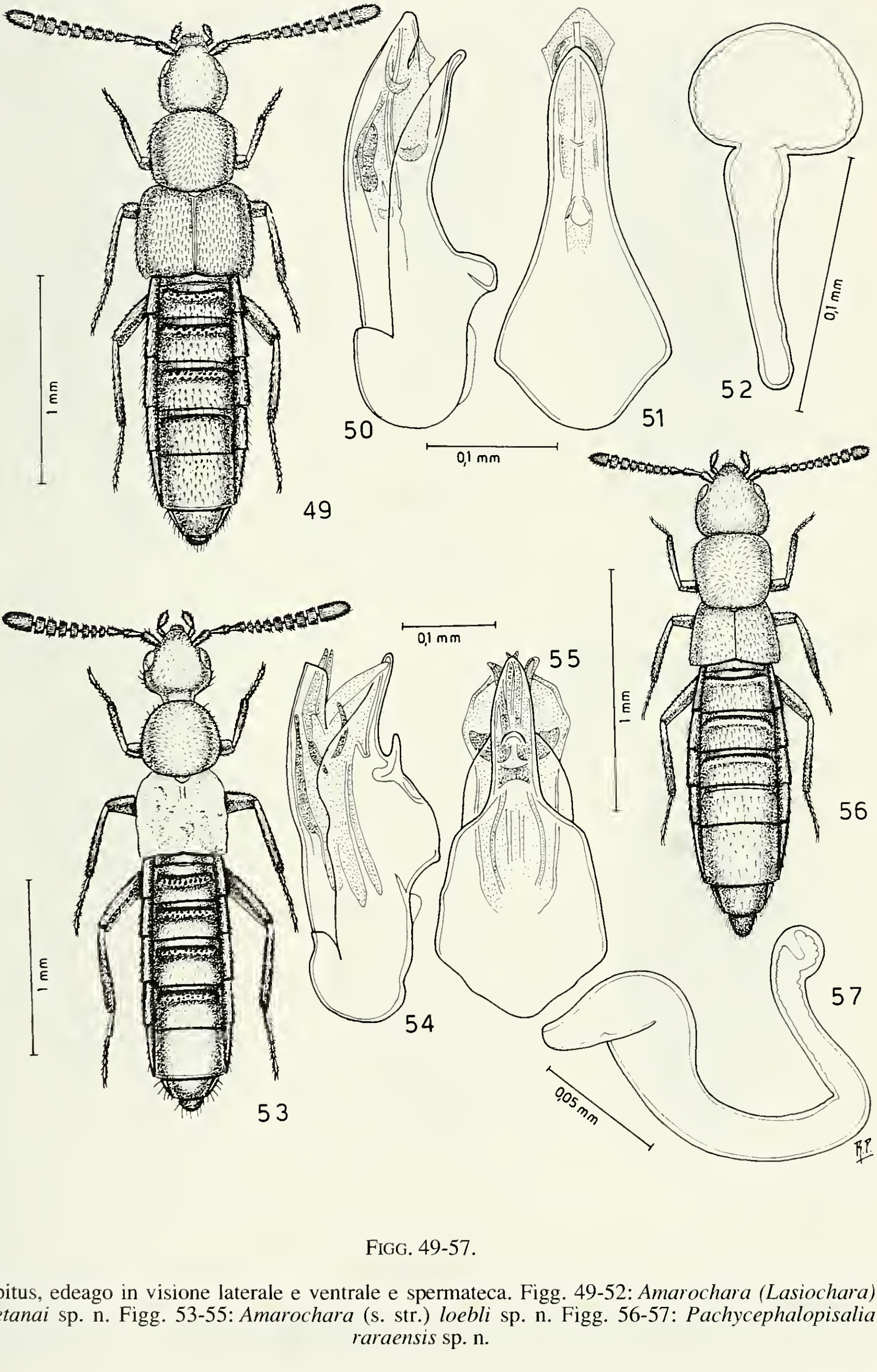
FIGG. 34-41.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 34-36: *Apimela aptera* sp. n. Figg. 37-38: *Apimela newar* sp. n. Figg. 39-41: *Apimela lucidula* sp. n.



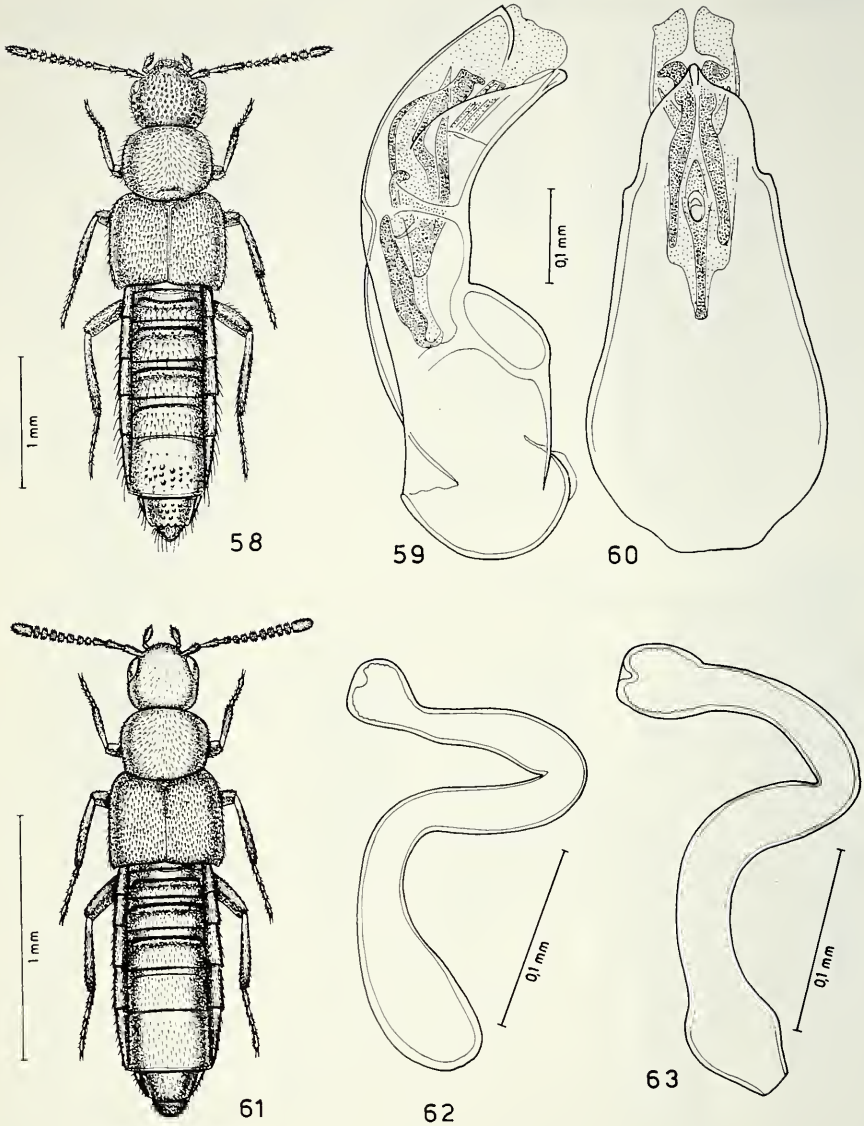
FIGG. 42-48.

Habitus, spermateca ed edeago in visione laterale e ventrale. Figg. 42-43: *Apimela consors* sp. n. Figg. 44-46: *Meotica orousseti* sp. n. Figg. 47-48: *Parapimela morvani* sp. n.



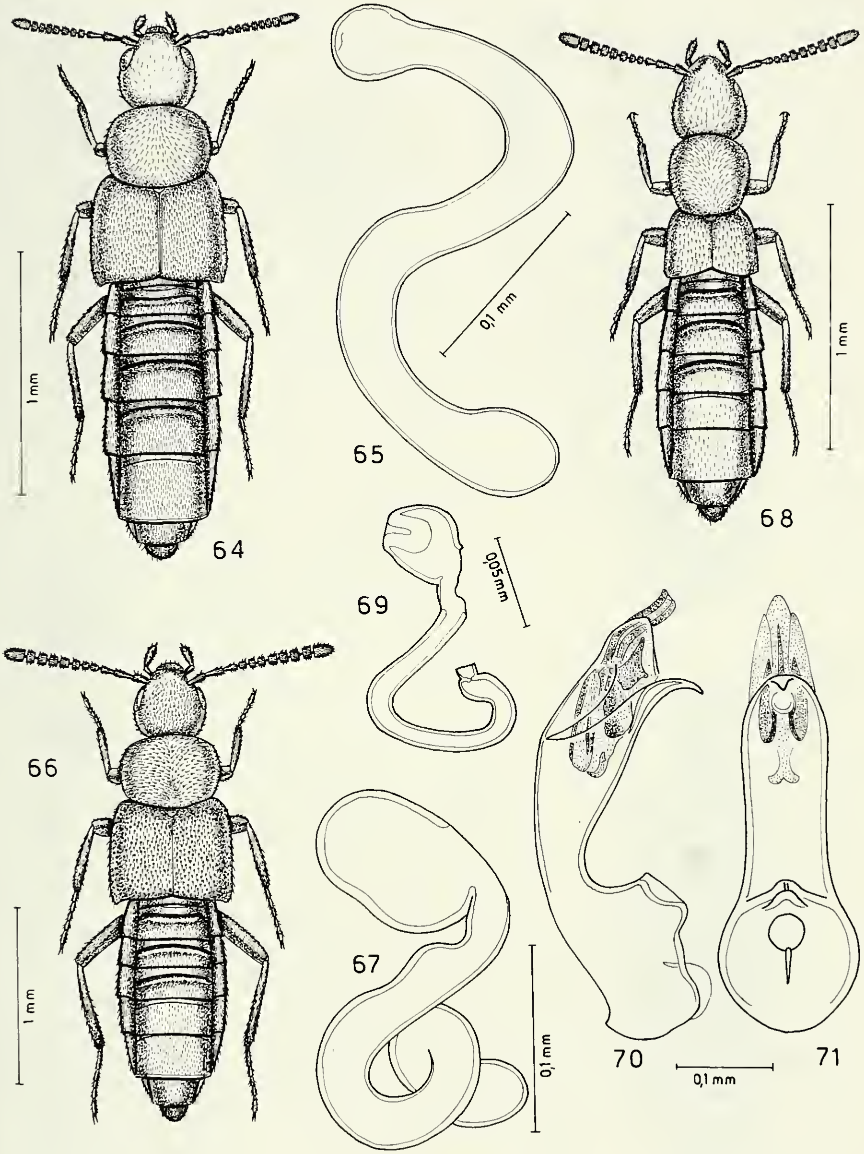
FIGG. 49-57.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 49-52: *Amarochara (Lasiochara) smetanai* sp. n. Figg. 53-55: *Amarochara* (s. str.) *loebli* sp. n. Figg. 56-57: *Pachycephalopisalia raraensis* sp. n.



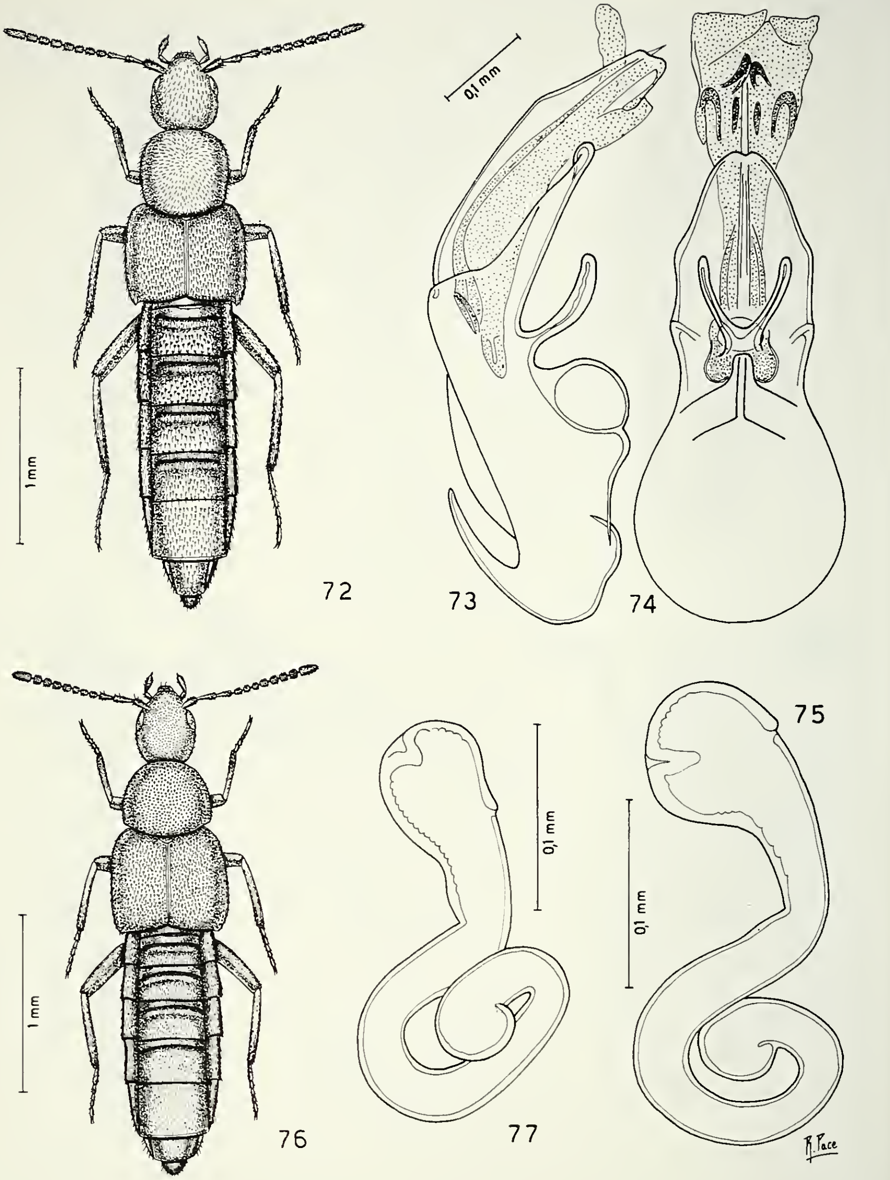
FIGG. 58-63.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 58-60: *Pachycephalopisalia smetanai* sp. n. Figg. 61-63: *Pachycephalopisalia loebli* sp. n.



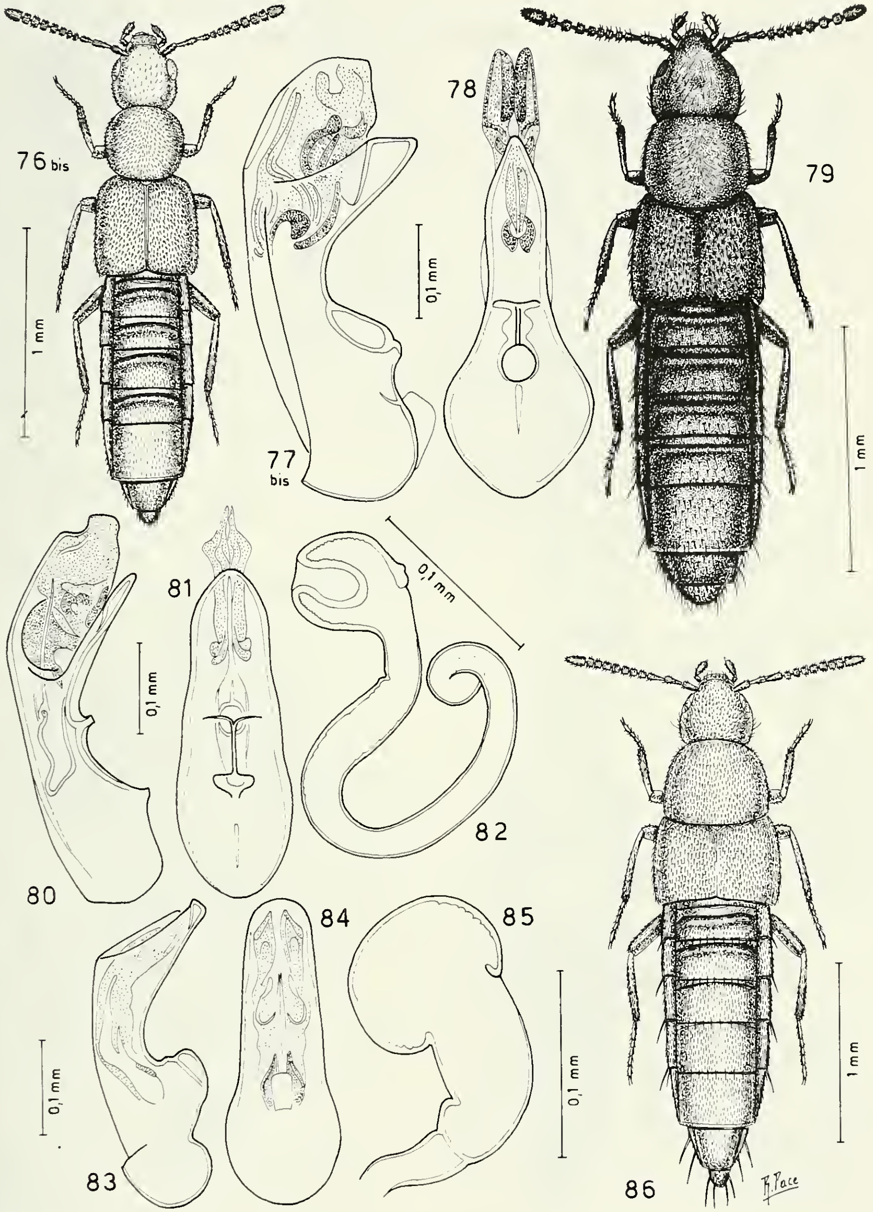
FIGG. 64-71.

Habitus, spermateca ed edeago in visione laterale e ventrale. Figg. 64-65: *Pachycephalopisalia loebli* sp. n. Figg. 66-67: *Hygropetrophila athetoides* sp. n. Figg. 68-71: *Hygropetrophila smetanai* sp. n.



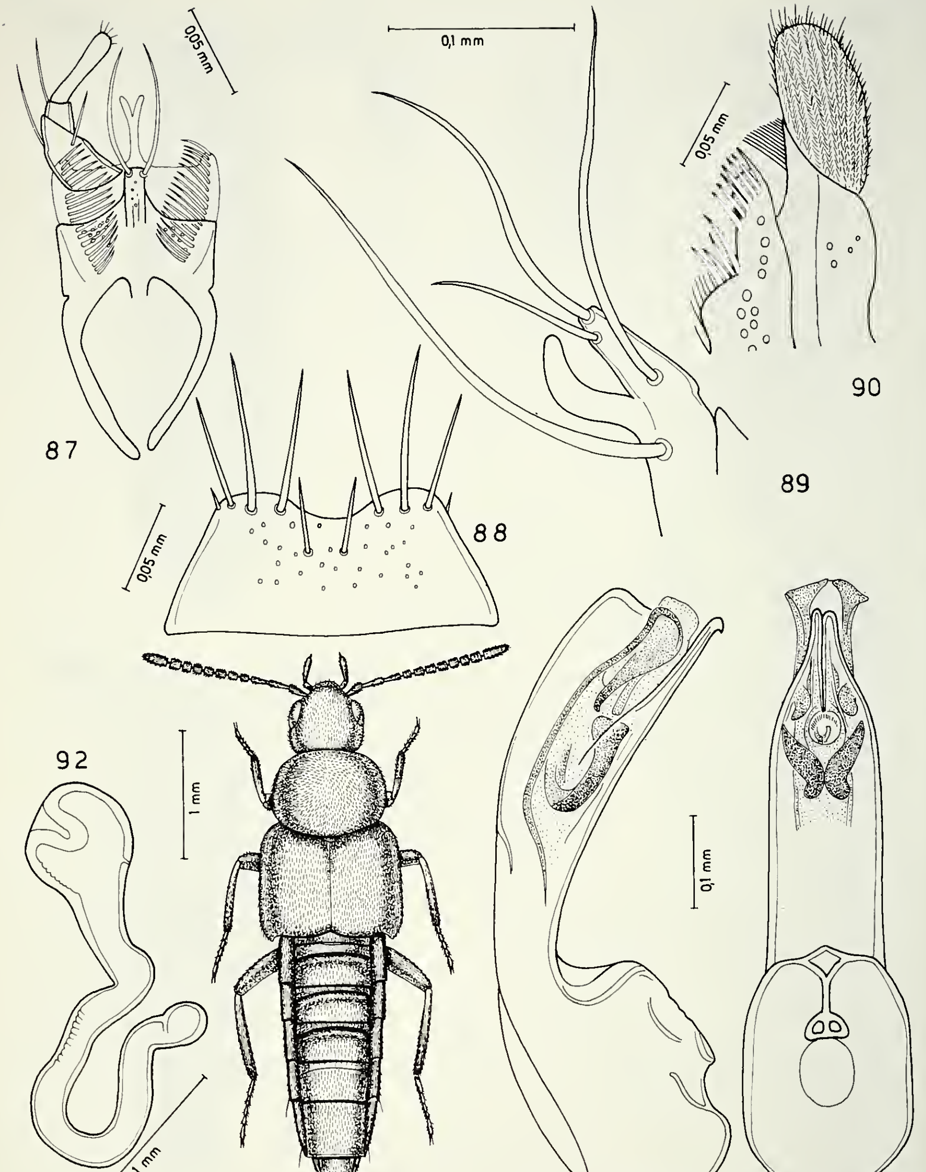
Figg. 72-77.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 72-75: *Hygropetrophila bifurcata* sp. n. Figg. 76-77: *Hygropetrophila ghoropanica* sp. n.



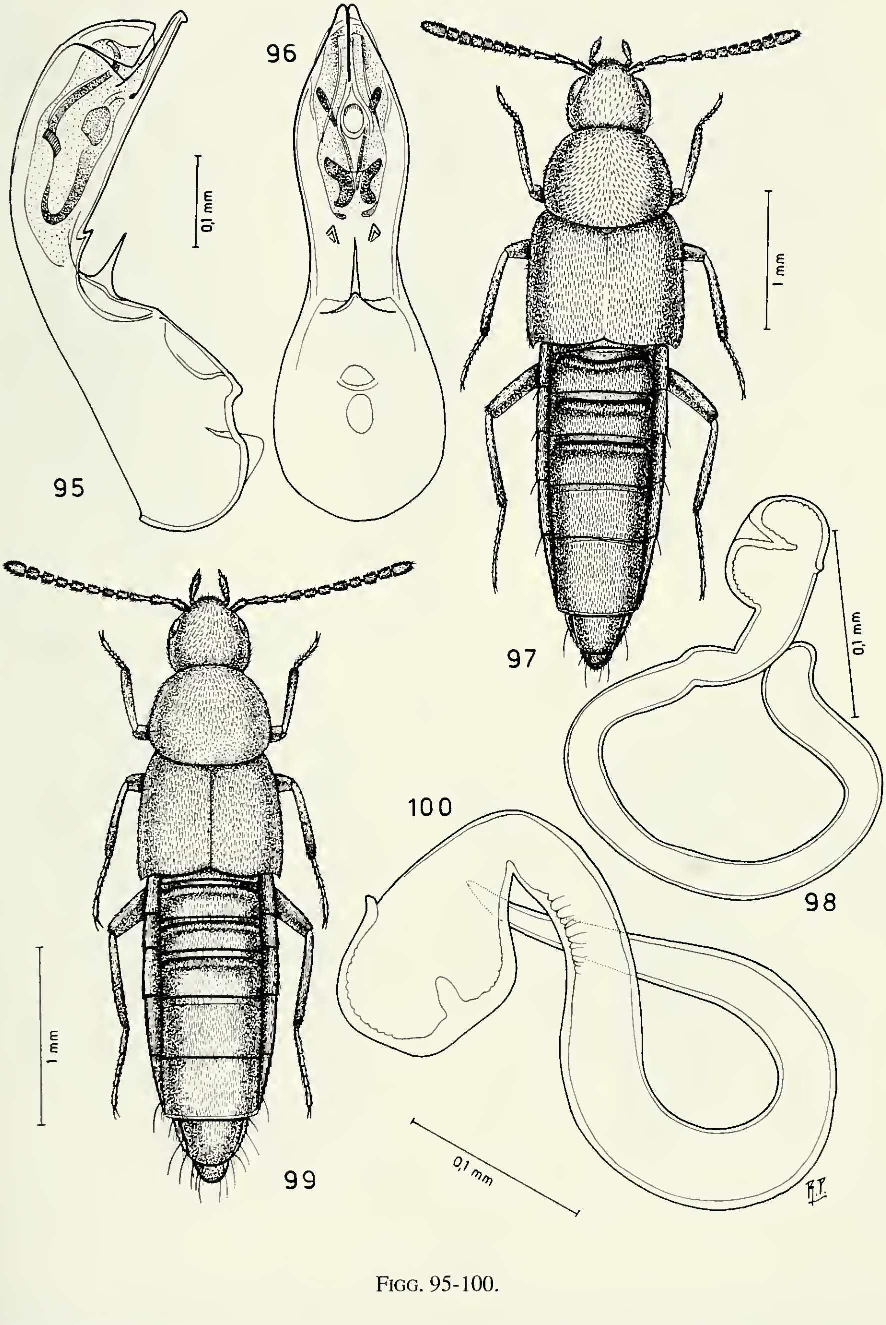
FIGG. 76bis-86.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 76bis-78: *Cousya smetanai* sp. n. Figg. 79-82: *Cousya quadrisulcata* Bernhauer. Figg. 83-86: *Smetanaetha tuberculicoliis* gen. n., sp. n.



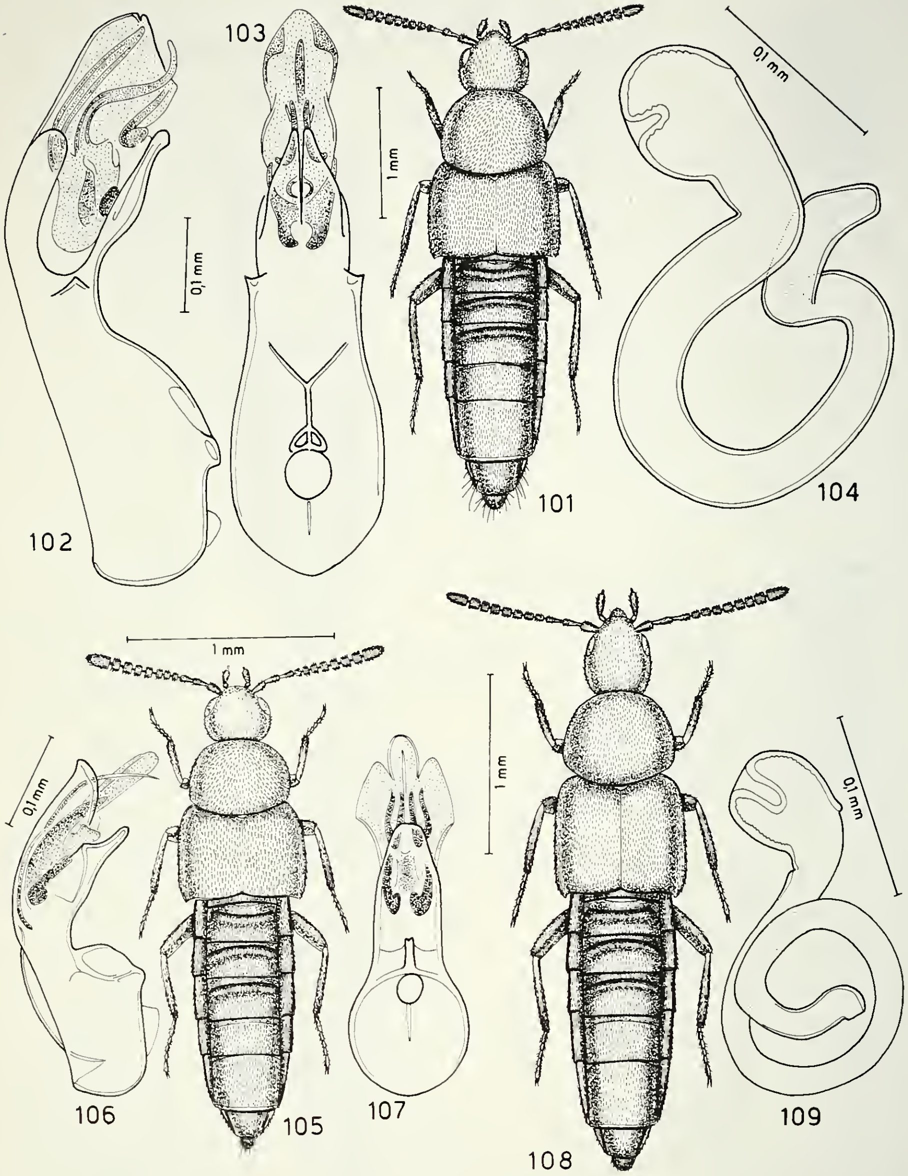
FIGG. 87-94.

Labio con palpo labiale, mento, apice di paramero, galea e lacinia, spermateca, habitus ed edeago in visione laterale e ventrale. Figg. 87-90: *Smetanaetha tuberculicollis* gen. n. sp. n. Figg. 91-94: *Oxypoda* (s. str.) *ingens* sp. n.



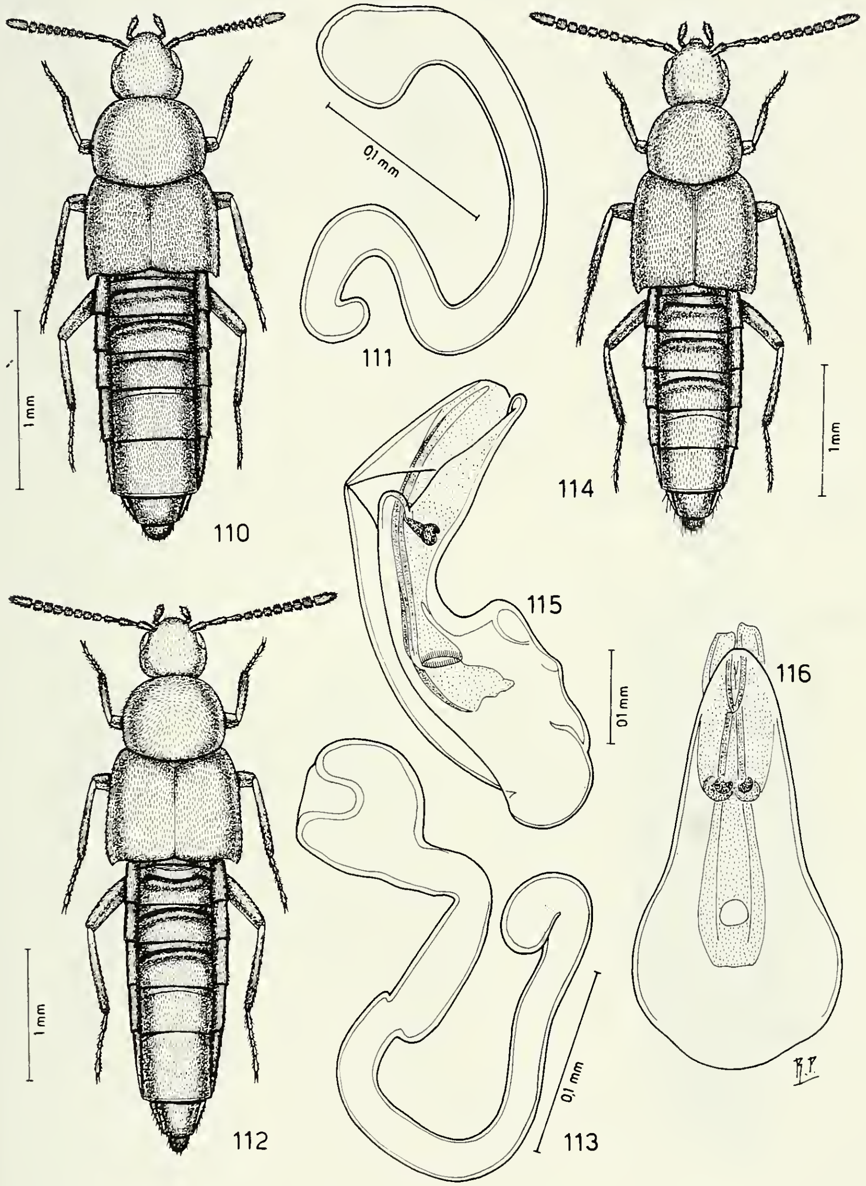
FIGG. 95-100.

Edeago in visione laterale e ventrale, habitus e spermateca. Figg. 95-98: *Oxypoda* (s. str.) *cameroni* sp. n. Figg. 99-100: *Oxypoda* (s. str.) *monticola* sp. n.



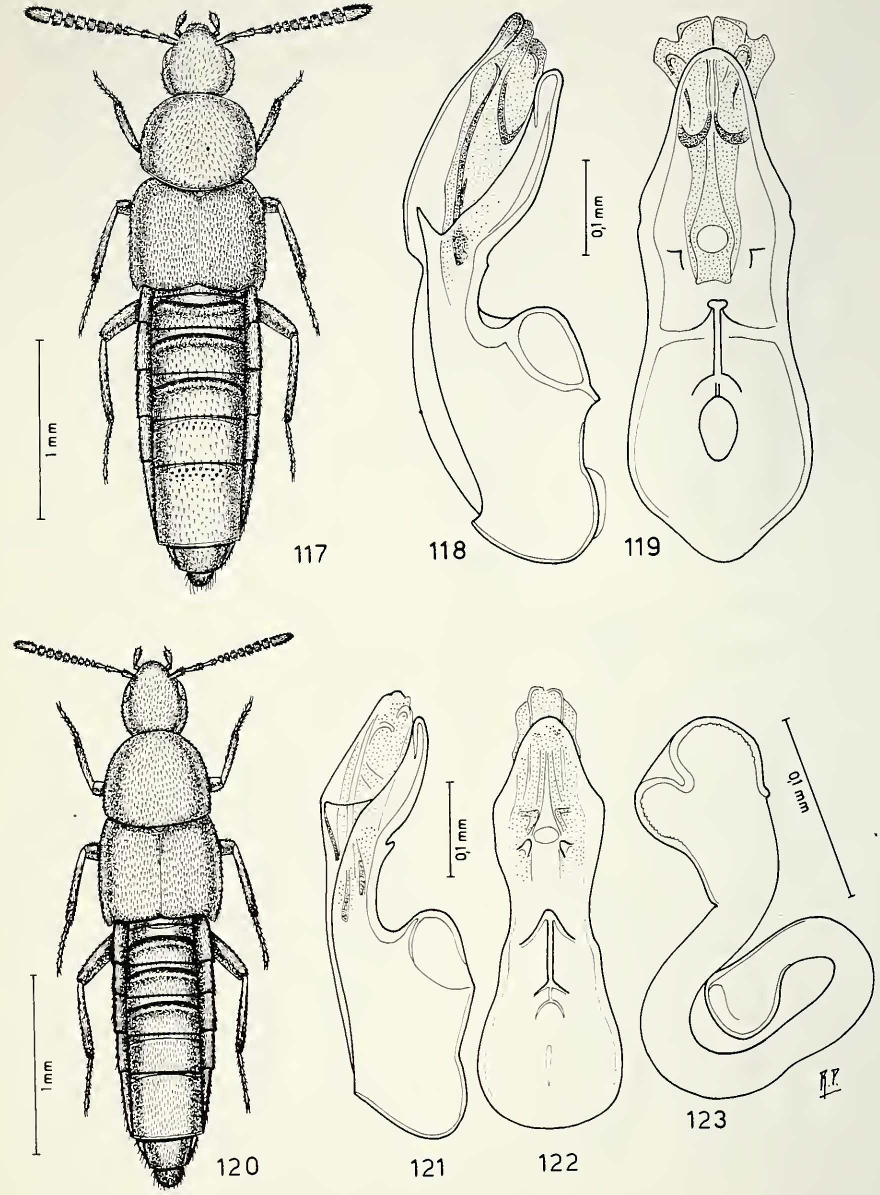
FIGG. 101-109.

Edeago in visione laterale e ventrale, habitus e spermateca. Figg. 101-104: *Oxypoda* (s. str.) *ulterior* sp. n. Figg. 105-107: *Oxypoda (Podoxya) subsericea* Cameron. Figg. 108-109: *Oxypoda (Podoxya) ahalensis* sp. n.



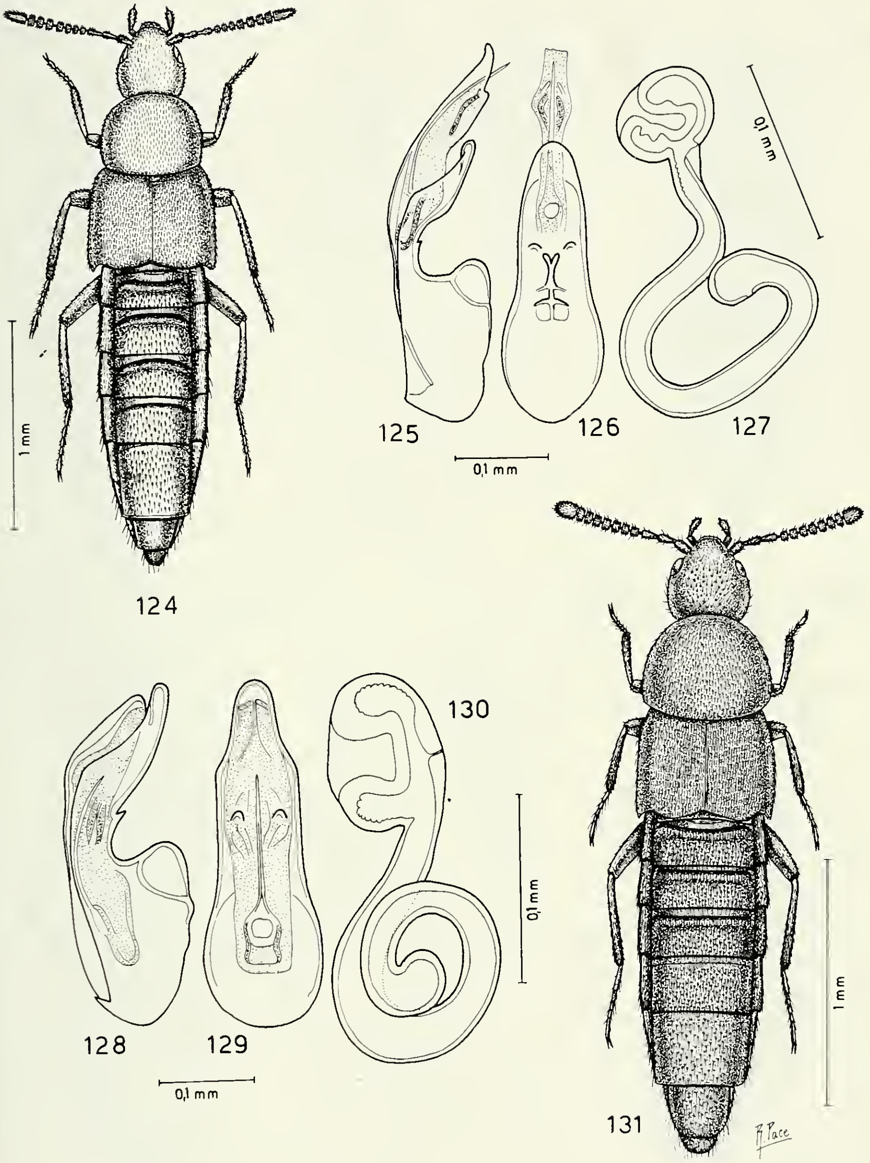
FIGG. 110-116.

Habitus, spermateca ed edeago in visione laterale e ventrale. Figg. 110-111: *Oxypoda (Podoxya) shastrana* sp. n. Figg. 112-113: *Oxypoda (Podoxya) mixtoides* sp. n. Figg. 114-116: *Oxypoda (Podoxya) smetanaiana* sp. n.



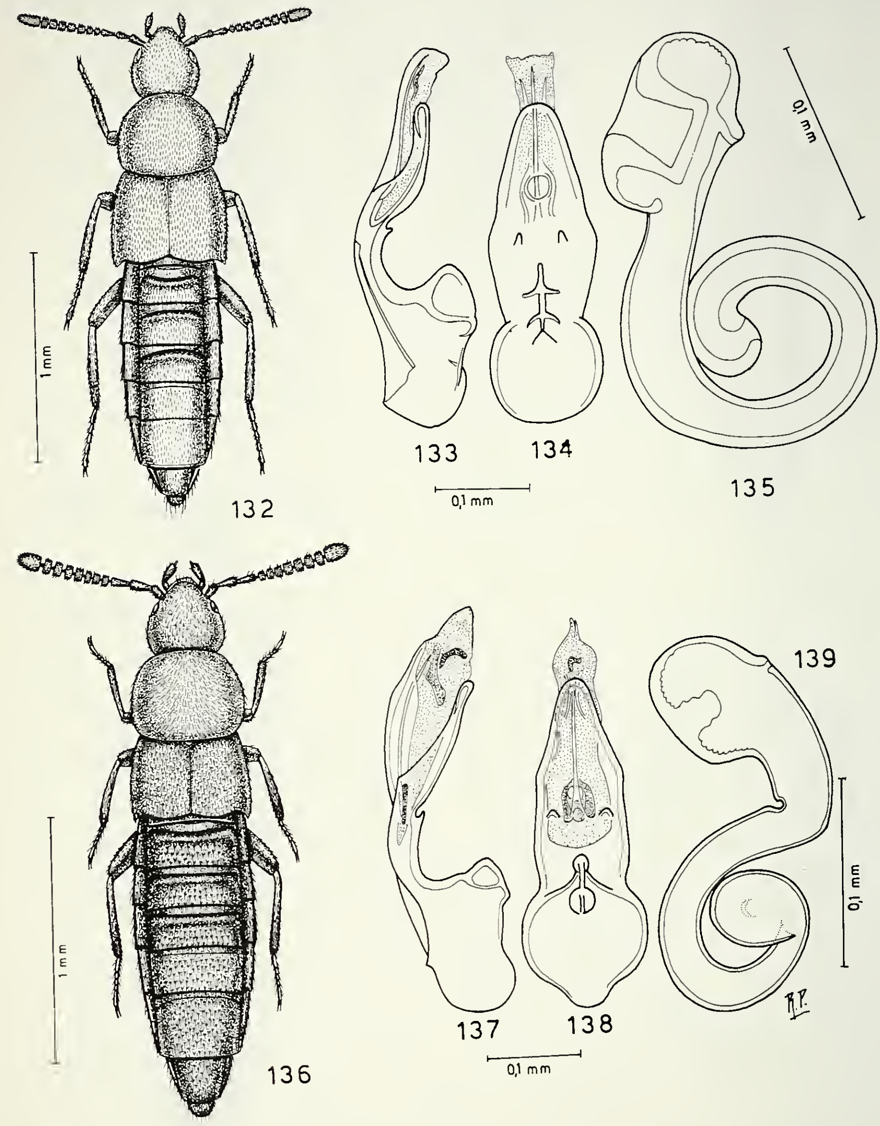
Figg. 117-123.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 117-119: *Oxypoda (Podoxya) clavata* sp. n. Figg. 120-123: *Oxypoda (Podoxya) kirata* sp. n.



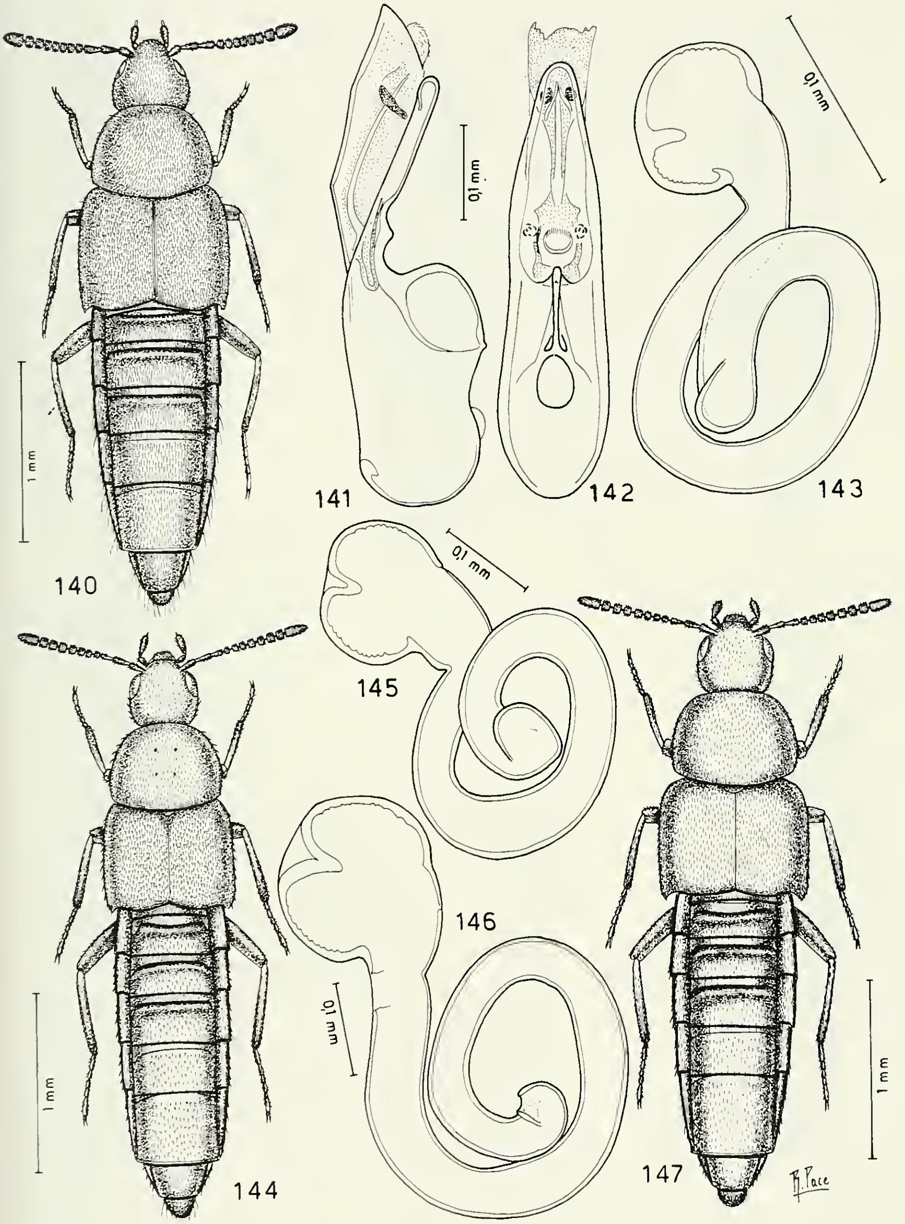
FIGG. 124-131.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 124-127: *Oxypoda (Podoxya) shermathangana* sp. n. Figg. 128-131: *Oxypoda (Podoxya) decessa* sp. n.



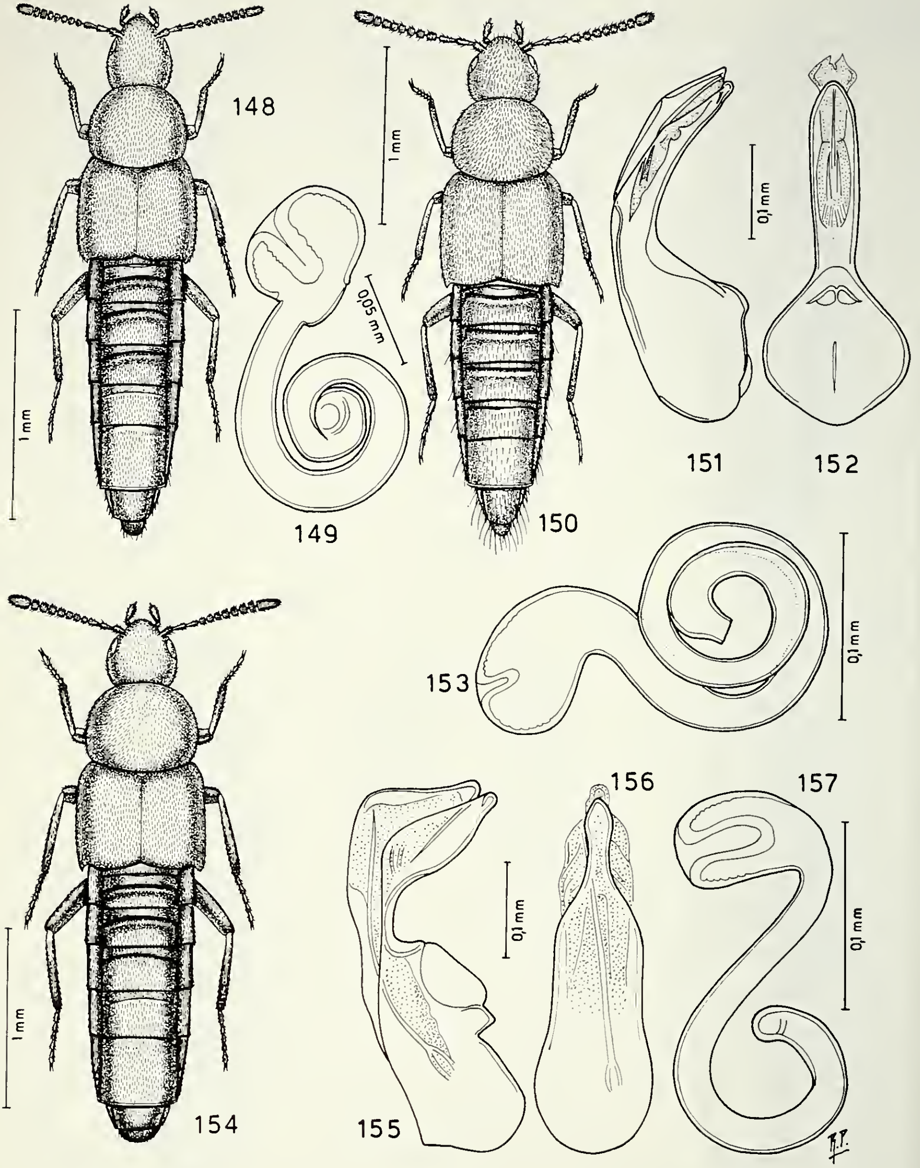
FIGG. 132-139.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 132-135: *Oxypoda (Podoxya) dilatata* sp. n. Figg. 136-139: *Oxypoda (Podoxya) gosainthanensis* sp. n.



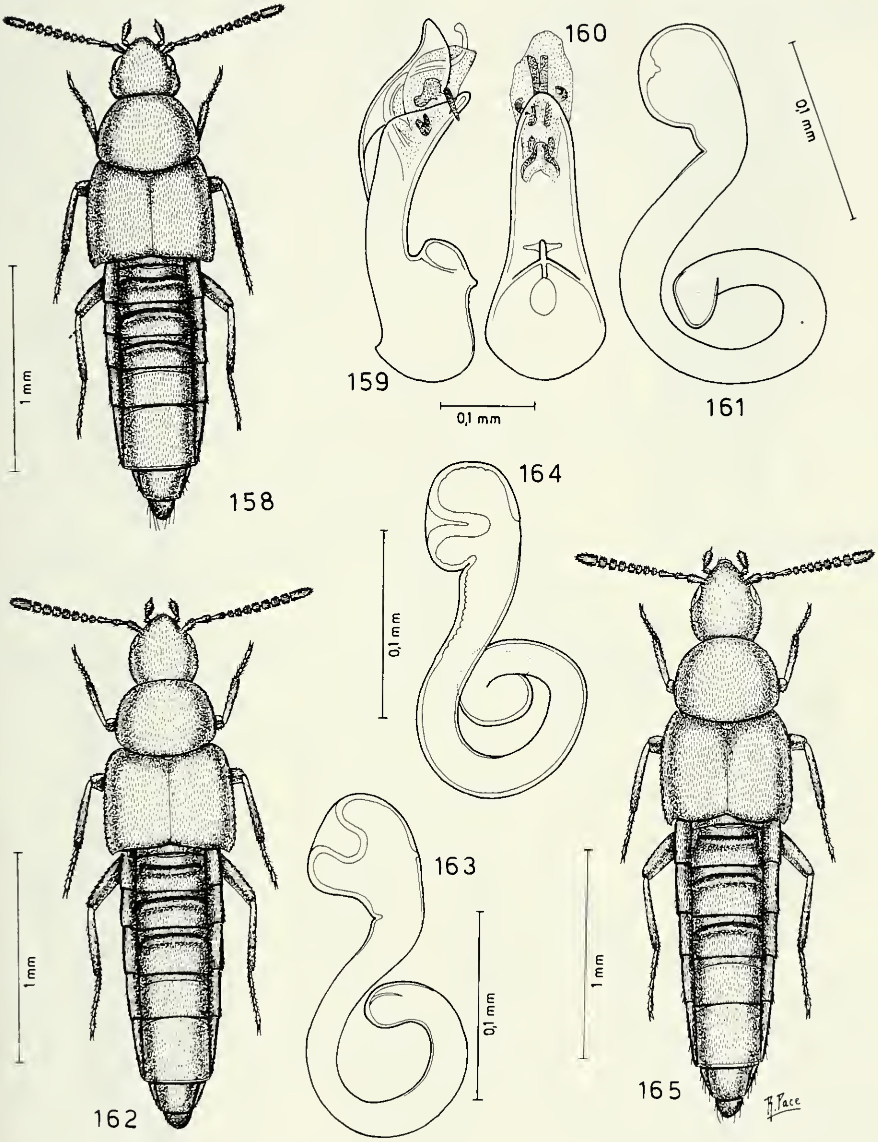
FIGG. 140-147.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 140-143: *Oxypoda (Podoxya) elata* sp. n. Figg. 144-145: *Oxypoda (Podoxya) remansa* sp. n. Figg. 146-147: *Oxypoda (Podoxya) remota* sp. n.



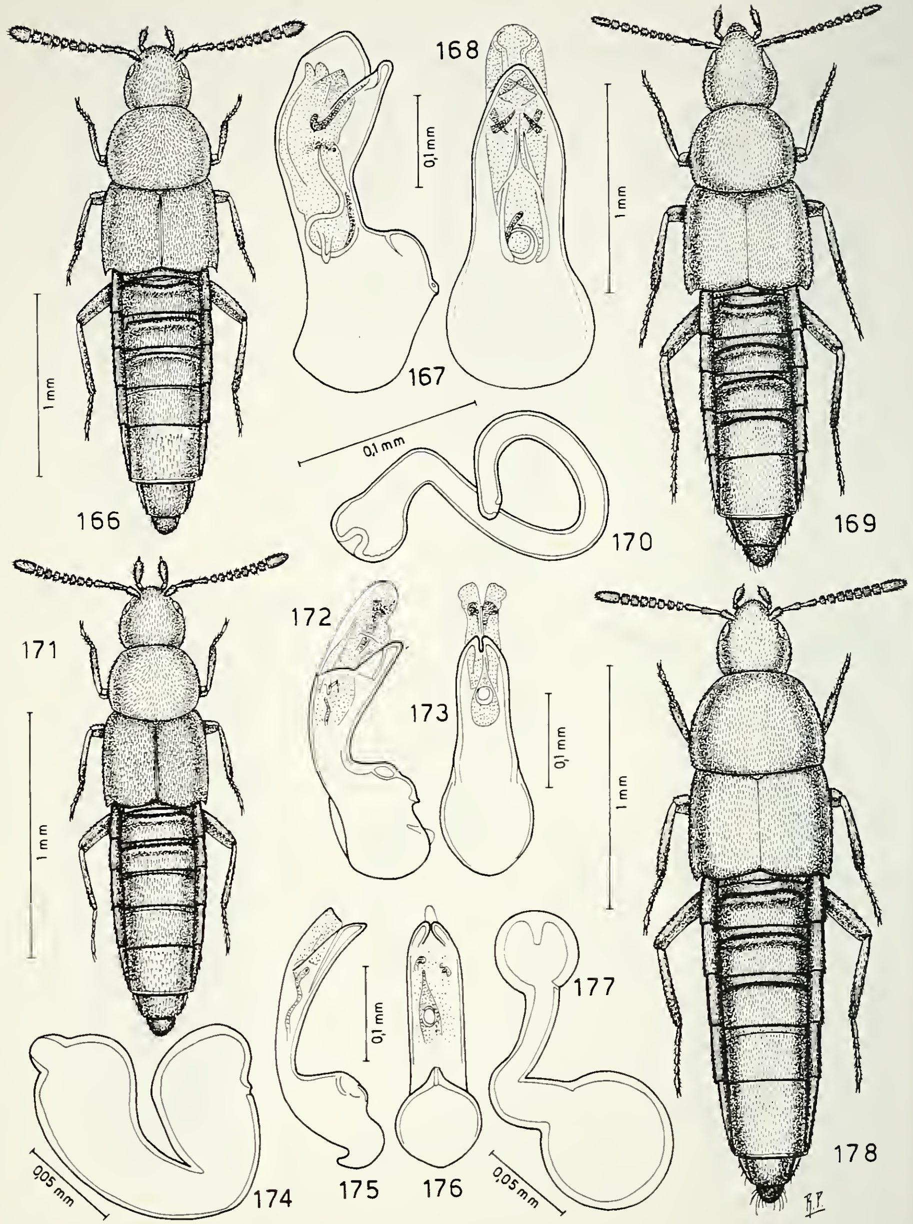
FIGG. 148-157.

Habitus, spermateca ed edeago in visione laterale e ventrale. Figg. 148-149: *Oxypoda (Podoxya) bhairava* sp. n. Figg. 150-153: *Oxypoda (Podoxya) rufomarginella* sp. n. Figg. 154-157: *Oxypoda (Podoxya) burlangana* sp. n.



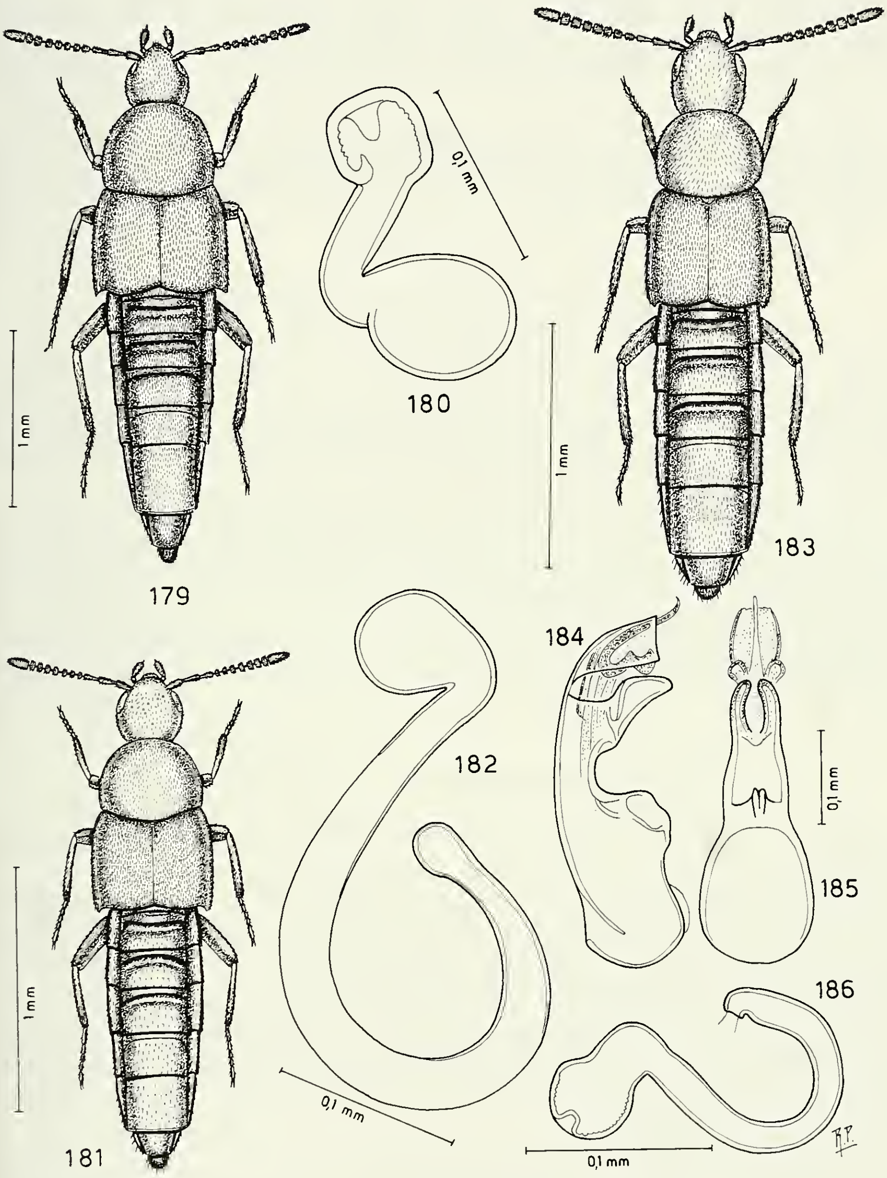
FIGG. 158-165.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 158-161: *Oxypoda (Podoxya) yakorum* sp. n. Figg. 162-163: *Oxypoda (Podoxya) specifica* sp. n. Figg. 164-165: *Oxypoda (Podoxya) durga* sp. n.



FIGG. 166-178.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 166-168: *Oxypoda (Podoxya) dama* sp. n. Figg. 169-170: *Oxypoda (Podoxya) decorella* sp. n. Figg. 171-174: *Oxypoda (Podoxya) pusilla* sp. n. Figg. 175-178: *Oxypoda (Podoxya) chetra* sp. n.



FIGG. 179-186.

Habitus, spermateca ed edeago in visione laterale e ventrale. Figg. 179-180: *Oxypoda (Podoxya) svetana* sp. n. Figg. 181-182: *Oxypoda (Podoxya) sudra* sp. n. Figg. 183-186: *Oxypoda (Podoxya) ganeshica* sp. n.

DESCRIZIONE. Lungh. 2,8 mm. Corpo lucido e bruno; elitre bruno-rossicce; apice addominale rossiccio; antenne brune con i due antennomeri basali, base del terzo e apice dell'undicesimo giallo-rossicci; zampe giallo-rossicce con femori oscurati. La superficie del corpo è coperta di tubercoletti fitti e poco salienti. Edeago figg. 188-189; spermateca fig. 190.

COMPARAZIONI. Specie affine alla precedente *O. ganeshica* sp. n. Se ne distingue per l'edeago a maggiore sviluppo, con profilo ventrale poco distintamente sinuato e "crista apicalis" avente maggiore sviluppo.

ETIMOLOGIA. Da Manjushri, dio induista del sapere.

Oxypoda (Podoxya) bissica sp. n. (Figg. 191-194)

TIPI. Holotypus ♂, Lalitpur distr. Phulcoki, 2650 m, 13.X.1983 (Smetana & Löbl leg., MHNG).

Paratypi: 3 ♀♀, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 2 ♂♂ e 1 ♀, Mont Phulcoki, 2600 m, 7.VI.1986, litière de bambous (Orousset leg., MHNO, CPA).

DESCRIZIONE. Lungh. 2,8 mm. Corpo lucido e bruno; antenne brune con antennomeri 1°, 2° e 11° giallo-rossicci; zampe brune con ginocchia e tarsi giallo-rossicci. La punteggiatura del capo è svanita. I tubercoletti del pronoto sono svaniti, quelli delle elitre distinti. Edeago figg. 191-192; spermateca fig. 193.

COMPARAZIONI. La presenza di due stiletti ben sclerificati del sacco interno dell'edeago, permette di distinguere nettamente questa specie da *O. nigrita* Cameron, 1939.

Oxypoda (Podoxya) limbu sp. n. (Figg. 195-196)

TIPO. Holotypus ♀, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG).

DESCRIZIONE. Lungh. 2,8 mm. Corpo lucido e bruno; elitre rossicce con macchia laterale bruna; apice addominale rossiccio; antenne brune con i due antennomeri basali e l'undicesimo giallo-rossicci; zampe gialle con femori rossicci. L'intero corpo è coperto di tubercoletti distinti. Spermateca fig. 196; maschio sconosciuto.

COMPARAZIONI. Per la forma della spermateca, la nuova specie sembra affine a *O. manjushrica* sp. n., sopra descritta. Poiché la nuova specie ha elitre diversamente colorate, pronoto più trasverso e parte prossimale della spermateca di più ampio sviluppo, si distingue da *O. manjushrica* sp. n.

ETIMOLOGIA. Dai Limbu, gruppo etnico del Nepal.

Oxypoda (Podoxya) personata sp. n. (Figg. 197-198)

TIPI. Holotypus ♀, Kathmandu distr., Kandbari, 1700 m, 23.III.1982 (A. & Z. Smetana leg., MHNG).

Paratypus: 1 ♀, stessa provenienza (CPA).

Descrizione. Lungh. 2,6 mm. Corpo lucido e bruno; pronoto, i tre uriti basali e l'apice addominale giallo-rossicci; antenne brune con antennomero basale giallo-rossiccio e secondo antennomero giallo bruniccio; zampe giallo-rossicce con tibie lievemente infoscate. Tutto il corpo ha superficie distintamente microtubercolata. Spermateca fig. 197; maschio sconosciuto.

Comparazioni. La nuova specie è distinta da *O. kashmirica* Cameron, 1939, perché il bulbo distale della spermateca ha introflessione apicale molto più profonda e larga e perché la parte prossimale della stessa spermateca è poco prolungata (molto prolungata in *kashmirica*).

Oxypoda (Podoxya) kuwapanensis sp. n. (Figg. 199-200)

Tipo. Holotypus ♀, Khandbari distr., for. NE Kuwapani, 2 2500 m, 14.IV.1981 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 2,7 mm. Corpo lucido e bruno; margine posteriore degli uriti ed estremità addominale rossicci; antenne brune con gli antennomeri 1°, 2° e 11° giallo-rossicci; zampe giallo-rossicce. Il capo e il pronoto presentano tubercoletti distinti. Le elitre sono prive di distinti tubercoletti. Spermateca fig. 200; maschio sconosciuto.

Comparazioni. Specie che si colloca in posizione intermedia tra *O. kashmirica* Cameron, 1939 e *O. personata* sp. n. sopra descritta. Della prima condivide il carattere della parte prossimale della spermateca prolungata, ma senza deviazione finale, né senza introflessione apicale del bulbo distale corta; della seconda condivide il carattere della lunga introflessione apicale del bulbo distale della spermateca, ma tale introflessione con è larga quanto quella di *personata*. Inoltre la parte prossimale della spermateca della nuova specie è molto più prolungata della parte corrispondente di *personata*.

Oxypoda (Podoxya) suturalis sp. n. (Figg. 201-205)

Tipi. Holotypus ♂, India, Himachal Pradesh, Rohtangpass, S-Hang, 2500-3500 m, (Franz leg., CFR).

Paratypi: 2 ♂♂, stessa provenienza (CFR, CPA); 1 ♀, Westnepal, Gebiet von Jumla, Dzunda Khola-Tal b. Talphi, 3000-3500 m, (Franz leg., CFR); 1 ♀ Nepal, Mustang. distr., S Lethe, 2450-2600 m, artenreicher Laubmischwald, 30.IV.-1.V.1980 (Martens & Ausobsky leg., Senckenberg-Museum, Frankfurt a. M.).

Descrizione. Lungh. 2,7 mm. Corpo bruno e lucido; sono rossicci la sutura e il margine posteriore e gli omeri delle elitre, la metà posteriore del 5° urite e il pigidio; antenne brune con antennomeri 1°, 2° e 11° giallo-rossicci; zampe rossicce. Fini e fitti tubercoletti poco salienti coprono tutta la superficie del corpo. Edeago figg. 202-204; spermateca fig. 205.

Comparazioni. Questa nuova specie, in base alla forma dell'edeago e della spermateca, è simile a *O. bissica* sp. n. sopra descritta e differisce per gli stiletti del sacco interno seghettati al margine dorsale e per la spermateca che ha parte prossimale molto più prolungata e introflessione apicale del bulbo distale molto larga.

Oxypoda (Podoxya) gupta sp. n. (Figg. 206-208)

Tipo. Holotypus ♂, Prov. Bagmati, Gokana for. nr. Kathmandu, 1400 m, 31.III.1981 (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 2,4 mm. Corpo lucido e bruno-rossiccio; capo ed elitre bruni; antenne brune con i tre antennomeri basali giallo-rossicci; zampe giallo-rossicce. Distinti e fitti tubercoletti coprono la superficie di tutto il corpo. Edeago figg. 207-208; femmina sconosciuta.

Comparazioni. Specie affine a *O. yakorum* sp. n., sopra descritta; ne differisce per l'edeago nettamente più largo, in visione ventrale, e per la più ampia incavatura ventrale dell'edeago, situata presso la "crista apicalis".

Etimologia. Da Gupta, età dell'arte nepalese del VII secolo.

Oxypoda (Podoxya) gokanica sp. n. (Figg. 210-213)

Tipi. Holotypus ♂, Prov. Bagmati, Gokana for. nr. Kathmandu, 1400 m, 31.III.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 1 ♀, stessa provenienza (CPA); 6 es., Khandbari distr. below Sheduwa, 2100-2550 m, 2.IX.1982 (A. & Z. Smetana leg. MHNG, CPA); 1 ♂, Khandbari distr., Khandbari, 1700 m, 23.III.1982 (A. & Z. Smetana leg., MHNG); 4 ♂♂ e 5 ♀♀, Nepal, Umg. Dhumpus b. Pokhara (Franz leg., CFR, CPA).

Descrizione. Lungh. 2,1 mm. Corpo lucido e rossiccio; capo, 4° urite e base del quinto bruni; antenne bruno-rossicce con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. Tubercoletti molto superficiali coprono l'intero corpo. Edeago figg. 209-211, spermateca fig. 213.

Comparazioni. In base alla forma dell'edeago e della spermateca, la nuova specie si mostra affine a *O. rubra* Cameron, 1939 dell'India. Le differenze sono le seguenti: la nuova specie presenta elitre più lunghe, l'edeago più sviluppato e con due angoli preapicali acuti laterali (fig. 210) (assenti in *rubra*) e spermateca molto più sivluppata, con introflessione apicale del bulbo distale in posizione meno asimmetrica.

Oxypoda (Podoxya) bahaliana sp. n. (Figg. 214-218)

Tipi. Holotypus ♂, Prov. Bagmati, Malemchi, 2800 m, 17.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 8 es., stessa provenienza, ma anche 14-16.IV.1981 (MHNG, CPA); 4 ♀♀, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG); 17 es., Prov. Bagmati, Pokhare NE Barahbise, 2700-2800-3000 m, 2-7.V.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♀, Khandbari distr., above Sheduwa, 3000 m, 31.III.-1.IV.1982 (A. & Z. Smetana leg., MHNG); 1 ♀, Parbat distr., Pun Hill at Ghoropani pass, 3050-3100 m, 8.X.1983, (Smetana & Löbl leg., MHNG); 1 ♂ e 1 ♀, Nepal, Sikha, 83° 40' E - 28° 26' N, 8000 ft., 24-26.V.1954, litter in oak forest (Hyatt leg., BM); 1 ♂ e 1 ♀, Gurjakhan, 83° 14' E - 28° 37' N, 8500 ft., 30.VI.1954 (Hyatt leg., BM).

Descrizione. Lungh. 2,4 mm. Corpo lucido e bruno-rossiccio; capo bruno; estremità addominale rossiccia; antenne brune con i due antennomeri basali rossicci; zampe giallo-rossicce. La superficie del corpo è coperta di tubercoletti fini e distinti. Edeago figg. 215-217; spermateca fig. 218.

Comparazioni. La nuova specie differisce da *O. rubra* Cameron, 1939, per l'apice dell'edeago angoloso ai lati e incavato all'estremità mediana, fig. 216. Per lo stesso carattere la nuova specie si distingue da *O. gokanica* sp. n., sopra descritta.

Etimologia. Da Bahal, gruppo di case nepalesi con cortile interno.

Oxypoda (Podoxya) brendelli sp. n. (Figg. 219-221)

Tipo. Holotypus ♂, Nepal, Kathmandu distr., Phulcoki, 27-31.V.1983, leaf litter (Brendell leg., BM).

Descrizione. Lungh. 2,7 mm. Corpo lucido e nero pece; margine posteriore degli uroterghi rossiccio; estremità addominale bruno-rossiccia; antenne nere con antennomero basale giallo-bruno e secondo bruno; zampe rossicce. Il capo e il pronoto sono coperti di tubercoletti svaniti. Le elitre e l'addome presentano tubercoletti salienti. Edeago figg. 220-221; femmina sconosciuta.

Comparazioni. Specie affine a *O. subconformis* Cameron, 1939, in base alla forma dell'edeago, se visto ventralmente. Se ne distingue per l'assenza di dentini ventrali dell'edeago e per la parte apicale dell'edeago stesso, nettamente più stretta.

Oxypoda (Podoxya) iuvenca sp. n. (Figg. 222-224)

Tipo. Holotypus ♂, Khandbari distr., for. NW Kuwapani, 2500 m, 12.IV.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 2,5 mm. Corpo lucido e bruno-rossiccio; capo e uriti 3°, 4° e 5° bruni; antenne brune con i due antennomeri basali rossicci; zampe giallo-rossicce. L'avancorpo presenta tubercoletti svaniti, l'addome è coperto di tubercoletti distinti. Edeago figg. 222-223; femmina sconosciuta.

Comparazioni. Specie nettamente distinta da *O. nigrita* Cameron, 1939, per gli occhi più sviluppati e per l'edeago poco sviluppato, a lati paralleli nelle regione mediana e non accentuatamente convergenti come in *nigrita*.

Oxypoda (Podoxya) notaticollis sp. n. (Figg. 225-226)

Tipo. Holotypus ♀, Umg. Goropani W Pokhara (Franz leg., CFR).

Descrizione. Lungh. 2,8 mm. Corpo lucido e nero pece; elitre nero-brune; margini posteriori degli uriti rossicci; antenne rossicce; femori bruni, tarsi, tibie a ginocchia rossicci. Il corpo nella totalità è coperto di tubercoletti fini e svaniti. Spermateca fig. 226; maschio sconosciuto.

Comparazioni. La nuova specie è distinta da *O. proxima* Cameron, 1939, per avere la spermateca più sviluppata, con bulbo distale meno asimmetrico e con sua introflessione breve e non lunga quanto quella di *proxima*.

Oxypoda (Podoxya) smetanaorum sp. n. (Figg. 227-228)

Tipo. Holotypus ♀, Khandbari distr., "Bakan" W of Tashigaon, 3250 m, 4.IV.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 3,7 mm. Corpo lucido e bruno; margine posteriore degli uriti 1°, 2° e 3° rossiccio; antenne brune con il primo antennomero basale giallo-rossiccio;

zampe gialle. I tubercoletti del capo e delle elitre sono svaniti, quelli del pronoto sono ben salienti. Spermateca fig. 228; maschio sconosciuto.

Comparazioni. Per alcuni caratteri della spermateca, questa nuova specie sembra affine a *O. mixta* Cameron, 1939, tuttavia è assente una strozzatura del tubulo intermedio tra bulbo distale e parte prossimale, evidente invece in *mixta*. Inoltre l'introflessione apicale del bulbo distale della spermateca stessa è molto meno sviluppato nella nuova specie.

Etimologia. Specie dedicata ai suoi raccoglitori, il Dr. A. Smetana e alla sua signora Zdena.

Oxypoda (Podoxya) kumariae sp. n. (Figg. 229-230)

Tipi. Holotypus ♀, Khandbari distr., for. above Ahale, 2400 m, 25.III.1982 (A. & Z. Smetana leg., MHNG).

Paratypi: 2 ♀♀, stessa provenienza (MHNG, CPA); 2 ♀♀, Khandbari distr., for. NE Kuwapani, 2500 m, 28.III.1982 (A. & Z. Smetana leg., MHNG, CPA).

Descrizione. Lungh. 3,7 mm. Corpo lucidissimo e bruno; pronoto ed elitre bruno-rossicce; antenne brune con i tre antennomeri basali giallo-rossicci; zampe rossicce. Il capo e il pronoto presentano tubercoletti svaniti. Le elitre sono coperte di tubercoletti distinti. Spermateca fig. 230; maschio sconosciuto.

Comparazioni. Specie distinta da *O. proxima* Cameron, 1939, per avere il bulbo distale della spermateca nettamente più sviluppato, con introflessione apicale meno prolungata e parte prossimale più ampiamente ricurva. Esternamente *O. kumariae* sp. n. si distingue da *O. proxima* per la punteggiatura delle elitre più distinta.

Etimologia. Da Kumari, personificazione vivente della figlia della dea Kali.

Oxypoda (Podoxya) haesitans sp. n. (Figg. 231-232)

Tipo. Holotypus ♀, Umg. Hinorasha Marpha, Takolageb. (Franz leg., CFR).

Descrizione. Lungh. 3,0 mm. Corpo bruno-rossiccio; capo bruno; margine posteriore degli uriti rossiccio; antenne bruno-rossicce con i tre antennomeri basali rossicci; zampe rossicce. Tubercoletti fini coprono la superficie del corpo. Spermateca fig. 231; maschio sconosciuto.

Comparazioni. Specie appartenente al gruppo a cui fa capo *O. proxima* Cameron, 1939. E' distinta da questa specie e dalle affini per la caratteristica introflessione del bulbo distale della spermateca, dilatata nella regione apicale e per la parte prossimale, pure della spermateca, sottile e descrivente una semispira e non una spira completa come in *proxima* e specie affini.

Oxypoda (Podoxya) expeditionis sp. n. (Figg. 233-236)

Tipi. Holotypus ♂, Naltartal, aber Naltar, 3.VIII.1974 (Karakorumexpedition, Leiter H. Linzbichler, CFR).

Paratypi: 2 ♂♂ e 2 ♀♀, stessa provenienza (CFR, CPA); 11 es., Nepal, Muktinath Thorangpass, 4000-4500 m, (Franz leg., CFR, CPA); 1 ♂, Westnepal, Gebiet von Jumla, Dzunda-

Khola Tal b. Talphi, 3000-3500 m, (Franz leg., CFR); 1 ♂, Kashmir, Aru, X.1977 (Franz leg., CFR); 1 ♂ e 1 ♀, Kashmir, Zagipal b. Pahalgam, X.1977 (Franz leg., MHNP, CPA); 1 ♂, Gebiet des Rarasees, Westnepal, Umg. Pina 29.IX-1.X.1977 (Franz leg., CFR); 1 ♂, Chautara distr., Nauling Lakh, 11-20.V.1983 (Brendell leg., BM); 7 es., Prov Bagmati, below Thare Pati, 330 m, 9-10-11.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 8 es., Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 6 es., Prov. Bagmati, Pokhara NE Barahbise, 2700-3000 m, 2-7.V.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♂, 2 ♀♀, Umg. Jarkot, Thakholagebiet, 4000-4300 m (Franz leg., CFR, CPA); 4 es., Thakholageb. Umg. Ainorasha, (Franz leg., CFR, CPA).

Descrizione. Lungh. 2,9 mm. Corpo lucido e bruno; capo e uriti 3°, 4° e 5° nero-bruni; estremità addominale rossiccia; antenne e zampe rossicce. Il corpo è coperto di tubercoletti fini poco distinti. Edeago figg. 234-235; spermateca fig. 236.

Comparazioni. Specie ben distinta da *O. nigrolucens* Cameron, 1939, se si osserva la forma dell'edeago, anche se esso è del medesimo tipo, cioè profondamente incavato al lato ventrale. L'edeago della nuova specie differisce da quello di *nigrolucens* per la minore dimensione, per la "crista apicalis" molto più ridotta, per il tubulo del sacco interno meno allungato e per la parte apicale dell'edeago stesso, molto stretta, se vista ventralmente. Di *O. nigrolucens* non è nota la femmina, pertanto non è possibile la comparazione delle spermateche.

Oxypoda (Podoxya) orousseti sp. n. (Figg. 237-239)

Tipo. Holotypus ♂, Kathmandu Valley, Mt. Phulcoki, 2600 m, 7.VI.1986, forêt de chênes, tamisage d'humus (Orousset leg., MHNP).

Descrizione. Lungh 2,4 mm. Corpo lucido e bruno-rossiccio; capo bruno; estremità addominale rossiccia; antenne brune con i due antennomeri basali, la base del 3° e l' 11° giallo-rossicci; zampe rossicce. Il capo e il pronoto presentano punteggiatura fine e svanita. Le elitre sono coperte di tubercoletti nettamente salienti, su un fondo a reticolazione distinta. Edeago figg. 237-238; femmina sconosciuta.

Nota. In base ai caratteri esterni, la nuova specie si colloca nel sottogenere *Podoxya*. Tuttavia, in base alla forma dell'edeago, questa specie mostra strette affinità con *O. nepalensis* Scheerpeltz, 1976, che però, ancora in base ai caratteri esterni, si colloca nel sottogenere *Sphenoma*. Ciò è un ulteriore dato che palesa l'artificiosità delle suddivisioni sottogeneriche attuali.

Comparazioni. Specie distinta da *O. nepalensis* Scheerpeltz, 1976, per avere elitre più lunghe e pronoto meno dilatato. L'edeago della nuova specie possiede due ricurvi spigoli preapicali ventrali, assenti in *nepalensis*. Il tubulo del sacco interno dell'edeago della nuova specie è analogo a quello di *nepalensis*, ma più corto, anche perché l'edeago della nuova specie è meno sviluppato di quello di *nepalensis*.

Etimologia. Specie dedicata al suo raccoglitore, il collega francese J. Orousset, noto studioso di Staphylinidae endogei.

Oxypoda (Demosoma) neutra sp. n. (Figg. 240-241)

Tipi. Holotypus ♀, Thakholagebiet, Nawronkot b. Larjung, 2900-3000 m (Franz leg., CFR).

Paratypi: 5 ♀♀, Prov. Bagmati, near Mere Dara, 3000 m, 7.IV.1981 (Löbl & Smetana leg., MHNG, CPA); 2 ♀♀, Prov. Bagmati, Malemchi, 2800 m, 14-17.IV.1981 (Löbl & Smetana leg., MHNG); 1 ♀, Prov. Bagmati, Gul Bhanjyang, 2600 m, 6.IV.1981 (Löbl & Smetana leg., MHNG).

Descrizione. Lungh. 2,6 mm. Corpo bruno-rossiccio; capo e uriti 3°, 4° e base del 5° bruni; antenne rossicce con i due antennomeri basali gialli; zampe rossicce. La punteggiatura del capo e del pronoto è svanita. Le elitre sono coperte di tubercoletti salienti. Spermateca fig. 241; maschio sconosciuto.

Comparazioni. Questa nuova specie ha tipo di spermateca del gruppo a cui fa capo *O. proxima* Cameron, 1939, che però in base ai caratteri esterni è attribuita al sottogenere *Podoxya*. Tuttavia l'addome a lati quasi paralleli della nuova specie esclude tale attribuzione sottogenerica, pertanto, in attesa di una futura revisione sottogenerica al fine di pervenire a una sistematica meno artificiale dell'attuale, la nuova specie è attribuita al sottogenere *Demosoma* e comparata con *O. proxima*, che mostra una spermateca a bulbo distale più asimmetrico e parte prossimale della stessa spermateca, molto più ampiamente volta a spira.

Oxypoda (Demosoma) newari sp. n. (Figg. 242-245)

Tipi. Holotypus ♂, Prov. Bagmati, Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypi: 1 ♀, stessa provenienza (MHNG); 22 es., Prov. Bagmati, Burlang Bhanjyang, 2600 m, 5.IV.11981 (Löbl & Smetana, MHNG, CPA); 8 es., Prov. Bagmati, Pokhare NE Barahbise, 2700-2800-3000 m, 2-7.V.1981 (Löbl & Smetana leg., MHNG, CPA); 1 ♂, Prov. Bagmati, Dobate Ridge, NE Barahbise, 2700 m, 2.V.1981 (Löbl & Smetana leg., MHNG); 1 ♂ e 1 ♀, Prov. Bagmati, Chaubas, 2600 m, 5.IV.1981 (Löbl & Smetana leg., MHNG); 11 es., Kathmandu distr., Phulcoki, 2600 m, 20-21-22.IV.1982 (A. & Z. Smetana leg., MHNG; CPA).

Descrizione. Lungh. 2,5 mm. Corpo lucido e bruno; antenne brune con i due antennomeri basali giallo-rossicci. L'avancorpo è coperto di tubercoletti salienti. Solo al margine posteriore degli uroterghi si osservano tubercoli nettamente sviluppati. Edeago figg. 244-245; spermateca fig. 243.

Comparazioni. Specie affine a *O. rubra* Cameron, 1939. Ne è distinta per il pronoto più trasverso, per il 4° antennomero lungo quanto largo (e non trasverso come in *rubra*) e per i due stiletti del sacco interno dell'edeago nettamente robusti (e non esili come in *rubra*).

Etimologia. Dai Newari, antico gruppo etnico del Nepal.

Oxypoda (Demosoma) monasterii sp. n. (Figg. 248-249)

Tipo. Holotypus ♀, Khandbari distr., below Sheduwa, 2550 m, 30.III.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 2,4 mm. Corpo lucido e bruno-rossiccio; estremità addominale rossiccia; antenne bruno-rossicce con antennomero basale giallo-rosscicio; zampe rossicce. L'intero corpo è coperto di tubercoletti salienti. Spermateca fig. 248; maschio sconosciuto.

Comparazioni. La spermateca della nuova specie ha forma atipica, dato che la parte prossimale, pur essendo sottile, non è fortemente ricurva, nè descrive una spira. Per questo carattere è distinta dalle specie di cui è finora nota la spermateca.

Oxypoda (Demosoma) parbatensis sp. n. (Figg. 250-253)

TIPI. Holotypus ♂, Parbat distr., Ghoropani pass, N slope, 2800 m, 5.X.1983 (Smetana & Löbl leg., MHNG).

Paratypi: 8 es., stessa provenienza, ma anche 8.X.1983, 3050-3100 m (MHNG, CPA).

DESCRIZIONE. Lungh. 3,5 mm. Corpo lucido e bruno; antenne brune con i tre antennomeri basali giallo-rossicci; zampe giallo-rossicce. La punteggiatura del capo e del pronoto è svanita. Le elitre sono coperte di tubercoletti distinti. Edeago figg. 251-252; spermateca fig. 253.

COMPARAZIONI. Specie distinta da *O. rubra* Cameron, 1939, per il 4° e 5° degli antennomeri non trasversi, per l'edeago molto più sviluppato, privo di 2 stiletti del sacco interno, ma provvisto di stiletti mediani e due piastre apicali. Inoltre la spermateca, pur avendo bulbo distale asimmetrico come in *rubra*, ha piastre prossimali non avvolte a spira.

Oxypoda (Sphenoma) franzi sp. n. (Figg. 254-256)

TIPO. Holotypus ♂, Westnepal, Gebiet von Jumla, Dzunda Khola-Tal b. Talphi, 3000-3500 m (Franz leg., CFR).

DESCRIZIONE. Lungh. 2,2 mm. Corpo giallo-rossiccio; capo, elitre, urite 4° e base del 5° rossicci; antenne e zampe gialle. La punteggiatura e i tubercoletti dell'avancorpo sono fitti e distinti. Edeago figg. 254-255; femmina sconosciuta.

COMPARAZIONI. L'edeago della nuova specie è simile a quello di *O. connexa* Cameron, 1939, tuttavia è priva di 2 impressioni ventrali che rendono il profilo ventrale bisinuato come in *connexa* ed è senza tubulo del sacco interno che in *connexa* è lungo e sporgente dall'orifizio apicale.

ETIMOLOGIA. Specie dedicata al suo raccoglitore, il Dr. Prof. H. Franz, noto studioso di Scydmaenidae.

Oxypoda (Sphenoma) breviantennata sp. n. (Figg. 257-259)

TIPO. Holotypus ♂, Zentralnepal, Umg. Shermathang Helambu, 1980 (Franz leg., CFR).

DECRIZIONE. Lungh. 2,8 mm. Corpo lucido e rossiccio; quarto urite bruno-rossiccio; antenne rossicce con i tre antennomeri basali gialli; zampe gialle. La pubescenza dell'avancorpo è fitta, quella dell'addome è eccezionalmente rada (normalmente in *Oxypoda* è fittissima). La punteggiatura o i tubercoletti dell'avancorpo sono distinti. Edeago figg. 258-259; femmina sconosciuta.

COMPARAZIONI. Specie unica nel genere per avere l'addome assai radamente pubescente; nelle specie del genere *Oxypoda* note la pubescenza dell'addome è fitta o assai fitta.

Oxypoda (Sphenoma) loebli sp. n. (Figg. 260-262)

TIPO. Holotypus ♂, Mustang distr., Lete, 2550 m, 2.X.1983 (Smetana & Löbl leg., MHNG).

Descrizione. Lungh. 2,8 mm. Corpo lucido e bruno-rossiccio; antenne brune con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. I tubercoletti che coprono il capo sono svaniti, quelli del pronoto e delle elitre sono distinti. Edeago figg. 261-262; femmina sconosciuta.

Comparazioni. Non è nota alcuna specie himalayana del sottogenere *Sphenoma* che presenta un edeago a profilo ventrale nettamente angoloso, come è quello della nuova specie.

Etimologia. Specie dedicata a uno dei suoi raccoglitori, il Dr. I. Löbl del Museo di Storia Naturale di Ginevra, noto studioso di Pselaphidae.

Oxypoda (Sphenoma) crassiuscula sp. n. (Figg. 263-265)

Tipo. Holotypus ♂, Khandbari distr., for. above Ahale, 2400 m, 25.III.1982 (A. & Z. Smetana leg., MHNG).

Descrizione. Lungh. 2,7 mm. Corpo lucido e rossiccio; capo e base degli uriti bruno-rossicci; antenne rossicce con i due antennomeri basali giallo-rossicci; zampe gialle. I tubercoletti che coprono l'avancorpo sono assai svaniti, quelli dell'addome sono salienti. Edeago figg. 264-265; femmina sconosciuta.

Comparazioni. Non sono note specie dell'Himalaya che presentano edeago inciso all'apice e appartenenti al sottogenere *Sphenoma*. Sono presenti specie himalayane con edeago simile (*O. manjushrica* sp. n., *O. ganeshica* sp. n. e *O. chetra* sp. n.), ma esse non presentando elitre nettamente più corte del pronoto, come nella nuova specie, sono attribuite a differente sottogenere. Inoltre l'incisura apicale dell'edeago è ben differente e la struttura dell'edeago della nuova specie è simile solo a quella dell'edeago di *chetra* sp. n. sopra descritta, ma di maggiore dimensione.

Oxypoda (Sphenoma) nagaidana sp. n. (Figg. 266-269)

Tipi. Holotypus ♂, Prov. Bagmati, Pokhare, 3000 m, 7.V.1981 (Löbl & Smetana leg., MHNG).
Paratypi: 14 es., stessa provenienza, ma anche 2800 m, 2.V.1981 (MHNG, CPA); 1 ♀, Nepal, Gurjakhani, 83° 14' E - 28° 37' N, 8500 ft., 30.VI.1954 (Hyatt leg., BM).

Descrizione. Lungh. 2,6 mm. Corpo lucido e bruno-rossiccio; estremità addominale giallo-rossiccia; antenne rossicce con i due antennomeri basali gialli; zampe giallo-rossicce. I tubercoletti del capo e del pronoto sono svaniti, quelli delle elitre sono distinti. Edeago figg. 267-268; spermateca fig. 269.

Comparazioni. Specie affine a *O. obscurella* Pace, 1984, a motivo della struttura generale dell'edeago. Tuttavia la nuova specie è nettamente distinta da questa specie per l'edeago meno robusto, per la presenza di più dentini ventrali (un solo dentino ventrale in *obscurella*), per la differente struttura dei pezzi copulatori del sacco interno e per la parte preapicale dell'edeago stesso non fortemente strozzata come in *obscurella*.

Etimologia. Da Nagaid, nome mitologico della Valle di Kathmandu.

Oxypoda (Sphenoma) cephalina sp. n. (Figg. 270-273)

Tipi. Holotypus ♂, Prov. Bagmati, Yangri Ridge, Yangri, 4150 m, 24.IV.1981 (Löbl & Smetana leg., MHNG).
Paratypus: 1 ♀, stessa provenienza, ma 4350 m, 22.IV.1981 (CPA).

Descrizione. Lungh. 2,8 mm. Corpo lucido e bruno; estremità addominale rossiccia; antenne brune con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. L'avancorpo è coperto di tubercoletti poco salienti. Edeago figg. 271-272; spermateca fig.273.

Comparazioni. Specie che per la forma dell'edeago è probabilmente affine a *O. obscurella* Pace, 1984, pure del Nepal, da cui si distingue per l'edeago meno robusto, non angoloso al lato ventrale e non fortemente strozzato nella regione preapicale, come in *obscurella*. I pezzi copulatori del sacco interno della nuova specie sono analoghi a quelli dell'edeago di *obscurella*, ma molto meno sclerificati.

Oxypoda (Mycetodrepa) nepaliella sp. n. (Figg. 274-275)

Tipi. Holotypus ♀, Prov. Bagmati, Malemchi, 2800 m, 14.IV.1981 (Löbl & Smetana leg., MHNG).

Paratypus: 1 ♀, stessa provenienza (CPA).

Descrizione. Lungh. 2,5 mm. Corpo lucido e bruno; margine posteriore degli uriti ed estremità addominale rossicci; antenne brune con i due antennomeri basali bruno-rossicci; zampe giallo-rossicce. I tubercoletti che coprono la superficie dell'avancorpo sono debolmente salienti. Spermateca fig. 275; maschio sconosciuto.

Comparazioni. A motivo del grande sviluppo della spermateca, la nuova specie è nettamente distinta sia da *O. marginalis* Cameron, 1939, che da *O. ustulata* Pace, 1984, che pure hanno spermateca molto sviluppata, ma non tanto quanto quella della nuova specie, che inoltre presenta forma differente.

Oxypoda (Mycetodrepa) minicephala sp. n. (Figg. 276-278)

Tipi. Holotypus ♂, Khandbari distr., for. above Ahale, 2300 m, 26.III.1982 (A. & Z. Smetana leg., MHNG).

Paratypus: 1 ♂, Khandbari distr., for. NE Kuwapani, 2500 m, 12.IV.1982 (A. & Z. Smetana leg., CPA).

Descrizione. Lungh. 2,2 mm. Corpo lucido e bruno; estremità addominale rossiccia; antenne brune con i due antennomeri basali giallo-bruni; zampe gialle. I tubercoletti del capo e del pronoto sono svaniti, quelli delle elitre salienti. Edeago figg. 276-277; femmina sconosciuta.

Comparazioni. La nuova specie è distinta da *O. marginalis* Cameron, 1939, oltre che per il colore del corpo, per l'edeago sinuato al lato ventrale e regolarmente arcuato in *marginalis*.

Gonionycha smetanai sp. n. (Figg. 279-281)

Tipo. Holotypus ♂, Lalitpur distr., 2 Km S Godawari, 1700 m, 12.IX.1983 (Smetana & Löbl leg. MHNG).

Descrizione. Lungh. 5,0 mm. Corpo lucido e nero; antenne e zampe brune; tarsi rossicci. La reticolazione del capo e del pronoto è assai svanita, quella delle elitre è indistinta. La punteggiatura dell'avancorpo è distinta. Edeago figg. 280-281; femmina sconosciuta.

COMPARAZIONI. Specie ben distinta sia da *G. indica* Cameron 1930 che da *G. assamensis* Cameron, 1939, per il colore e la dimensione corporea differenti e per le elitre più corte del pronoto, anche se di poco.

Pseudoplandria loebli sp. n. (Figg. 282-285)

TIPO. Holotypus ♂, Khandbari distr., below Sheduwa, 2100-2550 m, 9.IV.1982 (A. & Z. Smetana leg., MHNG).

DESCRIZIONE. Lungh. 3,7 mm. Corpo lucidissimo e rossiccio; antenne rossicce con i due antennomeri basali e la base del terzo giallo-rossicci; zampe giallo-rossicce. La punteggiatura del capo è distinta, quella del pronoto assente e quella delle elitre netta. Il primo solco trasverso basale è privo di punteggiatura nel fondo. Edeago figg. 284-285; femmina sconosciuta.

COMPARAZIONI. Specie ben distinta da *P. beesoni* Cameron, 1939, per l'edeago più sviluppato e più profondamente arcuato al lato ventrale e per il 4° antennomero trasverso (più lungo che largo in *beesoni*).

ETIMOLOGIA. Specie dedicata al Dr. I. Löbl del Museo di Storia Naturale di Ginevra, come ricordo della sua venuta al mio domicilio portandomi in studio le Aleocharinae del Nepal del suo Museo, oggetto del presente e dei sei precedenti lavori.

Pseudoplandria smetanai sp. n. (Figg. 286-288)

TIPI. Holotypus ♂, Khandbari distr., Arun River at Nun, 1500-1600 m (A. & Z. Smetana leg., MHNG).

Paratypi: 1 ♂ e 2 ♀♀, stessa pronenienza (MHNG, CPA).

DESCRIZIONE. Lungh. 2,7 mm. Corpo lucidissimo e interamente rossiccio. La punteggiatura del capo e del pronoto è fine. Le elitre sono coperte di tubercoletti salienti. Ciascuna elitra ha un tubercolo spigoloso sulla metà posteriore; dietro esso la superficie delle elitre è depressa. Edeago figg. 287-288; spermateca fig. 289.

COMPARAZIONI. Per il colore del corpo e per i caratteri sessuali secondari sulle elitre e sul 5° urotergo del maschio, la nuova specie è distinta da tutte le specie himalayane. L'edeago della nuova specie è distinto da quello di *P. nepalensis* Pace, 1984, per essere assai poco ricurvo al lato ventrale.

Pseudoplandria praesens sp. n. (Figg. 290-291)

TIPO. Holotypus ♀, Khandbari distr., Arun River at Nun, 1500-1600 m, (A. & Z. Smetana leg., MHNG).

DESCRIZIONE. Lungh. 3,3 mm. Corpo lucido e giallo-rossiccio; antenne bruno-rossicce con i tre antennomeri basali gialli; zampe giallo-rossicce. La punteggiatura del capo e del pronoto è estremamente svanita. Tubercoletti salienti a raspa coprono le elitre. I due solchi basali trasversi dell'addome sono privi di punteggiatura nel fondo. Spermateca fig. 291; maschio sconosciuto.

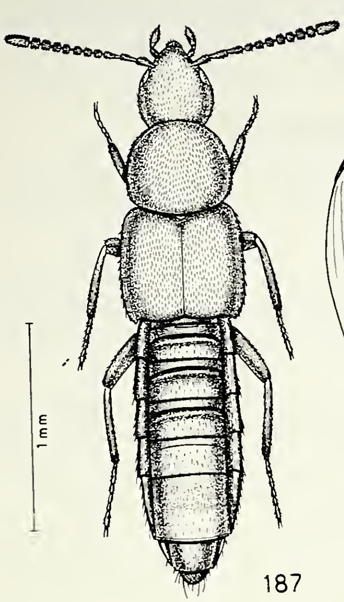
COMPARAZIONI. Specie distinta dalla simile *P. fraterna* Cameron, 1939 di Ceylon (di cui purtropoo non è nota la femmina), per il differente colore delle elitre (giallo-rossicce, invece di nericce con base,omeri e margine posteriore strettamente giallo-rossicci come in *fraterna*). Simpatrica di *P. smetanai* sp. n., sopra descritta, si distingue per gli occhi più sviluppati e soprattutto per la forma della spermateca (figg. 289 e 291).

Pseudoplandria convergens sp. n. (Figg. 292-295)

Tipi. Holotypus ♂, Kathmandu Valley, Budhanilkantha, 2000 m, 1.VI.1986, forêt de pins, tamisage et lavage de terre et d'humus (Orousset leg., MHNP).
Paratypus: 1 ♀, stessa provenienza (CPA).

Descrizione. Lungh. 3,7 mm. Corpo lucido e rossiccio; antenne bruno-rossicce con antennomeri 1°, 2°, 3° et 11° giallo-rossicci; zampe rossicce. la punteggiatura del capo e del pronoto è svanita. Le elitre sono coperte di tubercoletti salienti. Gli uroterghi posteriori sono privi di pubescenza. Edeago figg. 293-294; spermateca fig. 295.

Comparazioni. Questa specie è assai caratteristica e unica per avere gli ultimi tre uroterghi liberi del tutto glabri, con qualche setola isolata, mentre i lati sono normalmente pubescenti. Anche la spermateca ha forma non consueta, cioè è molto lunga e molto sviluppata, non simile a quella di altre finora note.



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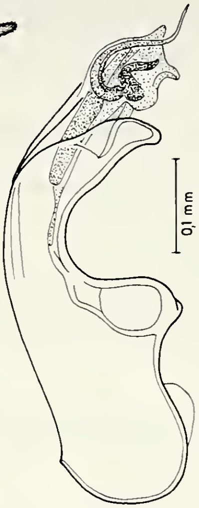

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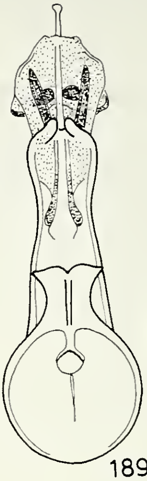
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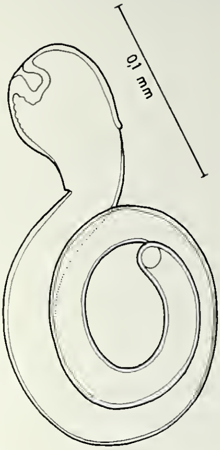

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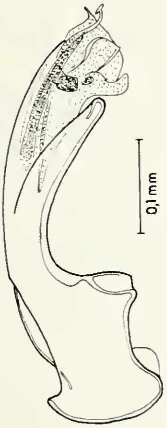

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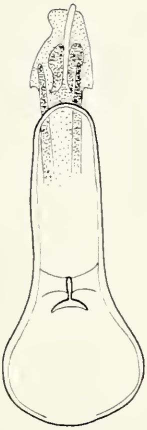
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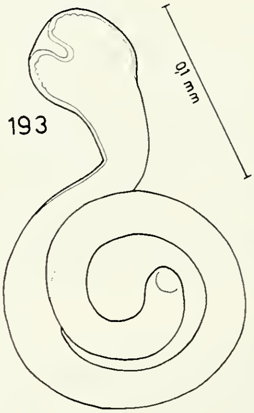

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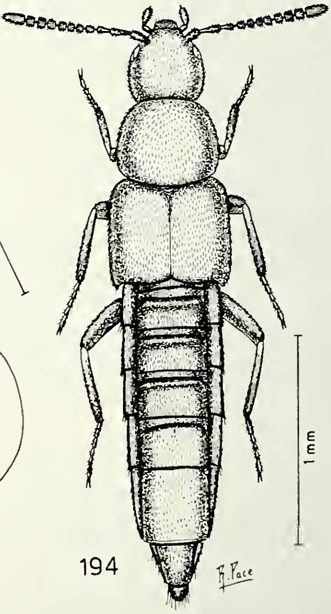

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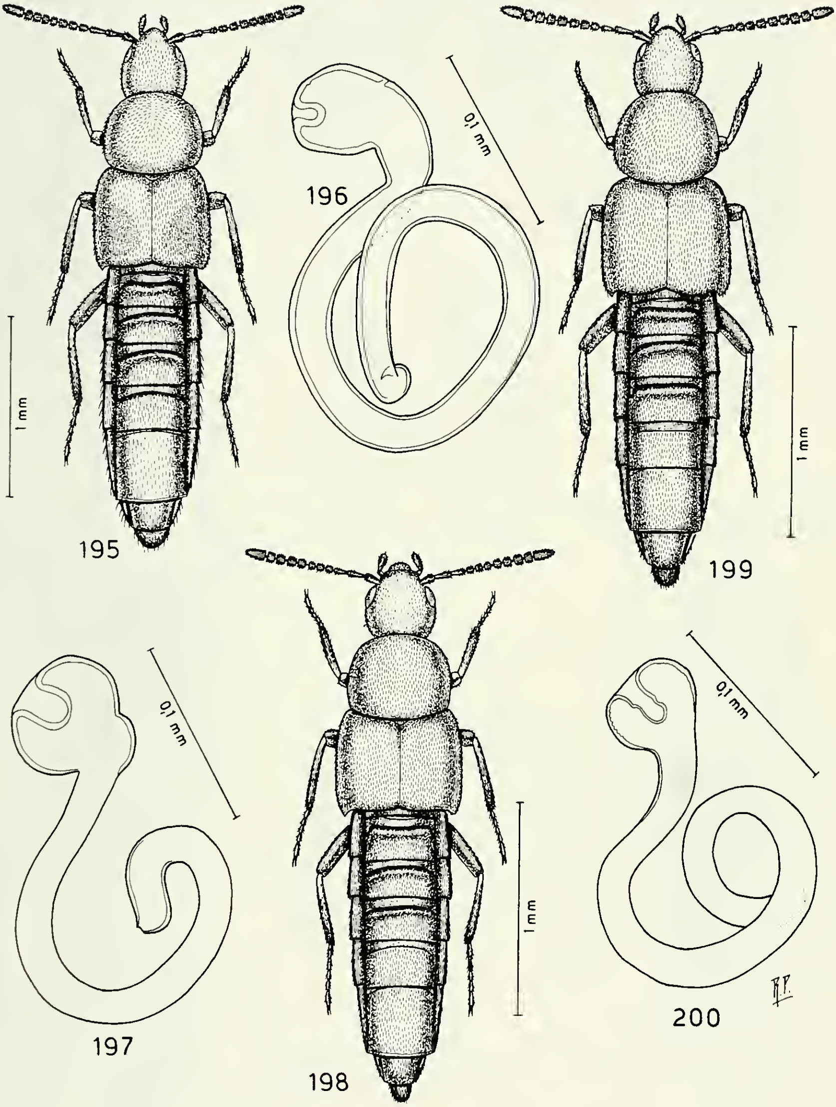
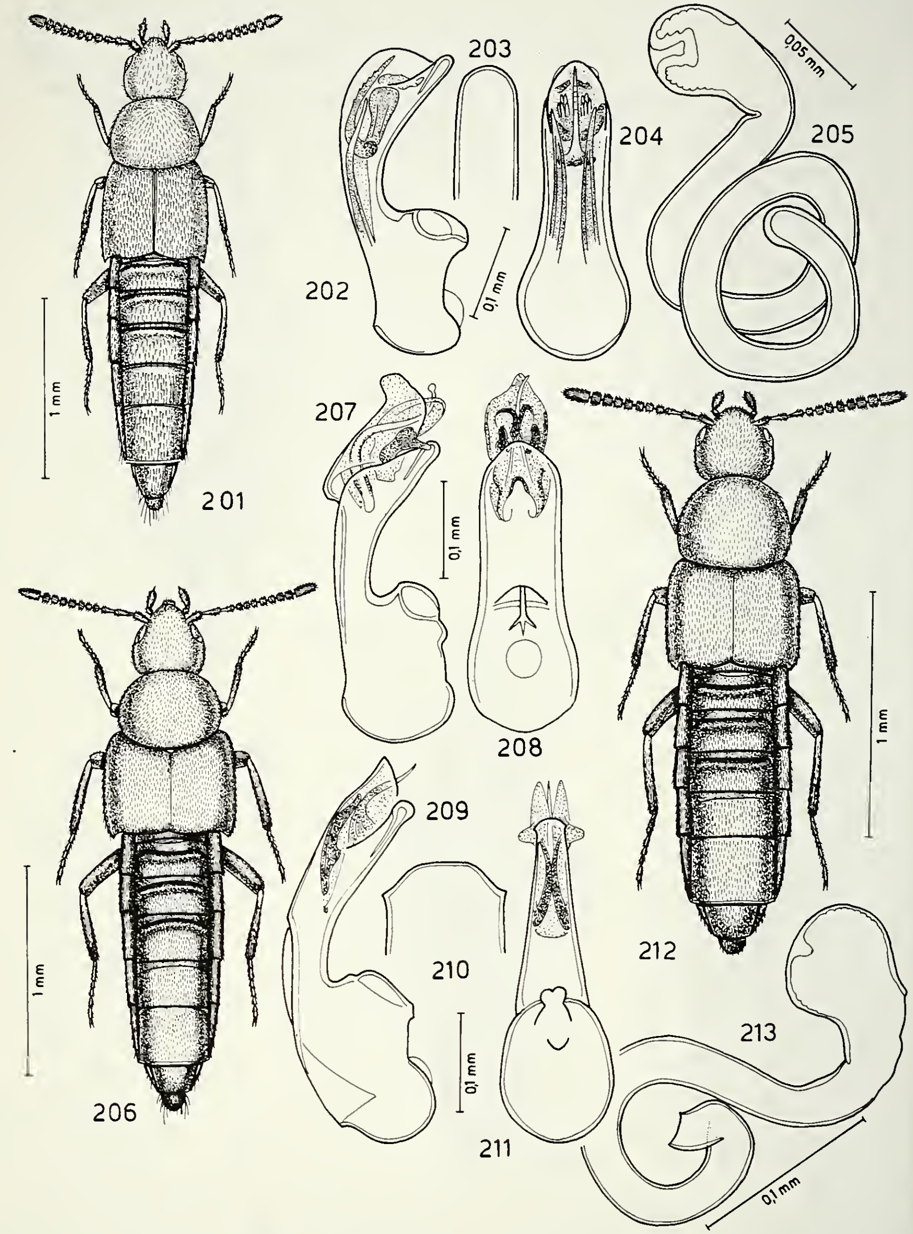
FIGG. 187-194.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 187-190: *Oxypoda (Podoxya) manjushrica* sp. n. Figg. 191-194: *Oxypoda (Podoxya) bissica* sp. n.



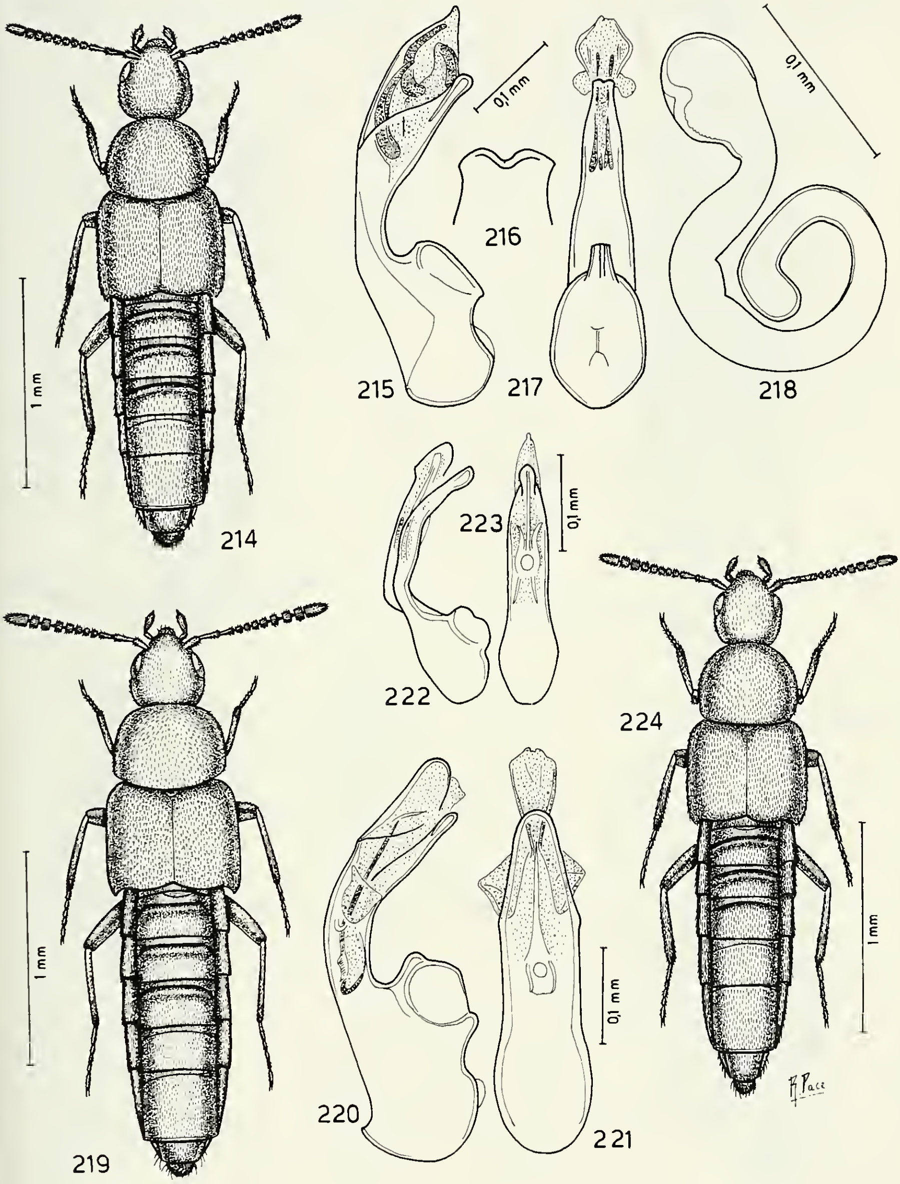
FIGG. 195-200.

Habitus e spermateca. Figg. 195-196: *Oxypoda (Podoxya) limbu* sp. n. Figg. 197-198: *Oxypoda (Podoxya) personata* sp. n. Figg. 199-200: *Oxypoda (Podoxya) kuwapanicola* sp. n.



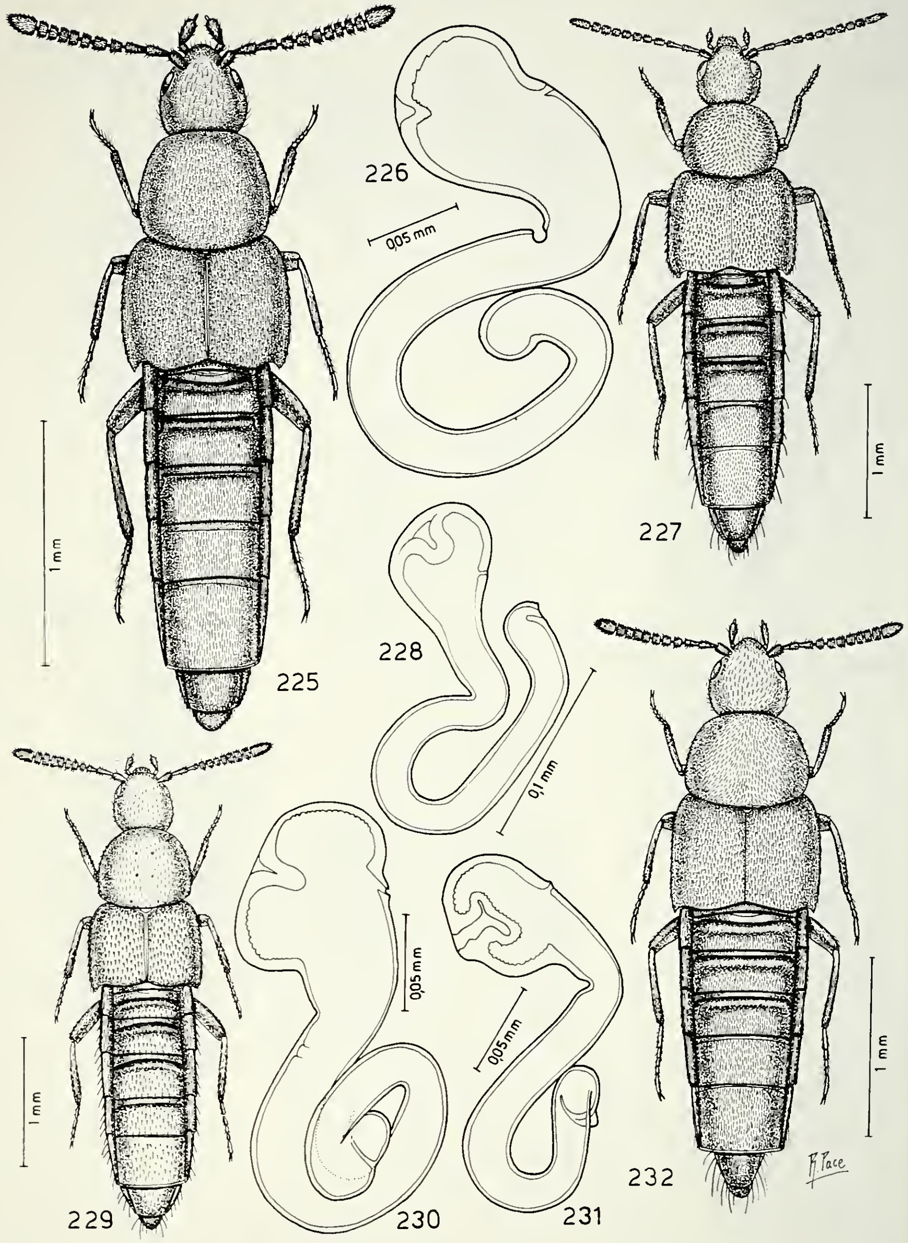
Figg. 201-213.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 201-205: *Oxypoda (Podoxya) suturalis* sp. n. Figg. 206-208: *Oxypoda (Podoxya) gupta* sp. n. Figg. 209-213: *Oxypoda (Podoxya) gokanica* sp. n.



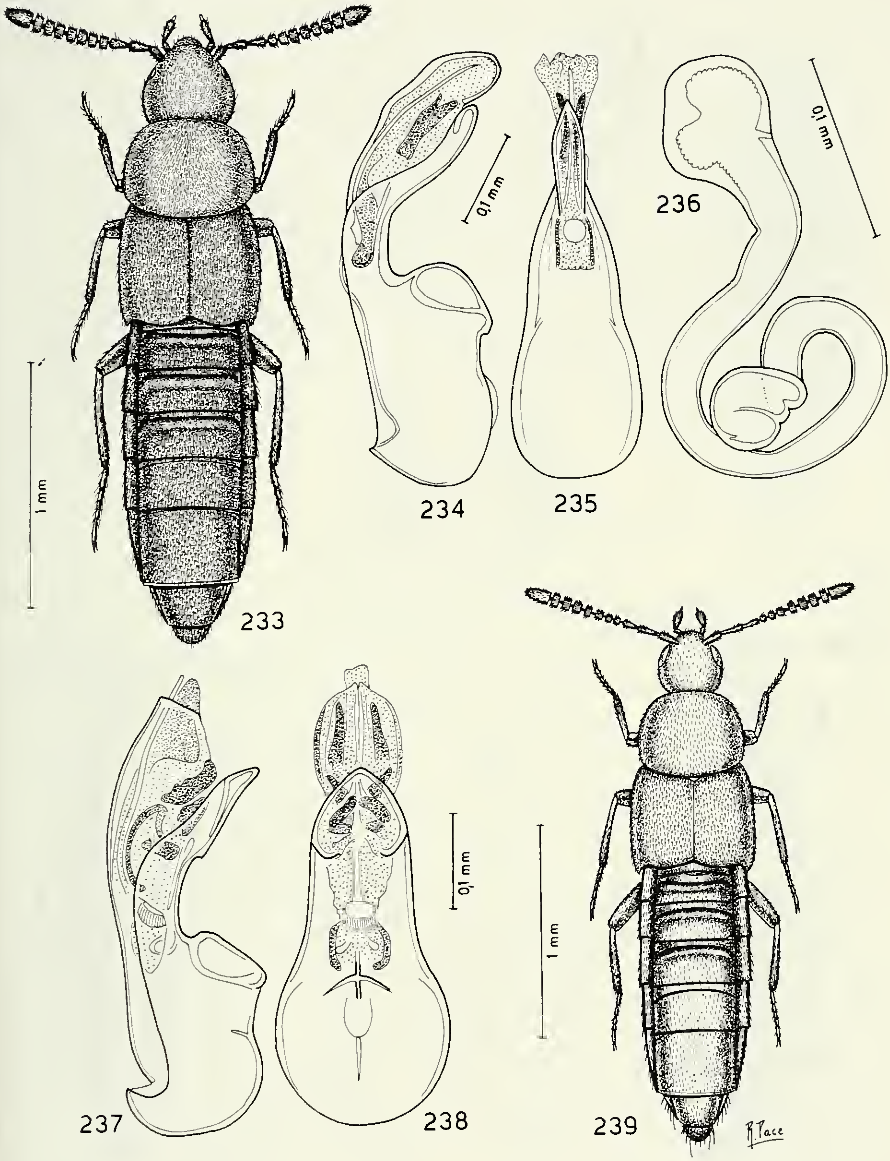
FIGG. 214-224.

Habitus, edeago in visione laterale e ventrale, apice dell'edeago a maggiore ingrandimento, e spermateca. Figg. 214-218: *Oxypoda (Podoxya) bahaliana* sp. n. Figg. 219-221: *Oxypoda (Podoxya) brendelli* sp. n. Figg. 222-224: *Oxypoda (Podoxya) juvenca* sp. n.



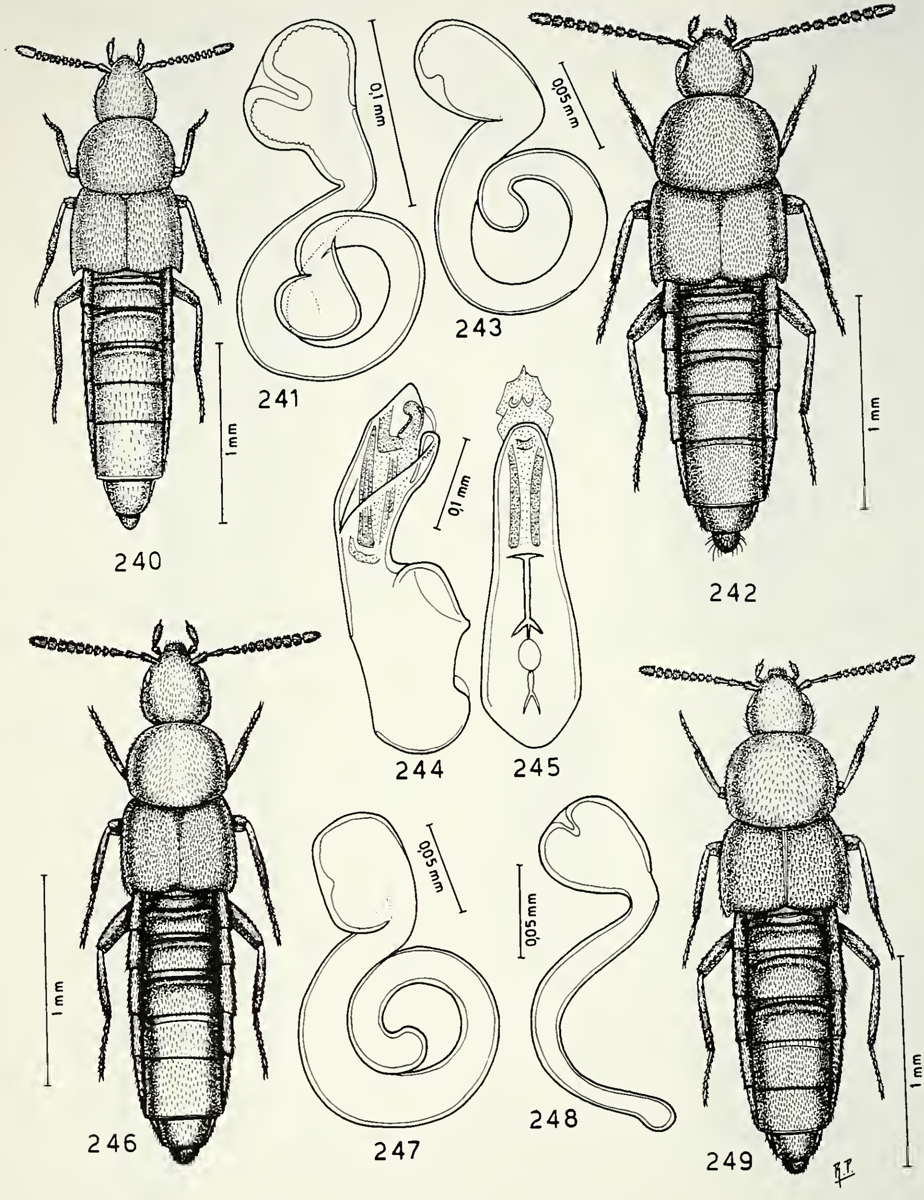
FIGG. 225-232.

Habitus e spermateca. Figg. 225-226: *Oxypoda (Podoxya) notaticollis* sp. n. Figg. 227-228: *Oxypoda (Podoxya) smetanaorum* sp. n. Figg. 229-230: *Oxypoda (Podoxya) kumariae* sp. n. Figg. 231-232: *Oxypoda (Podoxya) haesitans* sp. n.



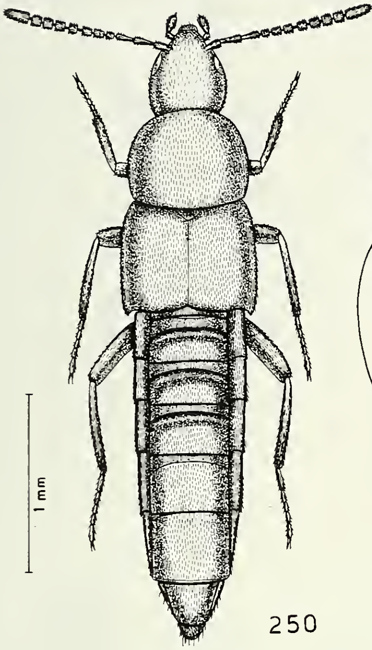
FIGG. 233-239.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 233-236: *Oxypoda (Podoxya) expeditionis* sp. n. Figg. 237-239: *Oxypoda (Podoxya) orousseti* sp. n.



FIGG. 240-249.

Habitus, spermateca ed edeago in visione laterale e ventrale. Figg. 240-241: *Oxypoda (Demosoma) neutra* sp. n. Figg. 242-245: *Oxypoda (Demosoma) newari* sp. n. Figg. 246-247: *Oxypoda (Demosoma) rubra* Cameron. Figg. 248-249: *Oxypoda (Demosoma) monasterii* sp. n.



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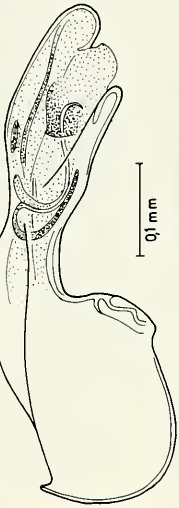

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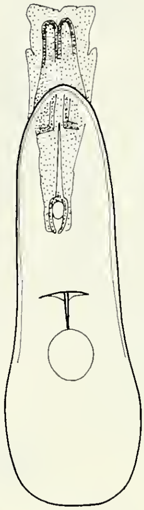

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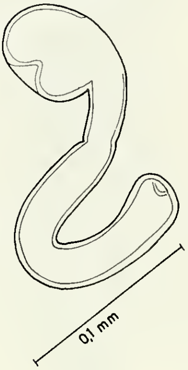

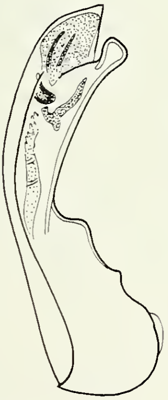

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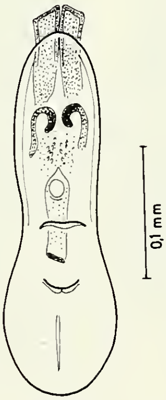

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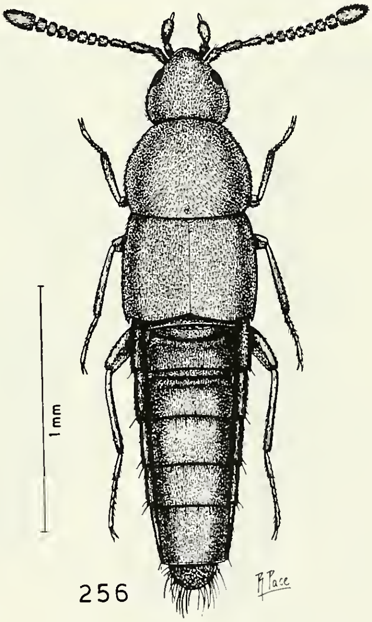

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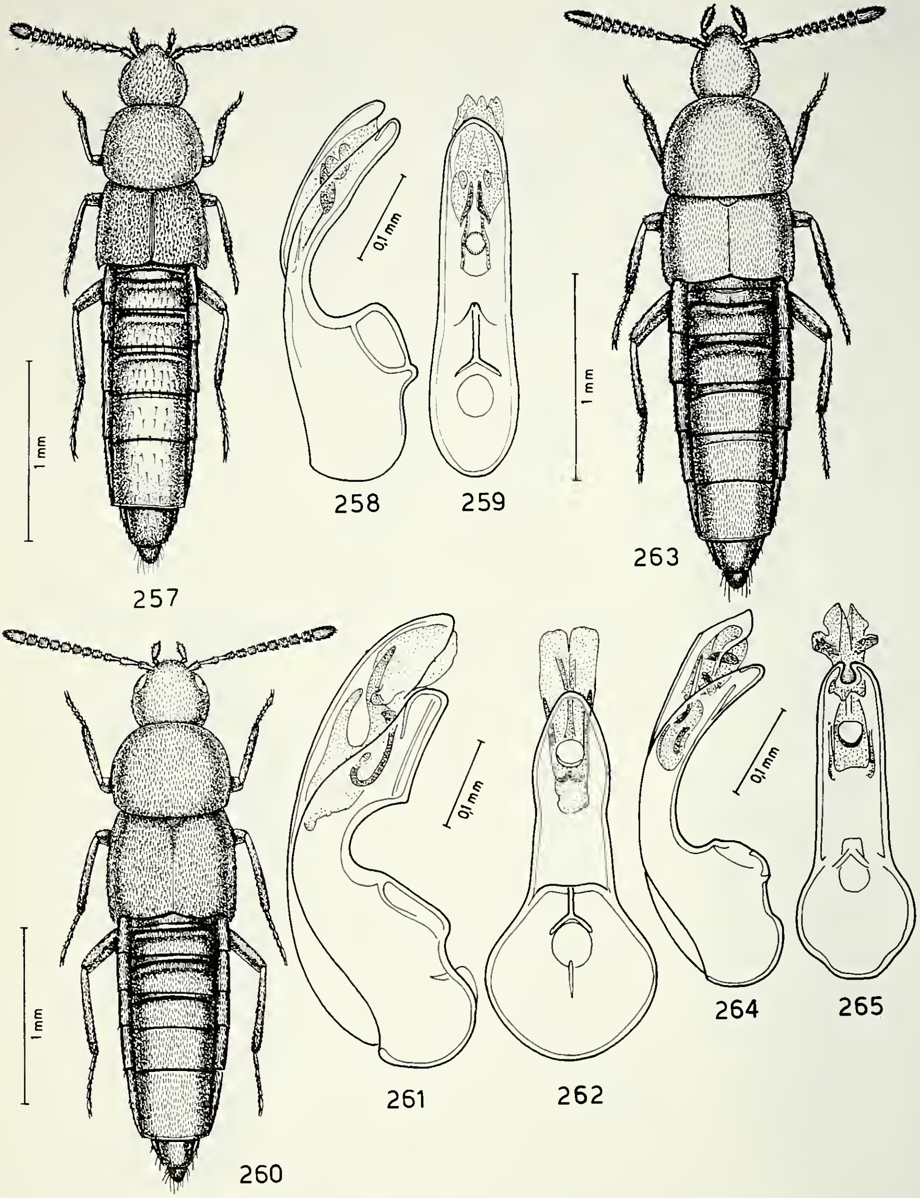
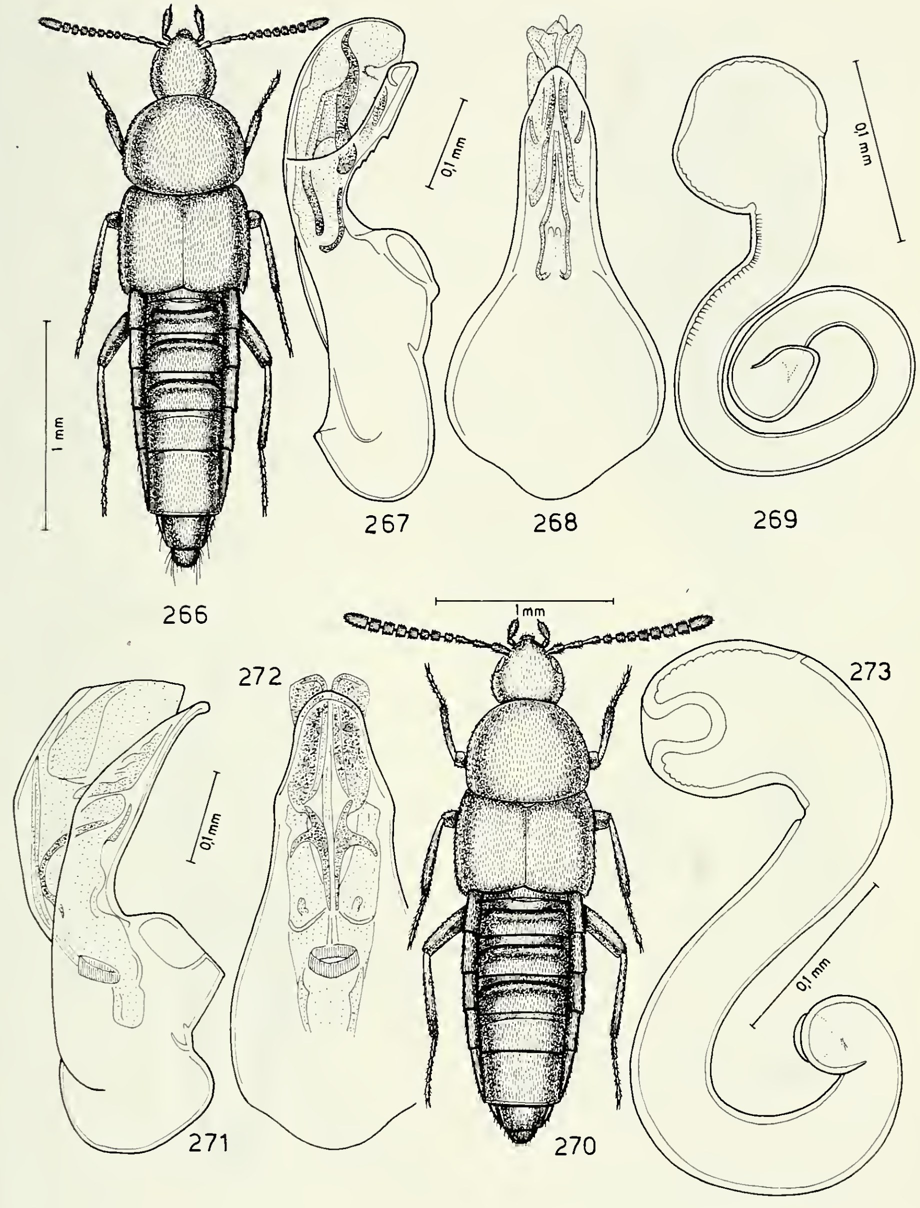
FIGG. 250-256.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 250-253: *Oxypoda (Demosoma) parbatensis* sp. n. Figg. 254-256: *Oxypoda (Sphenoma) franzi* sp. n.



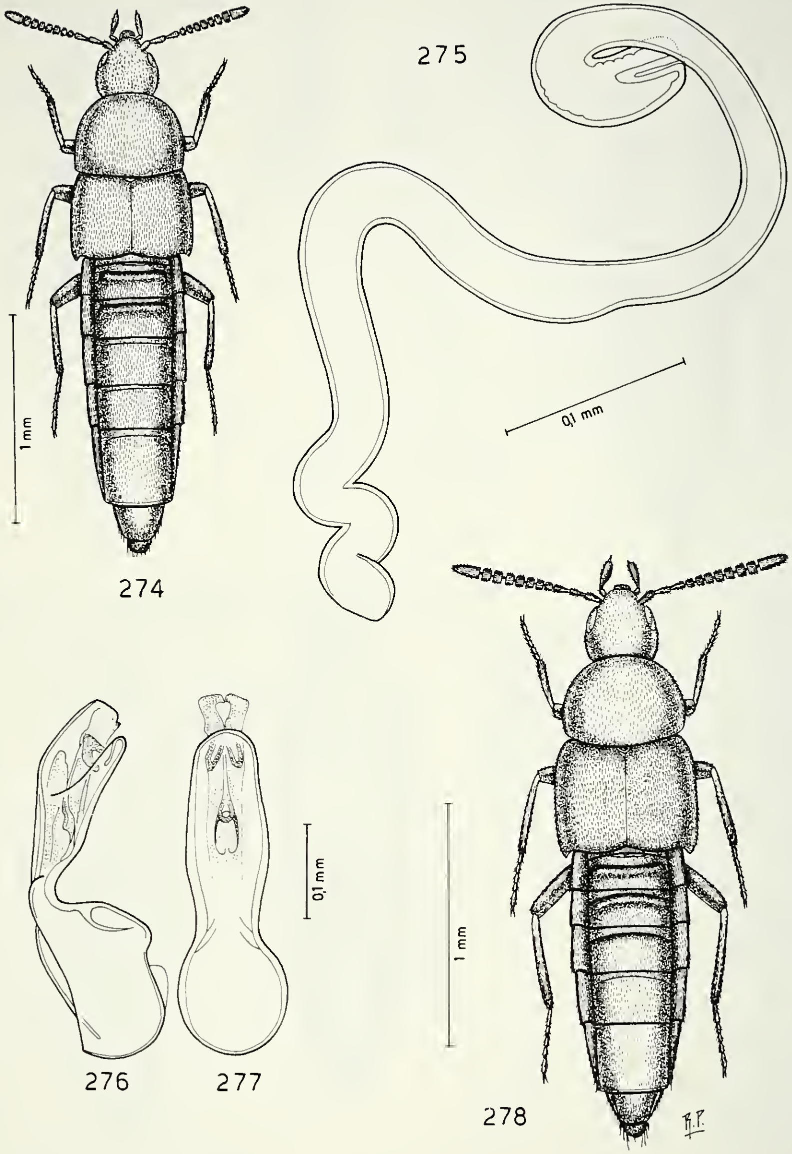
FIGG. 257-265.

Habitus ed edeago in visione laterale e ventrale. Figg. 257-259: *Oxypoda (Sphenoma) breviantennata* sp. n. Figg. 260-262: *Oxypoda (Sphenoma) loebli* sp. n. Figg. 263-265: *Oxypoda (Sphenoma) crassiuscula* sp. n.



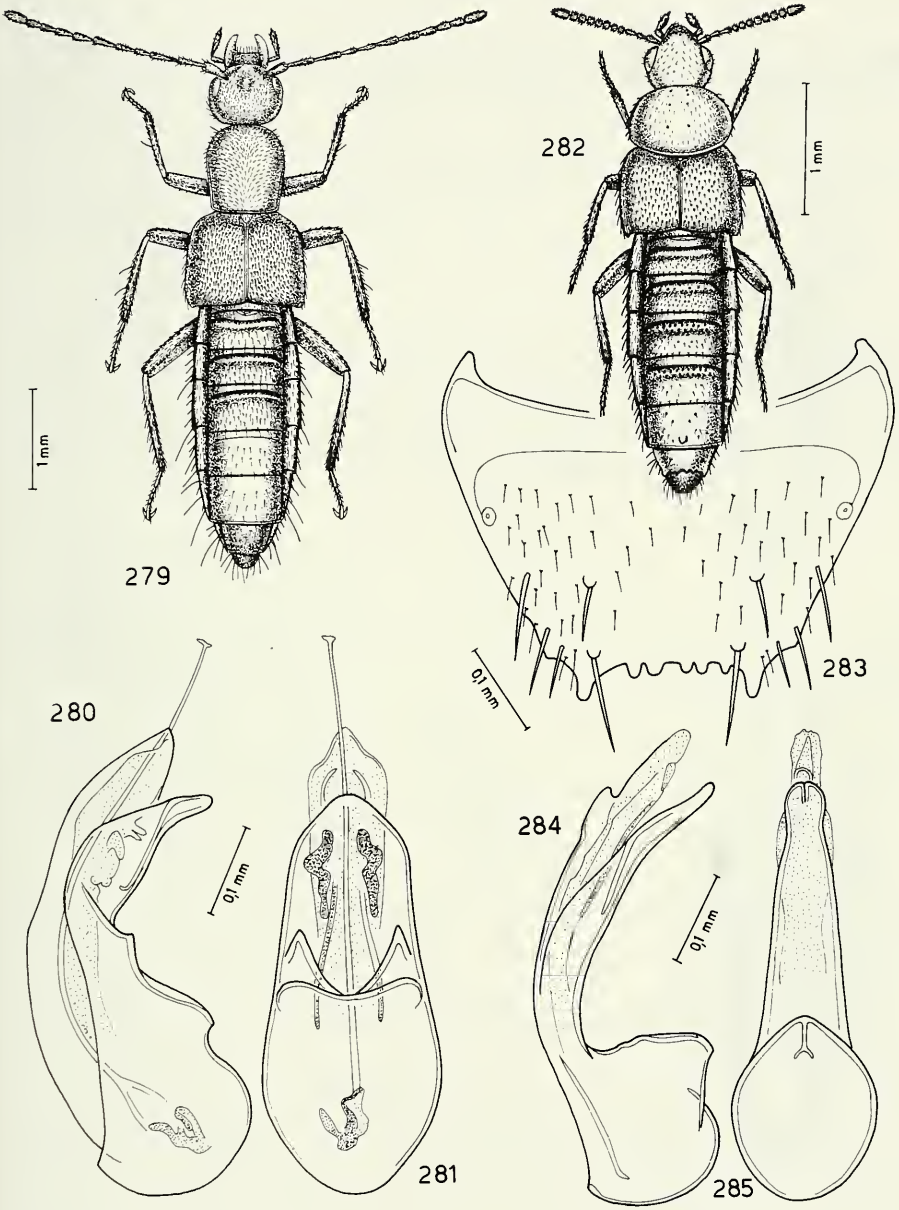
FIGG. 266-273.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 266-269: *Oxypoda (Sphenoma) nagaidana* sp. n. Figg. 270-273: *Oxypoda (Sphenoma) cephalina* sp. n.



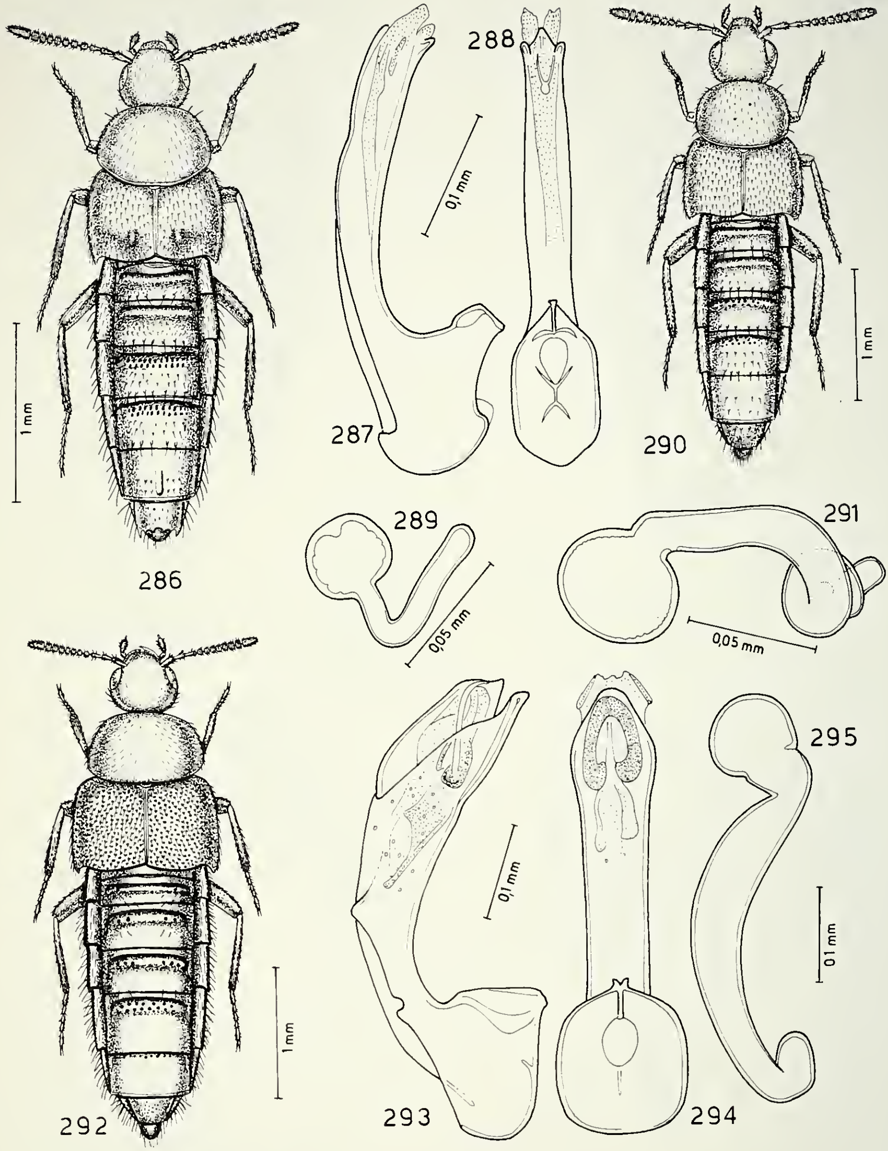
FIGG. 274-278.

Habitus, spermateca ed edeago in visione laterale e ventrale. Figg. 274-275: *Oxypoda (Mycetodrepa) nepaliella* sp. n. Figg. 276-278: *Oxypoda (Mycetodrepa) minicephala* sp. n.



Figg. 279-285.

Habitus, edeago in visione laterale e ventrale e sesto urotergo del maschio. Figg. 279-281: *Gonionycha smetanai* sp. n. Figg. 282: *Pseudoplandria loebli* sp. n.



FIGG. 286-295.

Habitus, edeago in visione laterale e ventrale e spermateca. Figg. 286-289: *Pseudoplandria smetanai* sp. n. Figg. 290-291: *Pseudoplandria praesens* sp. n. Figg. 292-295: *Pseudoplandria convergens* sp. n.

RINGRAZIAMENTI

Ringrazio molto cordialmente il Dr. C. Besuchet e il Dr. I. Löbl del Museo di Storia Naturale di Ginevra per avermi affidato in esame il materiale oggetto del presente lavoro. Per lo stesso motivo ringrazio di cuore il Dr. Prof. H. Franz e i colleghi J. Orousset e G. de Rougemont.

Per il prestito di tipi e di materiale indeterminato, rivolgo distinti ringraziamenti al Dr. P. M. Hammond del British Museum (Natural History) e al Dr. A. F. Newton del Field Museum of Natural History di Chicago.

RÉSUMÉ

Dans le présent travail, la dernière collection d'Aleocharinae du Nepal du Muséum de Genève est étudiée. Elle renferme 119 espèces récoltées récemment par le Dr. I. Löbl et le Dr. A. Smetana et inclut 91 espèces décrites comme nouvelles. Le nouveau genre *Smetanaetha* est décrit, basé sur une nouvelle espèce. Il est en affinité avec *Oxypoda*. Le genre *Blepharhymenus* est signalé du Nepal pour la première fois.

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Revue suisse Zool.	Tome 99	Fasc. 2	p. 343-367	Genève, juin 1992

Myopsocidae (Insecta : Psocoptera) from Java, including a discussion of the known Indonesian fauna

by

I.W.B. THORNTON and J.A. BROWNING*

With 27 figures

Abstract

The myopsocid fauna of Indonesia, in particular Java, is reviewed, based on a study of recent collections from Java. Twenty-one species are now known from Indonesia, 9 of *Myopsocus*, 4 of *Lichenomima*, 4 of *Lophopterygella*, 1 of *Mouldsia*, and 3 of a newly erected genus, *Smithersia*. Fourteen of these species (5 *Myopsocus*, 4 *Lichenomima*, 4 *Lophopterygella* and 1 *Smithersia*) are known from Java. The species *Lichenomima merapi*, *Myopsocus spatulatus* and *Smithersia newi* are described and *Myopsocus angustus* Vaughan *et al.* and *Myopsocus hermosoides* Vaughan *et al.* are transferred to *Smithersia*, for which *Psocus hermosus* (Banks) is designated the type species and a diagnosis provided. Keys are provided for Indonesian genera of the family, for Indonesian species of *Myopsocus* and *Lophopterygella*, and for species of *Smithersia*. Problems of generic limits within the family are raised and discussed.

INTRODUCTION

Mackinnon (1988) has concisely summarised the features of the biological province of Java, which comprises the islands of Java, Madura and Bali (only 3 km from Java), their satellite islands and a number of small island groups in the Java Sea, and is part of the Sundaic subregion. Many of Mackinnon's points are drawn upon below.

The Indo-Australian plate underthrusts the Asian plate resulting in a deep submarine trench parallel to Java's southern coast; the chain of volcanoes, several of them active, along the southern part of Java is a consequence of this tectonic process. Madura and Bali were joined to Java as a result of lowered sea levels (as much as 100m) during the Pleistocene ice ages (3 million to 8000 years ago), and for considerable periods all the Greater Sunda Islands (Java, Sumatra and the island of Borneo) were part of continental Asia.

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* Department of Zoology, La Trobe University, Bundoora, Victoria, Australia 3083

In the west of Java, lush tropical rain forests reflect a year-round wet climate, the Bogor area, for example, being one of the wettest in the world. The Javan climate becomes drier towards the east. Forests in East Java, where there is a dry season from May to October, are largely less rich deciduous monsoon forests (particularly evident in the north-east). Mackinnon notes that these more seasonal eastern areas of Java support a flora more similar to that north of the Kra isthmus of the Malayan peninsula, and have probably been responsible for the survival on Java, but not on Sumatra, Borneo or the southern Malayan peninsula, of a number of Asian birds of open wooded country. The northern coast also experiences more seasonal rainfall than the west or the southern coast. The mountains, many of which are over 3000 m in height (the highest, Gunung Semeru, being 3676m) are of course wetter than more low-lying country. Volcanic disturbance prevents the attainment of climax vegetation on the high ground of the active volcanoes, where one finds *Casuarina* forest rather than the richer flora of the less active volcanoes.

Java and Bali are among the most densely populated regions in the world (over 100 million people inhabit the two islands), a consequence of the fertile volcanic soils, good rainfall and warm climate, and most land that remains undisturbed (about 10%) is on the high volcanic slopes. Lowland rainforest has been reduced to less than 3% of its original extent and is now rare. Nevertheless, about 100 reserved areas, of varying status, have been established on Java and some of these, such as Ujung Kulon, Gunung Gede-Pangrango, Bromo-Tengger, Meru Betiri, and Baluran, are quite extensive national parks.

This is the first of a series of papers on Javan Psocoptera based on a study of recent collections. Collecting sites are shown in Fig. 1 and are listed, with collectors, month and year, below (abbreviations as in Fig. 1):

WEST JAVA

Ujung Kulon National Park (UK in Fig. 1): IWBT, Nov-Dec 1982; Mr P.J. Vaughan

Apr-May 1984; PJV, IWBT and Dr T.R. New Aug-Sep 1984.

Krakataus (KA): IWBT Nov 1982, Sep 1983; IWBT, TRN, PJV, Aug-Sep. 1984, Aug 1985; TRN, IWBT, Sep 1986; IWBT Feb 1986.

Carita area (CA): PJV Apr-May 1984; IWBT, PJV and TRN Aug-Sep 1984, Aug 1985; IWBT, TRN Oct 1986.

Kebun Raya, Bogor (BO): Dr Peter van Doesburg, Nov-Dec 1986, Sep 1977; IWBT Dec 1982, Feb 1988, Feb 1987; PJV Apr 1984; IWBT, TRN Oct 1986; Dr C. Lienhard, Nov 1987.

Gunung Gede- Pangrango, Cibodas area (CI): IWBT, TRN Oct 1986; IWBT Feb 1987; CL Nov 1987; Lobl, Agosti and Burckhardt Nov 1989.

Bandung area (BA): IWBT Feb 1987, Jan 1988.

Penanjun Wildlife Reserve, Pangandaran (PA): IWBT Feb 1987.

CENTRAL JAVA (IWBT Jan 1988)

Gunung Slamet, Baturaden area (GS); Dieng Plateau, Gunung Perahu (DP); Borobudur (BB); Gunung Merapi, Kaliurang area (GM); Prambanan (PR); Yogyakarta (YO).

EAST JAVA (IWBT Jan 1988)

Gunung Lawu, Sarangan area (GL); Gunung Arjuna, Gunung Welirang and Selekta area (GA); Singosari area (SI).

Madura Island, near Sumenep (MA): Dr D. Reid Jan 1980.

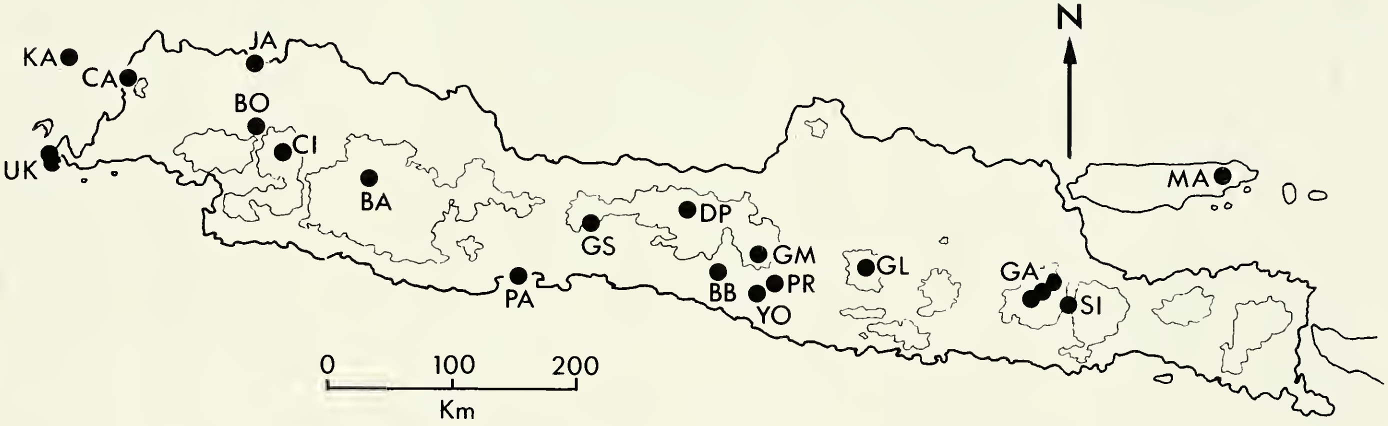


FIG. 1.

Java and adjacent islands, showing 500 m contour and collecting sites. BA Bandung area, BB Borobudur area, BO Bogor area, CA Carita area, CI Cibodas - Gunung Pangrango - Gunung Gede, DP Dieng Plateau, GA Gunung Arjuna - Gunung Welirang, GL Gunung Lawu, GM Gunung Merapi, GS Gunung Slamet, JA Jakarta area, KA Krakatau Archipelago, Ujung Kulon National Park, MA Madura Island, PA Penangun Wildlife Reserve, PR Prambanan area, SI Singosari area, YO Yogyakarta area, UK Ujung Kulon peninsula, Ujung Kulon National Park.

The treatment will be by families and, although the focus is on the fauna of Java, for convenience we also note species recorded from other parts of the Indonesian archipelago. This paper deals with the Myopsocidae. For the benefit particularly of Indonesian entomologists and ecologists, we provide a key to genera of Myopsocidae known from Indonesia, and for two genera a field key to known Indonesian species, based predominantly on characters not requiring dissection. Authorship of new species described in this paper should be ascribed to Thornton. Holotype and allotype specimens will be deposited in the Zoology Museum, Bogor (ZMB), paratypes in the Australian Museum, Sydney (AM), and other specimens in the Muséum d'Histoire naturelle, Geneva (MHNG).

THE FAMILY MYOPSOCIDAE

The Myopsocidae comprises medium to fairly large psocopterans (fore wing length 4.0 to 7.0mm) that in general are corticolous and feed on epiphytic fungi and lichens on the surface of bark. Many species have mottled or disruptively patterned fore wings, rendering them inconspicuous when resting on lichen-covered bark. In Indonesia they appear to be true forest insects, and tend to occur in greater diversity at middle to high elevations. Four genera of the family are represented in the New Guinea area where one line of *Myopsocus* has diversified (SMITHERS & THORNTON 1974), penetrating the Melanesian arcs (SMITHERS & THORNTON 1979) and speciating considerably on the Fiji Archipelago (THORNTON 1981, SMITHERS & THORNTON 1981).

Classification of the family, in particular the genera *Myopsocus* Hagen, 1866, *Rhaptoneura* Enderlein, 1910, *Phlotodes* Enderlein, 1910 and *Lichenomima* Enderlein, 1910, has been confused for some decades; some clarification has recently been made, and more is needed. MOCKFORD (1982) re-diagnosed the genus *Myopsocus* on the basis of an examination of the type specimen of *Psocus unduosus* Hagen from Sri Lanka, the type species of *Myopsocus*. In doing so he corrected an error of ENDERLEIN (1910:68) concerning *unduosus*, and showed that in this species veins rs and m are fused for a distance in the hind wing, not joined by a cross-vein as stated by Enderlein. Thus Mockford proposed that *Lichenomima* (hind wing veins rs and m joined by a cross-vein), for which he provided an augmented diagnosis, should not be synonymised under *Myopsocus* as had been the practice since Roesler's paper (ROESLER 1944) but should probably stand as a separate genus; in contrast, *Rhaptoneura* and *Phlotodes* (rs and m fused in the hind wing) were synonymised with *Myopsocus*.

As a result of Mockford's finding, MOCKFORD (1982) and SMITHERS (1985) reassigned to *Myopsocus* 74 species originally placed in or previously transferred to *Phlotodes* and *Psocus* Latreille, 1794, and to *Lichenomima* 15 species from the genera *Myopsocus*, *Psocus* and *Amphigerontia* Kolbe, 1880. Mockford noted that *Lichenomima medialis* (Thornton), which on the basis of hind wing venation he transferred to *Lichenomima*, appeared to be so unusual in several other features as to merit a distinct genus.

The following treatment follows Mockford's recommendations, although some points raised in the discussion suggest that generic placement in the family is still far from satisfactorily resolved.

SOEHARDJAN (1958) listed only 6 myopsocids from Indonesia: *Myopsocus kolbei* Enderlein, 1903 from Irian Jaya (Indonesian New Guinea), *Myopsocus longigena* (Enderlein, 1926) from Java, and *Myopsocus mjorbergi* (Karny, 1925) from Kalimantan (Indonesian Borneo); *Lichenomima fenestrata* Enderlein, 1926 from Java and

Lichenomima sumatrana (Enderlein, 1907) from Java and Sumatra; and *Lophopterygella camelina* Enderlein, 1907 from Java [and this species was also doubtfully recorded from western Java by Vaughan *et al.* (1991)]. Smithers and Thornton (1974) described *Lichenomima ampla*, *Myopsocus dentatus* and *Mouldsia inocellata* from Irian Jaya. Thornton (1984) described *Lophopterygella antennalis* and *Myopsocus apicalis* from Bali, and *Myopsocus lombokensis* from Lombok. Vaughan *et al.* (1991) described *Myopsocus corticola* and *Myopsocus javensis* from the western coast of Java and *Myopsocus hermosoides*, *Myopsocus angustus* and *Lophopterygella ridderi* from southern Sumatra. *Lophopterygella camelina* and another undescribed species of this genus were recorded from the Krakatau Islands, Sunda Strait, by Vaughan *et al.* (1989). In the present paper the following species additional to the above are recorded from Java: *Myopsocus spatulatus* n.sp., *Lichenomima ampla*, *Lichenomima merapi* n.sp., and *Smithersia newi* n.sp. Two species, *M. hermosoides* and *M. angustus*, are transferred to the new genus *Smithersia*. Thus 20 species (or 21, depending on the locality of *Myopsocus loriai* Ribaga, see below) of the family are now known from Indonesia, 8 (or 9) of *Myopsocus*, 4 of *Lichenomima*, 3 of *Smithersia*, 4 of *Lophopterygella* Enderlein, 1907, and one of *Mouldsia* Smithers, 1978; 14 of these are known from Java.

Key to Indonesian genera of Myopsocidae

1. Veins rs and m in hind wing fused for a distance (e.g. fig. 11) 2
   Veins rs and m in hind wing joined by a cross-vein (e.g. fig. 6) 4
2. Ocelli present, fore wing shape normal 3
   Ocelli absent, fore wing narrow .... *Mouldsia*
3. Phallosome without posterior U-shaped extension, female subgenital plate with narrow tapering terminal process bearing apical setae .... *Myopsocus*
   Phallosome with posterior U-shaped extension, female subgenital plate sclerotized, complex, with lateral groups of long narrow spines .... *Smithersia*
4. Fore wing margin scalloped apico-posteriorly; hypandrium sclerotized, with short, broad, apical lobe; female subgenital plate with short, broad, tuncate, apical lobe .... *Lophopterygella*
   Fore wing margin smoothly rounded apico-posteriorly; hypandrium simple, no distinct apical lobe; female subgenital plate with transverse distal sclerite .... *Lichenomima*

SPECIES OF MYOPSOCIDAE KNOWN FROM INDONESIA

Genus **Lichenomima** Enderlein, 1910

Type species: *Lichenomima conspersa* Enderlein, 1910.

Mockford's (1982) augmented diagnosis of *Lichenomima* included species with veins rs and m joined by a cross-vein in the hind wing and, correlated with this, "absence of a median style of the phallosome (possible exception: *L. ariasi* New) and female subgenital plate distally with a transverse sclerite, more or less separate from the main plate, and never terminating in a single process tapering posteriorly."

Thirty-four species are now assigned to this genus. Four are known only from Indonesia, all having been recorded from Java. Ten species are African, 6 are known from mainland Asia (including two occuring also in Indonesia, one of which occurs also in N. Australia), one from Japan and Fiji, one (*medialis*) from Fiji only, 8 from the Neotropics and 4 from the Nearctic.

The female genitalia of 15 species are known. Eight of them are African and 3 Oriental; 10 of these have a trilobed subgenital plate, *L. merapi* (below) exceptionally having a *Myopsocus*-like condition. *L. medialis* from Fiji has a unique form of subgenital plate, and in the three American species of which the subgenital plate is described, the apex is in the form of a broad, truncate lobe, not trilobed.

Lichenomima ampla (Smithers & Thornton)

Lichenomima ampla (Smithers & Thornton) Mockford, 1982:217.
Myopsocus amplus Smithers & Thornton, 1974: 95-97, figs. 1-3.

Distribution: Java, New Guinea, New Britain, Australia.

Specimen examined (AM): 1♀, West Java, Cibodas, Botanical Gardens, beating conifers, 1400m, 3.x.1986, IWBT.

This large mottled-winged species (Fig. 2) was described from the island of New Guinea, where it occurs from 10 m to 1500 m altitude and from the Vogelkopf in the west to the Owen Stanley range in the east, as well as in Queensland (Australia) and New Britain. Its range is now known to extend from West Java to New Britain and Queensland.

The lateral sub-lobes of the subgenital plate lack spinelets, as they do in *Lichenomima sanguensis* (New) from Nepal and Bhutan. The two species differ, however, in femur colour, *L. ampla* having a brown femur with a broad subapical paler band, and in pigmentation and sclerotisation of the apical lobe of the subgenital plate (*L. ampla* having a well-defined broad sclerotised border - see Fig. 3 from Cibodas female).

Lichenomima fenestrata Enderlein

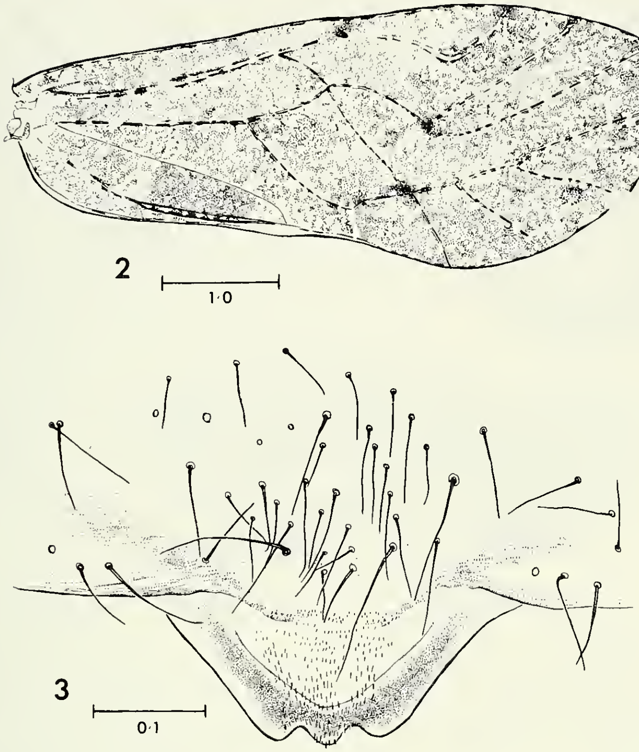
Lichenomima fenestrata Enderlein, 1926: 62.

Distribution: Central Java (Semarang, Aug).

Enderlein provided no illustrations nor genitalic information on his specimen (a male); its distinction from other described species cannot clearly be ascertained until the type is available for study.

Lichenomima merapi Thornton n.sp.

Female. *Coloration* (after 1 year in alcohol): Head buff, marked with brown as Fig. 4; frons with bell-shaped buff area surrounded by brown band; genae brown, buff adjacent to postclypeus continuing as a band below antennal socket, and a small buff mark near ventral margin. Maxillary palp brown, apical segment dark brown, basal segment pale brown. Scape and pedicel brown, f_1 pale brown with short darker ring subapically, shorter white ring apically, f_2 brown. Thoracic terga brown with buff margins. Within brown area



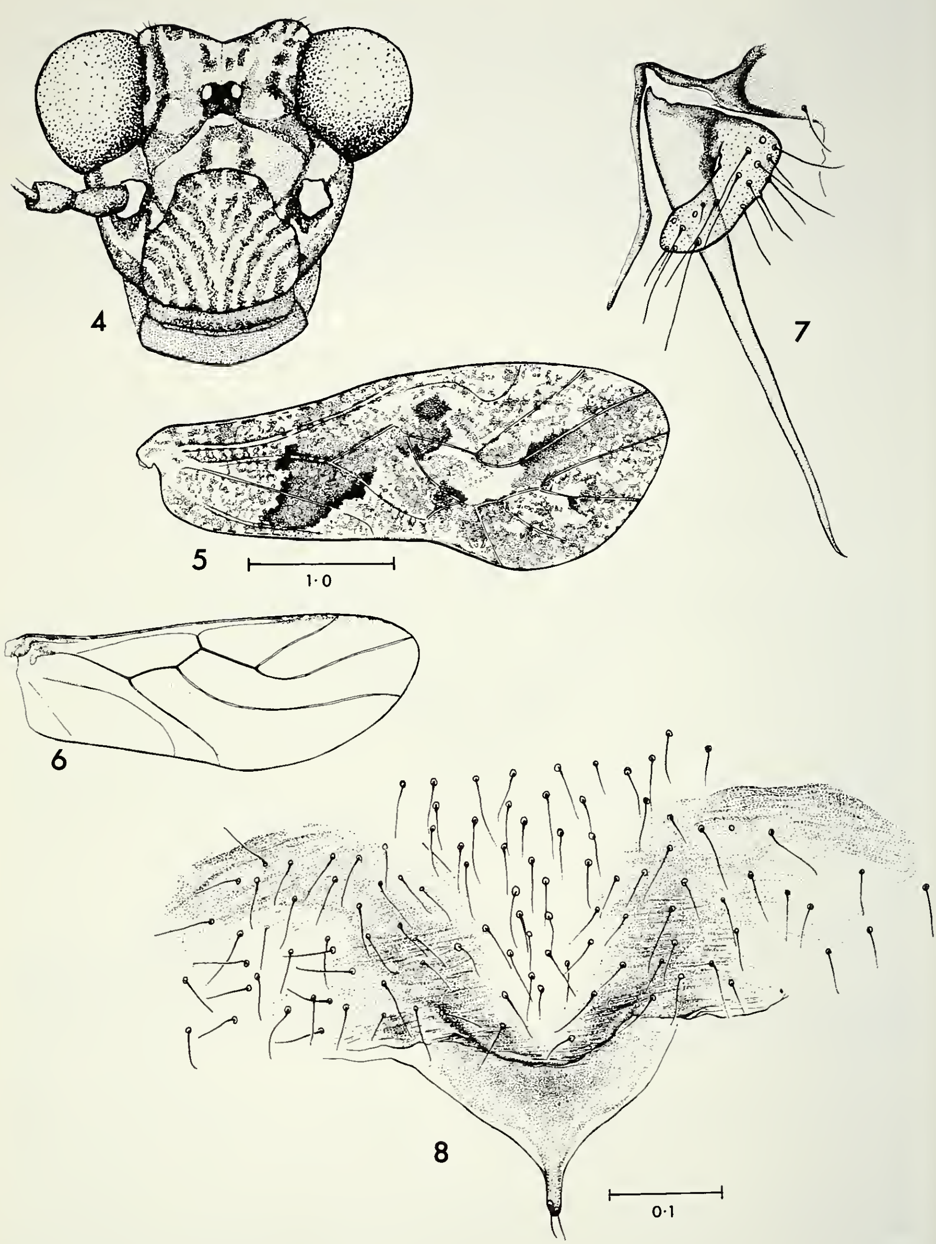
FIGS. 2-3.

Lichenomima ampla (Smithers & Thornton), female from Cibodas. 2 - fore wing, 3 - subgenital plate. (Scales in mm.)

of each mesothoracic dorsum 4 or 5 small circular buff spots, and transverse buff line anterior to posterior margin; thoracic pleura brown. Legs: coxa and trochanter brown; femur brown with subapical buff ring; tibia pale brown, dark at extreme apex; t_1 pale buff, t_2 and t_3 dark brown. Fore wing (Fig. 5) with discernible dark basal transverse fascia and contrasting dark and light pigment clouds.

Morphology. IO:D = 2.0. (Ratio of interocular distance to eye diameter, obtained here and in other descriptions by the method of Badonnel, as described in BALL 1943). Ctenidia on basal hind tarsal segment: 20. Fore wing (Fig. 5) small, pterostigma markedly rounded apically, areola postica fused with media for a distance. Hind wing as Fig. 6. Gonapophyses (Fig. 7): outer valve parallel-sided, setose; ventral valve bent medially at about half way along length. Subgenital plate (Fig. 8) narrow distal lobe fairly short, not sharply marked off from more basal part of plate, with one terminal and one subterminal seta (in both specimens dissected). Paraproct with a field of 26 trichobothria.

Material examined. *Holotype* ♀: Central Java, slopes of Gunung Merapi, near Kaliurang, 1000m, 19.I.1988, IWBT, (ZMB). Paratypes: 2 ♀, same data (AM and MHNG). 3 nymphs, same data (ZMB, AM, MHNG).



FIGS. 4-8.

Lichenomima merapi female. 4 - head, 5 - fore wing, 6 - hind wing, 7 - gonopophyses, 8 - subgenital plate. (Scales in mm. Figure 4 not to scale. Figs. 5 and 6, and 7 and 8, to common scales).

Although following MOCKFORD (1982), this species is assigned to *Lichenomima* on hind wing venation, its subgenital plate is clearly of the type included in Mockford's rediagnosis of *Myopsocus*. It is thus an exception to the correlation between hind wing venation and subgenital plate structure noted by Mockford, and could with equal justification be placed in *Myopsocus*.

Lichenomima sumatrana (Enderlein)

Lichenomima sumatrana (Enderlein) Enderlein, 1910 : 66.
Myopsocus sumatranus Enderlein, 1907a : 87; Enderlein, 1907b: 120-121.

Distribution: Sumatra (Sukaranda : Jan), West Java (Batavia: Feb, Apr, Jul, Aug), Central Java (Semarang: Dec), ? Thailand (Thoen : Dec).

Enderlein provided no illustrations nor genitalic information on this species, but the large size (fore wing almost 7 mm long) and pinkish colour of the pigment patch of the pterostigma are features of the description that led KUWAYAMA (1961) to ascribe the Thailand female to this species. Unfortunately Kuwayama did not describe the genitalia.

Genus **Myopsocus** Hagen, 1866

Type species: *Psocus unduosus* Hagen, 1859 : 201.

MOCKFORD (1982) noted that correlated with the fusion of veins rs and m in the hind wing were: "1) phallosome generally with a median style (known exceptions: *M. aldabrensis* New), *M. minor* (New & Thornton), *M. pallidus* (Smithers), *M. speciosus* (Smithers) and *M. splendidus* (Badonnel); 2) female subgenital plate terminating in a process tapered distally and with two large setae at the tip plus smaller setae in some species".

Over 90 species are now assigned to this genus (see MOCKFORD 1982, SMITHERS 1985), 8 (or 9?) from Indonesia (with 5 of these being recorded from Java). [We are unable to determine whether the locality of *M. loriai* ("Kapa kapa", in northern New Guinea) is within the Indonesian part of the island or not].

In about 60 species the female genitalia have been described. In all but one of these, the female subgenital plate has a narrow apical extension, and, except in *M. toxeres* (Smithers & Thornton) from New Guinea (in which the apex is bare), this bears at least a terminal pair of setae. *M. congolensis* (Badonnel) has an unusual subgenital plate; there is no narrow apical process.

In some 50 species the male genitalia are described. In 32 the phallosome is a closed ring with a median internal style, in 9 the ring has no style, in 6 the frame is open but the style is present, in 4 the frame is open and there is no style. In *M. ornata* (New, 1973) (Nigeria) the frame is complex with a divided style, and in the type species, *M. unduosus*, the frame is Y-shaped with a long median style projecting anteriorly beyond the frame. The hypandrium is shallowly lobed in the majority of species (over 30), but in 7 (from Africa, Madagascar, Malaya, Australia and Fiji) it bears large projecting lateral processes. In *M. australis* Brauer (Australia, New Zealand, Solomons, Norfolk I.) and *M. hickmani* Smithers (Tasmania) the hypandrium bears a complex posterior bow-shaped sclerite connected to the main plate by a narrow isthmus, recalling the condition in *Lichenomima* *pattoni* (Datta) from India. The hypandrium of *M. alticola* (Thornton) from Bali has a narrow apical projection, and in *M. pallidus* (Smithers) from Madagascar there is an unusual large, curved, notched posterior process. There is no correlation between the character states of phallic frame and hypandrium.

In general, the genus as now recognised differs from *Lichenomima* in having a median style in the phallosome frame and a narrow setose apical process on the subgenital plate, as well as in hind wing venation (see Table 1).

TABLE 1

Diagnostic features of genera of the Myopsocidae

	fore wing posterior apical margin	junction of veins rs and m fore wing	phallosome	hypandrium	subgenital plate	other features
Myopsocus unduosus	normal	fused	Y-shaped, median style longer than frame	trapezium shaped, 2 apical clusters of thick setae	not known	
Other species now placed in *Myopsocus* End. (= *Rhaptoneura* End., *Phlotodes* End.)	normal	fused	closed ring with or without median style no longer than frame	simple	with narrow tapering terminal process bearing setae at or near apex	
Lichenomima End.	normal	cross-vein	elongate, no median style	simple	transverse distal sclerite, no terminal tapering process (*L. medialis* pointed, flat apically with fringe of many strong setae)	
Mouldsia Smithers	normal	fused	closed frame, median style divided apically	sclerotised, spiculate	short setose tapering distal process	ocelli lacking, fore wing narrow, 2 flaps on 9th tergite of ♂
Lophopterygella End.	scalloped	cross-vein (2 spp. fused)	closed frame of distinctive shape	sclerotised short broad apical lobe setose or bare	short broad truncate apical lobe incipiently bi-lobed with 2 setae or bare	
Smithersia n.g.	normal	fused	closed ring, no median style, posterior U-shaped extension	sclerotised, complex, lateral groups of long narrow spine	tapering to short rounded apex	fore wing narrow

Myopsocus apicalis (Thornton) n.comb.

Phlotodes apicalis Thornton, 1984 : 162

Distribution: Bali (Jul, Dec).

Described from Bali (both sexes) this species is here transferred to *Myopsocus*, following MOCKFORD (1982). It appears to be a somewhat aberrant member of Group I of SMITHERS & THORNTON (1974).

Myopsocus corticola Vaughan *et al.*

Myopsocus corticola Vaughan, *et al.*, 1991:155

Distribution: West Java (Carita : Aug).

This species, known only from the male, is an exception to the correlation between the condition of the hind wing rs-m junction (in this species fused) and the presence/absence of a median phallosome style (absent), additional to those noted by MOCKFORD (1982). Its placement in *Myopsocus/Lichenomima* is thus at present equivocal. Discovery of females should help to resolve this; as noted by VAUGHAN *et al.* (1991), there is a possibility that this specimen is the male of *M. lombokensis* (see below).

Myopsocus dentatus (Smithers & Thornton)

Myopsocus dentatus (Smithers & Thornton) Mockford, 1982 : 215.

Phlotodes dentata Smithers & Thornton, 1974: 114

Distribution: Irian Jaya (Kamo Valley : Aug).

Known only from a single male taken at 1500 m, this species is placed in Group II by SMITHERS & THORNTON (1974). Slight scalloping of the apical fore wing margin is discernible, but the phallosome has a median style and the hypandrium lacks a rectangular setose lobe; placement in *Lophopterygella* on the basis of the slightly sinuous fore wing margin is not warranted.

Myopsocus javensis Vaughan *et al.*

Myopsocus javensis Vaughan, *et al.*, 1991:157

Distribution: West Java (Ujung Kulon : Nov).

Known only from the male. The condition of the junction of veins rs and m in the hind wing in the type is equivocal (the veins meet at a point in both hind wings). The phallosome is *Lichenomima*-like in that it lacks a median style, and following MOCKFORD (1982) strictly, the species should thus be placed in *Lichenomima*. Bearing in mind the several exceptions noted by Mockford (see above under *M. corticola*), however, for the time being it is considered wiser to leave the species in *Myopsocus* until information on female genitalia (and a better appreciation of hind wing venation) becomes available.

Myopsocus kolbei Enderlein

Myopsocus kolbei Enderlein, 1903: 302-303; Mockford, 1982 : 214

Phlotodes kolbei (Enderlein) Enderlein, 1910 : 67; Smithers, 1967 : 123; Smithers & Thornton, 1974: 103.

Distribution: Irian Jaya (month not specified); New Guinea (Jul, Sep); New Britain (Nov).

Specimens of both sexes from New Guinea were identified as this species (described from Irian Jaya without genitalic information) on the basis of fore wing pattern. It was placed in Group II by SMITHERS & THORNTON (1974).

Myopsocus lombokensis (Thornton) n.comb.

Phlotodes lombokensis Thornton, 1984 : 164

Distribution: West Java (Ujung Kulon : Oct, Nov); Lombok (Jul).

This species is known only from the female. It is here tranferred to *Myopsocus*. As noted by VAUGHAN *et al.* (1991) it may prove to be conspecific with *M. corticola*, and further field work is needed to decide this matter. It is closest to Group I of SMITHERS & THORNTON (1974), but the groups are not well-defined on female characters and if *M. corticola* (above) is indeed the male of this species, it cannot be included in either Groups I or II.

Myopsocus longigena (Enderlein)

Myopsocus longigena (Enderlein) Smithers, 1985 : 265

Phlotodes longigena Enderlein, 1926 : 63

Distribution: West Java (Jakarta : Jul).

Enderlein's description (from a single male) does not include an illustration of the fore wing, nor a description of genitalia.

Myopsocus loriai Ribaga

Myopsocus loriai Ribaga, 1908: 107-108; Smithers, 1985 : 266

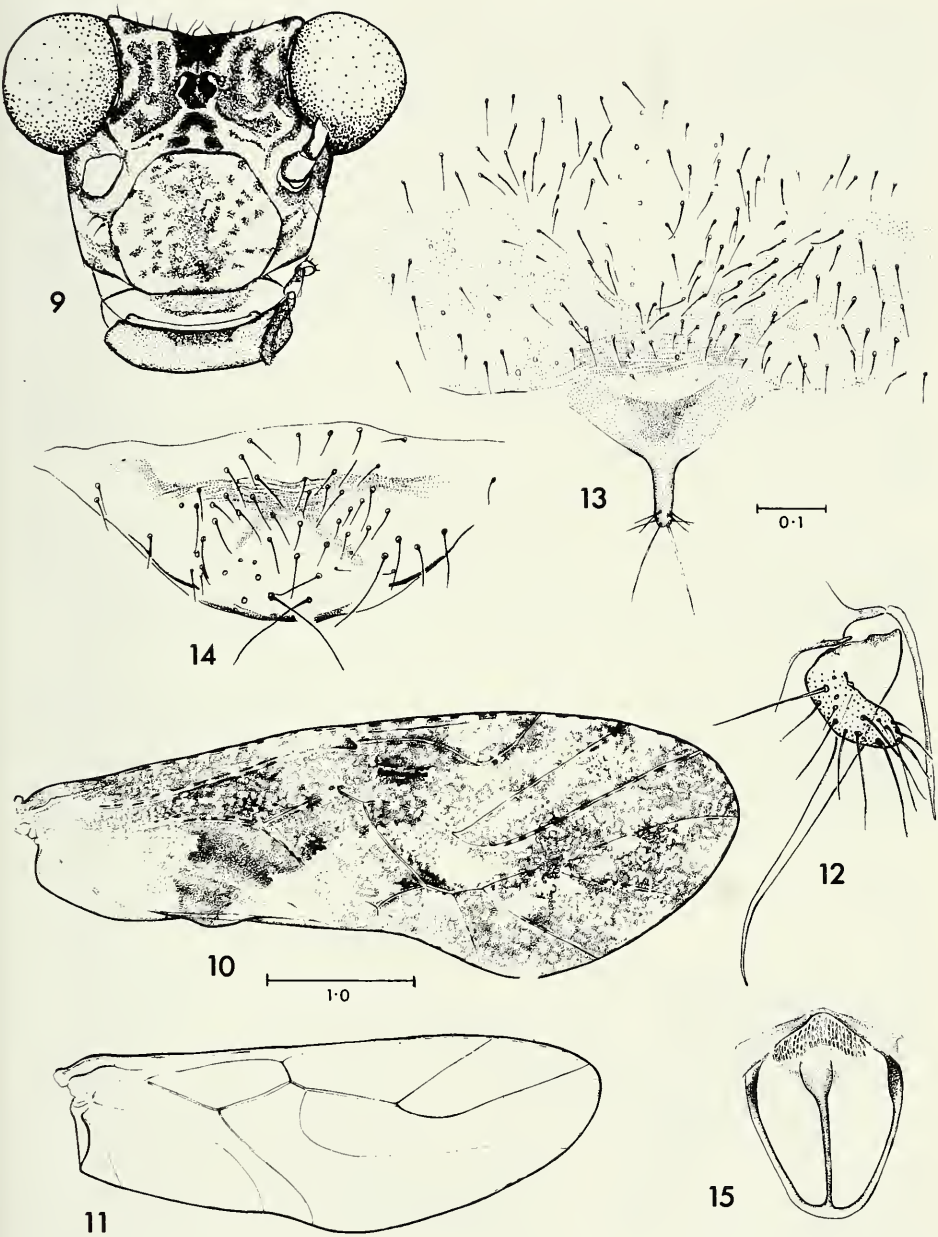
Phlotodes loriai (Ribaga) Enderlein, 1910 : 67

Distribution: New Guinea (Kapakapa : May, Jun).

The description includes a figure of the fore wing. This species was not collected in New Guinea by SMITHERS & THORNTON (1974).

Myopsocus spatulatus Thornton n.sp.

Female. – *Coloration* (after 1 year in alcohol). Eyes when fresh pale greenish with dark stripes. Head (Fig. 9) generally cream with dark brown marking predominant on vertex; frons with dark brown mark medially, otherwise predominantly cream; postclypeus cream, brown spots of striae very small and sparse but merging medially; gena largely cream, an L-shaped brown mark below orbit; labrum dark brown. Maxillary palps brown, apical segment dark brown. Scape and pedicel brown. Mesothoracic pronotum dark brown, a cream spot each side posteriorly; nota cream posterolaterally, brown anteromesially, brown area with 4-5 small circular cream spots; scutellum cream.



Figs. 9-15.

Myopsocus spatulatus 9 - 13 female: 9 - head, 10 - fore wing, 11 - hind wing, 12 - gonopophyses, 13 - subgenital plate. 14 - 15 male: 14 - hypandrium, 15 - phallosome. (Scales in mm. Figure 9 not to scale. Figs. 10 and 11, and 12 - 15, to common scales).

Metathoracic terga and scutellum cream. Thoracic pleura dark brown. Legs: coxa and trochanter brown; femur dark brown with buff subapical band; t_1 buff, shading to brown basally and apically; rest of tarsus dark brown. Fore wing (Fig. 10) with distinct basal dark fascia, broken subapical hyaline fascia discernible parallel to and some distance from wing margin. Hind wing (Fig. 11). Abdomen dorsally buff, ventrally grey-brown, darkening laterally.

Morphology. IO:D = 1.6. Ctenidia on basal hind tarsal segment: 22. Gonapophyses (Fig. 12) with relatively small outer valve, ventral valve short, straight. Subgenital plate (Fig. 13) tapering to clearly delimited fairly short narrow apical lobe bearing two long stout terminal setae and 6 finer setae (one third length of long terminal setae) subapically. Paraproct with field of 26 trichobothria and 1 seta without rosette socket.

Male. – *Coloration.* As female.

Morphology. 10:D = 1.0. Ctenidia on basal hind tarsal segment 22. Hypandrium (Fig. 14), simple, very shallowly trilobed, a pair of long stout setae subapically. Phallosome (Fig. 15) a closed ring with median style spatulate apically. Paraproct with field of 27 trichobothria and two setae without rosette sockets.

Material examined. - *Holotype* ♂: West Java, Cibodas, Botanical Garden, beating, 1400 m, 3.X.1986, IWBT (ZMB). *Allotype* ♀ (ZMB), paratype ♂: same data as holotype (AM). Other specimens examined: ♀, same locality as holotype, north slope Gunung Gede, submontane forest, 1600 m, 16.ii.1987, IWBT (AM); ♂, 2♀, Cibodas area, 27.xi.1987, C. Lienhard (MHNG); ♀, Cibodas, Botanical Garden, captured as nymph (MHNG); 1n, 25.xi.87, C. Lienhard (MHNG).

This species falls into Group I of SMITHERS & THORNTON (1974).

In the spatulate median style of the phallosome it is similar to *M. platyvalvula* (Smithers & Thornton) from the New Hebrides (Vanuatu), whilst in female genitalia it is similar to *M. punctatus* (Thornton, Lee & Chui) from Micronesia, *M. punctatoides* (Thornton) from Fiji and Tonga, and *M. lombokensis* (Thornton) from Lombok. From the two first species *M. spatulatus* differs in lacking prominent pigment spots in the apical

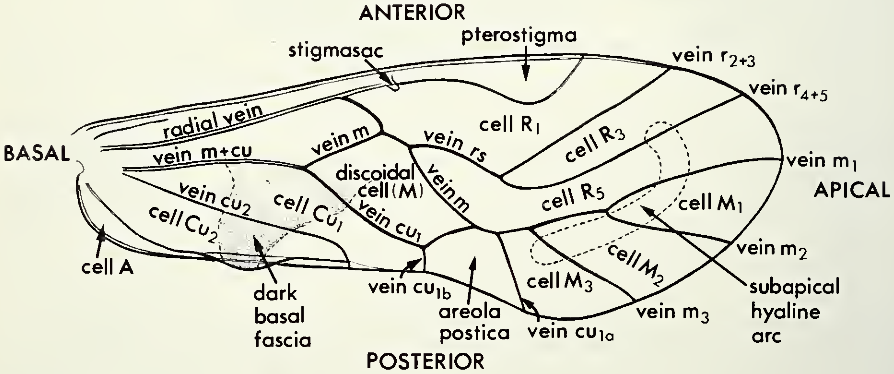


FIG. 16.

A diagrammatic myopsocid fore wing showing veins, cells and features to which the key to *Myopsocus* species refers.

cells of the fore wing. It differs from *M. punctatoides* in that the pair of apical setae of the subgenital plate are decidedly longer than the other setae of the median process, and from *M. lombokensis* in lacking the dark spot posterior to the pterostigma in the fore wing. It appears to be a mountain form, not having been collected in the lowlands.

We provide a field key (based largely on fore wing pattern) to Indonesian species of *Myopsocus* and those of the non-Indonesian part of the island of New Guinea (asterisked). *M. mjorbergi* (Karny) from Sarawak, which may well occur in Kalimantan, and *M. longigena* are not included since no figures are provided in the descriptions, which are inadequate for use in the key. Figure 16 illustrates cells, veins and characteristics of the fore wing that are mentioned in the key. Where several specimens are available, e.g. *lombokensis*, *spatulatus*, *kolbei* (and several New Guinea and New Caledonian species in Smithers & Thornton 1974), careful study of the distribution of intensely pigmented patches and hyaline areas of the fore wing shows that subtle characteristics of fore wing pattern are consistent; thus the key is probably of value even for the several species that are known from only one specimen.

Field Key to Indonesian species of *Myopsocus*

1. Cell R_5 with at least one hyaline area in basal half extending over almost whole width of cell and at least as long as broad 2
   Cell R_5 without such a hyaline area 7
2. Basal half of cell R_5 with two separate similar circular hyaline areas .. *M. apicalis*
   Basal half of cell R_5 with a single hyaline area 3
3. Cell R_5 > two thirds hyaline .... *M. marginatus**
   Cell R_5 < half hyaline 4
4. Hyaline areas fills basal third of cell R_3 extends over width of cell and is longer than broad .... *M. preclarus**
   Hyaline area does not fill basal third of cell R_3, hyaline area narrow or not extending to base of cell 5
5. Pigment in cell R_5 adjacent to areola postica much darker than that within areola postica .... *M. spatulatus*
   Pigment in cell R_5 adjacent to areola postica of same intensity as that within areola postica 6
6. Cell M_3 with an elongate hyaline area passing from near base of vein m_3 towards outer margin of cell .... *M. fenestratus**
   Cell M_3 without such an elongate hyaline area .... *M. venustus**
7. Pterostigma with distinct ovoid hyaline or very pale area filling distal half .... *M. lombokensis*
   Pterostigma not as above 8
8. Dark basal fascia in cells Cu_2 and Cu_1 not extending into base of discoidal cell .... *M. javensis*
   Dark basal fascia extends into discoidal cell 9
9. Around apical margin of fore wing a pigmented band as wide as 1/2 length of pterostigma and with irregular basal margin, clearly darker than pigment in apical half of pterostigma 10
   No such marginal band, or if so, no darker than pigment in apical half of pterostigma 11
10. Basal half of cell Cu_2 hyaline, with small pigmented area and pigment spots; outer margins of medial cells lacking small semilunar areas .... *M. corticola*

Basal half of cell Cu_2 pigmented brown, with small hyaline areas and hyaline spots; medial cells each with a small semilunar hyaline area in middle of outer margin .... *M. loriai*

11. Approximately half-way along vein m_1 a small cloud of darker pigment with adjacent small hyaline more basal area 12
Vein m_1 without such a cloud 16

12. Vein m_2 with dark pigment cloud as on vein m_1 13
Vein m_2 without dark pigment cloud as on vein m_1 .... *M. pilipes**

13. Vein r_{4+5} without a distinct cloud on vein m_1, pigment in cell R_5 (as dark as cloud on vein m_1) adjacent to base of radial fork 14
Vein r_{4+5} with distinct darker pigment cloud as on vein m_1, no pigment as dark as this cloud in cell R_5 adjacent to base of radial fork 15

14. Apical margin of wing and vein m+cu with many adjacent evenly spaced pigmented and hyaline areas; hind femur brown, darker apically, tibia brown; phallosome a closed frame .... *M. toxeres**
Apical margin of wing and vein m+cu with irregular pigmented and hyaline areas; hind femur brown with preapical pale band, tibia pale, dark distally; phallic frame open posteriorly .... *M. dentatus**

15. Narrow hyaline areas across veins m_1, m_2 and m_3 separated from one another by very short mottled areas; no small dark spot about size of stigmasac just posterior to it; apical half of femur darkly pigmented .... *M. rimosus**
Hyaline areas across medial branches separated from one another by stretches of mottled pigment as long as or longer than hyaline areas themselves; small dark spot about size of stigmasac just posterior to it; apical half of femur pale with dark brown apical band .... *M. kolbei*

16. Small dark pigmented area immediately anterior to apex of areola postica 17
Areola postica apex without more darkly pigmented area immediately anterior to it 19

17. Vein r_{2+3} with >4 narrow hyaline areas crossing it, area immediately posterior to basal posterior margin of pterostigma hyaline .... *M. maculatus**
Vein r_{2+3} not crossed by narrow hyaline areas, area posterior to basal posterior margin of pterostigma mottled 18

18. Male epiproct triangular, with central rectangular rugose field; hypandrium rounded, with pair of internal pointed flanges; phallosome closed, median style projecting beyond frame, style 6 times as long as broad .... *M. scabiosus**
Male epiproct circular, no central rugose field; hypandrium shallowly trilobed, no internal flanges; phallic frame open, median style 12 times as long as broad but not projecting beyond arms of frame .... *M.peltatus**

19. Basal border of basal fascia of fore wing not extending to radial vein, fascia edges parallel; no continuous irregular narrow subapical hyaline arc across medial cells; femur pale, apical tarsal segments pale with darker apices .... *M. bomasa**
Basal border of basal fascia of fore wing extends to radial vein, fascia edges diverge anteriorly; cells M_1, M_2, M_3 traversed by continuous narrow irregular subapical arc; femur dark brown with pale subapical band, apical tarsal segments dark brown .... *M. gressiti**

Smithersia Thornton n.g.

Type species: *Psocus hermosus* Banks, 1920 : 300, as redescribed (and lectotype designated) by SMITHERS (1979) from Banks' type material.

DIAGNOSIS. - Fore wing fairly narrow; hind wing with veins rs and m connected by a short fusion; hypandrium complex, apical lobe divided distally, with lateral groups of narrow curved spurs; phallosome a closed ring without median style and with large apical bifid extension; female subgenital plate with distinct apical lobe tapering convexly to a short rounded apex, no long narrow apical process or apical setae (except possibly a pair in *Smithersia angusta*).

Apart from *Smithersia hermosa* Banks (n. comb.), from Singapore, three other species are assignable to this genus: *Smithersia newi* [= *Myopsocus hermosus* (Banks) of New (1975), see below] (Singapore and West Java), *Smithersia angusta* (Vaughan *et al.*) (Sumatra) and *Smithersia hermosoides* (Vaughan *et al.*) (Sumatra).

The genus differs from all known myopsocid genera in the complex of spurs on each side of the hypandrium lobe, the large bifid posterior extension of the phallosome and the sclerotized patches of the ninth tergite of the female. It also differs from *Mouldsia* Smithers in possessing ocelli and lacking paired lobes on the male epiproct, from *Lichenomima*, in that veins rs and m of the hind wing are fused for a distance, from *Lophopterygella* Enderlein in lacking scalloping along the margins of the outer fore wing cells and from *Myopsocus* Hagen (*sensu* Mockford) in lacking the narrow apical process of the subgenital plate (see table 1).

Smithersia angusta (Vaughan *et al.*) n.comb.

Myopsocus angustus Vaughan, *et al.*, 1991:159

Distribution: Sumatra (Liwa : Sep)

Male unknown, one female only.

Smithersia hermosoides (Vaughan *et al.*) n.comb.

Myopsocus hermosoides Vaughan *et al.*, 1991:158

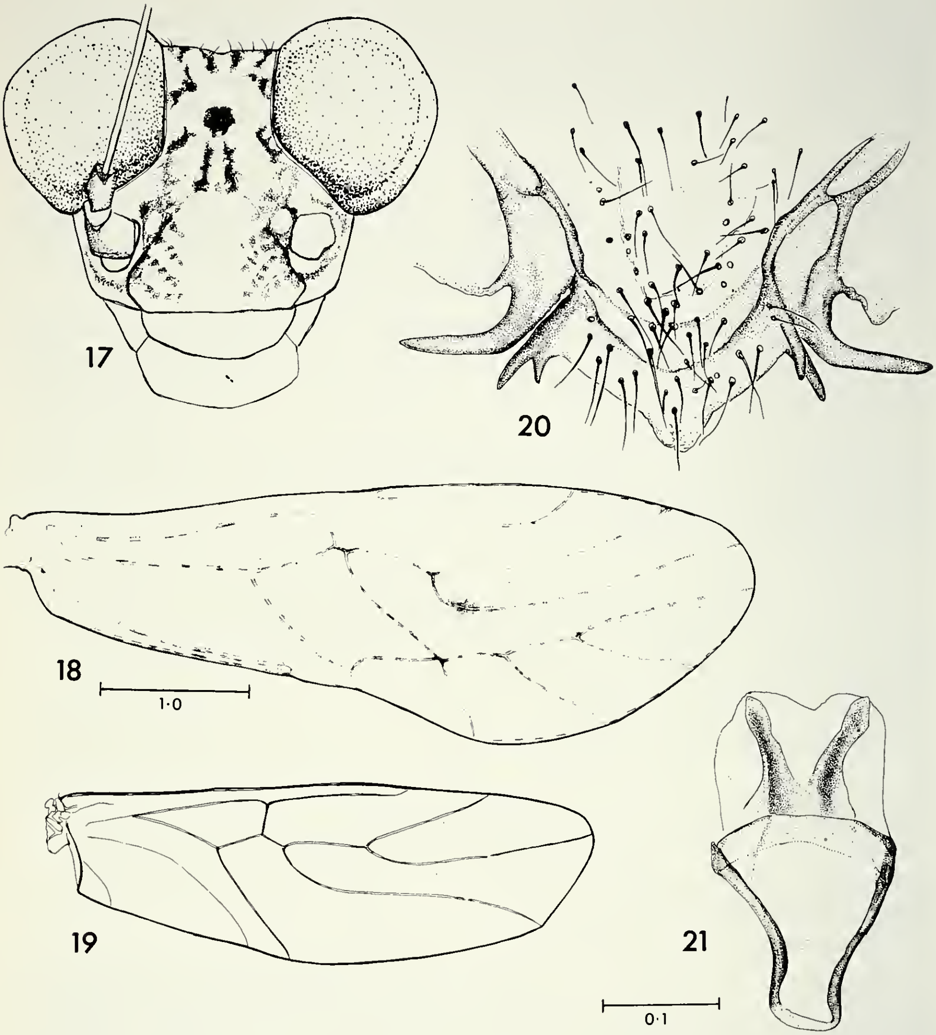
Distribution: Sumatra (Liwa : Sep)

Female unknown, one male only.

The above two species were taken at Liwa, in Barisan Selatan National Park, southern Sumatra, a week apart. It is unlikely, however, that the two specimens represent one species. The fore wing patterns are quite different, and the type species, which has a fore wing pattern close to that of *S. hermosoides*, is not sexually diomorphic in this regard.

Smithersia newi Thornton n.sp.

Male. – *Coloration*. Head (Fig.17) predominantly cream, vertex and frons markings very dark brown, sparse; ocellar protuberance black; clypeal striae brown, short, leaving a very broad cream medial band; genae cream, dark brown adjacent to antennal socket; labrum cream. Scape buff; pedicel brown; flagellar segments buff, darkening slightly gradually towards apices. Maxillary palp very pale buff except apical segment pale brown. Fore wing (Fig. 18) pigment faint brown except dark over vein r_{4+5} near its base, pterostigma unpigmented. Hing wing hyaline (Fig. 19). Mesothoracic pronotum with 4



FIGS. 17-21.

Smithersia newi male. 17 - head, 18 - fore wing, 19 - hind wing, 20 - hypandrium, 21 - phallosome. (Scales in mm. Figure 17 not to scale. Figs. 18 and 19, and 20 and 21, to common scales).

dark grey longitudinal bands on anterior face, dorsally with 2 brown marks and dark grey bands along posterior margins. Mesothoracic dorsa brown, fading to broad cream margins, scutellum pale buff with small grey-brown triangle medially. Metathoracic dorsa and scutellum as mesothorax. Thoracic pleura cream with some grey-brown granulated pigment. Legs: cream, except apical tarsal segments brown. Abdomen cream ventrally, dorsally with lateral grey-brown granulated longitudinal bands.

Morphology. IO:D = 0.8, eyes large. Ctenidia on basal hind tarsal segment: 23. In fore wing (Fig. 18) areola postica fused with media for a very short distance; in hind wing (Fig. 19) rs and m fused for a distance, wing margin slightly lobed at end of vein m (not in other wing, nor in other specimen), hind wing broadest in mid-wing. Hypandrium (Fig. 20) with trapezoid apical lobe, each side a bifid spur and more laterally a longer sharply bent stouter spur, tips of hypandrial spurs not sharply pointed; medial tract of fairly long setae. Phallosome (Fig. 21) a closed ring of characteristic shape, with large bifid terminal sclerotised extension. Paraproct with field of 29 trichobothria and 1 seta without rosette socket.

Female. – *Coloration*. As male, except pterostigma of fore wing (Fig. 22) with pale brown cloudiness.

Morphology. IO:D = 1.6. Ctenidia on basal hind tarsal segment: 24. In fore wing (Fig. 22) areola postica meets media at a point; hind wing (Fig. 23) as male but of normal shape. Gonapophyses (Fig. 24) with dorsal valve strongly curved. Subgenital plate (Fig. 25) sclerotization of disc as narrow bands reflected distally. Gonapore plate (Fig. 26) with four small distinctive sclerotized areas, those of the anterior pair underlying triangular flaps. Epiproct chactotaxy as that of *S. hermosa* except three small setae, not two, on apical margin. Paraproct with oval field of 31 trichobothria.

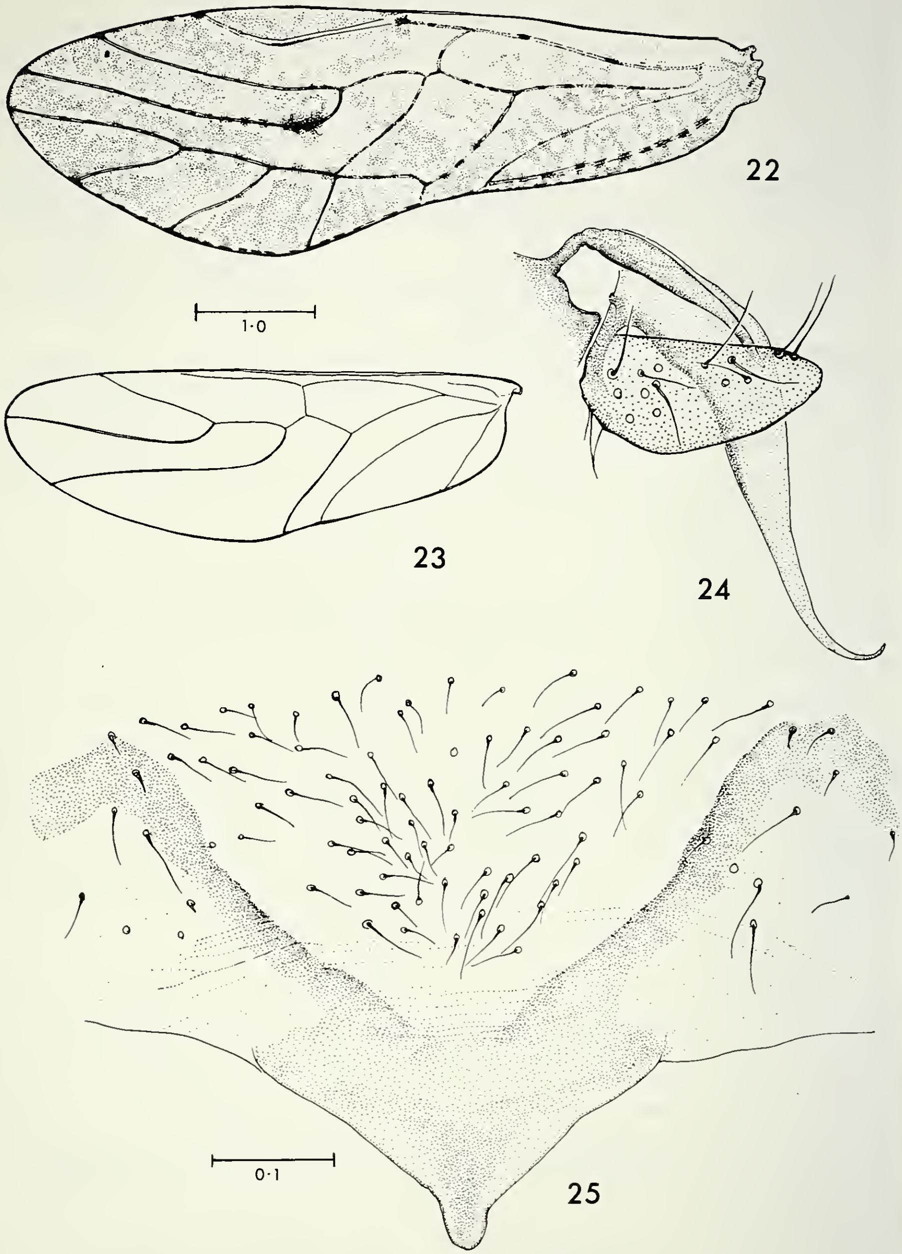
Material examined. *Holotype* ♂: West Java, Cibodas, Botanical Garden, 1300 m, 3.X.1986, IWBT (ZMB). *Allotype* ♀: Cibodas, 1400-1550 m, sweeping vegetation in montane *Lithocarpus-Castanopsis* forest, 3-6.xi.1989, Lobl Agosti and Burckhardt (ZMB). Paratype ♂: data as holotype (AM). Other specimens: 2♂, Singapore, Bukit Timah Botanical Reserve, 27.V.1967, D.H. Murphy (in AM) [assigned to *Psocus hermosus* (Banks) by New 1975].

SMITHERS (1979) noted that figures (NEW 1975) of a Singapore specimen (see above) assigned by New to *Psocus hermosus* (Banks) showed a myopsocid wing with psocid genitalia. Smithers provided a redescription of the *Psocus hermosus* female from Banks' type material, designated a female lectotype, and described the male. We have seen the specimens examined by New, and they are not conspecific with *hermosus* as redescribed by Smithers but are referable to the species described above. In Smithers' drawing of the male genitalia of Banks' type material, the median lobe of the hypandrium appears to carry two spurs each side, not one as stated in the text of the redescription, and these may be fused at their bases, thus being similar to the condition in *S. newi*.

S. newi differs from *S. hermosa* in the following: head pattern, lack of darker pigment beside veins associated with areola postica apex and greater extent of pigment in cells R_3 and R_5 in fore wing; hypandrial spurs sharply pointed, outer spur longer than in *S. hermosa* and more sharply curved, apical lobe of hypandrium narrow; posterior extension of phallosome with arms diverging more widely; shape of sclerotized bands on disc of subgenital plate (not hook-shaped in *S. hermosa*), pattern of sclerotization of spermapore plate. *Smithersia hermosoides* (above) lacks the long, stout, sharply bent outer hypandrial spine seen in *S. newi*, and *Smithersia angusta* (above) differs from *S. newi* in having more extensive unpatterned areas in the fore wing and in the shape of the sclerotized arms on the subgenital plate disc.

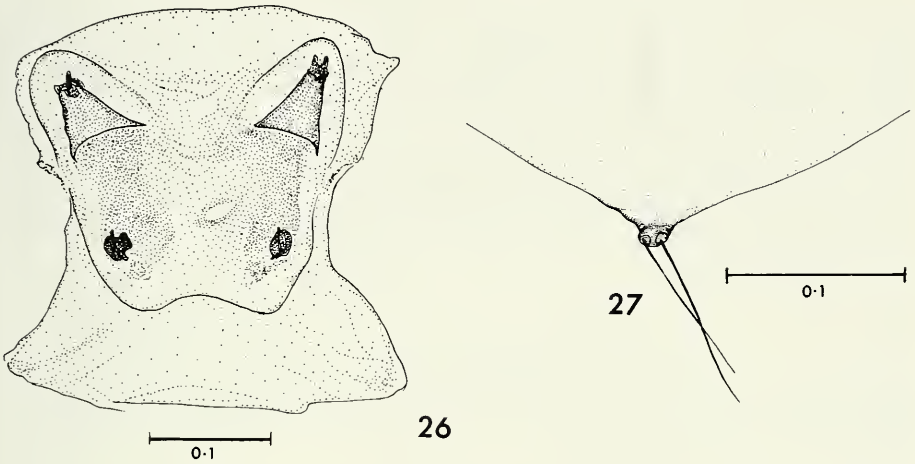
Field key to species of *Smithersia*

1. In fore wing, pigment over vein r_{4+5} near its base clearly darker than all other pigment clouds 2



FIGS. 22-25.

Smithersia newi female. 22 - fore wing, 23 - hind wing , 24 - gonapophyses, 25 - subgenital plate. (Scales in mm. Figs. 22 and 23, and 24 and 25, to common scales.



FIGS. 26-27.

26 - *Smithersia newi* female, gonopore plate. 27 - *Myopsocus tropicus* (Smithers), type specimen, apex of subgenital plate. (Scales in mm.).

In fore wing, some other pigment clouds as dark as pigment over vein r_{4+5} near its base 3

2. Apical half of cell R_5 in fore wing covered with pigment clouds; hypandrium each side with one sharply bent spur twice the length and thickness of others .... *S. newi*

Less than one quarter of area of apical half of cell R_5 in fore wing covered with pigment clouds; hypandrium with no lateral spur twice the length of others .... *S. hermosoides*

3. In fore wing only the pigment at apex of areola postica and along vein m immediately basal to it is as dark as that over r_{4+5} near its base .... *S. hermosa*

In fore wing many small clouds are as dark as that over r_{4+5} near its base .... *S. angusta*

Genus **Lophopterygella** Enderlein, 1907b

Type species : *Lophopterygella camelina* Enderlein, 1907b : 122.

This genus is characterised by having the fore wing margin apically scalloped; rs and m in the hind wing joined by a cross-vein (except the South American *L. cincta* New and *L. albomaculata* New); female subgenital plate with an apical truncate lobe (again except the two S. American species), in some species bearing two or more setae; male epiproct with apical tongue-like process; hypandrium with a distinct small short rectanguloid setose lobe; phallosome lacking a median style or penial bulb sclerites.

Some 16 described species are currently placed in this tropicopolitan genus, including 9 from the Oriental-Australian-Pacific region, 2 from S. America, and one each from China, Taiwan, N. America, Haiti and Africa. The two S. American species, both known only from females, stand apart from the rest, as indicated above. *Myopsocus tropicus* (Smithers) from northern Queensland, Australia, recently transferred from *Phlotodes* by SMITHERS (1985) and known only from the female, satisfies all the applicable generic criteria except hind wing venation. We have examined the subgenital plate of the type and provide a figure of the apex (Fig. 27). The apical lobe, as mentioned by Smithers, is very short and bears two long setae; when the male is discovered this species may prove to be assignable to *Lophopterygella*. Four species are currently known from Indonesia; 3 of these are recorded from Java and one undetermined species has been found as yet only on the Krakatau archipelago.

Lophopterygella antennalis Thornton, 1984

Lophopterygella antennalis Thornton, 1984: 160-162; Vaughan *et al.*, 1991:162

Distribution: West Java (Ujung Kulon : Nov), Bali (Jul).

Known from one female from Bali and one from Gunung Payung on the Ujung Kulon peninsula, the species is evidently closely related to *L. camelina* (below).

Lophopterygella camelina Enderlein, 1907

Lophopterygella camelina Enderlein, 1907b: 122-126; Vaughan *et al.*, 1989 : 88.

Festona lunata Navas, 1922 : 60; Smithers, 1967 : 121.

Distribution: Philippines, China, Taiwan, West Java (Krakatau Is. : Sep; Bogor : no month cited), Central Java (Semarang: no month cited).

This widespread species has successfully colonized the Krakatau Archipelago but has not been found in Sumatra.

Lophopterygella ridderi Vaughan *et al.*

Lophopterygella ridderi Vaughan *et al.*, 1991:161

Distribution: West Java (Carita : May)

The field of narrow spines on the apical lobe of the subgenital plate is unique in the genus as now known; the fore wing pattern is also distinctive.

? **Lophopterygella** sp.

Lophopterygella sp. Vaughan *et al.*, 1989 : 89.

Distribution: West Java (Krakatau Is. : Sep).

Detailed knowledge of genitalia of this species is limited, and the scalloping of the fore wing, characteristic of this genus, is only weakly developed. The species is only provisionally assigned to *Lophopterygella*.

Field key to Indonesian species of *Lophopterygella*

1. Fore wing with extensive hyaline areas, a single narrow broken hyaline wavy band, bordered distally by dark pigment, following shape of posterior apical wing margin and some distance from it 2
   Fore wing with hyaline areas not extensive, three separate narrow hyaline bands bordered with dark pigment or no hyaline bands 3
2. Three basal flagellar segments of ♀ with 7, 4-5 and 3 broad brown rings, (basal to more apical), ♀ subgenital plate with pair of short apical lobes separated by more than 4 times greatest width of lobes .... *L. antennalis*
   Three basal flagellar segments of ♀ with 7-8, 8 and 6 broad brown rings, ♀ subgenital plate with pair of short apical lobes separated by less than twice greatest width of lobes .... *L. camelina*
3. Fore wing with three narrow hyaline bands (basal, apical and mid-wing) bordered on one side by dark pigment .... *L. ridderi*
   Fore wing without such bands .... ? *Lophopterygella* sp. from Krakatau Is.

Genus **Mouldsia** Smithers, 1978

Type species : *Mouldsia barbarae* Smithers, 1978 : 106, described from Queensland, Australia.

In this genus ocelli are lacking, the eyes are very large in both sexes, the wings are long and narrow, in the hind wing veins rs and m are fused and the anal vein reaches only half way to the wing margin, the subgenital plate has a short setose distal process, the phallosome is a closed frame with an apically divided median style, the hypandrium is sclerotized and spiculate, and the ninth tergite of the male is heavily sclerotized and bears two lateral flaps which may overlap a median lobe.

Four species are described, from Queensland, Irian Jaya, New Britain, and the Solomons.

Mouldsia inocellata Smithers & Thornton, 1974

Mouldsia inocellata (Smithers & Thornton), Smithers, 1978 : 106.

Phlotodes inocellata Smithers & Thornton, 1974 : 115-117.

Distribution: Irian Jaya (Jayapura area : Oct).

Described from a single female. The male is unknown.

DISCUSSION

MOCKFORD (1982) demonstrated that in the type species of *Myopsocus (M. unduosus)* not only are veins rs and m of the hind wing fused for a length, but also the hypandrium and phallosome are unique in the family in basic structure. In none of the other species of which the male is described is the hypandrium trianguloid with a pair of clusters of thick pointed setae near the apex. The peculiar Y-shaped structure of the phallic frame is approached only by *M. anomalus* (Smithers & Thornton) (Solomons), *M. scabiosus*

(Smithers & Thornton) (New Guinea), in both of which, however, the frame is closed, the Galapagos *M. chelata* (Thornton & Wong) which has no median style, and M. peltatus (Smithers & Thornton) from New Guinea. The distinction between *M. unduosus* and other species placed in *Myopsocus* appears to be of a magnitude at least comparable to that between *Myopsocus* and *Lichenomima* summarised by MOCKFORD (1982), and we believe the genus *Myopsocus* should logically be restricted to its type species, *M. unduosus*. The other species (over 90) now assigned to the genus would then need to be reassigned elsewhere. Such a reassignment, however, must await a critical examination of the large number of species now placed in *Myopsocus*, which almost surely represent more than a single taxon of generic or subgeneric rank [compare, for example, the phallosomes of *M. maculatus* (Smithers & Thornton) and the more typical *M. gregarius* (Smithers & Thornton) or the hypandria of *M. apicalis* Thornton and *M. zealandicus* Smithers]. In 59 of the 61 species in which female genitalia are known the subgenital plate has a terminal elongate extension carrying two or more setae, in one there are no setae, and in one there is no apical process; female genitalia appear to be conservative, only *M. congolensis* (Badonnel) being unusual in this regard. The typical *Myopsocus* subgenital plate has, however, been found in one species otherwise assignable to *Lichenomima* : *L. merapi* (see above).

Following Mockford's re-examination of the type species of *Myopsocus*, the next logical step is a critical analysis of all species now assigned to the genus. This would entail re-examinations of the type species of *Phlotodes* and *Rhaptoneura*, the rankings of which may need to be restored, and an attempt to examine the genitalia of the many species described without genitalic information. Such a task is, of course, outside the scope of this work, but would be a most important contribution to the systematics of the family.

In addition to the paradoxical taxonomic distance of the type species of *Myopsocus* from other species now assigned to that genus, differences in subgenital plate between African species of *Lichenomima* and their congeners in the Americas, in hypandrium within the species now placed in *Myopsocus*, and between the South American *Lophopterygella* species and the remaining species of that genus, together with the equivocal generic placements of such species as *Lichenomima merapi* (*? Myopsocus*), *Myopsocus tropicus* (*? Lophopterygella*), *Myopsocus javensis* (*? Lichenomima*) and *Lichenomima medialis* suggest that a revision of the whole family would now be appropriate.

SMITHERS & THORNTON (1974, 1981) noted that two definable groups (I and II) have representatives on the Melanesian arcs as far as Fiji (SMITHERS & THORNTON 1981 figures 7, 8 and 10). It is not surprising that species belonging to these groups have been found in Indonesia (Group I - *apicalis* (Bali), *?lombokensis* (Java, Lombok), *spatulatus* (Java); Group II - *dentatus* and *kolbei* (Irian Jaya).

ANKNOWLEDGMENTS

We thank the Australian Museum, Sydney, for the loan of material, including important preparations by Dr C.N. Smithers, Mrs. J. Kernutt for the illustrations of heads, and Dr Smithers and Dr T.R. New for reviewing the manuscript. We are also extremely grateful to Dr C. Lienhard of the Museum d'Histoire Naturelle, Geneva, for the loan of the collection he made in Indonesia in 1987, and to Dr D. Reid for a small collection from Madura Island.

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Revue suisse Zool.	Tome 99	Fasc. 2	p. 369-376	Genève, juin 1992

Eisothistos besar n. sp. from a coral reef in the Tioman Archipelago, first member of the genus from southeast Asia (Crustacea: Isopoda)

by

Hans-Georg MÜLLER*

With 26 figures and 1 table

ABSTRACT

Eisothistos besar n. sp. is described from a coral reef in the Tioman Archipelago, Malaysia. The new species is closely related to *Eisothistos teri* Kensley & Snelgrove, 1987 from the Caribbean and was found associated with dead coral substratum.

INTRODUCTION

During a survey of marine invertebrates inhabiting dead coral substratum on fringing reefs in the Tioman Archipelago, off the Malaysian Peninsula, a new species of *Eisothistos* (Anthuridea: Hyssuridae) was discovered. Species of this genus are not often found and the new one described below is the first record of *Eisothistos* from southeast Asia. Up to now 16 species were described, 9 of them since 1980. 11 species are included in a catalogue of Anthuridean isopods (NEGOESCU & WÄGELE 1984: 117) with notes on their geographic and bathymetric distribution, as well as on their habitat. The information on the 5 species discovered since 1984 is summarized in table 1.

The coral reef fauna of the two Malaysian islands Pulau Babi Besar and Pulau Tioman was studied by the author over a period of 3 weeks in April 1991. Specimens of the new *Eisothistos* were found only at Pulau Babi Besar, associated with dead *Acropora* sp. and *Pocillopora damicornis* corals.

Specimens are deposited in the Muséum d'Histoire naturelle, Genève (MHNG) and in the author's private collection.

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* Pfaffenmühlerweg 2, D-6331 Waldsolms-Brandoberndorf, W-Germany (present address).

Laboratoire de Biologie Marine et de Malacologie, Université de Perpignan, Avenue de Villeneuve, F-66025 Perpignan Cedex, France.

EISOTHISTOS Haswell, 1884

Eisothistos besar n. sp. (Figs. 1-26)

Holotype: Immature adult (MHNG), Malaysia; fringing reef at the north-west coast of Pulau Babi Besar, 15 km off Mersing; dead coral substratum *(Acropora* sp., *Pocillopora damicornis)* on outer reef flat, reef margin and upper coral slope, 1-2 m, 2-9 April 1991.

Paratypes: 3 immature adults, deposited as follows: 2 immature adults (including 1 preparatory ♂) (MHNG), 1 immature adult (Coll. MÜLLER); collected together with holotype.

Derivatio nominis – The specific name refers to the type locality, Pulau Babi Besar.

Description, immature adult: Body about 8 times longer than wide, total length 1.7-2.1 mm. Body proportions: C<1<2>3<4>5>6>7. Eyes anterolaterally situated, composed of 5 large, feebly pigmentid ommatidia. Pereonites 1-6 with shallow middorsal depression and poorly defined brownish pigment reticulations. Pleonites 1-5 free and subequal in length. Telson widest in distal half, with convex lateral margins; shallow middorsal ridge becoming obsolete distally, with 4 small tooth-shaped tubercles; distal margin with strong serrations, bearing 7 simple and 2 long plumose setae; 2 short simple setae arising near dorsodistal margin.

Antenna 1 elongate-slender; three peduncular articles slightly increasing in length and decreasing in width distally; first peduncular article with shallowly rounded mediodistal projection; flagellum of 7 articles, 5th and 6th article with long aesthetasc. Antenna 2 also elongate-slender, with 5-articulated peduncle; second peduncular article widest, with small, narrowly rounded mediodistal projection; 5th peduncular article longest; flagellum of 6 setose articles.

Mandible lacking palp; incisor with single rounded, sclerotized cusp, and small subterminal seta; lamina dentata lacking. Slender, curved maxilla with 6 distal teeth, the terminal one much broader than others. Maxilliped elongate-slender, 5-articulated; articles 2 and 3 with simple seta at mediodistal margin; tiny terminal article bearing 4 simple setae.

All pereopods ambulatory, similar in shape among one another. Pereopod 1 barely setose, with a small non-denticulate compound spine at posterodistal margin of propodus; unguis about 1/2 length of dactylus; carpus of pereopods 1-3 triangular, with short free anterior margin; carpus of pereopods 4-7 trapezoid, increasing in length from pereopod 4 to 7; pereopods 2-3, merus and ischium with several sclerotized tubercles near posterior margin; carpus of pereopods 2-3 and merus of pereopods 4-6 with small tubercle at posterior margin; propodus of pereopods 2-7, also carpus of pereopods 4-7 with a strong denticulate compound spine at posterodistal margin and many scales along posterior margin.

Rami of pleopod 1 fused for about 4/5 length, distal endopodite and exopodite with 4 plumose setae each. Pleopod 2, exopodite of half width and 4/5 length of endopodite, distal margins of exopodite bearing 2 plumose, of endopodite bearing 4 plumose setae.

Uropodal sympodite with serrate mesial margin; convex inner margin of endopodite longer than outer margin, both strongly serrate; acute apex of endopodite not extending beyond distal margin of telson; proximal part of uropodal exopodite broad with serrate margins; distal part of exopodite with elongate slender projection, this projection 2/3 length of wide proximal part; outer dorsal margin of exopodite with strong recurved tooth in proximal third of slender extension; distal margins of both endopodite and exopodite with small plumose sensory spine.

Preparatory ♂: Body poorly sclerotized and 8 times longer than wide, total length 2.0 mm. Cephalon with few feebly pigmented ommatidia, 3 in left, 5 in right half. Pereopods 2-6 with some small, indistinct brownish pigment reticulations. Middorsal ridge of telson with strong proximal tooth and 4 much smaller teeth distally; strongly serrate distal margin bearing 5 slender and 2 long plumose setae.

Antennae smooth, with few short simple setae; flagellar articles of right antennae poorly defined.

Mouthparts metamorphosed, reduced to unsclerotized uniarticulated lobes.

Pereopods smooth, without compound spines and smaller tubercles on merus and ischium of pereopods 2-3.

Rami of pleopod 1 fused for 4/5 length, distal endopodite with 2, exopodite with 3 plumose setae; second pleopods similar to other immature adults, distal margins of rami with 2 plumose setae each.

Uropodal exopodite more slender than in other immature adults, otherwise similar in shape.

Distribution. – Pulau Babi Besar, Tioman Archipelago (Malaysia).

TABLE 1.

List of *Eisothistos* species not included in the catalogue of Anthuridea (NEGOESCU & WÄGELE 1984), with some additional information.

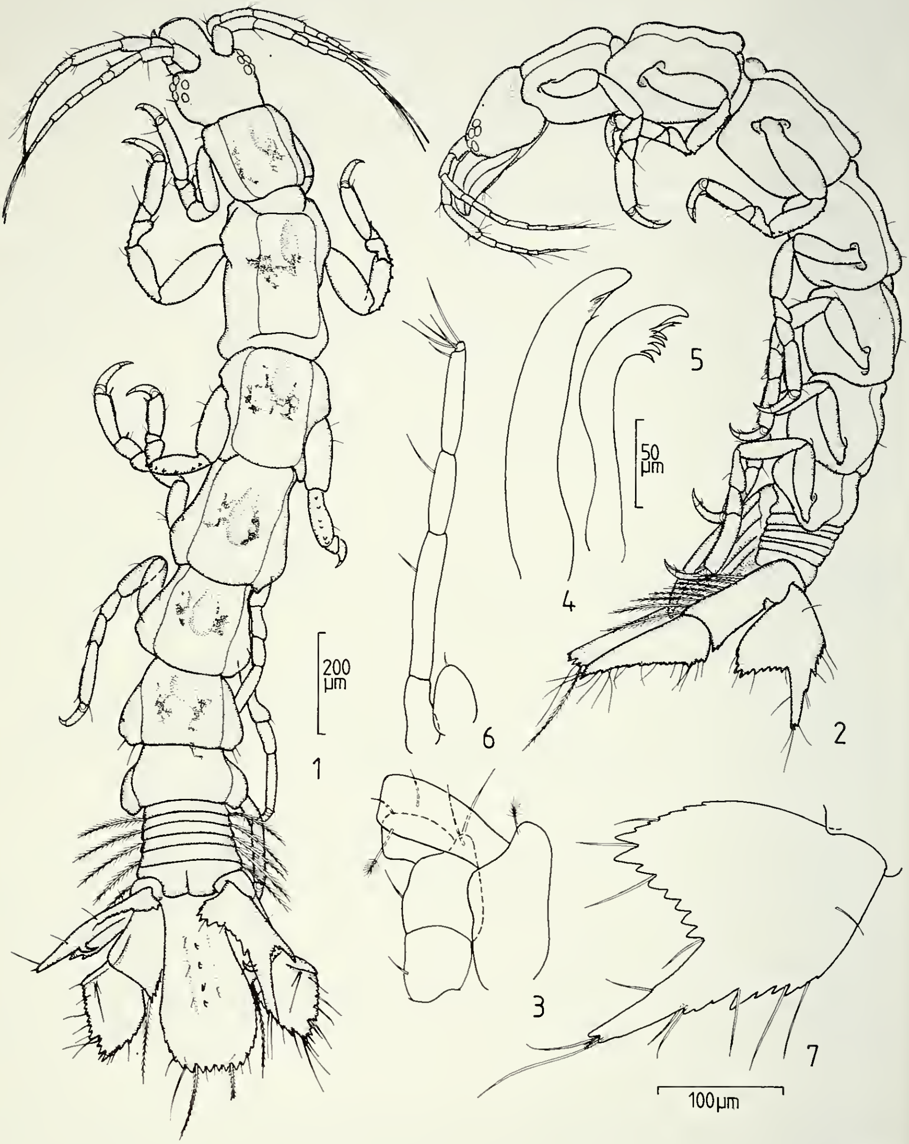
1. *Eisothistos nipponicus* Nunomura, 1984
   Length: immature adult 3.6-4.8 mm, erronously described as ♀.
   Distribution: Japan (Osaka Bay).
   Depth range: 0.4 m.
   Habitat: associated with algae (*Ulva pertusa*, *Gelidium amansii* and sessile invertebrates (*Hydroides ezoensis*, *Mytilus edulis*, *Balanus trigonus*).

2. *Eisothistos petrensis* Kensley, 1984
   Length: immature adult 4.0 mm, erronously described as ♀; ♂ 1.5-2.0 mm.
   Distribution: Florida, Belize, U.S. Virgin Islands, Turks and Caicos Islands.
   Depth range: 0.1-36 m.
   Habitat: reef crest rubble, *Neogoniolithon* washings.

3. *Eisothistos societensis* Müller, 1990
   Length: immature adult 3.8 mm.
   Distribution: Society Islands (Moorea; unpublished record from Bora Bora).
   Depth range: 1-2 m.
   Habitat: dead coral substratum.

4. *Eisothistos tayrona* Müller, 1990
   Length: immature adult 2.47 mm.
   Distribution: Caribbean Sea of Colombia (Santa Marta area).
   Depth range: 2-3 m.
   Habitat: in seagrass bed (*Thalassia testudinum*).

5. *Eisothistos teri* Kensley & Snelgrove, 1987
   Length: immature adult 1.3-3.2 mm, erronously described as ♀; ♂ 1.8-2.0 mm.
   Distribution: Barbados.
   Depth range: 9-15 m.
   Habitat: associated with the coral *Madracis mirabilis*.

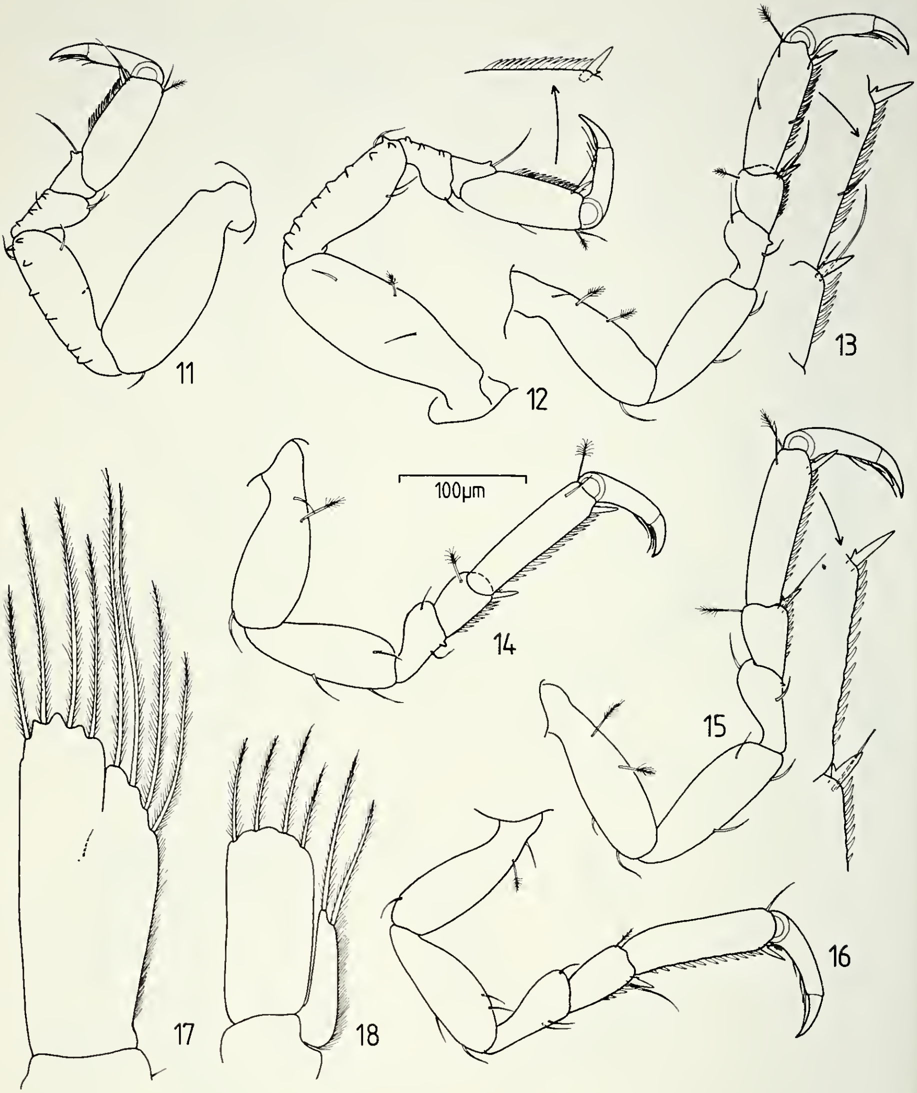


FIGS 1-7.

Eisothistos besar n. sp., immature adult (FIG. 1 holotype, others paratype): 1) dorsal view; 2) lateral view; 3) proximal peduncular articles of left antennae, dorsal view; 4) mandible; 5) maxilla; 6) maxilliped; 7) uropodal exopodite, lateral (=ventral) view.

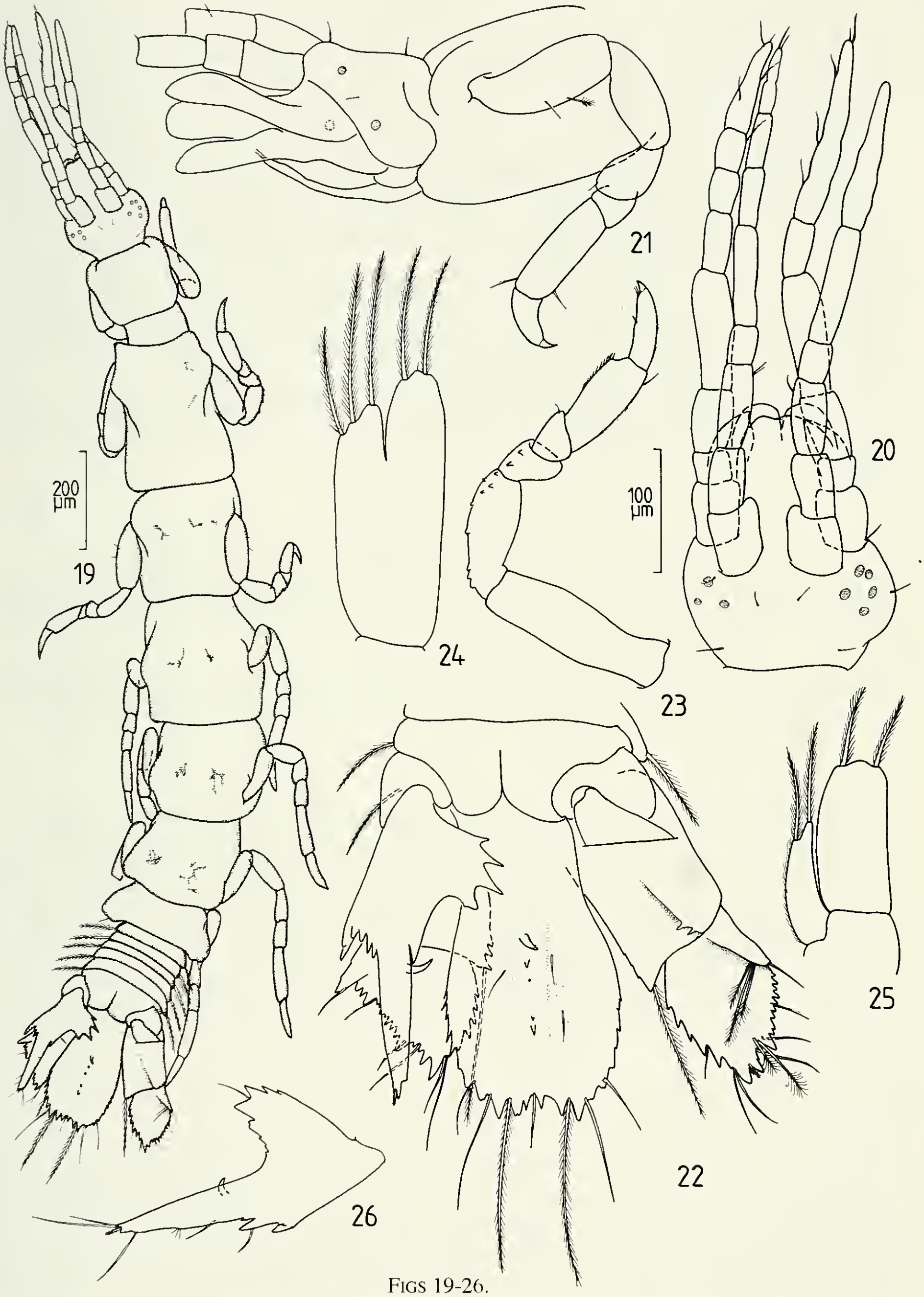
FIGS 8-10.

Eisothistos besar n. sp., immature adult (FIG. 10 paratype, others holotype): 8) anterolateral part of cephalon and left antennae, dorsolateral view; 9) tail fan; 10) pereopod 1.



Figs 11-18.

Eisothistos besar n. sp., immature adult, paratype: 11) pereopod 2; 12) pereopod 3; 13) pereopod 4; 14) pereopod 5; 15) pereopod 6; 16) pereopod 7; 17) pleopod 1; 18) pleopod 2.



FIGS 19-26.

Eisothistos besar n. sp., preparatory ♂, paratype: 19) dorsal view; 20) cephalon, dorsal view; 21) lateral view of cephalon and pereonite 1 (only proximal articles of antennae figured); 22) tail fan; 23) pereopod 3; 24) pleopod 1; 25) pleopod 2; 26) uropodal exopodite.

Remarks. – *E. besar* n. sp. is most closely allied with *Eisothistos teri* Kensley & Schotte, 1987 from the Caribbean (Barbados). It shares with this species the sclerotized tubercles on merus and sischium at least on pereopod 2, middorsal telsonic tubercles and a strong recurved, tooth-shaped tubercle at the uropodal exopodite. *E. teri* differs from the new species in several features, as through a strong narrowly rounded process at the mediodistal margin of the first antenna 1 article; the dorsal tooth-shaped tubercles on the telson of *E. teri* are more numerous (9) and increase in size distally. Also, the uropodal endopodite of the Caribbean species is distinctly more slender and the fused rami of the first pleopod bear only 4 distal plumose setae (8 in *E. besar*) (cf. KENSLEY & SNELGROVE 1987: 190, Figs. 6-7). The strong and curved tooth-shaped tubercle at the uropodal exopodite is known only for *E. teri* and *E. besar* n. sp., while *Eisothistos antarcticus* Vanhöffen, 1914 (Antarctic), *E. crateris* Kensley, 1976 (St. Paul and Amsterdam Islands), *E. marcrurus* Wägele, 1979 (Mediterranean) and *E. pumilus* Wägele, 1979 (Mediterranean) bear also dorsal tooth-shaped tubercles on the telson.

All specimens of *E. besar* n. sp. collected were found at Pulau Babi Besar associated with dead coral substratum on the outer reef-flat, reef-margin and upper coral slope in 1-2 m depth.

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Urbanisation et populations de microtides dans le foyer Haut-Savoyard d'echinococcose alvéolaire (Alpes françaises du Nord): l'exemple de La-Roche-sur-Foron[1]

by

LAFORGE, M.L.*, GILOT, B., DOCHE, B.*, DEBLOCK, S.*****
PETAVY, A.F.****

Avec 5 figures

ABSTRACT

Urban environment and Microtides populations in an endemic alveolar echinococcosis area (Northern Alps; Haute-Savoie; La Roche-sur-Foron) – The effect of the urban environment on Microtides populations, intermediate hosts in *Echinococcus multilocularis* life cycle is studied in an endemic alveolar echinococcosis area.

Four Microtides receptors of the germ have been found at 500 m and 1110 m (*Arvicola terrestris, Microtus agrestis, Microtus arvalis, Clethrionomys glareolus*). Only in two *A. terrestris* was the parasite detected, in the upper part of the community (1100 m).

Suburban and periurban areas are highly favourable to Microtides. Their presence in the urban center has not been detected.

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[1] Travail réalisé avec .le soutien financier du C.N.R.S. - ATP PIREN "Ecologie des Invasions" n° 86.208.

* Laboratoire de Biologie Alpine, Université Joseph Fourier, Grenoble I – B.P. 53 X – F-38041 GRENOBLE CEDEX.

** INSERM (Ecologie parasitaire), Laboratoire de Parasitologie, Faculté de Médecine, 27 bd. Jean Moulin F–13385 MARSEILLE CEDEX 05.

*** Laboratoire de Parasitologie, Faculté de Pharmacie, rue du Professeur Laguesse – F–59045 LILLE.

**** Laboratoire de Parasitologie, Faculté de Médecine et de Pharmacie, 8 av. Rockfeller – F–69008 LYON.

INTRODUCTION

L'échinococcose alvéolaire, liée à l'infestation animale ou humaine par le taenia *Echinococcus multilocularis* Leuckart 1863 connaît une très large distribution mondiale, la maladie pouvant de ce fait présenter des caractères épidémiologiques variés, selon que l'on se trouve dans un pays ou dans un autre, en Alaska ou en Europe occidentale. Au sein d'un même pays, plusieurs types de cycles sont susceptibles d'exister : ainsi en France, d'authentiques «foyers naturels», faisant intervenir le renard et des Microtidés sylvestres, dans un environnement strictement naturel existent encore et, dans les régions où la pression humaine est particulièrement forte, on peut supposer que la maladie s'est largement anthropisée (foyers «anthropurgiques» des auteurs tchèques). Si, comme le pense Garnahm (1959), les zoonoses évoluent toujours dans le sens d'une anthropisation plus poussée, on peut se demander quel est le statut épidémiologique actuel de la maladie dans un pays où les phénomènes d'urbanisation sont très puissants et très polymorphes.

Ainsi, l'adaptation du cycle parasitaire aux divers contextes urbanisés existant dans les Alpes françaises est une question que l'on peut légitimement se poser. En effet, l'échinococcose alvéolaire est connue depuis un siècle dans les Alpes françaises, la Haute-Savoie recelant un foyer particulièrement actif de la maladie. Or, la croissance démographique actuelle de ce département est importante (taux de progression de 10,4 % par an), nettement supérieure à la moyenne nationale (+ 3,1 % par an), ce qui entraîne une recrudescence des phénomènes d'urbanisation (données de l'I.N.S.E.E., 1982). D'autre part, certains patients haut-savoyards, chez lesquels l'échinococcose alvéolaire a été diagnostiquée récemment, exercent des professions qui ne les mettent pas particulièrement en contact avec l'espace rural et habitent des agglomérations d'importances diverses, toutes touchées par les formes modernes d'urbanisation. Le même phénomène a été constaté en Franche-Comté par Delattre *et al.* (1991).

Pour que la parasitose puisse se développer, il est nécessaire que coexistent, dans un contexte écologique approprié, des hôtes définitifs infestés (renards) et des hôtes intermédiaires en quantité suffisante (Rongeurs réceptifs), afin de permettre le passage du germe d'un maillon de la chaîne épidémiologique à un autre.

La présente étude a pour but d'étudier l'impact de l'urbanisation, quelle qu'en soit la forme, sur les Rongeurs réceptifs au taenia échinoccoque et en tout premier lieu sur les Microtidés, dont le rôle essentiel dans le cycle parasitaire a été établi en Europe occidentale et, plus récemment, en France (Houin *et al.*, 1980; Petavy *et al.*, 1984).

Nous avons donc recherché la présence des Microtidés susceptibles de servir d'hôtes intermédiaires, étudié leur répartition dans des contextes d'urbanisation les plus divers, essayé de préciser les conditions écologiques favorables à leur existence dans de tels milieux (caractérisation des biotopes et étude des processus impliqués dans leur genèse).

CHOIX DU SITE D'ETUDE

Nous avons retenu comme site d'étude la commune de La-Roche-sur-Foron située au centre du département de la Haute-Savoie (Fig. 1). Ce choix a été motivé par les raisons suivantes :

– Cette commune (6 727 habitants en 1982) s'inscrit dans un canton où l'augmentation de population est particulièrement sensible; il s'agit d'une commune classée parmi celles «à forte pression foncière», pour lesquelles le nombre de permis de construire délivré par an est supérieur à 20 (données émanant des services de la Direction

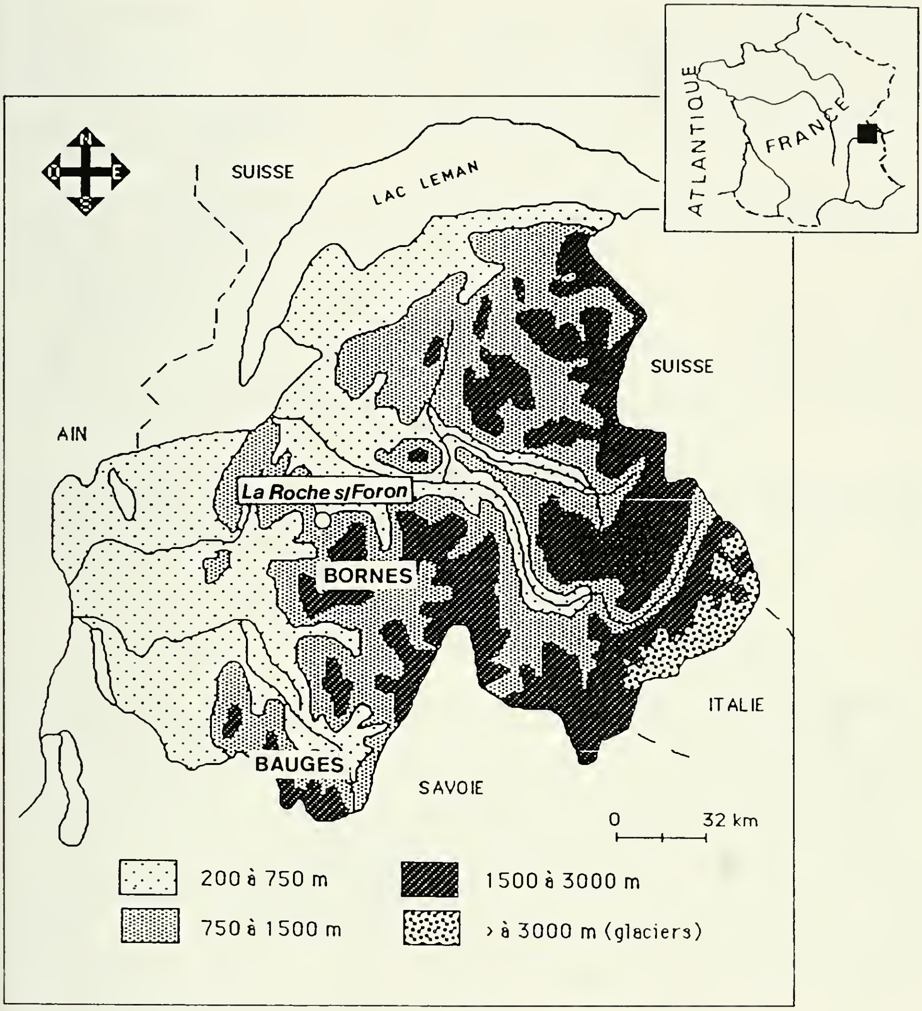

FIG. 1.

Situation et carte hypsométrique du département de la Haute-Savoie.

Départementale de l'Equipement de Haute-Savoie). A partir d'un noyau ancien, bien individualisé, de nouvelles résidences diffusent au sein du tissu rural, en densité suffisamment forte pour être susceptible d'en modifier les conditions écologiques de base. La répartition dans l'espace de ce nouveau type d'habitat le différencie fondamentalement de l'habitat traditionnel, plus ancien, regroupé en hameaux (DAVID, 1980).

– La part du milieu naturel, encore importante sur le territoire communal, nous a paru favorable pour essayer de saisir l'impact débutant de l'urbanisation sur la maladie.

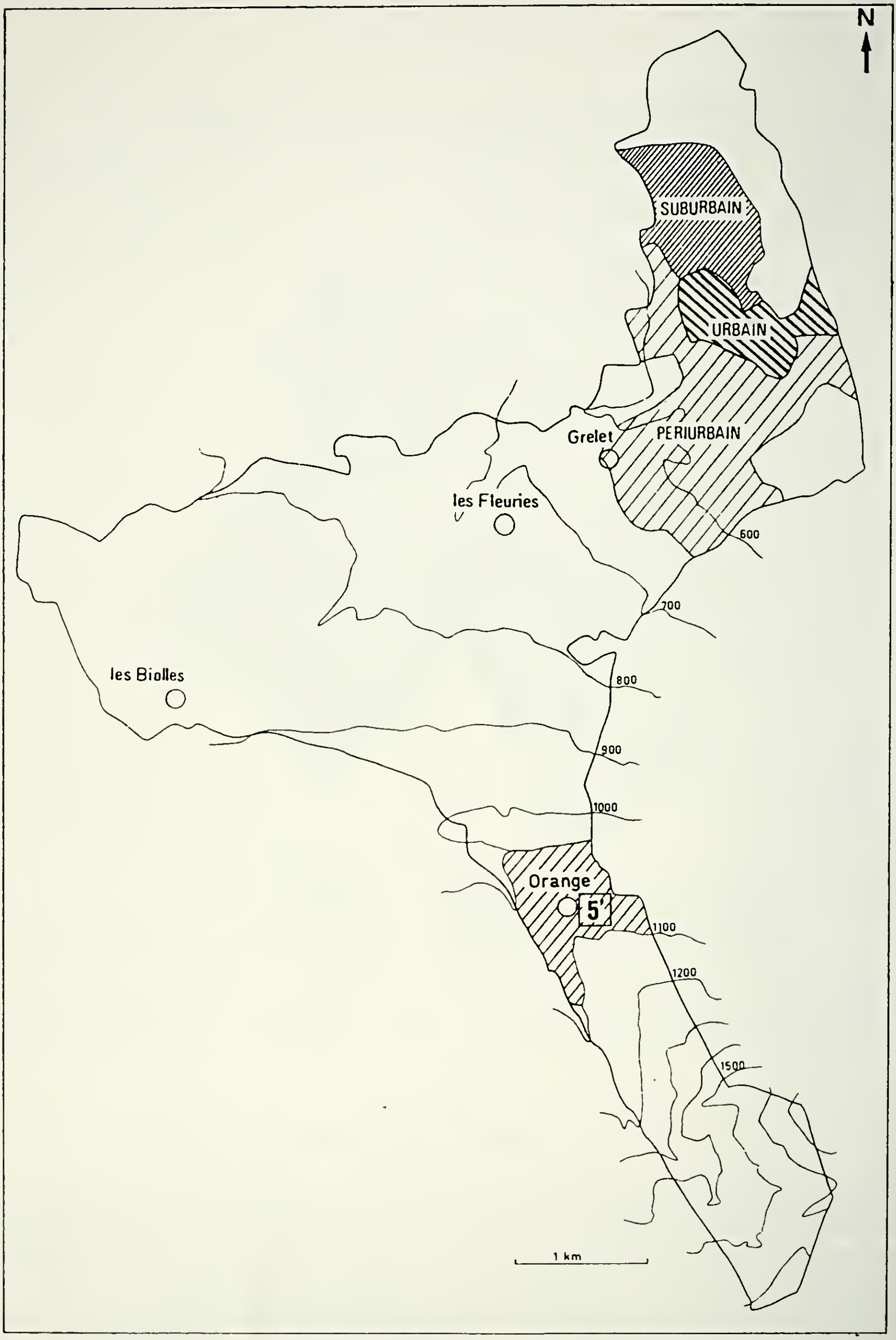

FIG. 2.

Topographie du territoire communal de La-Roche-sur-Foron.

– L'étalement de la commune selon un gradient altitudinal régulier (de 500 m au centre de La-Roche-sur-Foron à 1100 m au lieu-dit «Orange») permet de disposer d'une gamme très diversifiée de milieux, depuis le Collinéen jusqu'au Montagnard, au sein d'une même unité administrative (Fig. 2). Rappelons que des travaux de CONTAT (1984) ont montré que l'étage montagnard inférieur paraissait plus particulièrement favorable au déroulement du cycle.

– La présence d'une importante surface boisée en amont de la commune se prolongeant vers l'aval en un réseau de forêts riveraines est susceptible d'avoir une incidence épidémiologique en facilitant le cheminement des renards sur tout le territoire et en leur permettant de pénétrer dans la ville.

– Cette commune s'inscrit dans une zone où, selon GILOT *et al.* (à paraître), l'incidence de la maladie détectée chez le renard est globalement la plus forte de toute la Haute-Savoie (taux d'infestation des renards : 57,9 %). Cette zone, à cheval entre le Collinéen et le Montagnard inférieur, constitue une transition entre l'avant-pays alpin (taux d'infestation : 17,2 %) et les massifs montagneux (taux d'infestation : 42,1 %).

– L'existence de nombreux renards sur le territoire communal (plus de 30 renards tués durant l'été 1987) et l'infestation récente d'un certain nombre d'entre eux par l'échinocoque (3/7 sur le plateau d'Orange, mais aussi dans l'espace périurbain de la ville) ont été des arguments décisifs.

MÉTHODOLOGIE

a) PIÉGEAGE DES MICROTIDÉS : Sites de piégeage : dans la partie «basse altitude» de La-Roche-sur-Foron, où sont concentrées les diverses formes d'urbanisation, nous avons effectué des piégeages sur toute la surface du territoire communal, dans les parcelles non clôturées de l'espace interstitiel recelant les principaux types de végétation (pelouses, landes, haies, forêts). Dans la partie «haute altitude» de la commune (plateau d'Orange), les parcelles explorées sont situées entre les habitations constituant les hameaux, ou dans un espace encore rural (pelouses permanentes, pâturages de montagne, cultures fourragères) ponctué de constructions récentes (chalets avec jardin). Ces parcelles peuvent être regroupées en fonction de la végétation dominante, de la forme et du degré d'anthropisation (Tableau n°1). A l'intérieur des parcelles, le choix des lieux d'installation des pièges a été guidé par l'observation des signes d'activité des micromammifères (terriers, passages, déjections,...).

Les milieux les plus artificialisés (jardins publics), très peu nombreux, n'ont fait l'objet d'aucune investigation.

– Types de pièges utilisés : nous avons utilisé les pièges les plus spécifiques possibles : pièges INRA pour la capture de *Microtus arvalis*, *Microtus agrestis* et *Clethrionomys glareolus*; pièges Sherman ou «pinces à taupes» pour *Arvicola terrestris*. Cependant, dans les milieux où la pression humaine était particulièrement forte (vols de pièges), nous avons dû recourir aux «tapettes» à souris, moins onéreuses. Chaque fois qu'il a été possible, nous avons procédé à un piégeage semi-quantitatif avec les pièges INRA.

– Mise en évidence du parasite : les micromammifères capturés sont disséqués, leur foie est examiné, les lésions hépatiques macroscopiques sont prélevées; les coupes sont colorées à l'hémalun-éosine (DEBLOCK et PETAVY, 1983) en vue de l'examen histologique ultérieur.

Type de biotope	Type de Végétation	Anthropisation
Friches	Friche nitratophile à *Sambucus nigra* ou mesohygrophile à *Populus nigra*	Exploitation extensive ou abandon
Haies et reliquats boisés	Strate arborescente à *Populus nigra* ou à *Quercus pedunculata* et *Carpinus betulus*	Minimale ou nulle
Pâtures, prés de fauche	Pelouses pâturées à *Cynosurus cristatus* et *Trifolium repens* (Cynosurion) Prairies fauchées à *Arrhenaterum elatius* (Arrhenaterion)	Pâture ou fauche régulière (alternance possible)
Pelouses artificielles	Ray-grass dominant	Tonte régulière

TABL. 1.

Principales caractéristiques des différents types de biotopes «urbains».

b) LE ZONAGE : ce piégeage ne s'est pas exercé «au hasard» mais dans le cadre d'un découpage écologique de l'espace.

– Documents utilisés : cartes topographiques I.G.N. à 1/50 000 et à 1/25 000. Plan à 1/2 000 de La-Roche-sur-Foron indiquant les zones d'intervention foncière. Photographies aériennes à 1/5 000 (missions de 1956 et 1986). Carte de végétation à 1/50 000 (RICHARD, 1983) et minutes qui ont servi à l'élaboration de cette carte.

– Critères utilisés : cette zonation a pris en compte tant l'espace interstitiel que l'espace bâti, espaces caractérisés par un certain nombre de critères :

.. espace bâti : typologie, densité et évolution des constructions (de 1956 à 1986);

.. espace interstitiel : importance et nature du tissu interstitiel (agricole, dégradé,...).

– Zones distinguées : nous avons limité notre découpage aux territoires les plus urbanisés : partie basse de la commune (500 m) où 5 zones nettement individualisées ont été distinguées (Fig. 3) et, en zone complémentaire, le plateau d'Orange (1100 m). Leurs caractéristiques écologiques sont données dans le Tableau n°2.

Les zones non touchées par l'urbanisation sont de trois types : la zone agricole, avec des pratiques bien conservées qui, dans la partie basse de la commune, pénètre jusqu'à proximité du centre urbain et deux types de formations forestières (formations riveraines et bois).

– Regroupement des zones en strates écologiques : les diverses zones touchées par les phénomènes d'urbanisation sont regroupées en trois strates écologiques majeures : urbain (sensu stricto), suburbain, périurbain (Fig. 2).

c) CARACTÉRISATION DES BIOTOPES À MICROTIDÉS : on a procédé à la caractérisation floristique des formations et étudié leur évolution depuis 1956 (évaluation du degré de stabilité des groupements).

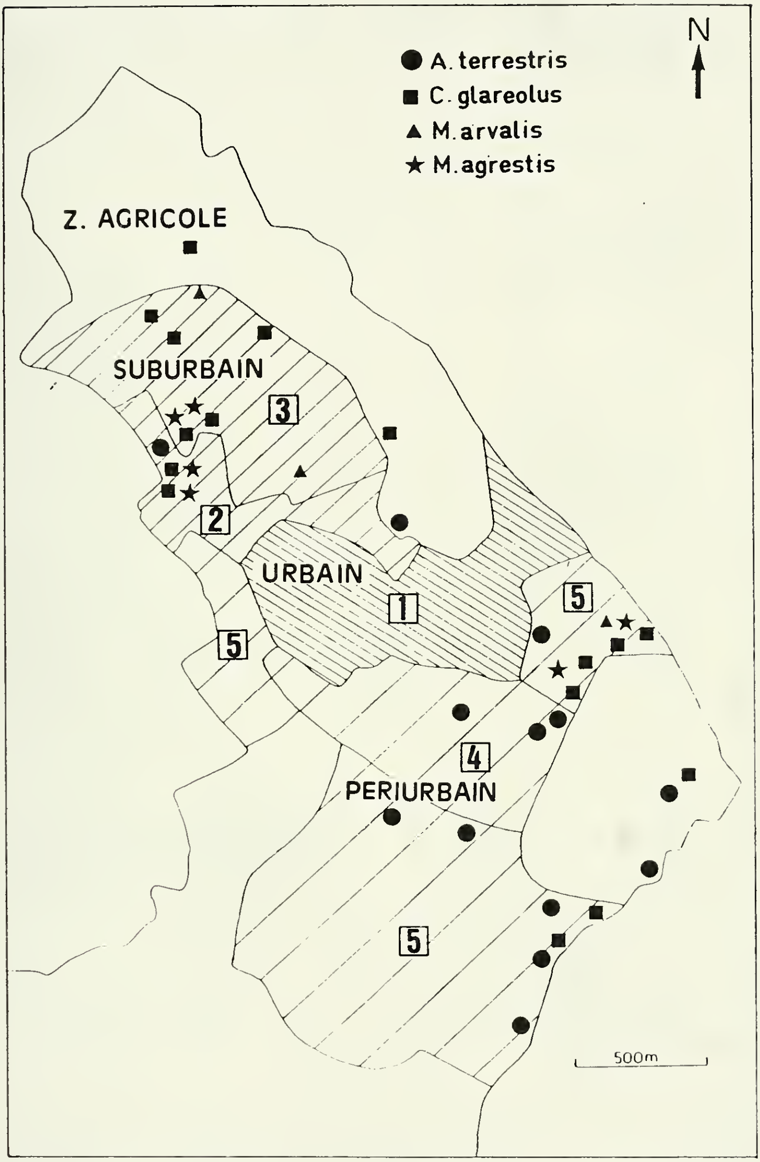

FIG. 3.

Répartition des Microtidés au sein des différentes zones distinguées à La-Roche-sur-Foron (500 m).

TABL. 2.

Caractéristiques écologiques des différentes zones distinguées sur le territoire «urbanisé» de La-Roche-sur-Foron

			Espace bâti			Espace interstitiel					
			densité	ancienneté	nature	espace agricole		espace boisé		végétation dégradée	
			nombre de constructions/ha			% surface agricole utilisée		% surface en bois		% surface en «friches»	
						1956	1986	1956	1986	1956	1986
U.	1	Centre-ville	20	antérieur à 1956	bâti continu	0	0	2,5	2,5	1	1
S.	2	Zone à grands immeubles	1,5	1960	ensembles de logements collectifs	50	10	11,5	3,5	1	3,5
	3	Zone industrielle	3	1966 (encore en développement en 1989)	usines, entrepôts	60	1,5	32	3	0	10
P.	4	Périurbain dense	4,5	antérieur à 1956	maisons individuelles en lotissements	10	7,5	12	12	1	1
	5	Périurbain lâche (500 m)	1,6	1970 (en plein développement en 1989)	maisons individuelles avec jardins	70	18	10	12	0	2,5
	5'	Plateau d'Orange (1100 m)	0,8	1975	chalets avec jardins	80	55	10	10	0	2

d) Recherches sur la genese des biotopes : elles ont nécessité l'usage de missions aériennes multidates (1956 et 1986), d'enquêtes auprès de la population locale et ont été complétées par des observations de terrain. En l'absence d'état primitif des biotopes, il est parfois délicat de préciser le mécanisme de cette génèse. Cependant, la comparaison avec des parcelles sans Microtidés peut servir de point de repère.

	Nombre d'individus capturés	
	La-Roche-sur-Foron (550 m)	Orange (1100 m)
Arvicola terrestris Linnaeus, 1758	69	46
Clethrionomys glareolus Schreber, 1780	28	21
Microtus arvalis Pallas, 1779	10	12
Microtus agrestis Linnaeus, 1758	49	2
Apodemus sylvaticus Linnaeus, 1758	119	5
Apodemus flavicollis Melchior, 1834	1	0
Talpa europea Linnaeus, 1758	0	2
Sorex gr. araneus Linnaeus, 1758	6	2
Neomys fodiens Pennant, 1771	7	1
Crocidura russula Hermann, 1780	74	0

Tabl. 3.

Micromammifères capturés sur le territoire «urbanisé» de La-Roche-sur-Foron (1987, 1988, 1989).

RÉSULTATS

Le Tableau n°3 indique la gamme des micromammifères capturés sur l'ensemble du territoire communal.

1 - **Les Microtidés piégés à Orange** (1100 m). Quatre Microtidés ont été mis en évidence.

a) *Arvicola terrestris* Linnaeus, 1758 : cette espèce colonise principalement les prés de fauche et les pâturages. Cependant *A. terrestris* a été décelé, à plusieurs reprises, dans des sites nettement plus anthropisés. Ainsi le Microtidé a pu diffuser à partir d'un pré de fauche dans le jardin potager d'un chalet. Dans un autre cas, c'est une pelouse artificielle autour d'un chalet (pelouse type «Ray grass»), semée depuis vingt ans et tondue plusieurs fois par an, qui est colonisée.

La pénétration de l'espèce au sein du village est également à noter. En effet, une cour d'école, envahie par une végétation en partie nitratophile, est elle aussi colonisée par *A. terrestris* dans la mesure où les activités de fauche persistent, même si celles-ci ne sont pas régulières. Nous avons déjà rencontré une situation homologue dans un autre village de Haute-Savoie (Mieussy; jardin abandonné et recolonisé par des nitratophiles).

Bien que ces parcelles ne soient pas véritablement abandonnées, la présence de *A. terrestris* dans de tels milieux ne gêne pas l'homme (contrairement à la colonisation des

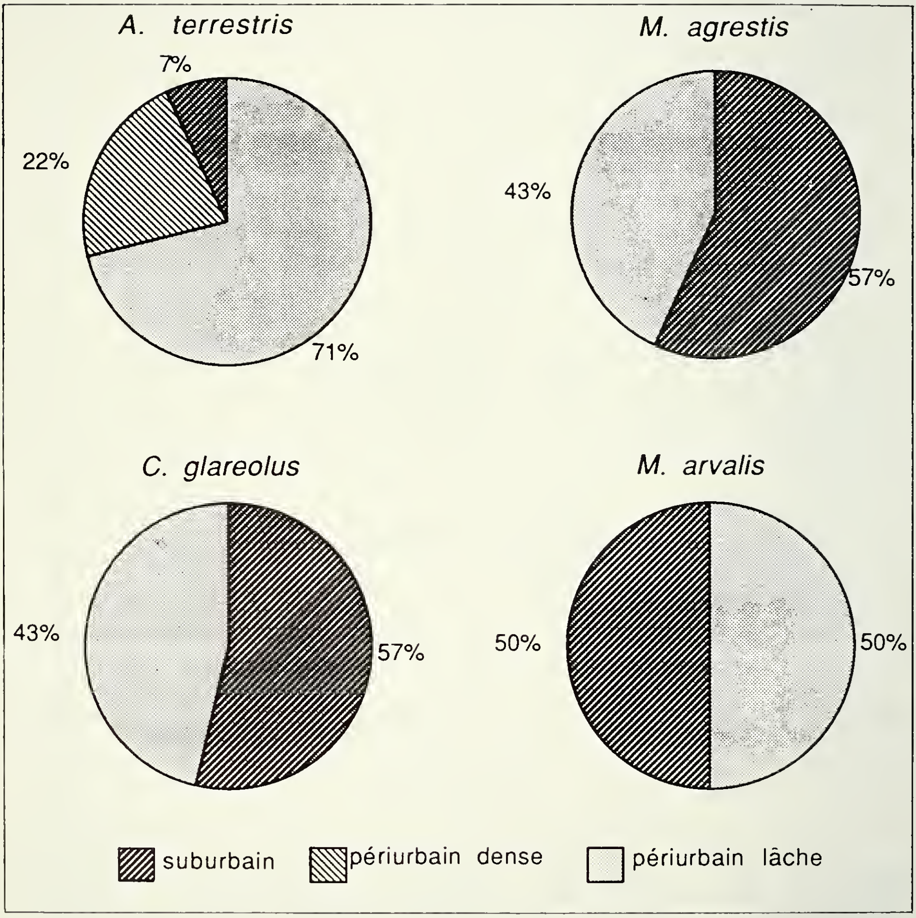

FIG. 4.

Colonisation des diverses strates écologiques distinguées par les quatre espèces de Microtidés capturés.

jardins potagers); ainsi le «noyau villageois» peut receler un grand nombre de ce type de sites où l'espèce est susceptible de proliférer.

b) *Microtus agrestis* Linnaeus, 1761 et *Microtus arvalis* Pallas, 1779 ont été décelés sur une pelouse à *Arrhenatherum elatius* en voie de colonisation par *Rosa canina.* Il s'agit d'une parcelle sous-pâturée depuis environ 10 ans. Cet état de fait résulte de conditions topographiques défavorables (pente un peu trop forte) et des difficultés d'accès du pâturage engendrées par le passage fréquent d'automobiles des «néo-ruraux» du plateau. L'insuffisance de la pression pastorale paraît induire des conditions favorables à l'installation des populations de *Microtus* : dans cette parcelle, les deux *Microtus* ont été mis en évidence, *M. arvalis* étant plus abondant. Nous n'avons pas trouvé sur le plateau d'autres biotopes similaires, la «déprise pastorale» demeurant peu accentuée.

c) *Clethrionomys glareolus.* Schreber, 1780 : les individus piégés se localisent dans des biotopes traditionnels : reliquats boisés avec sous-bois et litière épaisse.

d) Infestation par *Echinococcus multilocularis* Leuckart, 1863 : seuls deux *A. terrestris*, capturés en novembre 1987 ont été trouvés parasités par *E. multilocularis* (lésions non fertiles). Ils ont été piégés dans un pâturage situé à proximité du hameau primitif d'Orange : pelouse mésophile à *Trisetum flavescens*, *Holcus lanatus*, *Rhinanthus cristagalli* et *Dactylis glomerata* avec une très grande diversité floristique (plus de 40 espèces végétales ont été identifiées).

2 - **Les micromammifères piégés à La-Roche-sur-Foron (500 m)**

a) Les espèces : dix espèces différentes ont été capturées : *Arvicola terrestris*, *Clethrionomys glareolus*, *Microtus arvalis*, *Microtus agrestis*, *Apodemus sylvaticus*, *Apodemus flavicollis*, *Talpa europaea*, *Crossidura russula*, *Sorex* gr. *araneus*, *Neomys fodiens.*

b) Répartition des Microtidés dans les différentes zones distinguées : les résultats sont synthétisés dans la Figure n°3.

La Figure n°4 montre comment se répartissent les Microtidés au sein des principales strates écologiques distinguées.

La strate «urbaine» (sensu stricto) ne paraît pas abriter de Microtidés. Les deux strates les plus colonisées sont celles dont l'espace intersticiel résiduel est le plus développé : «périurbain» lâche et «suburbain».

c) Répartition des Microtidés dans les différents types de biotopes «urbains» : les résultats sont synthétisés dans la Figure n° 5.

d) Infestation par *E. multilocularis* : aucun des foies de Microtidés capturés dans la partie basse de la commune n'était parasité par *E. multilocularis.*

3 – **Genèse et caractérisation des biotopes à Microtidés**

a) Les biotopes à *Arvicola*

– Pelouse du «Pensionnat» (zone à grands immeubles): C'est une pelouse mésophile, à topographie plane, assez homogène (recouvrement herbacé de 90 %). Ce pré, encore régulièrement fauché, sans aucun ligneux, présente un cortège de plantes herbacées sélectionnées par la fauche, avec une dominance de *Trifolium repens* et de *Plantago lanceolata.*

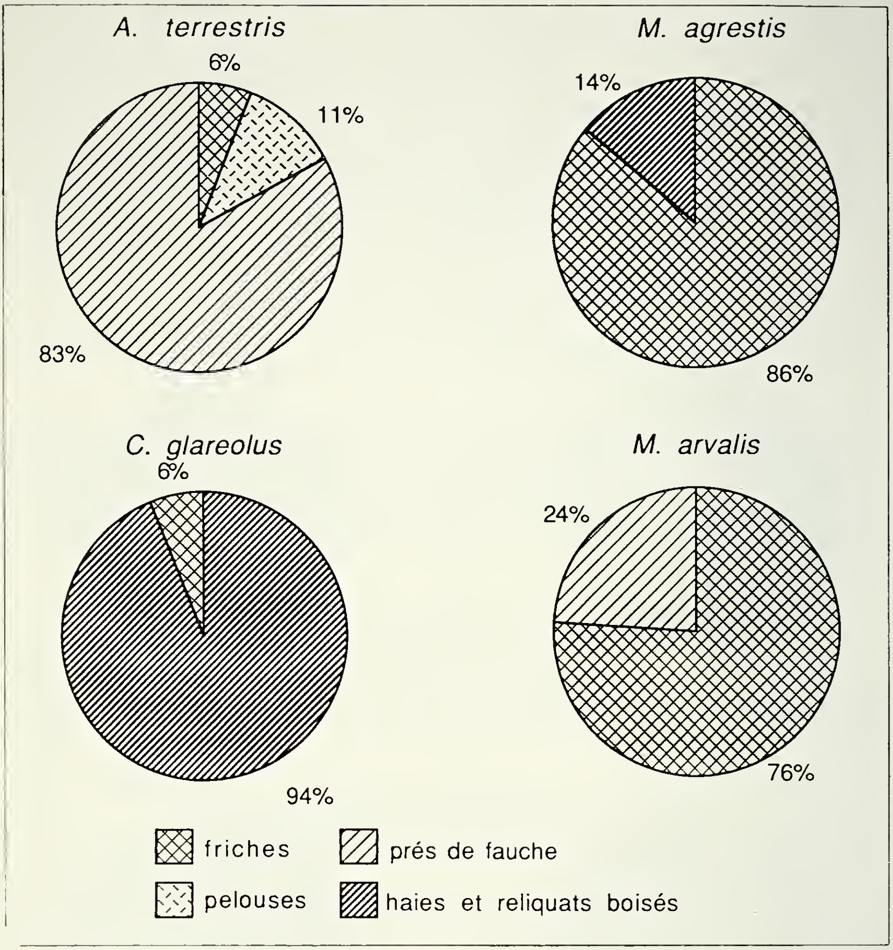

FIG. 5.

Affinité des quatre Microtidés capturés pour les différents types de biotopes «urbains».

– Le pré de «La Gouttette» (enclave agricole): Il s'agit également d'une pelouse mésophile régulièrement exploitée, homogène, à *Holcus lanatus*, *Dactylis glomerata*, *Arrhenatherum elatius* et *Trifolium repens*. Le recouvrement herbacé est d'environ 80 %. Cette parcelle constitue une enclave rurale en zone urbaine délimitée par des haies (*Fraxinus excelsior*, *Populus tremula*, *Rosa canina*, *Rubus* sp).

Les populations de *A. terrestris* persistent dans un environnement très urbanisé, au sein de prés de fauche dont les dimensions sont suffisamment importantes (0,2 à 0,5 hectare) pour permettre le maintien de pratiques agricoles régulières. Dans la ville de La-

Roche-sur-Foron, nous n'avons pas mis en évidence *A. terrestris* dans les pelouses entretenues, comme nous l'avons noté à Orange. Mais l'espèce est présente, parfois en abondance, dans certains jardins potagers; dans la zone à habitat individuel dense, un jardinier a capturé une soixantaine de *A. terrestris* en quelques jours dans le jardin non clôturé d'une villa jouxtant un petit pré de fauche.

b) Les biotopes à *Microtus agrestis* : nous décrirons divers types de friches suburbaines colonisées par *M. agrestis*.

– Friche à *Populus nigra* et *Rubus caesius* (zone industrielle) : Ce terrain, situé en contrebas par rapport à la route, servait autrefois de jardin potager. En 1975, les pratiques culturales ont été abandonnées et cette parcelle fait aujourd'hui l'objet de dépôts réguliers de matériaux exogènes (gravats) à l'origine d'une microtopographie très irrégulière. Sur ce substrat rapporté ne résultant pas de la pédogenèse, une mosaïque de groupements pionniers se sont développés, à partir d'une lisière arborescente, en fonction du microrelief (par exemple, groupement à *Alnus glutinosa* dans les parties dépressionnaires plus humides, groupement à *Cornus sanguinea* dans les endroits plus secs); cette grande diversité floristique (plus de 30 espèces relevées en novembre) confère un aspect particulièrement hétérogène à cette «friche». Il est vraisemblable que cette hétérogénéité se maintiendra dans le temps, chaque groupement végétal évoluant selon sa propre dynamique.

M. agrestis colonise les zones à forte biomasse herbacée, sans arbustes; *C. glareolus* est également présent, mais dans les secteurs à *Salix caprea* et à *Rubus caesius*.

– Verger abandonné (zone à grands immeubles) : Il s'agit d'un verger de pommiers planté vers 1960 sur une pelouse, puis abandonné depuis une dizaine d'années. On y observe une strate herbacée très dense (recouvrement = 100 %) constituée principalement de Graminées (*Arrhenatherum elatius*, *Dactylis glomerata*) vraisemblablement présentes dans la composition floristique initiale; ce verger est progressivement colonisé par les ligneux (*Rubus* sp., *Sambucus nigra*, *Crataegus monogyna*, *Cornus sanguinea*, *Fraxinus excelsior*, *Corylus avellana*). L'ensemble a un aspect mosaïqué.

M. agrestis et également *C. glareolus* ont été capturés dans ce biotope.

Nous avons pu constater à plusieurs reprises l'existence de biotopes identiques colonisés par M. agrestis, dans certains villages de Haute-Savoie (Mieussy).

– Terrain le long du Foron (zone à habitat individuel diffus) : Situé au sein d'un lotissement nouvellement créé, ce terrain dont la forte pente interdit la construction de villas voit progressivement son utilisation agricole disparaître. Il s'agit d'une pelouse mésophile, exposée au Sud, avec une importante couche de matières végétales minéralisées. Régulièrement fauchée jusqu'en 1980, cette parcelle a été ensuite convertie en pâturage à chevaux. L'irrégularité de la pression pastorale pendant une dizaine d'années, puis son abandon depuis 1988 (un an) entraînent le développement localisé de plantes nitratophiles en forte densité (*Rumex* sp., *Urtica dioica*) et la recolonisation ponctuelle par des buissons de ligneux bas (*Rosa canina*, *Clematis vitalba*). Dès lors, l'absence de perturbation (piétinement) favorise le dynamisme naturel de la végétation.

Dans ce biotope, les populations de *M. agrestis* sont particulièrement abondantes. Nous avons noté également la présence de *M. arvalis*.

c) Les biotopes à *Microtus arvalis* : nos piégeages n'ont décelé cette espèce que de façon ponctuelle, dans un petit nombre de biotopes, ce qui ne nous permet pas d'appréhender de façon précise la répartition de ses populations.

En dehors de la parcelle précédement décrite, *M. arvalis* a été retrouvé sur un talus à végétation pionnière ligneuse bordant un «terrain vague» de la zone industrielle. Ce *Microtus* a également été capturé le long d'un autre talus, à *Arrhenatherum elatius* et *Trisetum flavescens*, longeant un pré résiduel fauché irrégulièrement, dans cette même zone. Nous n'avons pas retrouvé *M. arvalis* sur le talus de la route à grande circulation, situation que l'espèce paraît pourtant affectionner (BOURQUIN et MEYLAN, 1982).

d) Les biotopes à *Clethrionomys glareolus* : l'espèce a été décelée dans divers types de conditions. Sa présence n'est pas rare dans les friches suburbaines (cf. «Friche à *Populus nigra* et *Rubus caesius*», «verger abandonné»), mais le plus souvent *C. glareolus* a été capturé dans des formations boisées diverses quant à leur composition botanique : forêt-galerie le long du Foron; chênaie à charme dégradée en situation urbaine, avec très peu de sous-bois mais un apport en matières organiques (le bois servant de dépôt d'ordures); haies stratifiées, à *Populus nigra*, *Cornus sanguinea*, *Crataegus monogyna*, apparemment peu dégradées malgré l'environnement urbanisé (zone industrielle). Il est à noter que les haies arborescentes ne comportant ni strate arbustive (fourré), ni strate herbacée dense ne se sont pas révélées favorables à l'espèce.

DISCUSSION

Au niveau d'Orange, la présence des quatre espèces de Microtidés est particulièrement intéressante. Sans conteste, le Microtidé le plus abondant en 1987 (année où ses populations étaient en phase d'expansion) est *Arvicola terrestris*. Bien que cette espèce présente des lésions le plus souvent stériles, son intérêt focalisateur est indéniable; en effet, elle constitue un facteur attractif certain pour le renard et de ce fait peut engendrer des sites propices à la contamination humaine (comportement de défécation du carnivore sur les lieux de prédation, selon DELATTRE *et al.*,1985). Ainsi, la très vaste distribution d'*A. terrestris* sur le plateau constitue un élément épidémiologique important. Dans ce paysage à habitat disséminé, les populations de renards circulent avec une grande facilité et peuvent être attirées vers les chalets, en particulier par les dépôts d'ordures domestiques (ARTOIS, 1989).

Les populations de *Microtus* ne nous ont pas paru très abondantes sur le plateau d'Orange. Le caractère récent des constructions, leur grande dispersion expliquent vraisemblablement le fait que le tissu rural intercalaire soit, en général, peu modifié. Ainsi, le nombre de terrains en friches est peu important. Peut-être, à cette même altitude, très favorable au cycle, d'autres types de situations propices aux *Microtus* seraient-ils à rechercher dans un contexte urbanisé plus dense, en relation avec une déprise pastorale plus importante.

Dans la partie basse de la commune, nettement plus urbanisée, les quatre espèces de Microtidés, réservoirs potentiels pour le parasite, ont également été capturés (nos recherches dans la littérature ne nous ont cependant pas permis de vérifier le caractère d'hôte intermédiaire confirmé de *M. agrestis*).

Ces divers Microtidés avaient déjà été signalés au sein de plusieurs agglomérations : *M. arvalis* à Moscou (POYARKOV, 1956), Léningrad (KLYUCHNIK et STAROSTINA, 1963), Berlin (DATHE, 1988), Grenoble (GILOT *et al.*, 1976) - *M. agrestis* dans l'espace suburbain d'Oxford (DICKMAN et DONCASTER, 1987) - *Clethrionomys glareolus*, à Bâle et à Oxford (RAHM et DIETRICH, 1987; DICKMAN et DONCASTER, 1987). LEURQUIN (1975), grâce aux données recueillies par l'analyse des pelotes de réjection de la *Tyto alba* (chouette effraie), signale la présence de *A. terrestris*, *M. arvalis* et *M. agrestis* dans la zone suburbaine des villes du Hainaut (Belgique). Jamais, à notre connaissance, n'avait été signalée la présence simultanée de ces quatre espèces au sein d'une même agglomération.

L'intérêt principal de cette étude réside dans le fait qu'une petite agglomération, très représentative des communes de piémont en Haute-Savoie, peut privilégier deux types de situations opposées, toutes deux favorables aux Microtidés :

– Le maintien du caractère fonctionnel de certaines parcelles qui, en dépit de leur isolement, de leur morcellement et du type nouveau d'environnement créé par le cadre urbain, conservent leur caractère rural. Telles sont les prairies fauchées régulièrement qui hébergent toujours des populations de *A. terrestris* malgré leur «incarcération» dans la ville; telles sont aussi les haies qui demeurent favorables à *C. glareolus* et *M. agrestis* pour peu qu'elles soient suffisament touffues. Il en est de même pour les îlots boisés qui, malgré leur morcellement et la dégradation dont ils ont fait l'objet, recèlent encore *C. glareolus.*

Ainsi, ces milieux transposés en pleine ville présentent encore des potentialités homologues à celles qu'ils offrent en milieu rural (Saint-Girons, 1973; Taberlet, 1982).

Ces constatations sont voisines de celles qu'ont pu faire Dickman et Doncaster (1987), dans la ville d'Oxford : ces auteurs concluent que les paramètres liés aux îlots de végétation naturelle sont plus importants pour prévoir la présence des différentes espèces de micromammifères que ceux liés à l'urbanisation de l'environnement.

– L'apparition de biotopes nouveaux générés par le développement de certaines formes d'urbanisation (bâtiments industriels, grands ensembles) ou par des conditions topographiques défavorables qui entraînent l'abandon des pratiques culturales. Il s'agit, le plus souvent, de «friches suburbaines» liées au libre dynamisme de la végétation. Ce type d'espace, dont on doit souligner l'originalité, offrent à *M. agrestis* non seulement la végétation à haute diversité qu'il affectionne, mais également toute une gamme d'abris artificiels (gravats). Stoddart (1980) avait déjà souligné la possibilité de pénétration des Microtidés, dont *M. agrestis*, dans la ville de Manchester, par les sentiers bordés de végétation rudéralisée qui longent les voies de chemin de fer.

Selon l'histoire de la ville considérée, ses conditions topographiques, ou selon la prédominance d'une forme d'urbanisation sur une autre, on peut penser que l'une de ces deux situations dominera; ce qui paraît certain, c'est le fait que l'espace urbanisé pourra toujours engendrer des populations de Microtidés, à distribution en mosaïque, susceptibles de servir d'hôtes intermédiaires pour le cycle du taenia échinocoque.

Bien que les résultats des examens parasitologiques des foies de Microtidés capturés dans la partie basse de La-Roche-sur-Foron aient été négatifs, il est vraisemblable que ces populations sont susceptibles de constituer pour le renard un élément d'attraction particulier.

Or, quelques observations privilégiées ont permis de constater la présence du carnivore sauvage dans l'espace périurbain de villes aussi différentes que La-Roche-sur-Foron (Broys), Annecy (Annecy-le-vieux) ou Evian (renard parasité capturé sur une décharge publique).

De telles conditions vont dans le sens de celles qui ont été faites dans d'autres contextes biogéographiques (Harris, 1977, pour Londres) : l'environnement urbain n'est pas pour le renard un élément de répulsion.

De plus, on a pu mettre en évidence l'infestation du renard par le taenia échinocoque «aux abords» de certaines grandes villes (Aubert *et al.*, 1987, à Metz et Nancy).

Un renard infesté a d'ailleurs été décelé en août 1987 dans l'espace périurbain de La-Roche-sur-Foron (zone 5).

Ces populations de Microtidés constituent également un élément attractif pour certains carnivores domestiques, comme nous avons pu le vérifier à plusieurs reprises : chat en train de chasser *A. terrestris* dans la zone à habitat individuel dense de La-Roche-sur-Foron; terriers de *Microtus* surcreusés par des chiens dans un terrain vague d'Annemasse.

Or, les carnivores domestiques eux-mêmes sont susceptibles de servir de relai (cf. pour le chien, CONTAT, 1984; pour le chat, PETAVY *et al.*, 1988).

En définitive, une telle étude apporte une contribution à la définition du risque épidémiologique lié à la colonisation de la trame urbaine par une gamme relativement diversifiée de micromammifères, comme l'ont signalé divers auteurs, et plus particulièrement ROSICKY en 1978.

REMERCIEMENTS

Nous remercions bien vivement M. le Professeur L. RICHARD pour les conseils judicieux dont il nous a fait bénéficier.

Nous remercions également la Municipalité de La-Roche-sur-Foron qui nous a permis d'effectuer des piégeages sur le territoire communal.

Nous sommes de plus très reconnaissants envers Messieurs NAVILLE et RANARD, Madame et Monsieur DUNAND pour leur accueil et les indications fort utiles dont ils nous ont fait part.

RÉSUMÉ

L'impact des diverses formes d'urbanisation sur les populations de Microtidés, hôtes intermédiaires dans le cycle d'*Echinococcus multilocularis* Leuckart 1863 est étudié dans une zone d'endémie échinococcique (Alpes du Nord, Haute-Savoie, Commune de La-Roche-sur-Foron, 500-1100 m). Le piégeage est effectué dans le cadre d'un découpage écologique des territoires urbanisés prenant en compte tant l'espace bâti que l'espace interstitiel. Les divers types de biotopes «urbains» colonisés par les Microtidés sont caractérisés et l'étude des processus impliqués dans leur genèse est amorcée.

Quatre des Microtidés réceptifs au Cestode (*Arvicola terrestris* Linnaeus, 1758; *Microtus agrestis* Linnaeus, 1761; *Microtus arvalis* Pallas, 1779 et *Clethrionomys glareolus* Schreber, 1780) sont décelés à 500 et à 1100 m. Seuls deux *A. terrestris* ont été trouvés parasités par *E. multilocularis* sur le plateau d'Orange (1100 m).

Les zones suburbaines et périurbaines sont particulièrement favorables aux différents Microtidés alors que leur présence n'a pas été décelée dans le centre urbain (sensu stricto).

Les prés de fauche sont colonisés par *A. terrestris* dans la mesure où leur inclusion dans la trame urbaine n'a pas modifié leur état primitif (exploitation agricole régulière). L'espèce a également été retrouvée dans des milieux très anthropisés (pelouses artificielles, jardins potagers).

Les terrains «en friches», générés par certaines formes d'urbanisation (bâtiments industriels) ou abandonnés en raison de leur situation topographique (pentes), hébergent essentiellement *M. agrestis* et plus rarement *C. glareolus* et *M. arvalis.* Enfin, certaines haies, peu perturbées par leur insertion en zone urbaine, sont colonisées par *C. glareolus* et

parfois *M. agrestis*. *C. glareolus* peut également persister dans des reliquats boisés en voie de dégradation.

Ces populations de Microtidés constituent vraisemblablement un facteur attractif pour l'hôte définitif, le renard, dont la présence dans un environnement fortement anthropisé a été fréquemment notée.

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Revue suisse Zool.	Tome 99	Fasc. 2	p. 395-403	Genève, juin 1992

Neue und interessante Milben aus dem Genfer Museum XXXVII. Neue Milben von den pazifischen Inseln (Acari: Anoetidae, Scutacaridae)

von

S. MAHUNKA*

Mit 27 Abbildungen

ABSTRACT

New and interesting mites from the Geneva Museum XXXVII. New mites from the Pacific Islands (Acari: Anoetidae, Scutacaridae). – Three new species of Anoetidae (*Histiostoma berndhauseri* sp. n., *H. genavensium* sp. n. and *H. pseudolongipes* sp. n.) and one new species of Scutacaridae (*Imparipes (I.) caledonicus* sp. n.) are described from millipeds of Tahiti, Fiji and New Caledonia.

Die bekannten Höhlenforscher Dr. V. Aellen und Dr. P. Strinati haben im Rahmen einer biospeläologischen Weltreise auch mehrere Höhlen in der pazifischen Region untersucht. Neben den Untersuchungen der Höhlenfauna sammelten sie auch ausserhalb und entnahmen Bodenproben, die in Genf mittels Berlese-Apparaten ausgelesen wurden. Der zur Konservierung der Diplopoden verwendete Alkohol wurde im Labor von Dr. B. Hauser von seiner Mitarbeiterin Frau L. Comte sorgfältig ausgesucht. Das dabei anfallende Milbenmaterial wurde mir von Dr. Hauser zur Bearbeitung überlassen, wofür ich ihm auch an dieser Stelle herzlich danken möchte. Bereits früher hatte ich über Oribatiden berichtet, die aus Guano- und Bodenproben derselben Reise stammten (MAHUNKA 1982).

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* Zoologisches Abteilung des Ungarischen Naturwissenschaftlichen Museums, Baross utca 13, H-1088 Budapest, Ungarn

ACARIDA

ANOETIDAE

Histiostoma berndhauseri sp. nov.

Dimensionen: Länge: 128-132 µ, Breite: 88-96 µ

Habitus: Eiförmig. Oberfläche des Hysterosoma sehr fein punktiert.

Dorsalansicht (Abb. 1): Rostrum mit einer abgesonderten, gerundeten Spitze, daneben zwei gut sichtbare Einbuchtungen. Seite des Propodosoma gewölbt. Dorsosejugalregion breit, mit aus kleinen, kurzen Linien bestehender Skulptur. Die Haare des Propodosoma, sowie fast alle des Hysterosoma lang, nach vorne gerichtet. Von den letzteren sind die e_1, f_1, h_1 und e_2 viel kürzer als die übrigen.

Ventralansicht (Abb. 2): Das Infracapitulum des Gnathosoma (Abb. 5) rechteckig, die Palpen deutlich abgesondert, die Solenidien lang, wenig gebogen. Die Apodeme sind gut entwickelt, aber *ap. sa.* und *ap.* 2. erreichen nicht die Querbogen der Sejugalapodeme. Die Apodeme der hinteren Sternalplatte bilden ein geschlossenes Netz. Die Saugnäpfe der 1., 3. und 4. Epimeren sind sehr gross, auch die Saugnapfplatte ist gross und füllt den Platz hinter den 4. Beinen gut aus.

Beine: Hafthaar des 1. Beines (Abb. 3) löffelförmig. Zwischen den 4 tibiotarsalen Solenidien bestehen nur geringe Längenunterschiede: ϵ am kürzesten, φ_2 länger als ω_1. Auf dem 2. Bein (Abb. 4) die ω_1 und φ_1 etwa gleich lang. Auf dem 3. Bein (Abb. 6) befindet sich ein an der Basis verbreitertes Endhaar. Am 4. Bein (Abb. 7) ist das Endhaar einfach.

Untersuchungsmaterial: Holotypus: Tahiti: Cascade de Faarumai, sur diplopodes, 26.III.1977. leg. V. Aellen et P. Strinati. 2 Paratypen am selben Fundort gesammelt. Holotypus und 1 Paratypus im Naturhistorischen Museum Genf, 1 Paratypus in der Arachnoiden-Sammlung des Naturhistorischen Museums Budapest (Inventarnummer 387-PA-1978).

Bemerkung: Auf Grund der besonderen Form des Propodosoma unterscheidet sich die neue Art von allen bisher bekannten *Histiostoma* Kramer, 1877 Arten. Ich widme die neue Art meinem guten Freund, Dr. Bernd Hauser, der mir dieses interessante Material zur Bearbeitung überlassen hat.

Histiostoma genavensium sp. nov.

Dimensionen: Länge: 172 µ, Breite: 142 µ.

Habitus: Körper sehr breit, etwa umgekehrt eiförmig, aber das Rostrum ohne Spitze, gerade abgeschnitten. Auf dem Propodosoma mehrere halbmondförmige Flächen mit verdicktem Chitinrand. Auf dem Hysterosoma seitlich eine ganz feine Polygonalskulptur.

Dorsalansicht (Abb. 8): Die hier entspringenden Haare sind ziemlich lang, gebogen, sie erreichen den Seitenrand des Propodosoma. Dorsosejugalregion breit, mit gut sichtbarer, aus kurzen Linien bestehender Skulptur. Die Haare des Hysterosoma ähneln den Haaren des Propodosoma, sind aber etwas länger.

Ventralansicht (Abb. 9): Infracapitulum des Gnathosoma (Abb. 12) fassförmig, Palpen kaum abgesondert, Solenidien sehr dünn und kurz. Apodeme gut entwickelt, *ap. sej.* ebenso dick wie die übrigen. *Ap. sp.* erreicht den Bogen der

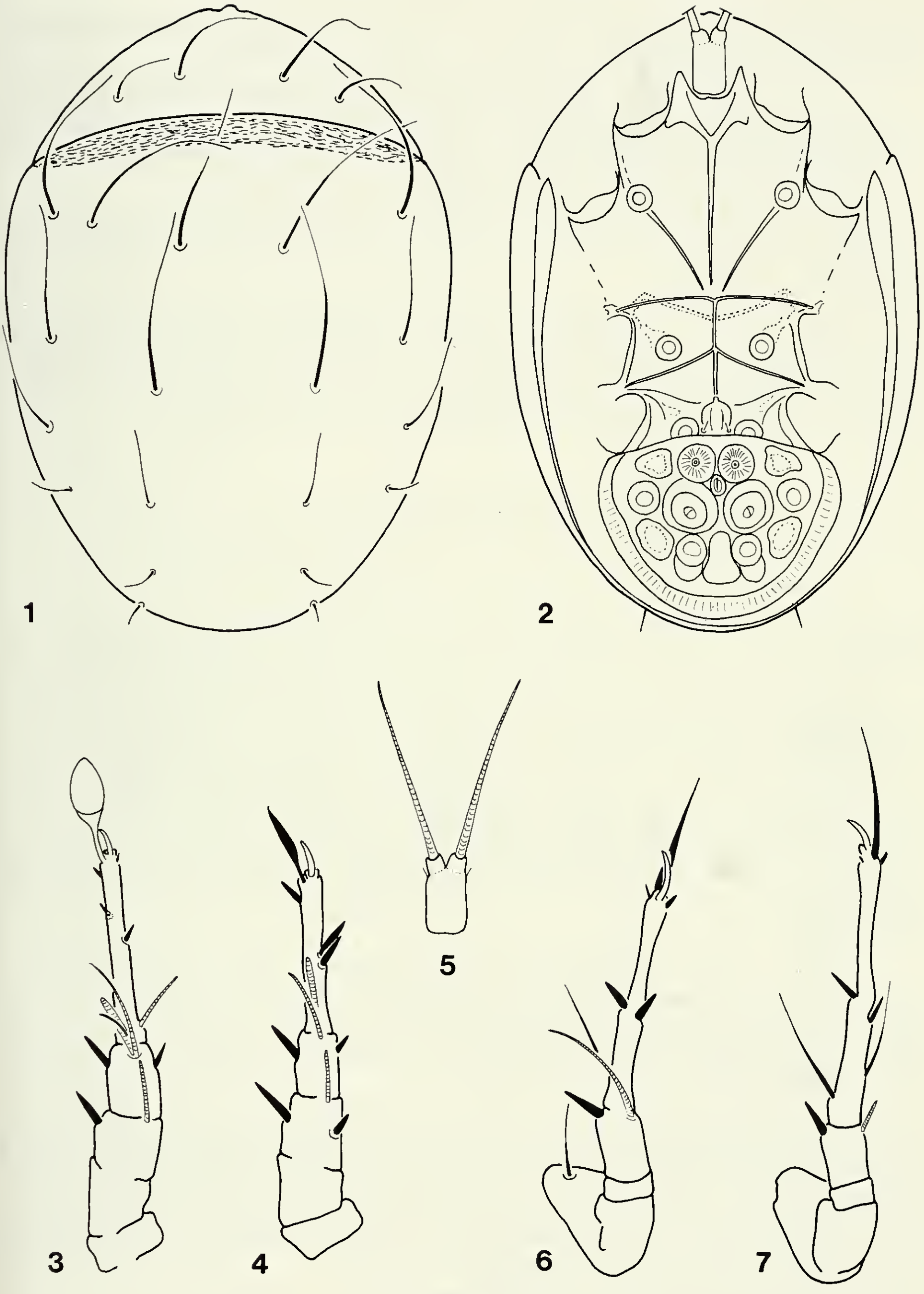

ABB. 1-7.

Histiostoma berndhauseri sp. nov.; 1: Dorsalansicht; 2: Ventralansicht; 3: Bein I.; 4: Bein II.; 5: Gnathosoma; 6: Bein III.; 7: Bein IV.

Sejugalapodeme. Auf den 1. 3. und 4. Epimeren befindet sich je ein Saugnapf, Saugnapfplatte gut entwickelt.

Beine: Am 1. Bein (Abb. 11) 4 tibiotarsale Solenidien vorhanden, aber ϵ ganz winzig, kaum sichtbar. ω_1 kurz, am Ende keulenförmig verdickt. φ_1 lang, das *l*" Haar weit überragend. Auf dem 2. Bein (Abb. 10) ω_1 sehr gross, lang, φ_1 ganz winzig, δ_1 viel länger als die letzte. Endhaare der 3. und 4. Beine (Abb. 13, 14) kurz, einfach.

Untersuchungsmaterial: Holotypus: Fidji, Viti Levu: entre Yanuca et Nadi, bord de rivière, sur diplopodes, 31.III. 1977, leg. V. Aellen et P. Strinati. Holotypus im Naturhistorischen Museum Genf aufbewahrt.

Bemerkung: Die neue Art ist durch die Propodosoma-Skulptur, durch die ziemlich langen Dorsalhaare und vor allem durch das eigenartige Gnathosoma gekennzeichnet. Sie steht *Histiostoma cyrtandrae* (Vitzthum, 1913) am nächsten, unterscheidet sich aber von dieser Art durch die Form des Gnathosoma und durch die Solenidiengruppe des 1. Beines. Die neue Art widme ich den beiden Biospeläologen aus Genf (lat. Genava).

Histiostoma pseudolongipes sp. nov.

Dimensionen: Länge: 160-186 µ, Breite: 104-122 µ.

Habitus: Körper verkehrt eiförmig, aber das Propodosoma mit scharfer Spitze. Oberfläche des Propodosoma sehr fein punktiert, seitlich mit langen, feinen Strichen.

Dorsalansicht (Abb. 15): Propodosoma ziemlich klein. Die hier entspringenden Haare sind winzig, das innere Paar steht etwas vor dem äusseren. Dorsosejugalregion schmal, mit feiner Skulptur. Haare des Hysterosoma winzig, kaum sichtbar.

Ventralansicht (Abb. 16): Gnathosoma, Infracapitulum, sowie Solenidien sehr lang (Abb. 19), Palpen deutlich abgesondert. Apodeme gut entwickelt, das *ap. sa* und die *ap.* 2. erreichen den Bogen der Sejugalapodeme. *Ap. sec.* und *ap. sp.* ebenfalls lang. Auf den 1., 3. und 4. Epimeren befinden sich Saugnäpfe, die letzteren sind viel grösser als diejenigen der 1. und 3. Epimeren. Saugnapfplatte ziemlich klein, aber alle Saugnäpfe gut entwickelt.

Beine: Tibien und Tarsen aller Beine sehr lang, besonders lang der Tarsus des 1. Beines (Abb. 18). 4 tibiotarsale Solenidien vorhanden: ϵ länger als ω_1 und φ_2, φ_1 erreicht die *l*' und *l*" Haare nicht, δ_1 Solenidium sehr kurz, Auf den 2. Beinen (Abb. 17) ist ω_1 dick, aber kaum länger als φ_1. Das Endhaar des 3. Beines (Abb. 20) ist etwa ein Drittel so lang wie dasjenige des 4. Beines (Abb. 21).

Untersuchungsmaterial: Holotypus: Fidji, Viti Levu: entre Yanuca et Nadi, bord de rivière, sur diplopodes, 31.III.1977, leg. V. Aellen et P. Strinati, 10 Paratypen vom selben Fundort. Holotypus und 6 Paratypen im Naturhistorischen Museum Genf, 4 Paratypen in der Arachniden Sammlung des Naturhistorischen Museums Budapest (Inventarnummer 388-PA-1978).

Bemerkung: Die neue Art gehört zur "*longipes*" Artengruppe. Diese Gruppe ist durch die folgenden Merkmale gekennzeichnet:

1. Beine sehr lang, Tibia und Tarsus besonders lang.
2. Infracapitulum des Gnathosoma ebenfalls sehr lang.
3. Apodeme gut entwickelt, das *ap. sa.* erreicht den Bogen der Sejugalapodeme.
4. Bogen der Sejugalapodeme stark nach vorne gewölbt.

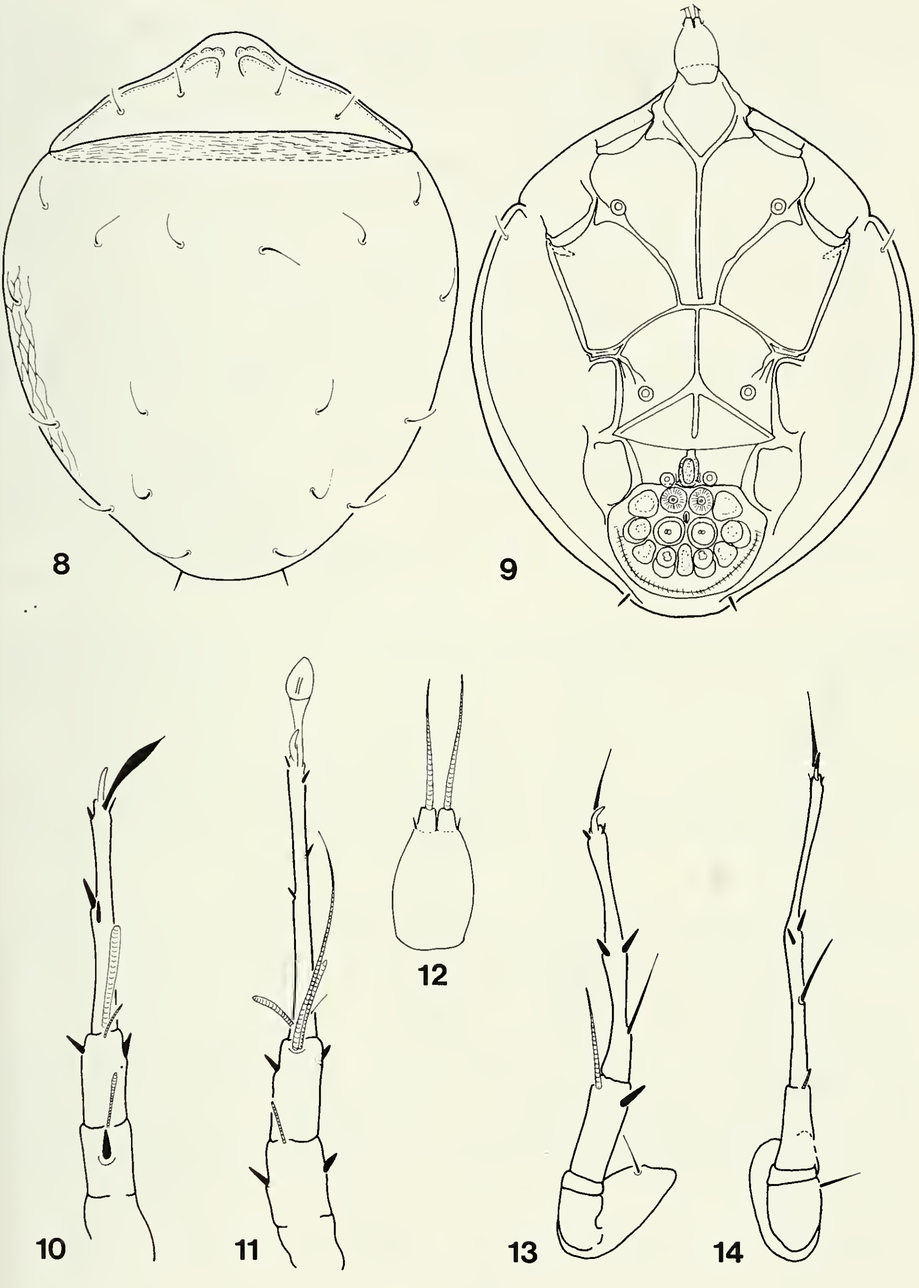

ABB. 8-14.

Histiostoma genavensium sp. nov.; 8: Dorsalansicht; 9: Ventralansicht; 10: Bein II.; 11: Bein I.; 12: Gnathosoma; 13: Bein III.; 14: Bein IV.

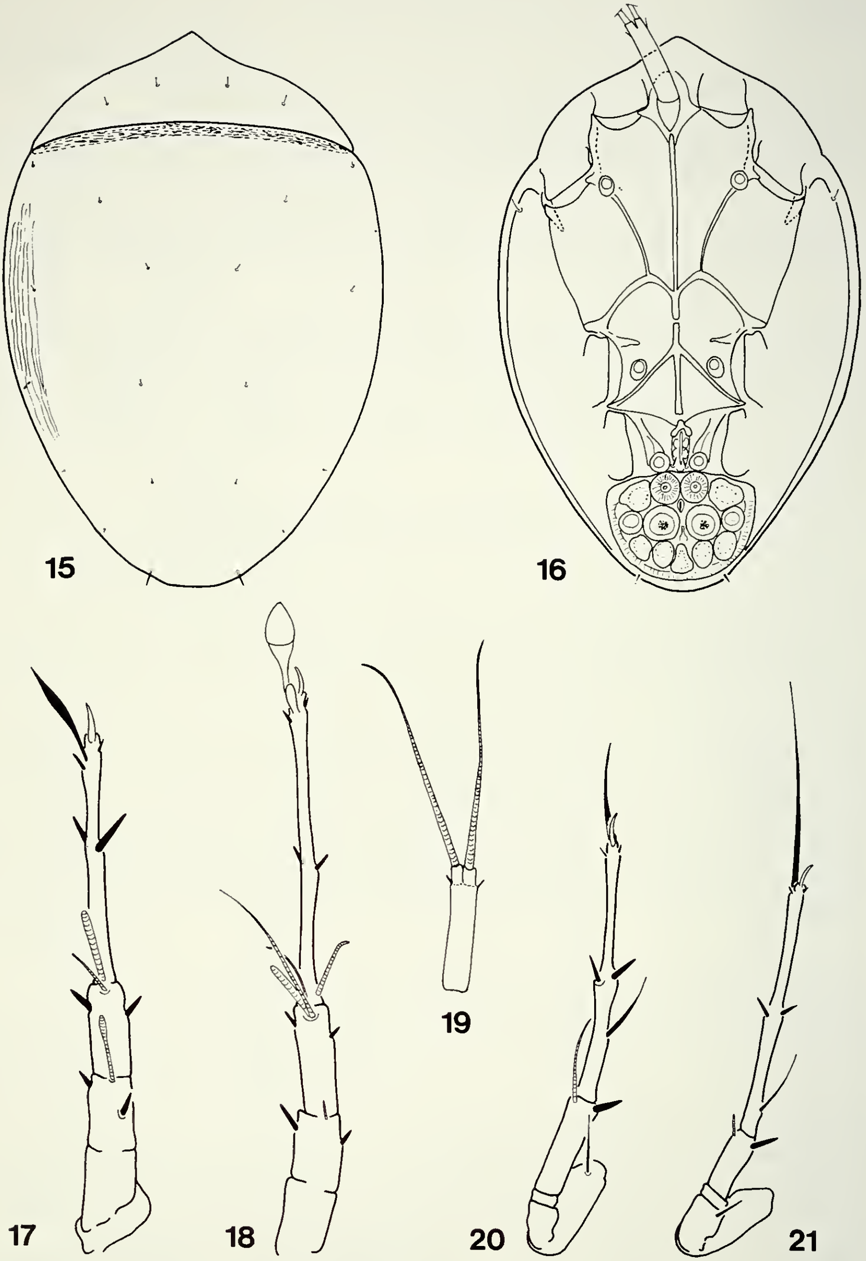

ABB. 15-21.

Histiostoma pseudolongipes sp. nov.; 15: Dorsalansicht; 16: Ventralansicht; 17: Bein II.; 18: Bein I.; 19: Gnathosoma; 20: Bein III.; 21: Bein IV.

Die neue Art steht *Histiostoma longipes* Oudemans, 1911 am nächsten, unterscheidet sich jedoch von dieser Art durch das relativ lange ϵ (viel länger als ω_1 und φ_2), durch die gut sichtbaren Palpen und durch das kürzere φ_1 auf den 1. und 2. Beinen.

TARSONEMINA

SCUTACARIDAE

Imparipes (Imparipes) caledonicus sp. nov.

Dimensionen: Länge: 188-225 µ, Breite: 160-205 µ.

Habitus: Vorne und hinten gleichförmig abgerundet. Clypeus kaum breiter als die übrigen Dorsalsegmente. Oberfläche des Körpers sehr fein punktiert.

Dorsalansicht (Abb. 22): Clypeuskante breit, beide Clypeushaare dünn, c_1 viel kürzer als c_2. Die d_1, e und h_1 Haare steif, gerade, h_2 (90 µ) etwas länger als h_1 (82 µ). Auf dem *H*-Segment entspringen 3 Haarpaare, von denen die ps_3 viel länger sind als die ps_1 und ps_2; ps_1 gebogen.

Trichobothrium (Abb. 25): Sensillus pflaumenkernförmig, das Exobothridialhaar grösser als der Bothridialdorn.

Ventralansicht (Abb. 23): Apodeme gut entwickelt, auch *ap. sec.* sichtbar. Sämtliche Epimeralhaare – mit Ausnahme von *2b* – dünn, gefiedert. Die *4a* Haare stehen sehr weit voneinander entfernt, die Entfernung zwischen ihnen ist fast so gross wie zwischen den *4b* Haaren.

Beine: Kralle des 1. Beines (Abb. 27) ziemlich klein. Chitinzapfen des *tc"* Haares lang, etwa so lang wie das ω_1 Solenidium. Haare *tc"* und *l"* fast gleich lang. Auf dem 2. Bein (Abb. 24) ist das *tc'* Haar dornförmig, aber gefiedert. Tarsus des 4. Beines (Abb. 26) verkürzt, *pl"* Haar mehr als doppelt so lang wie der Tarsus und Praetarsus zusammen.

Untersuchungsmaterial: Holotypus: Nouvelle Caledonie: Koumac, près des grottes, prélèvement de terre sèche, 5.IV.1977. leg. P. Strinati et V. Aellen. 5 Paratypen am selben Fundort gesammelt. Holotypus und 3 Paratypen im Naturhistorischen Museum Genf, 2 Paratypen in der Arachnoiden Sammlung des Naturhistorischen Museums Budapest (Inventarnummer 389-PT-78).

Bemerkung: Die neue Art gehört zur "*aequalis*" Artengruppe. Diese Gruppe ist durch die verkürzten 4. Beine, die sehr verstärkten *pl"* des 4. Tarsus, und die Behaarung des *H*-Segments gekennzeichnet. Von den hierher gehörenden Arten (*Imparipes* (*I.*) *aequalis* Mah., 1963, *I.* (*I.*) *covarrubiasi* Mah., 1968 und *I. zicsii* Mah., 1968) steht die neue Art *I.* (*I.*) *aequalis* am nächsten. Von dieser Art unterscheidet sie sich durch die verdickten h_1 Haare, durch die viel kürzeren *e* Haare und durch das Verhältnis der d_1, *f* und h_1 Haare.

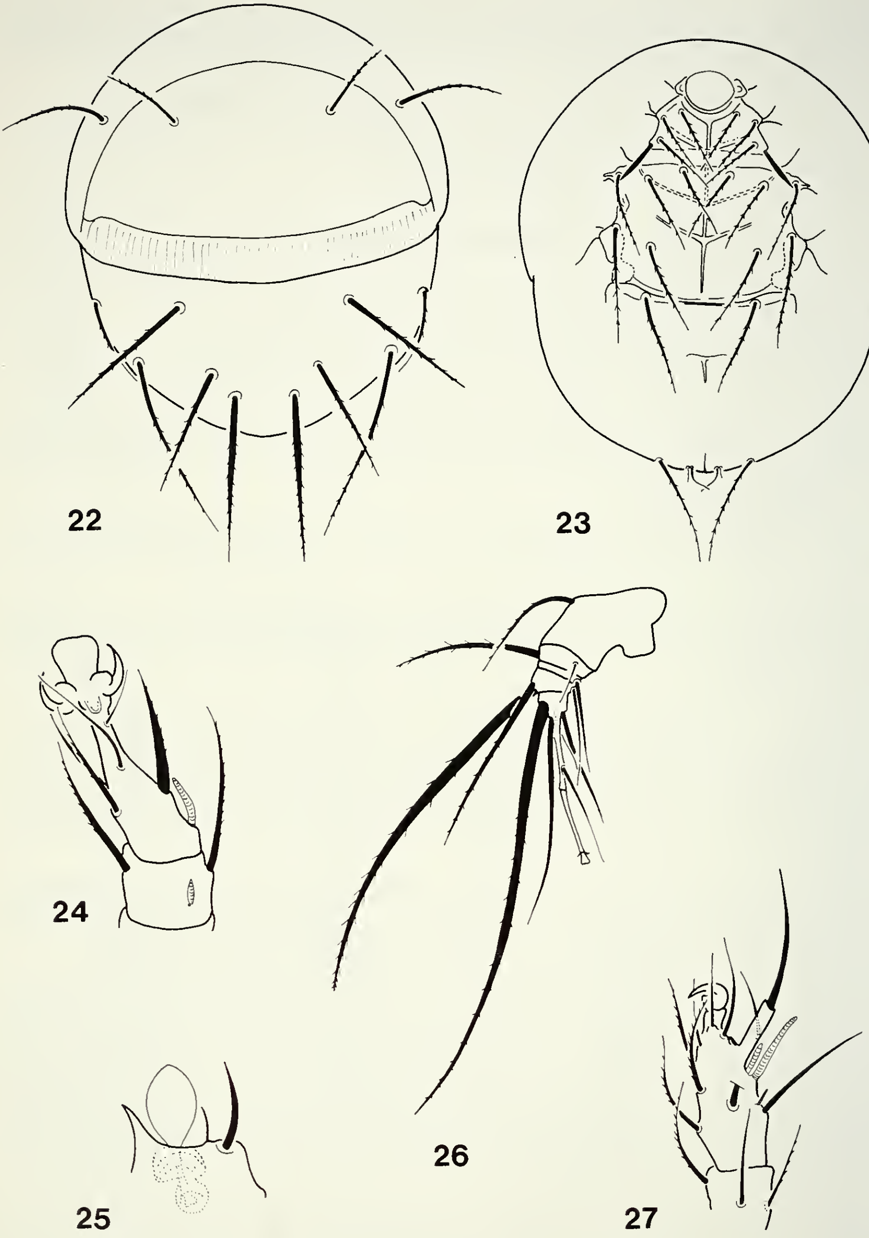

Abb. 22-27.

Imparipes (Imparipes) caledonicus sp. nov.; 22: Dorsalansicht; 23: Ventralansicht; 24: Bein II.; 25: Trichobothrium; 26: Bein IV.; 27: Bein I.

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Revue suisse Zool.	Tome 99	Fasc. 2	p. 405-429	Genève, juin 1992

Revision of the ant genus *Myrmoteras* of the Malay Archipelago (Hymenoptera, Formicidae)

by

Donat AGOSTI[1]

With 42 figures

ABSTRACT

The species of *Myrmoteras* from the Malay Archipelago are reviewed, and a key to the species is provided. Thirteen species are described as new: *Myrmoteras arcoelinae*, *baslerorum*, *brigitteae*, *danieli*, *elfeorum*, *estrudae*, *ivani*, *jacquelineae*, *marianneae*, *maudeae*, *nicoletteae*, *susanneae*, *tonboli*. The distribution of *Myrmoteras* within the Malay Archipelago is discussed.

INTRODUCTION

Ants are among the most familiar animals. They are considered to be a relatively well known insect family, with most of the genera described, and with approximately 12,000 named species of an expected total of 20,000 species (HÖLLDOBLER & WILSON, 1990). Recent collecting in the Malay Archipelago, especially from leaf litter, confirms these figures as a minimal estimate but also points out where a potentially rich source for new species, and thus a higher number of species, can be found.

In the collections of the Natural History Museum, London and the Museum d'Histoire Naturelle, Geneva are, for example, in each of the two taxa *Leptogenys* and Dacetini over 100 undescribed species based on samples from only a few expeditions led by researchers not specialized on ants. This includes only leaf litter ants and not those of the canopy, but from where high numbers of species are also expected (VERHAAG *in* HÖLLDOBLER & WILSON, 1990; WILSON 1987). In a comparative quantitative study in Northern Sulawesi, HAMMOND (1990) pointed out, that in the Coleoptera the leaf litter fauna is richer than the canopy fauna. These facts point out a possible doubling of the number of existing ant species and that the attribute 'rare' for certain ant taxa should not yet be applied, but is better considered to be due to a lack of collections and revisionary studies.

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[1] Zoologisches Institut, Universität Zürich, Winterthurerstr. 190, CH-8057 Zürich, Switzerland.

Myrmoteras is hardly represented in collections and therefore is supposed to be a rare genus. These ants with their long mandibles which can be opened well over 270° and their large eyes are among the most bizarre forms. Moffett's revision of the genus revealed 10 new species totalling 18 species (MOFFETT, 1985). Over half of the newly described species are based upon samples obtained using Winkler-Moszarski apparatus which is often used by coleopterists and only recently by myrmecologists for the study of the leaf litter fauna. In leaf litter samples of moist tropical lowland rain forests, processed by using Winkler-Moszarski apparatus, and not in direct hand collections, *Myrmoteras* is regularly represented but never in large numbers. Consequently, collections since 1985 revealed another 13 new species, now totalling 31 species, and an extension of the range of the genus further East to the Lesser Sundas. Almost all the species are known by their worker caste only.

The aim of this study is to describe the new species of the Malay Archipelago, including the Malay peninsula South of the Kra Isthmus, the Philippines, Indonesia, New Guinea, and the Islands of New Britain and New Ireland, based on the worker caste, to provide a new key to the species, and to present and discuss the distribution of the species.

MATERIAL AND METHODS

All scanning electron micrographs were prepared with a Hitachi S700 with uncoated specimens. The measurements and indices in the text follow HÖLLDOBLER & WILSON (1990).

Alitrunk Length (TL). The diagonal length of the alitrunk in profile from the point at which the pronotum meets the cervical shield to the posterior base of the metapleuron.

Cephalic Index (CI). HW x 100 / HL.

Eye Index (EI). EL x 100 / HW.

Eye Length (EL). The maximum length of the eye.

Head Length (HL). The length of the head proper, excluding the mandibles, measured from the mid-point of the anterior clypeal margin to the mid-point of the occipital margin, including the occipital lobe, in full-face view.

Head Width (HW). The maximum width of the head in full-face view, measured behind the eyes.

Mandibular Index (MI). ML x 100 / HL.

Mandibular Length (ML). The maximum length of the mandible when closed, from the anterior teeth to the lateral basal joint.

Palp Formula (PF). Number of maxillary palp segments followed by number of labial palp segments; e.g PF 6/4.

Scape Index (SI). SL x 100 / HW.

Scape Length (SL). The maximum length of the antennal scape excluding the basal constriction or neck to the condylar bulb.

All measurements are given as minimum, maximum and in brackets the median, the unit is mm; e.g. AL 1.23-1.45 (1.40). The measurements of the species included in MOFFETT (1985) are based on his data.

Material from the following collections has been included in the study.

BMNH	The Natural History Museum, London, U.K.
DAAC	Collection of D. Agosti, Uster, Switzerland.

MBBJ	Museum Zoologicum Bogoriense, Bogor, Indonesia.
MCZC	Museum of Comparative Zoology, Harvard University, Cambridge, U.S.A.
MHNG	Muséum d'Histoire Naturelle, Geneva, Switzerland.
MCSN	Museo Civico di Storia Naturale, Genova, Italy.
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands.

Myrmoteras Forel

Myrmoteras Forel, 1893:607. Type species *Myrmoteras binghami* Forel, by monotypy.

Diagnosis. Worker.
Formicine ant with the following diagnostic characters.

1. Mandibles long (longer than head length), subparallel with a distinctive dentition pattern with the apical teeth the longest (Figs 7-10).
2. The mandibles can be opened up to 270°.
3. Maxillary palps not exceeding half the distance between the buccal opening and the foramen magnum.
4. Clypeus anteriorly bilobed, antero-medially emarginate (Fig. 1).
5. Frontal carinae not present, but toruli prominent (Fig. 1).
6. Large eyes (EI > 55).
7. Long erect hair present antero-ventral of the eyes.
8. Head posteriorly truncated and with a distinctive transverse lobe (Figs 1-2).
9. Pronotum anteriorly with transverse straight sculpture (Fig. 5).
10. Mesonotum tubular and forming a constriction of the alitrunk (Fig. 6).
11. On the dorsum of the meso- and metanotum restricted hair pattern. A group of symmetrically positioned hairs and the anterior part of the mesonotum and 2 to 6 hairs on the metanotal spiracles, rarely 1 to 2 single hairs on the margins between the two groups.
12. Propodeal spiracle round, situated at some distance from the declivous and the basal face (Fig. 42).
13. Anteriormost point of the metanotal petiolar cavity not crossing a line spanned between the anteriormost points of the metanotal coxal cavities.
14. Petiole squamiforme.
15. First gastral segment of *Formica* type (see Agosti, 1991, fig. 4).
16. First gastral tergite much smaller then the second.
17. Hind legs and and antennae with long, scattered, erect pilosity.
18. Mid and hind femora swollen.

Description. The palpal formula is variable, from 6/4 to to 3/3, in most cases 6/4 (44%). The reduction of the terminal segments does not have a very distinct influence on the overall length of the maxillary palps, which generally do not reach beyond the midpoint between the buccal orifice and the foramen magnum.

The frontal sulcus is in most species very distinct and wide, but can be absent, especially in the *Myrmoteras* subgenus.

The coloration is yellowish to dark brown with different brown shades and can be variable in some species.

The diagnostic characters 1, 2, 4, 6 and 8 are very likely autapomorphies of the genus, as they are not present in other formicine genera. These make *Myrmoteras* one of the most easily diagnosable monophyletic formicine genera.

Phylogeny. *Myrmoteras* belongs to the *Formica* genus group, based on the construction of the first gastral sternite which is not part of the helcium (AGOSTI, 1991). The phylogenetic relationships of this genus within the subfamily and within the *Formica* genus group are not resolved, but are currently being studied (AGOSTI, in prep.). Within *Myrmoteras* the two sister groups *Myrmoteras* s. str. and *Myagroteras* can be diagnosed by the following autapomorphies: the labral shape and the presence of trigger hairs, and the frontal sulcus and mandibular bend character respectively (MOFFETT, 1985). Whereas these two clades are in congruence with the results of this study and additional material from Thailand in MHNG, not all the new species can be placed into Moffett's species groups. For this reason and without the re-assessment of the characters Moffett's species groups have been suppressed.

Distribution. *Myrmoteras* is an Indomalayian genus, with some species in Southern India, Sri Lanka, Burma, Thailand, and the islands west of the Wallace Line with the exception of Sulawesi and Lombok (see maps in MOFFETT, 1985). Within the Malay Archipelago, the subgenus *Myrmoteras* is restricted to the West of the Wallace Line and *Myagroteras* to the West of Weber's Line.

The fauna of Sulawesi and Lombok deserve special attention. On Lombok *brigitteae* is the only species which has been collected so far. It has also been collected in Bali. The fine differences between the two populations have been considered as intraspecific, and indicate that there is a link with the islands west of the Wallace Line based on dispersal.

In contrast, Sulawesi has an isolated fauna which, with its 10 species, is as rich as the fauna of Borneo, but does not share any species with any other islands.

The low number of species found in Sumatra and Java is surprising. Both in Sulawesi and Borneo, wherever the genus *Myrmoteras* is present, there are almost always several species to be found. They are not necessarily in exactly the same habitat but rather present at different altitudes. Our collections in Java and Sumatra included the same collecting techniques and sampling strategy as in Sulawesi or in Borneo. It is thus probably an indication that *Myrmoteras* might have the highest number of species in Borneo and Sulawesi.

Thailand and W-Malaysia are certainly underrated, with regard to the 13 species here described, an increase of over 70% based on a few collecting sites and limited time. Mainland Asia has to be studied before generalizations can be made.

However, Sulawesi and Lombok might very likely define the Eastern limits of the distribution, as specific collections from Seram, Flores, Timor and the Vogelkop did not reveal any *Myrmoteras* species (W.L. Brown, Jr, pers. com.; Agosti, unpubl.). The apparent high degree of endemism, if not contradicted by further collections, would make this genus an ideal object for biogeographic studies.

Biology. The biology of *Myrmoteras* ants is virtually unknown. They are elements of the leaf litter fauna in moist tropical forest, from lowland up to montane forests with the highest recorded altitude of a species at 2200 m in Assam. The uniform morphology, especially the head with the two long mandibles, indicate that all the species are predatory on soft bodied insects, which was observed in colonies kept in captivity (Moffett, 1985). Most *Myrmoteras* specimens have been collected from leaf litter samples from beneath rotting logs. In one case a *Myrmoteras* sp. has been observed on a shrub in the understory. Nests have been found in hollow dead twigs in the litter (Moffett, 1985).

SYNOPSIS OF THE SPECIES OF *Myrmoteras*

Myrmoteras subgenus
    barbouri Creighton, 1930. Java, Peninsular Malaysia, Sabah, Sarawak.
        = *kemneri* Wheeler, 1933.

baslerorum new species. Sumatra.
binghami Forel, 1893. Burma, Thailand.
brachygnathum Moffett, 1985. India.
ceylonicum Gregg, 1956. Sri Lanka.
iriodum Moffett, 1985. Kalimantan, Sarawak, W-Malaysia.
mjoebergi Wheeler (in Creighton, 1930). Borneo (Sarawak?).
scabrum Moffett, 1985. India.

Myagroteras subgenus
arcoelinae new species. Sabah
bakeri Wheeler, 1919. Sabah, W-Malaysia.
brigitteae new species. Bali, Lombok
chondrogastrum Moffett, 1985. Sarawak.
danieli new species. Sabah.
diastematum Moffett, 1985. Sabah, Sarawak.
donisthorpei Wheeler, 1916. Kalimantan, Sabah, Sarawak.
elfeorum new species. Sulawesi.
estrudae new species. Sumatra.
indicum Moffett, 1985. India.
insulcatum Moffett, 1985. Luzon.
ivani new species. Sulawesi.
jacquelineae new species. Sulawesi.
karnyi Gregg, 1954. Mentawai Archipelago.
marianneae new species. Sulawesi.
maudeae new species. Sulawesi
morowali Moffett, 1985. Sulawesi.
nicoletteae new species. Sulawesi.
susanneae new species. Sulawesi.
tonboli new species. Sabah.
toro Moffett, 1985. Sulawesi.
williamsi Wheeler, 1985. Phillipines.
wolasi Moffett, 1985. Sulawesi.

KEY TO WORKERS OF *Myrmoteras* OF THE MALAY ARCHIPELAGO

M. karnyi is not keyed out, as the holotype has not been found in the Zoological Museum in Bogor.

The abbreviation 'Mo' refers to the figures in MOFFETT 1985, i.e. 'Mo.25' refers to his figure 25.

1. Trigger hairs present, at least one fourth as long as mandible (Fig. 3); the labrum coneshaped, in full frontal view, the insertions of the trigger hairs visible between the bases of the mandibles (Mo5); the apical part of the mandible (last apical tooth) bent ventrally (Fig. 3) .... 2 (*Myrmoteras*)
– Trigger hairs not present; labrum flat (Mo4); teeth of mandible in the same plain, the apical tooth not bent ventrally (Fig. 4) .... 5 (*Myagroteras*)
2 4 maxillary palps; mesonotum smooth, with only two lateral rugae (Mo18) *mjoebergi*

– 5 or 6 maxillary palp segments; mesonotum laterally with reticulate sculpture (Mo15-17) which includes at least some dorso ventral rugae (Fig. 41) 3
3 Dorsal surface of head and pronotum smooth and shining with an iridescent shine; body chestnut, coxae and basal parts of femora brighter .... *baslerorum*
– Dorsal surface of head and pronotum smooth or granulate, and matt; body reddish to yellowish brown; coxae and femora of the same color as alitrunk 4
4 6 maxiliary palp segments; dorsal surface of head and alitrunk granular; mesonotum strongly constricted (Mo15) .... *barbouri*
– 5 maxillary palp segements; dorsal surface of head and alitrunk smooth and matt; mesonotum as in Mo17. .... *iriodum*
5 Frontal sulcus lacking (Mo33)... *insulcatum*
– Frontal sulcus present (Fig. 1) 6
6 Occiput of head smooth and shining, at least at the margin of the occiput a distinct change in the sculpture, from distinct sculpture very weak, which is almost impercepatable (in donisthorpei sometimes the dorso median part with some granular sculpture, but never the lateral parts of the declivitous face) (Fig. 1); sculpture on the dorsum and lateral parts of alitrunk varying from absent to elaborate; in lateral view the dorsal outline of the propodeum anteriorly not angulate (Fig. 12) 11
– Posterior face of occiput and pronotum sculptured; in lateral view, alitrunk always with distinct sculpture; the dorsal outline of the propodeum anteriorly with a distinct step (Fig. 6) 7
7 Head in full frontal view longitudinally sculptured, sometimes mixed sculpture but the longitudinal rugae visible in dorso lateral view (Fig. 7); yellowish brown. 10
– Head in full frontal view finely granulate sculptured (Fig. 1) 8
8 Dorsum of pronotum granulate; dorsum of propodeum in lateral view convex and smooth with at most some granular sculpture (Mo44) .... *williamsi*
– Dorsum of pronotum longitudinally sculptured (Fig. 5); dorsum of alitrunk in lateral view flat with longitudinal sculpture (Fig. 6) 9
9 Frontal triangle smooth and shining (Mo38); dorsum of pronotum with broad longitudinal rugae; alitrunk with granular sculpture and longitudinal rugae (Mo42); yellow .... *morowali*
– Frontal triangle granulate (Fig. 1); dorsum of pronotum with reticulate to longitudinal sculpture (Fig. 5); dark redish brown; .... *jacquelineae*
10 Posterior face of occiput longitudinally sculptured (Mo39); head in full frontal view with distinct longitudinal sculpture (Mo39); dorsum of pronotum with reticulate sculpture .... *toro*
– Posterior face of occiput coarsely sculptured (Fig. 7); head in frontal view with longitudinal sculpture which is obscured by granular sculpture (Fig. 7); dorsum of pronotum with a semicircular longitudinal sculpture (Fig. 11) .... *elfeorum*
11 Head in full frontal view with frons shining and smooth 12
– Head in full frontal view with frons sculptured 16
12 Dark chestnut brown, coxae and femora bicoloured; TL > 1.50 mm; propodeum smooth and shining, only sometimes with a few low soft transversal rugae on the dorsum of the propodeum (Figs 14, 16, Mo29) 13
– Yellowish, coxae and femorae all one colour; TL 1.50 < mm; propodeum distinctly sculptured (Figs 18, Mo28) 15
13 Head in full frontal view between the antennal insertions smooth and shining (Mo26); erect hairs up to 0.25 mm .... *diastematum*
– Head in full frontal view with longitudinal sculpture between the antennal insertions (Figs 8, 9); hairs on alitrunk shorter than 0.20 mm. 14

14 Dorsum of pronotum smooth and shining (Fig. 13) .... *tonboli*

– Dorsum of pronotum sculptured as in Fig. 15 .... *arcoelinae*

15 Genae (part ventral of eyes) sculptured, dorsum of mesonotum and propodeum smooth .... *ivani*

– Genae not sculptured or at most few short dorsoventral rugae adjacent to the eye; dorsum of mesonotum coriaceous, dorsum of propodeum with transversal sculpture (Mo28) .... *bakeri*

16 Dorsum of pronotum smooth and shining (Figs 23, 25) 17

– Dorsum of pronotum sculptured (Figs 27, 29) 18

17 Genae (part ventral of the eye) with longitudinal sculpture; dorsaly of the propodeal spiracles transversally sculptured (Fig. 24) .... *marianneae*

– Genae at most with some dorsoventral short sculpture adjacent to the eye; dorsum of propodeum without transversal sculpture (Fig. 26) .... *estrudae*

18 Gastral tergites coriaceous .... *chondrogastrum*

– Gastral tergites smooth and shining (sometimes obscured by an oily layer) 19

19 Head in frontal view granulate, giving the impression of a longitudinal sculpture, but the lines are built up by individual small granules (Mo32). Dorsum of pronotum and mesonotum granulate (Mo35); dorsum of propodeum smooth and shining or slightly granulate (Mo35) .... *donisthorpei*

– Head in frontal view with longitudinal sculpture, the rugae are long and not interrupted (Figs 21, 22) 20

20 Whole body yellow to orange red 21

– Whole body dark brown to chestnut 23

21 Head in full frontal view distinctly, longitudinally sculptured (Figs 22, 31) 22

– Head in full frontal view very finely, longitudinally sculptured. This is very shiny and is best seen in dorsolateral view (Fig. 21); gula smooth and shining; dorsum of pronotum as in Fig. 27 .... *brigitteae*

22 On gula few longitudinal rugae; clypeus longitudinally sculptured (Fig. 22); dorsum of pronotum shining and with three circular sculptural elements (Fig. 29); ventral part of the declivity of the propodeum without sculpture .... *nicoletteae*

– On gula no longitudinal rugae; clypeus with granular sculpture (Mo41); declivitous face of propodeum without sculpture .... *wolasi*

23 Dorsum of pronotum anteriorly with convergent longitudinal sculpture (Fig. 35) .... *danieli*

– Dorsum of pronotum anteriorly without longitudinal sculpture but with a spacious undulating surface (Figs 37, 39) 24

24 Dorsum of pronotum with erect hairs which are shorter than a third of the maximum diameter of the front femora (Fig. 37); ventral part of the lateral parts of the mesonotum with a metallic blue shine .... *maudeae*

– Dorsum of pronotum with erect hairs which are of the same length as the maximum diameter of the front femora (Fig. 39); ventral part of the lateral parts of the mesonotum dark brown .... *susanneae*

DESCRIPTION OF THE SPECIES

The descriptions of the species are based on types, specimens identified by Moffett deposited in BMNH and MHNG, and new, recently collected material. In cases where no type material could be examined, the descriptions follow those of Moffett 1985 and the SEMs he provided, which show the characters used in this study.

The range of variation is only known for a few species where sufficient specimens are available. As far as it can be concluded at this moment, the variation is low. Therefore, in the following descriptions only the standard measurements of the holotypes as approximate figures are given.

SUBGENUS **Myrmoteras** Forel

Myrmoteras Forel, 1893: 607. Type species *Myrmoteras binghami* Forel, by monotypy.

Diagnosis. *Myrmoteras* ant with the following diagnostic characters.

1 Labrum coneshaped (Mo5), in full frontal view only the basal part with the most raised point with the insertions of the trigger hairs visible.
2 Trigger hairs present (Fig. 3, Mo5).
3 Mandibles with the apical part bent ventral (Fig. 3).
4 Frontal sulcus absent or at most feably developed (Fig. 34).
5 Body with an iridescent shine.

Characters 1 and 2 are autopomorphies of this subgenus (Moffett,, 1985)

barbouri Creighton

Myrmoteras barbouri Creighton, 1930: 185, fig. 2, pl. 11 fig. 6, Holotype 1 worker, JAVA, Singdanglalia [=Sindanglaja?], T. Barbour, MCZC. [See also MOFFETT, 1985: figs 2, 11, 15.]

Diagnosis: Holotype TL 1.86, HL 1.25, HW 1.28, CI 102, SL 1.56, SI 122, EL 0.76, EI 59, ML 1.58, MI 126, PF 5/3.

This species is the only species of this subgenus with granulate sculpture on the dorsum of the head, seen in full frontal view.

baslerorum new species
(Figs 3, 34, 41, 42)

HOLOTYPE WORKER. TL 1.88, HL 1.14, HW 1.12, CI 98, SL 1.28, SI 114, EL 0.70, EI 63, ML 17.6, MI 153, PF 5/3. Head in full frontal view and occiput and dorsum of alitrunk smooth and shining. Around the antennal insertions few longish engravings. Dorsum of mesonotum and propodeum transversally sculptured. Metanotal tubercle rugae reduced and lower then the dorsoventral rugae; few short longitudinal rugae on the posterior dorsal part of the lateral parts of the mesonotum. Ventrolateral part of mesonotum and lateral parts of metanotum and propodeum smooth and shining. Gaster with silky and finely iridescent shine.

The palp formula (PF 5/3), the shining body, and the bicoloured body with the head, alitrunk and gaster chestnut and the legs yellowish, are unique within this subgenus.

Material examined: Holotype worker, Indonesia, Sumatra, Jambi, W Mt. Tujuh Lake, 1400 m, 14.xi.1989 (D. Agosti. D.H. Burckhardt & I. Löbl), sifting of vegetational debris, montane *Lithocarpus-Castonopsis* forest; MBBJ on long term loan in MHNG.

Paratypes: 4 workers, same series as holotype; 1 worker, Indonesia, Sumatra, Jambi, G. Kerinci, 1750-1850 m, 11.-12.xi.1989 (D. Agosti, D.H. Burckhardt & I. Löbl), sifting of vegetational debris, montane *Lithocarpus-Castanopsis* forest; 1 worker, Indonesia, Sumatra, Jambi, km 15 from Sungaipenuh to Tapan, 1450 m, 9.xi.1989 (D. Agosti, D.H. Burckhardt & I. Löbl), sifting of vegetational debris, degraded montane *Lithocarpus-Castanopsis* forest. BMNH, DAAC, MBBJ, MCZC, MHNG.

iriodum Moffett

Myrmoteras iriodum Moffett, 1985: 24, figs 13, 17. Holotype 1 worker, Indonesia, Kalimantan, 17-46 km W Batulitjin, 28.vi.-2.vii.1972, W.L. Brown, lowland rainforest, hollow stick in litter, #B18, MCZC. Partypes 6 workers and 1 dealate female, same locality, MCZC, BMNH [examined].

Diagnosis. Holotype and five paratypes TL 1.80-1.82, HL 1.17-1.22, HW 1.14-1.20, CI 97-99, SL 1.36-1.40, SI 115-120, EL 0.72-0.76, ML 1.68-1.74, MI 142-145, PF 5/3.

Whole body yellowish brown, dull with some iridescent shine. Lateral part of mesonotum with spacious reticulate sculpture.

mjoebergi Wheeler

Myrmoteras mjoebergie Wheeler, in Creighton 1930: 188, fig. 2, pl. 11, fig. 1. Syntypes 3 workers, E-MALAYSIA, Sarawak, Mt. Tobangs, top, 1700 m [= Bukit Tobang ?], E. Mjoeberg, MCZC.

Diagnosis. Three syntypes TL 1.60-1.70, HL 1.12-1.18, HW 1.02-1.08, CI 91-92, SL 1.21-1.27, SI 116-119, EL 0.66-0.71, ML 1.26-1.31, MI 111-112, PF 4/3.

This species is separated from all other malaysian species of the subgenus *Myrmoteras* by the palp formula 4/3.

SUBGENUS **Myagroteras** Moffett

Myagroteras Moffett, 1985:31. Type species *Myrmoteras donisthorpei* Wheeler, by original designation.

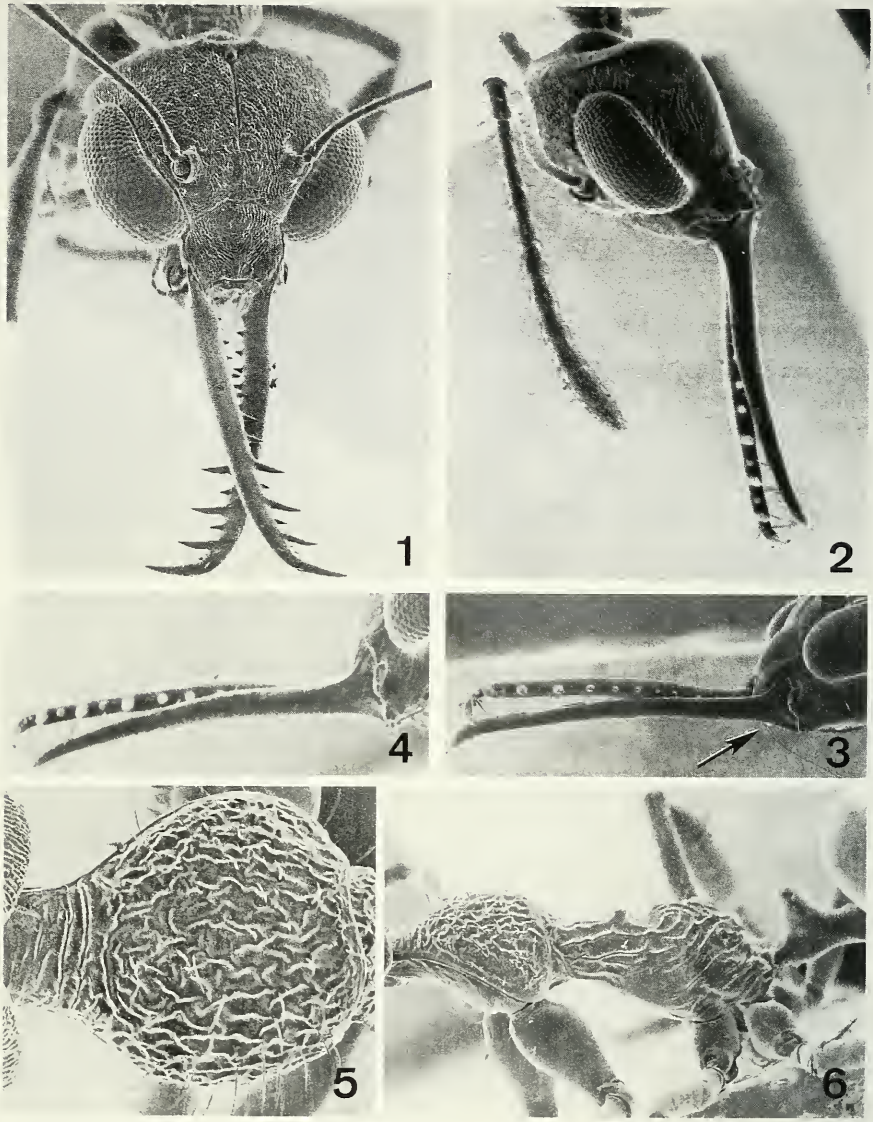
Diagnosis. *Myrmoteras* ant with the following diagnostic characters.

1 Labrum flat (Mo4), not coneshaped, ie. with the median part distinctly raised.
2 Mandibles with the dentition in the same plane (Fig. 4).
3 Frontal sulcus distinct (Fig. 1), with the exception of *insulcatus* where it is not present, but then PF = 3/3.

Characters 2 and 3 are autapomorphies of this subgenus (Moffett, 1985).

arcoelinae new species
(Figs 9, 15, 16)

HOLOTYPE WORKER. TL 1.66, HL 1.00, HW 1.04, CI 104, SL 1.16, SI 112, EL 0.61, EI 59, ML 1.64, MI 164, PF 5/3. In full frontal view, head and occiput smooth and shining, with the exception of three to four rugae originating posterio-medially of the torulus. Alitrunk shining, dorsum of pronotum and propodeum with a smooth and spacious curvilinear



Figs 1-6.

Head in full frontal (Fig. 1) and in lateral view (Fig. 2) of *Myrmoteras jacquelineae*. CL = Clypeus; EY = Eye; FS = Frontal sulcus; FT = Frontal triangle; G = genae; L) occipital lobe; M = mandible; OS = occular sulcus; T = torulus. Figs 3-4. Lateral view of the head of *Myrmoteras* species. Trigger hairs indicated by an arrow. 3. *Myrmoteras baslerorum* with trigger hairs, and the apical part of the mandible bent ventrally. 4. *Myrmoteras jacquelineae* without trigger hairs and the apical part of the mandible in line with the remaining parts of the mandible. Fig. 5. Dorsal view of pronotum of *Myrmoteras jacquelineae*. Fig. 6. Alitrunk in lateral view of *Myrmoteras jacquelineae*.

sculpture; pronotum, anteriorly and posteriorly transversally, and in between convergent rugose.

The sculpture is rather variable in this species, i.e. the sculpture can be reduced but the basic pattern is still visible; on the anterior part of the head, the sculpture can be extended beyond the antennal insertions. The sculpture is not variable on the occiput, the occipital lobe, and on the propodeum.

M. arcoelinae might include two species, as from the same localities two different distinct forms are recognizable. One with smooth lateral parts of the pronotal dorsum, the second with the whole pronotal dorsum spacious and flat rugously sculptured. The colour is variable from dark brown to chestnut. See also below *tonboli*.

Material examined: Holotype worker, E-Malaysia, Sabah, G. Kinabalu, Liwagu Trail, 1560-1660 m, 27.iv.1987 (D.H. Burckhardt & I. Löbl), #5b, leaf litter; MHNG.

Paratypes: 1 worker same locality as holotype; 2 workers, E-Malaysia, Sabah, G. Kinabalu, 1750 m, 24.iv.1987 (D.H. Burckhardt & I. Löbl); #2a, leaf litter; 3 workers E-Malaysia, Sabah, G. Kinabalu, Liwagu Trail, 22.v.1987 (D.H. Burckhardt & I. Löbl); #3b, leaflitter; BMNH, DAAC, MCZC, MHNG.

Additional material examined: 2 workers, E-Malaysia, Crocker Range, km 51-52 from Kota Kinabalu to Tambunan, 1600 m, 18.v.1987 (D.H. Burckhardt & I. Löbl), sifting of vegetational debris in a wet gully and in a gap, humide forest of *Lithocarpus-Castanopsis* with tree ferns.

bakeri Wheeler

Myrmoteras bakeri Wheeler, 1919: 145. Syntypes 1 queen and 3 males, E-Malaysia, Sabah, Sandakan, Baker, MCZC [not examined]. [See MOFFETT, 1985: figs 25, 28.]

Diagnosis (two workers). TL 1.23-1.25, HL 0.88, HW 0.86-0.89, CI 98-102, SL 0.94-0.92, SI 107-109, EL 0.56-0.58, ML 1.33-1.34, MI 152-153, PF 5/3.

Yellowish brown species, head in full frontal view, occiput and dorsum of alitrunk smooth and shining. Frontal sulcus distinct, one carina parallel to the inner margin of the eyes up to the occipital corners.

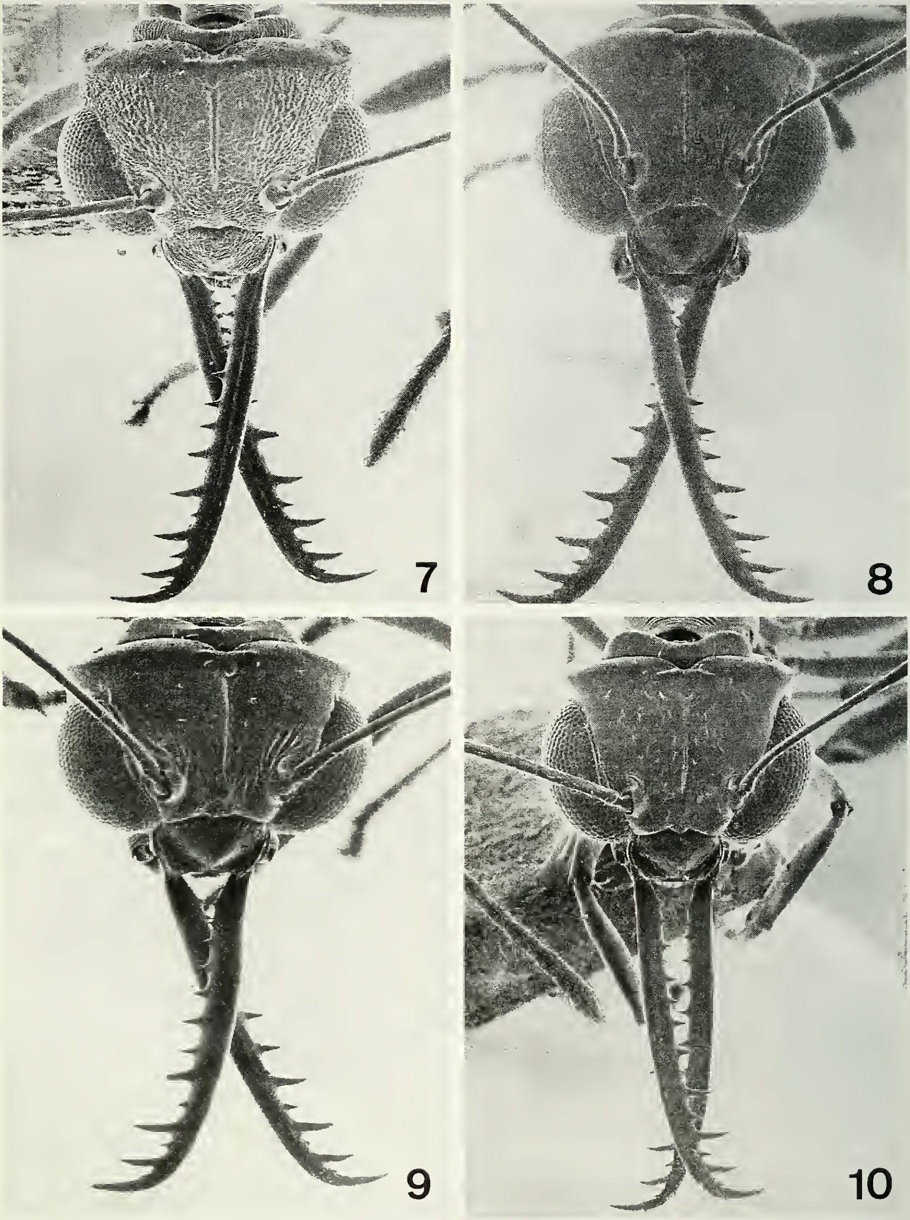
M. bakeri differs from *ivani* by the sculpture or the dorsal parts of pronotum and the mesonotum.

Material examined: 3 workers, E-Malaysia, Sabah, Poring Hot Springs, 500 m, 6.v.1987 (D.H. Burckhardt and I. Löbl), Dipoterocarpaceae forest, sifting of rotting logs with mushrooms in a gap of the forest and dead leaves at the base of trees within the forest: 12 workers, 2 deleate queens, E-Malaysia, Sabah, Poring Hot Springs, 550-600 m, 9.v.1987 (D.H. Burckhardt and I. Löbl). Dipterocarpaceae forest, sifting of dead leaves and rotten log; E-Malaysia, Sabah, Poring Hot Springs, 500 m, 11.v.1987 (D.H. Burckhardt and I. Löbl), Dipterocarpaceae forest, sifting at the base of old trees and on mushrooms near a stream; E-Malaysia, Sabah, Poring Hot Springs, 500 m (D.H. Burckhardt and I. Löbl), sifting of dry leaf litter at the base of old trees; E-Malaysia, Sabah, Kibongol Valley, 20.v.1987 (D.H. Burckhardt and I. Löbl), sifting under bomboo. BMNH, DAAC, MHNG.

brigitteae new species

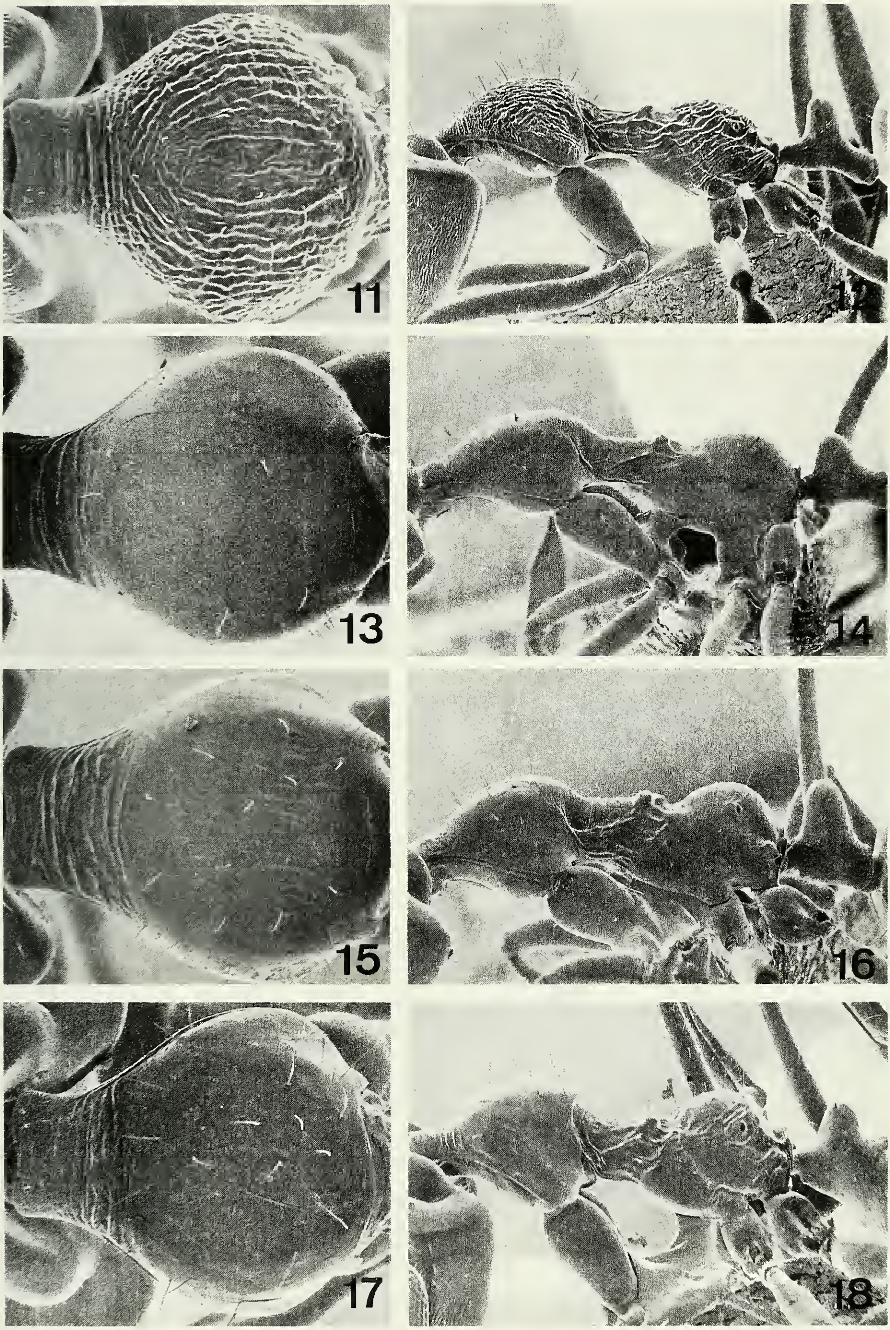
(Figs 21, 27, 28)

HOLOTYPE WORKER. TL 1.58, HL 0.96, HW 1.02, CI 106, SL 1.08, SI 106, EL 0.62, EI 61, ML 1.46, MI 152, PF 5/3. Head in full frontal view smoothly, longitudinally sculptured, velvet shine, declivitous face of occiput shining and smooth. Frontal sulcus and sulcus



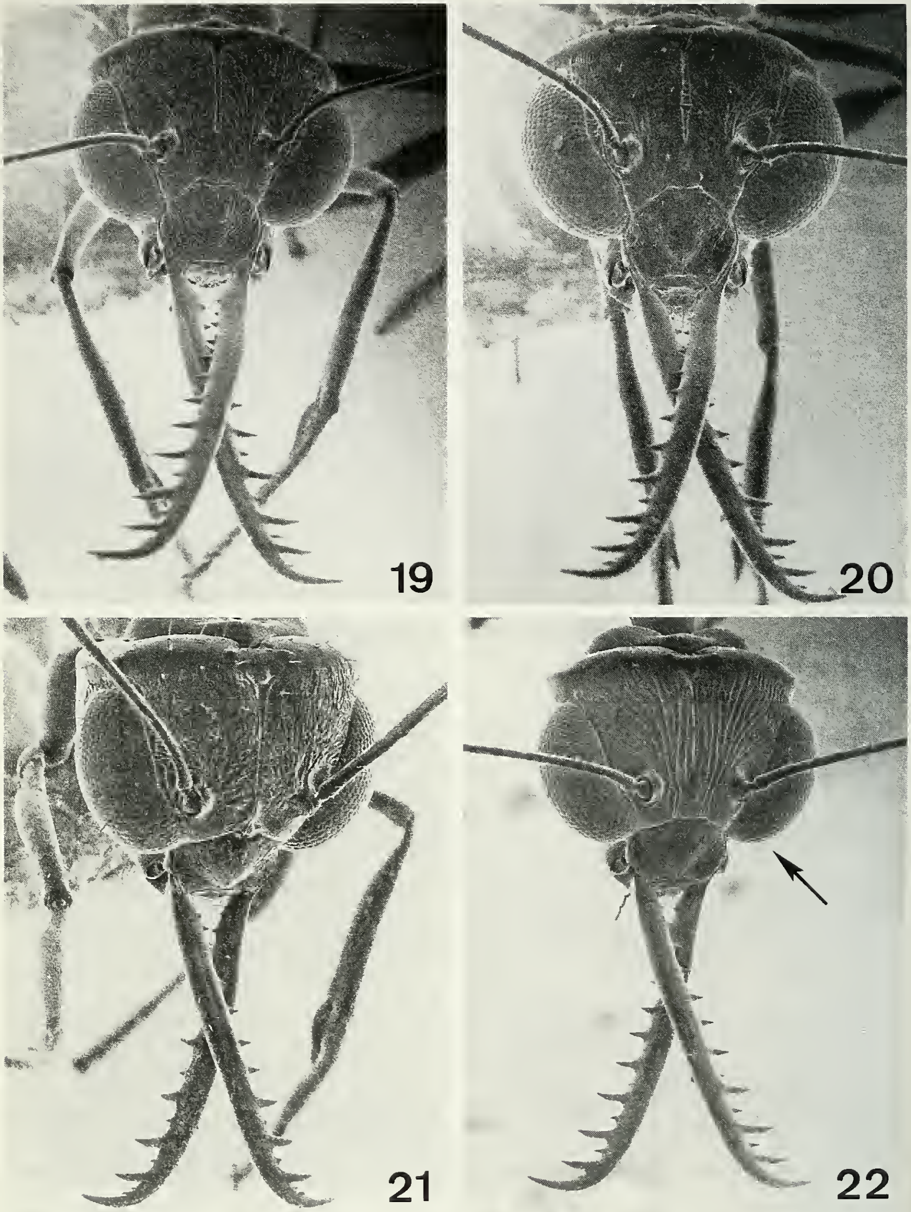
Figs 7-10.

Head in full frontal view. 7. *M. elfeorum*; 8. *M. tonboli*; 9. *M. arcoelinae*; 10. *M. ivani*.



FIGS 11-18.

Dorsal view of pronotum (left) and lateral view of alitrunk (right). 11-12. *M. elfeorum*; 13-14. *M. tonboli*; 15-16. *M. arcoelinae*; 17-18. *M. ivani*.

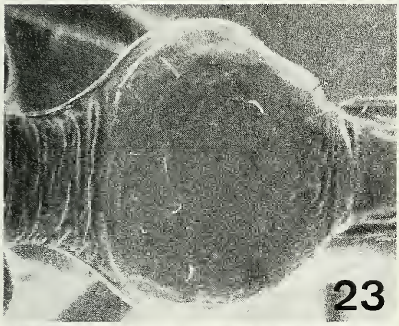


Figs 19-22.

Head in full frontal view. 19. *M. marianneae*; 20. *M. estrudae*; 21. *M. brigitteae*; 22. *M. nicoletteae*, arrow indicating the long. erect hair below the eye.

Figs 23-30.

Dorsal view of pronotum (left) and lateral view of alitrunk. 23-24. M. *marianneae*; 25-26. *M. estrudae*; 27-28. *M. brigitteae*; 29-30. *M. nicoletteae*.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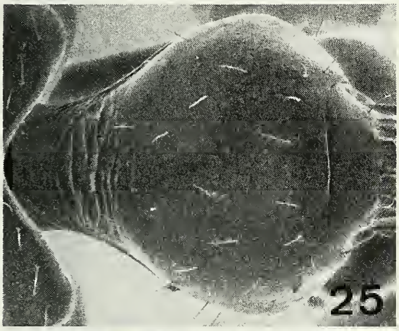
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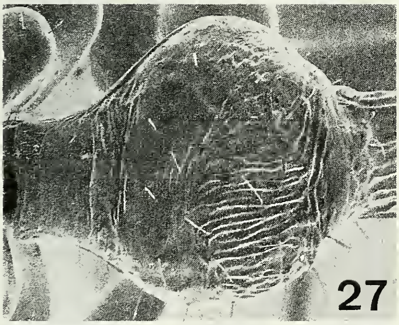
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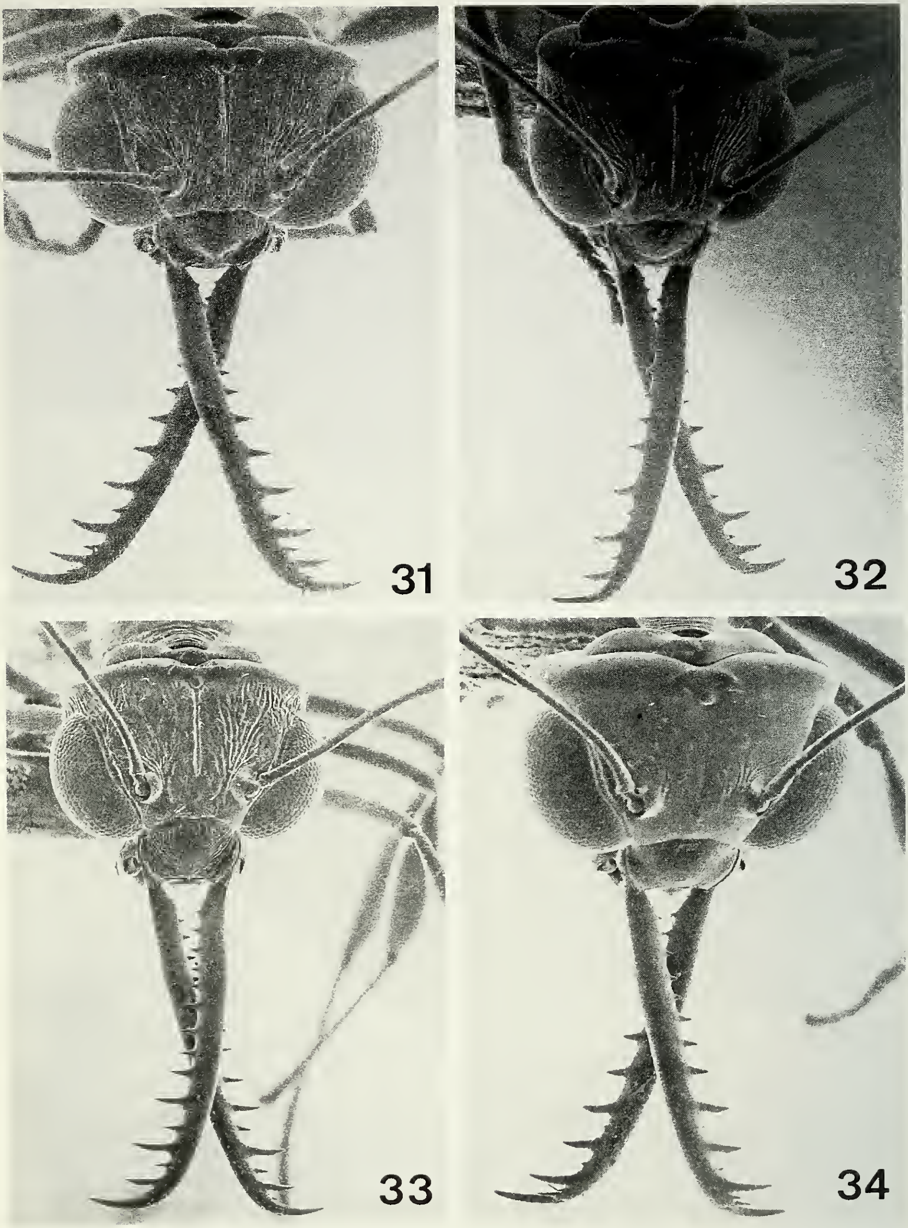
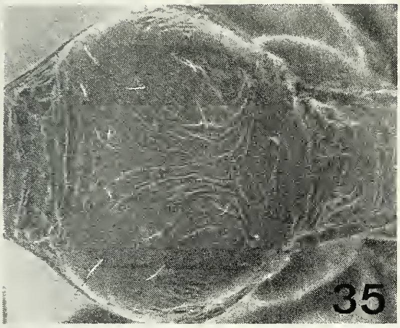


Figs 31-34.

Head in full frontal view. 31. *M. danieli*; 32. *M. maudeae*; 33. *M. susanneae*; 34. *M. baslerorum*.

Figs 35-42.

Dorsal view of pronotum (left) and lateral view of alitrunk. 35-36. *M. danieli*; 37-38. *M. maudeae*; 39-40. *M. susanneae*; 41-42. *M. baslerorum*.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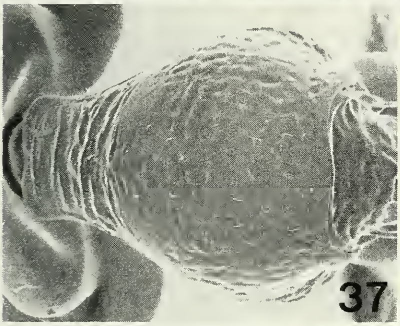
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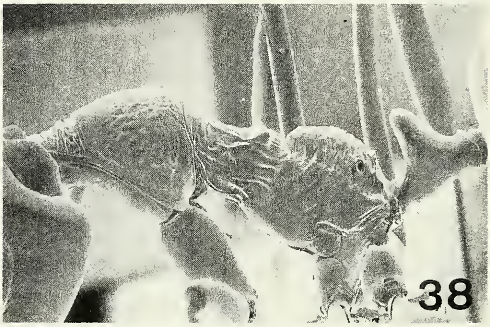
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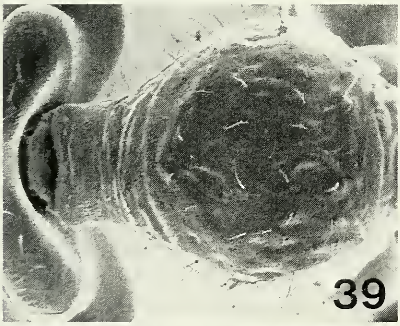
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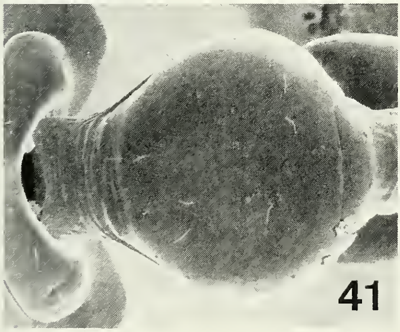
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anterior the clypeus and along the inner margin of the eye distinct and broad. Dorsum of pronotum anteriorly and posteriorly with transversal sculpture, median part with convergent sculpture; mesonotal sculpture with few large longitudinal rugae, dorsum of propodeum transversally rugose. Body, including the appendages uniform yellowish brown.

The specimens from Bali are all smaller and paler as the conspecific from Lombok.

Material examined: Holotype worker, Indonesia, Lombok, Batu Koq, 500 m, 12.iii.1991 (D. Agosti), leaf litter; MBBJ, on long term loan in MHNG.

Paratypes: 3 workers, same locality as holotype, BMNH, MCZC, MHNG.

Additional material examined: 1 female, Indonesia, Lombok, Pusuk, Monkey forest, 550 m, 11.iii.1991 (D. Agosti), leaf litter, secondary forest; 5 workers, Indonesia, Bali, Yehbua (E of Mendaya), 250 m, 25.iv.1991 (D. Agosti), leaf litter, secondary forest; DAAC, MBBJ, MHNG, MCZC.

chondrogastrum Moffett

Myrmoteras chondrogastrum Moffett, 1985: 38, figs 31, 34. Holotype worker, E-Malaysia, Sarawak, 4th Division, Gunung Mulu National Park, v.-viii.1978 (P.M. Hammond and J.E. Marshall) #49; BMNH [examined].

Diagnosis. TL 1.72, HL 1.10, HW 1.02, CI 93, SL 1.22, SI 120, EL 0.70, EI 69, ML unknown, tips broken, PF 5/4.

The granulate sculpture of the gaster is unique within *Myrmoteras*; slightly bicoloured with the alitrunk yellowish brown and the gaster and head darker.

danieli new species
(Figs 31, 35, 36)

HOLOTYPE WORKER. TL 1.70, HL 1.04, HW 1.08, CI 104, SL 1.18, SI 109, EL 0.68, EI 63, ML 1.70, MI 163, PF 5/3. The longitudinal sculpture of the head in full frontal view, fading towards the occiput; frons with three to four distinct rugae on each side, originating medially to the torulus; frontal triangle indicated, frontal sulcus distinct, occiput shining and smooth; dorsum of pronotum and mesonotum sculptured (see Fig. 35); on mesonotum metapleural tubercle ruga not present, but ventrally two distinct longitudinal rugae present; ventral part of the mesopleurae and propodeum with continuous longitudinal rugose sculpture, which is on the dorsum of the propodeum transversal. Frontal coxae with dorsal half brown and ventral half yellowish white.

Material examined: Holotype worker, WEST MALAYSIA, Sabah, Mt. Kinabalu, Liwagu Trail, 1500 m, 21.v.1987, (D.H. Burckhardt & I. Löbl), *Lithocarpus Podocarpus*-forest, sifting of vegetational debris on a partially deforested slope; MHNG.

Paratypes: 1 dealate queen, 1 male,17 workers, same series as holotype; 7 workers, E-Malaysia, Sabah, M. Kinabalu, between Ranau and Kota Kinabalu, 1150 m, 24.v.1987 (D.H. Burckhardt and I. Löbl) sifting of rotting wood with mushrooms and vegetational debris near a plantation and of forested gully; 2 dealate queens, 11 workers, E-Malaysia, Sabah, Mt. Kinabalu, 1540 m, 29.iv.1987 (D.H. Burckhardt andI. Löbl), sifting of vegetational debris in a small gully and the bases of old trees. 1 worker, E-Malaysia, Mt. Kinabalu, 1750 m, 21.iv.1987 (D.H. Burckhardt and I. Löbl), sifting of bark, rotten wood and vegetational debris at the base of a log and tree stumps; BMNH, DAAC, MCZC, MHNG.

Additional material examined: 8 workers, E-Malaysia, Sabah, Crocker Range National Park, Kota Kinabalu – Tambunan km 60, 1270 m (D.H. Burckhardt and I. Löbl), secondary forest with big *Agathis*, sifting of vegetational debris at the base of old trees and along a large log in a gap close to a burnt field; 1 worker, E-Malaysia, Sabah, Crocker Range National Park, Kota Kinabalu - Tambunan km 63, 19.v.1987 (D.H. Burckhardt and I. Löbl), secondary *Lithocarpus-Castanopsis* forest, sifting of vegetational debris in a humid gully; BMNH, DAAC, MHNG.

diastematum Moffett

Myrmoteras diastematum Moffett, 1985: 36, figs 26, 29. Holotype worker, E-Malaysia, Sarawak, 4th Division, Gunung Mulu National Park, camp 2, v.-viii.1978 (P.M. Hammond and J.E. Marshall), BMNH [examined].

Diagnosis. TL 1.76, HL 1.12, HW 1.07, CI 96, SL 1.28, SI 1.20, EL 0.68, EI 64, ML 1.84, MI 164, PF 5/4.

The conspicuous sulcus between the clypeus and the frontal triangle and on the frons, and the long erect hairs (up to 0.25 mm) are unique to this species.

Material examined: 9 workers, E-Malaysia, Kibongal Valley, 700 m, 20.v.1987 (D.H. Burckhardt and I. Löbl), sifting of vegetational debris in a wooded gully close to fields, BMNH, DAAC, MHNG.

donisthorpei Wheeler

Myrmoteras donisthorpei Wheeler, 1916: 14, fig. 3. Holotype dealate queen, E-Malaysia, Sarawak, Mt. Matang, 16.1.1914 (G.E. Bryant); MCZC [Not examined; for description of worker see MOFFETT, 1985: 42 and figs 32, 35.].

Diagnosis. TL 1.19-1.28, HL 0.82-0.91, HW 0.83-0.90, CI 97-101, SL 0.84-0.98, SI, EL 0.56-0.61, ML 1.20-1.38, MI 146-154, PF 5/4 or 5/3.

The following combination of characters is unique for *donisthorpei*. Sculpture of head in full frontal view, including the frontal sulcus and clypeus, and the dorsum of pronotum and mesonotum granulate, occiput smooth and shining; trochanter and femora much brighter then the remaining body.

elfeorum new species
(Figs 7, 11, 12)

HOLOTYPE WORKER. TL 1.48, HL 0.99, HW 0.94, CI 95, SL 1.06, SI 113, EL 0.56, EI 60, ML 1.46, MI 147, PF 6/4. Head in full frontal view, including declivous face of occiput, glabrous, giving the impression of a longitudinal sculpture; dorsum of pronotum with a symmetric, fine longitudinal rugose sculpture in form of a U with the opening posterior; lateral parts of mesonotum and propodeum longitudinally rugose, rugae more distinct than on pronotum. Few scattered erect hairs on the eyes. Whole animal a uniform yellowish brown.

Material examined: Holotype worker, Indonesia, Sulawesi Selatan, Punjak (W of Palopo), 600 m, 21.iv.1991 (D. Agosti), forest in gully with stream, steep slopes and few leaf scattered on a clayey soil, sifting of vegetational debris; MBBJ, on long term loan in MHNG.

Paratype: 1 worker, INDONESIA, Sulawesi Selatan, Punjak (W of Palopo), 1000 m, 20.iv.1991 (D. Agosti), heath forest on top of a ridge with a very thick leaf litter layer with many roots, sifting of vegetational debris, MHNG.

estrudae new species
(Figs 20, 25, 26)

HOLOTYPE WORKER. TL 1.50, HL 0.96, HW 0.99, CI 103, SL 1.04, SI 105, EL 0.65, EI 66, ML 1.76, MI 163, PF 5/4. Head in full frontal view with discontinuous sculpture, clypeus granulate, the anterior part of the frons finely spaciously longitudinal sculptured, confluent with the chagrination on the posterior part. Declivitous face of occiput smooth and shining. Frontal sulcus and the sulcus posterior of the clypeus and sulcus medially of the eyes of about the same width. Dorsum of pronotum and propodeum chagrinated, the prododeum with some additional transversal spacious sculpture. Lateral parts of mesonotum laterally with few distinct rugae, including a straight metanotal tubercule ruga, ventral parts smooth and shining. Coxae and femorae bicolored with the apical parts of coxae and basal parts of femorae distinctly paler. The coloration is variable from castaneous to yellowish brown.

Material examined: Holotype worker, Indonesia, Sumatra, Aceh, G. Leuser NP., Ketambe research station, 500 m, 23.-30.xi.1989 (D. Agosti, D.H. Burckhardt & I. Löbl), lowland dipterocarp rainforest, sifting of vegetational debris, MBBJ, as long term loan in MHNG.

Paratypes: 15 workers, 6 females same series as holotype; BMNH, DAAC, MBBJ, MCZC, MHNG.

Additional material examined: 3 females, 1 worker, Indonesia, W-Sumatra, Panti, 250 m, 19.xi.1989 (D. Agosti, D.H. Burckhardt, I. Löbl), swamp forest, sifting of vegetational debris; 3 females, 4 workers, Indonesia, W-Sumatra, Palopo Nature Reserve, N of Bukittingi, 900 m, 18.-20.1989 (D. Agosti, D.H. Burckhardt & I. Löbl), secondary forest on steep slope, sifting of vegetational debris; 1 worker, 1 female, Indonesia, W-Sumatra, Padangpanjan, 600 m, 17.xi.1989 (D. Agosti, D.H. Burckhardt and I. Löbl), sifting of rotten bamboo. BMNH, DAAC, MBBJ, MCZC, MHNG.

insulcatum Moffett

Myrmoteras insulcatum Moffett, 1985: 45, figs 33, 36, 37. Holotype dealate queen, PHILIPPINES, Luzon, Lagunas, Mt. Makiling, ca. 150 m below summit, litter, ii.1968 (R.A. Morse); MCZC [not examined].

Diagnosis. The worker caste of this species is unknown. The following characters, which normally do not vary between worker and queen, are unique within *Myagroteras*. The lack of a frontal sulcus and the low palp formula (PF 3/3).

ivani new species
(Figs 10, 17, 18)

HOLOTYPE WORKER. TL 1.26, HL 0.86, HW 0.82, CI 95, SL 0.89, SI 109, EL 0.53, EI 65, ML 1,34, MI 159, PF 6/4. Small yellow species with head in full frontal view and dorsum of pronotum, with the exception of the anteriomost part with few transverse rugae, smooth and shining. Mesonotum laterally rugose which are continues on the dorsal region of the propodeum. Frontal sulcus posterior the clypeus and median of the eyes narrow. Mid and hind tibiae very wide.

The two populations are slightly different. The Palopo population has shorter hairs on the dorsum of the alitrunk and is paler then the Larompang population.

This species differs from *bakeri* by the absence of sculpture on the head in full frontal view.

Material examined: Holotype worker, Indonesia, Sulawesi Selatan, 30 km NE of Palopo, 50 m, 21.iv.1991 (D. Agosti), sifting of vegetational debris at the base of a *Ficus* in cacao plantation, MHNG.

Paratypes: 1 female and 1 worker, Indonesia, Sulawesi Selatan, between Larompang and Temboe, S of Palopo, 50 m, 20.iv.1991 (D. Agosti), secondary lowland rainforest, sifting of vegetational debris out of a thick leaf litter layer heavily infested with funghi, MHNG.

jacquelineae new species
(Figs 1, 2, 4-6)

HOLOTYPE WORKER. TL 1.30, HL 0.89, HW 0.86, CI 97, SL 0.90, SI 105, EL 0.55, EI 64, ML 1.42, MI 160, PF 6/4. Head in full frontal view, including the declivous face of the occiput which is additionally finely longitudinally rugose, glabrous. Frontal sulcus, and the sulcus posterior of the clypeus and along the inner margin of the eyes, distinct and narrow. The dorsum of the pronotum reticulate, the lateral parts of the mesonotum and propodeum longitudinally rugose. Body including appendages castaneous.

The combination of the glabrous head sculpture, the reticulate sculpture on the dorsum of the pronotum, the small size and the castaneous color is unique among the *Myagroteras*. From the similar *morowali* separted by the absence of a granular sculpture on the alitrunk and the dark brown to reddish colour.

Although only known by the holotype, this species is outstanding, unmistakable and with the most beautiful appearance.

Material examined: Holotype worker. Indonesia. Sulawesi Selatan, Punjak (W of Palopo), 1000 m, 20.iv.1991 (Agosti), heath forest on the top of a ridge with a thick leaf litter layer with many roots, sifting of vegetational debris, MBBJ, as long term loan in MHNG.

marianneae new species
(Figs 19, 23, 24)

HOLOTYPE WORKER. TL 1.62, HL 1.08, HW 1.04, CI 96, SL 1.24, SI 120, EL 0.65, EI 63, ML 1.80, MI 167, PF 6/4. Head in full frontal view longitudinally, separating rugose, occiput with dorsal and posterior face shining. Clypeus separated posteriorly from the frons by a distinct sulcus which is laterally continuing medially the eyes up to their posterior end. Frontal sulcus present, narrow. Dorsum of pronotum shining. Mesonotum shining, laterally dorsally with few distinct rugae, ventral part smooth. Metanotum smooth, separated by a serially arranged row of impressions from the mesonotum. Propodeum with longitudinal, continuous sculpture.

Separated from all the other *Myrmoteras* species by the distinct sulcus posterior of the clypeus, and the sculpture of the alitrunk, especially by the arrangement on the pleurae.

Material examined: Holotype worker, Indonesia, Sulawesi Selatan, Ulumambi (W of Momasa), 1000 m, 11.iv.1991 (D. Agosti), remnants of rainforest and coffee plantation, sifting of vegetational debris, as long term loan in MHNG.

maudeae new species
(Figs 32, 37, 38)

HOLOTYPE WORKER. TL 1.96, HL 1.24, HW 1.28, CI 103, SL 1.42, SI 111, EL 0.72, EI 36, ML 2.00, MI 161, PF 6/4. Head in full frontal view with longitudinal, diverging sculpture which ends well before the declivitous face of the occiput; occiput smooth and shining. Frontal sulcus distinct but very narrow. Frontal triangle indicated. Pronotum with spacious, large, round to elongate punctation, and has a shining surface. Dorsum of mesontoum anteriorly with transverse sculpture; posteriorly and laterally with a longitudinal sculpture. Propodeum and metanotum with continuous shallow spacious longitudinal sculpture. Propodeum separated from the metanotum by a narrow carina, crossing the longitudinal sculpture almost in a right angle, dorsum of mesonotum and propodeum continous in later view. Few, very short hairs on alitrunk (< 0.05 mm); head, alitrunk and gaster dark chestnut, legs yellowish brown.

The dorsal outline, in lateral view, and the short hairs on the alitrunk are unique within *Myagroteras*.

Material examined: Holotype worker, Indonesia, Sulawesi Selatan, Penanang, 1600 m, 13.iv.1991 (D. Agosti), montane rainforest, #19, leaf litter, MHNG.

morowali Moffett

Myrmoteras morowali Moffett, 1985: 48, figs 38, 42. Holotype worker, Indonesia, Central Sulawesi, near Morowali, Ranu river area, 27.i.-20.iv.1980 (M.J.D. Brendell), #B.M.1980-280 [Holotype not in BMNH, not examined].

Diagnosis. (Holotype and four paratypes) TL 1.15-1.20, HL 0.83-0.85, HW 0.80-0.82, CI 96-97, SL 0.87-0.90, SI 108-112, EL 0.49-0.50, ML 1.13-1.19, MI 140-144, PF 6/4.

Distinguished from closely related *wolasi* and *toro* by the finely granulate sculpture dorsally on head and pronotum; very smooth and shining frontal area; granulate clypeus; presence of transverse rugae across declivity of propdeum, which is smooth only near base; and light yellow colour with the petiole concolourous with trunk and gaster (Moffett, 1985).

nicoletteae new species
(Figs 22, 29, 30)

HOLOTYPE WORKER. TL 1.64, HL 1.04, HW 1.06, CI 102, SL 1.24, SI 117, EL 0.64, EI 60, ML 1.62, MI 156, PF 6/4. Head in full frontal view with a spacious, distinct longitudinal diverging sculpture; clypeus and occiput smooth. Dorsum of pronotum with a blurred converging sculpture, often alternating with smooth and shining patches, anterior part with transversal sculpture. Dorsum of mesonotum smooth, laterally with one distinct ruga. Metanotum and propodeum with spacious, flat longitudinal sculpture which is somewhat interrupted at the segmental transition from the metanotum to the mesonotum. Few short erect hairs on the genae. Large propodeal spiracle. Whole body yellow.

The spacious longitudinal sculpture on the head is unique among *Myagroteras* species.

Material examined: Holotype worker, Indonesia, Sulawesi Utara, G. Muajat, 1780 m, 25.i.1985 (leg. unknown), BMNH.

Paratype: 1 worker, same series as holotype, MHNG.

Additional material examined: 1 queen, Indonesia, Sulawesi Utara, Danau Mooat, nr Kotamobagu, 24.i.1985, #24, leg. ?; 1 queen, Indonesia, Sulawesi Utara, Dumoga Bone National Park, 9.-16.v.1985, leg. unknown; BMNH, MHNG.

susanneae new species
(Figs 33, 39, 40)

HOLOTYPE WORKER. TL 1.64, HL 1.04, HW 1.04, CI 100, SL 1.20, SI 115, EL 0.61, EI 59; ML 1.82, MI 175, PF 6/4. Head in full frontal view with diverging longitudinal sculpture, only the posterior face of the occiput smooth and shining. Occipital collar finely longitudinally sculptured. Frontal sulcus and sulcus posterior of the clypeus and median of the eyes narrow and distinct. Dorsum of pronotum with an irregular spacious rugosity. Mesonotum, metanotum and propoedeum with a spacious longitudinal sculpture, shining. Propodeum high, in lateral view much higher then the mesonotum and convex. Body chestnut with the appendages brighter and the mid and hind coxae yellowish white.

Material examined: Holotype worker, Indonesia, Sulawesi Selatan, Ulumambi (W of Momosa), 12.iv.1991 (D. Agosti), montane forest, sifting of vegetational debris, MHNG.

Paratypes: 2 workers, same series as holotype, MHNG, BMNH.

Additional material examined. 1 dealate queen and 1 worker, Indonesia, Sulawesi Selatan, Penanang (W of Mamasa), 1600 m, 9.iv.1991 (D. Agosti), montane forest, leaf litter, MHNG.

tonboli new species
(Figs 8, 13, 14)

HOLOTYPE WORKER. TL 1.66, HL 1.00, HW 1.00, CI 100, SL 1.20, SI 120, EL 0.62, EI 62, ML 1.64, MI 164, PF 5/3. Head, pronotum and propodeum only with sculpture between the frontal carinae. Frontal sulcus, and sulcus posterior the clypeus and medially of the eyes distinct and narrow. Mesonotum laterally with a longitudinal fold and dorsally few smooth transversal rugae. Few erect hairs on the dorsum of the alitrunk, anteriorely of the dorsum of the mesonotum a pair of hairs and two hairs on the mesonotal spiracles.

As *arcoelinae* but with the alitrunk shining and stouter, and fewer hairs on the alitrunk.

Material examined: Holotype worker, E-.Malaysia, Sabah, G. Kinabalu, 1500-1600 m, 24.iv.1987 (D.H. Burckhardt & I. Löbl), leaf litter, MHNG.

toro Moffett

Myrmoteras toro Moffett, 1985: 49. Holotype worker, Indonesia, Central Sulawesi, Lore Lindu National Park at Toro, 82 km South of Palu, 15.vii.1983 (W.M. Moffett), disturbed rainforest, single cluster of ants in loose leaf litter, MCZC [not examined].

Paratypes workers and dealate queen, same colony as holotype, MCZC, BMNH, MHNG, MCSN [examined].

Diagnosis. (Holotype and Paratypes) TL 1.35-1.56, HL 0.97-1.03, HW 0.97-1.05, CI 100-102, SL 1.07-1.15, SI 109-1120, EL 0.58-0.62, ML 1.48-1.58, MI 153-154, PF 6/4.

The sculpture all over head and alitrunk, especially the longitudinal sculpture on the occiput and the reticulate sculpture on the dorsum of the pronotum are unique to this species.

williamsi Wheeler

Myrmoteras williamsi Wheeler, 1919: 146. Syntypes 2 winged queens, 1 male, PHILIPPINES, Luzon, Los Baños (F.X. Williams), MCZC [not examined]. [Description of worker: Creighton, 1930: 189, fig. 2 pl. 11, fig. 4.; see also Moffett, 1985: figs 40, 44].

Diagnosis. TL 1.30-1.40, HL 0.95-1.00, HW 0.95-1.00, CI 100, SL 1.10, SI 113, EL 0.55-0.58, ML 1.38-1.50, MI 145-151, PF 6/4 (two workers).

The combination of the granulate sculpture on the head in full frontal view and on the dorsum of the pronotum, and the high pronotum and propodeum is unique within *Myrmoteras*.

wolasi Moffett

Myrmoteras wolasi Moffett, 1985: 52, figs 41, 45. Holotype worker, Indonesia, S.E. Sulawesi, 1-2 km East of Wolasi, 42 South of Kendari, ca. 350 m, 13.-14.vii.1972 (W.L. Brown), rainforest, MCZC [not examined].

Diagnosis. TL 1.20, HL 0.88, HW 0.88, CI 100, SL 0.96, SI 109, EL 0.55, EI 63, ML 1.23, MI 141, PF 6/4.

The combination of the palpformule (PF 6/4), the granulate sculpture on both the clypeus and the frontal area, the longitudinal rugose sculpture on the frons, but not on the occiput and on the dorsum of the alitrunk, and the flat dorsum of the propodeum in lateral view, are unique within *Myagroteras*.

ACKNOWLEDGMENTS

I thank PPI, Jakarta and LIPI, Bogor and the people of Indonesia who provided the necessary permissions and infrastructure. Rosichon Ubaidilla, Sih Kahono and Baharudin have been helpful colleagues in Indonesia. Daniel Burckhardt, Dana and Ivan Löbl, Rienk de Jong and Kees van Achterberg made collecting very pleasant. A. Anggraitoningsih, Claude Besuchet, Barry Bolton and Daniel Burckhardt, James Carpenter and Stefan Cover arranged loans of specimens. Martin Müller, René Hermann and Daniel Studer helped in a very generous way to prepare the electron micrographs. Barry Bolton's advice, Larraine Ficken's corrections of my English, and especially Andy Polaszek's red pencil made it possible to get the manuscript its present form.

Parts of the work have generously been supported by the following institutions and persons. The travel grant of the Schweizerische Akademie der Wissenschaften, a 'bourse pour l'encouragement de la recherche du Museum d'Histoire naturelle, Genève', a fellowship to study Southern hemisphere ants of the Janggen-Poehn-Stiftung, St. Gallen, and financial support by Elisabeth and Felix Agosti-Maurer, Uster, and Anselm and Anni Basler-Germann, Zollikon. The various contributions of Daniel Burckhardt, Nicolette Lavoyer and Ivan Löbl have always been very stimulating.

This study is dedicated to the women who did not let me forget sweet life.

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Revue suisse Zool.	Tome 99	Fasc. 2	p. 431-438	Genève, juin 1992

Anisotomini della Corea con descrizione di tre nuove specie (Coleoptera, Leiodidae)

di

Fernando ANGELINI*

Con 19 figure

Abstract

Anisotomini from Korea with description of three new species (Coleoptera, Leiodidae.). – The author gives collecting data for 5 species of Anisotomini from Korea and describes three new species: *Agathidium coreanum* n. sp., *A. oblongum* n. sp. and *A. merkli* n. sp.

New records from Korea: *Anisotoma curta* (Port.), *Agathidium mequignoni* Roubal.

INTRODUZIONE

Grazie alla cortesia dei Dr. C. Besuchet e O. Merkl, ho avuto la possibilità di studiare gli Anisotomini della Corea conservati rispettivamente nelle collezioni dei Musei di Storia Naturale di Ginevra e Budapest e precisamente: 10 esemplari provenienti da una località, 3 specie, leg. Besuchet, coll. Museo Ginevra; 5 esemplari provenienti da 3 località, 3 specie, leg. Merkl. Szél, Forrò & Ronkay, coll. Mus. Budapest. Complessivamente, pertanto, sono stati studiati 15 esemplari provenienti da 4 località e riferibili a 5 diverse specie nuove per la Corea (*Anisotoma curta* Port. e *Agathidium mequignoni* Roubal) o non ancora descritte (*Agathidium coreanum* n. sp., *A. oblongum* n. sp. e *A. merkli* n. sp.). Sinora, della Corea, era noto solo *Agathidium curticorne* Hlisn. (1964: 49).

Gli exemplari sono conservati in coll. Angelini, coll. Museo di Storia Naturale di Budapest e coll. Museo di Storia Naturale di Ginevra.

Mi é gradito ringraziare i Dr. Claude Besuchet (Ginevra) e Ottó Merkl (Budapest) per il materiale inviatoni in studio e l'amico prof. Luigi De Marzo per l'assistenza nella redazione della presente nota.

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* S.S.7 per Latiano, Km. 0,500 – 72021 Francavilla Fontana (Brindisi), Italy

Anisotoma curta (Port.)

Eucyrta curta Portevin, 1927: 83,93.
Anisotoma curta; Wheeler, 1979: 301-303; Angelini & De Marzo, 1990:56.

Materiale esaminato: Corea del Nord, N Pyongan Prov., Hucijanggim, Singted, 17.VII.1982, leg. Forrò & Ronkay, n. 817, 1 ex. in coll. Museo Budapest.

Note sistematiche: L'esemplare esaminato é del tutto simile agli esemplari nipponici.

Distribuzione: Giappone, Corea. Nuovo per la Corea.

Agathidium (s. str.) mequignoni Roubal

Agathidium mequignoni Roubal, 1911:49.
Agathidium (s. str.) mequignoni; Hlisnikovsky, 1964: 221; Angelini, 1986: 16; 1988: 155; Angelini & De Marzo, 1988: 286.
Agathidium (s. str.) melichari Hlisnikovsky, 1964: 205.
Agathidium (s. str.) orientale Hlisnikovsky, 1964: 212.

Materiale esaminato: Corea del Nord, Ryanggang Prov., Samgiyon, 1000 m, 26.VI.1988, leg. Merkl & Szél, n. 1347, 1 ♂ in coll. Museo di Budapest.

Note sistematiche: L'esemplare esaminato é del tutto simile, per microreticolazione e punteggiatura, agli esemplari del caucaso; la determinazione é stata verificata mediante l'esame dell'edeago.

Distribuzione: Caucaso, Iran, Turkestan (Hlisnikovsky, 1964, l.c. sub *A. orientale* n. sp.), Corea. La specie mi é nota anche di Siberia (Far East, Vladivostoc; Novosibirsk). Nuovo per Corea e Siberia.

Agathidium (s. str.) coreanum n. sp.

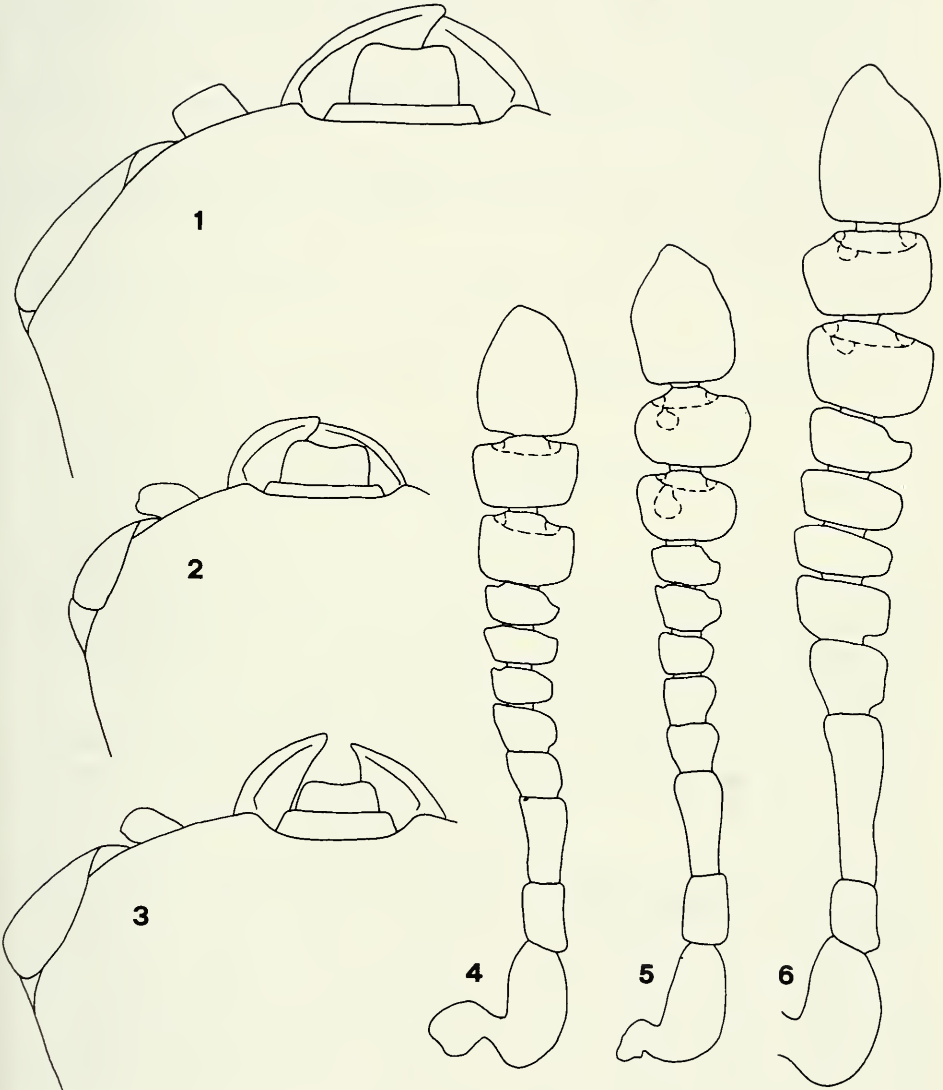
Figg. 2, 5, 7, 8, 14, 17

Lunghezza 3,1 mm (holotypus ♂). Colorazione di capo e pronoto rosso-bruno, elitre più scure, parte inferiore rosso-bruna; antenne uniformemente testacee, zampe rosso-brune. Microreticolazione assente, punteggiatura fine su capo e pronoto, più netta sulle elitre.

Capo: punti piccoli e superficiali, distanti tra loro 3-8 volte il proprio diametro; clipeo poco incavato, linea clipeale assente, solo vaghe tracce; mandibole piccole, poco sviluppate; occhi ben visibili, breve tempia dietro di essi (fig. 2); 3° antennomero lungo 1,45 volte il 2° e più lungo del 4° + 5° (fig. 5). Organo di Hamann: solco e una vescicola negli antennomeri 9° e 10°.

Pronoto: punteggiatura costituita da punti simili a quelli del capo per dimensione, impressione e distanza; largo 1,55 volte il capo, discretamente trasverso (la/lu = 1,43) e molto converso (1a/alt = 1,43); margine anteriore poco curvo, profilo laterale molto largamente arrotondato (fig. 14). Misure holotypus: lungh. 1,02 mm, largh. 1,46 mm, alt. 1,02 mm.

Elitre: punteggiatura netta, costituita da punti più grandi di quelli del capo, impressi, distanti tra loro 2-3 volte il proprio diametro; larghe quanto il pronoto, più lunghe che larghe (1a/1u = 0,96) e discretamente convesse (1a/alt = 1,64); profilo laterale con angolo omerale molto lieve e largamente arrotondato ed iniziante verso la metà delle elitre; strie suturali lievi e limitate alla metà distale. Misure holotypus: lungh. 1,50 mm, largh. 1,45 mm, alt. 0,88 mm.



FIGG. 1-6.

Capo in vista dorsale: 1, *Agathidium oblongum* n. sp.; 2, *A. coreanum* n. sp.; 3, *A. merkli* n. sp. Antenna di: 4, *A. merkli* n. sp.; 5, *A. coreanum* n. sp.; 6, *A. oblongum* n. sp.

Ali metatoraciche presenti. Meso e metasterno: carena mediana netta, linee laterali incomplete, linee femorali complete.

Zampe: metafemori del ♂ con lieve dente distale (fig. 17). Formula tarsale: ♂ 5-5-4; ♀ sconosciuta; primo articolo dei tarsi anteriori nettamente più grande del 2°, articoli 1-4 anteriori e medi dilatati.

Armatura genitale maschile (figg. 7, 8): Edeago di forma allungata, con parte prossimale a uncino, lati subparalleli, arrotondato all'apice; parameri esili, arrotondati all'apice.

Note comparative: specie simile ad *A. chinense* Hlisn. (1964: 144) per assenza di microreticolazione e colorazione della clava antennale; se ne differenzia per il maggiore rapporto 3°/2° antennomero, minore rapporto pronoto/capo, punteggiatura del dorso meno netta e colorazionedello stesso.

Holotypus ♂ : Corea del Sud, Mt. Kayasan, 16.IX.1987, leg. Besuchet, n. 6669, in coll. Museo Ginevra.

Note ecologiche: vaglio di foglie morte e legno marcio.

Distribuzione: Corea del Sud.

Agathidium (s. str.) oblongum n. sp.

Figg. 1, 6, 9-11, 15, 18

Lunghezza 3, 10-3,95 mm (holotypus ♂ 3,95 mm). Colorazione del dorso rosso-bruno scuro con venature nere; un paratypus, lievemente immaturo, presenta tutto il dorso rosso-bruno chiaro, un altro rosso-bruno più scuro; parte inferiore rosso-bruna; antenne uniformemente testacee, zampe rosso-brune. Microreticolazione presente solo sulle elitre, superficiale o in tracce; punteggiatura presente sull'intero dorso.

Capo: punti piccoli e superficiali ma ben visibili, distanti tra loro 1-4 volte il proprio diametro; clipeo poco incavato, linea clipeale assente; mandibole piccole, occhi molto allungati, massima larghezza del capo al loro livello (fig. 1): 3° antennomero lungo 2,36 volte il 2° e più lungo del 4° + 5° (fig. 6). Organo di Hamann: solco e una vescicola negli antennomeri 9° e 10°.

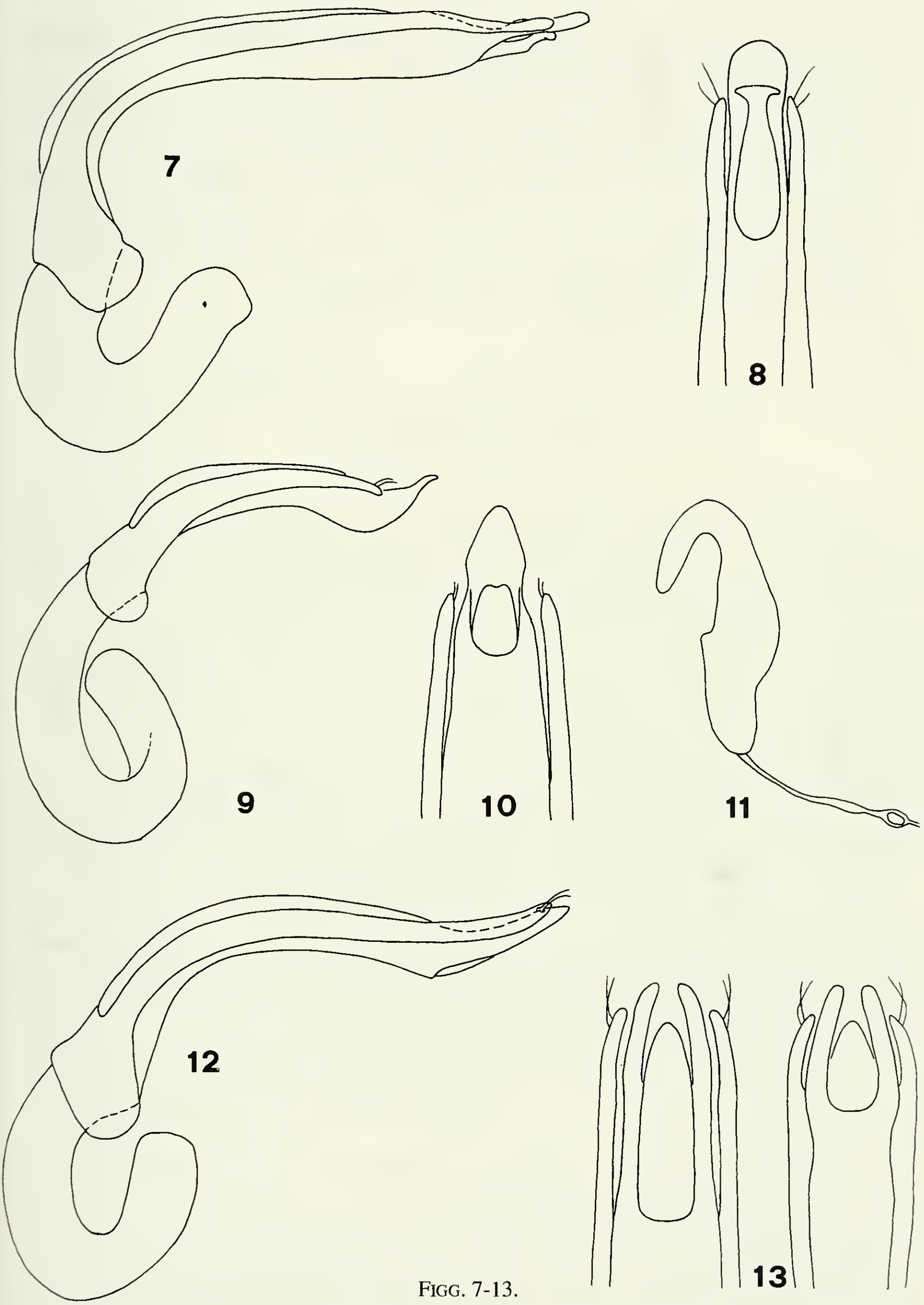
Pronoto: punteggiatura simile a quella del capo per dimensione e distanza tra i punti ma più superficiale; 1,3 volte più largo del capo, poco trasverso (la/lu = 1,36) e molto converso (la/alt =1,4); margine anteriore molto curvo, profilo laterale molto largamente arrotondato (fig. 15). Misure holotypus: lungh. 1,34 mm, largh. 1,83 mm, alt. 1,30 mm.

Elitre: dorso microreticolato molto superficialmente o in tracce rilevabili a 100X; punteggiatura costituita da punti molto grandi ma superficiali, distanti tra loro 1 volta il proprio diametro; appena più strette del pronoto, poco più larghe che lunghe (la/lu = 1,05) e discretamente convesse (la/alt = 1,6); profilo laterale con angolo omerale molto lieve e largamente arrotondato ed iniziante verso la metà delle elitre; strie suturali assenti. Misure holotypus: lungh. 1,70 mm, largh. 1,80 mm, alt. 1,13 mm.

Ali metatoraciche assenti. Meso e metasterno: carena mediana netta, linee laterali incomplete, linee femorali complete.

Zampe: metafemori del ♂ con forte dente subdistale (fig. 18). Formula tarsale: ♂ 5-5-4.; nel ♂ i primi 4 tarsi anteriori e medi poco dilatati.

Armatura genitale maschile (figg. 9, 10) Edeago di forma allungata, con parte prossimale a uncino, margini laterali sinuosi verso l'apice, questo strettamente arrotondato; parameri esili e arrotondati all'apice.



FIGG. 7-13.

Armatura genitale maschile (visione laterale e visione dell'apice dal dorso e/o dal ventre) di: 7-8, *Agathidium coreanum* n. sp.; 9-10, *A. oblongum* n. sp.; 12-13, *A. merkli* n. sp. Spermateca di: 11, *A. oblongum* n. sp.

Spermateca (fig. 11): parte basale piriforme e allungata, parte apicale lunga meno della metà, di calibro relativamente grosso, dotto esile.

Note comparative: specie simile ad *A. pseudosamurai* Ang. & Dmz. (1990-: 106, Giappone) per il rapporto 3°/2° antennomero; se ne differenzia per il molto minore rapporto pronoto/capo e la forma degli occhi, molto più allungati.

Holotypus ♂ : Corea del Sud, Mt. Kayasan, 16.IX.1987, leg. Besuchet, n. 6660, in coll. Museo di Ginevra.

Paratypus: stessi dati dell'holotypus, 3 ♀ n. 6661-6663 in coll. Museo di Ginevra, 2 ♀ n. 6664-6665 in coll. Angelini.

Note ecologiche: vaglio di foglie morte e legno marcio.

Distribuzione: Corea del Sud.

Agathidium (s. str.) merkli n. sp.

Figg. 3, 4, 12, 13, 16, 19

Lunghezza 3,00-3,45 mm (holotypus ♂ 3,45 mm). Colorazione di capo e pronoto rosso-bruno scuro, elitre nere, un paratypus uniformemente rosso-bruno, parte inferiore rosso-bruno; antenne uniformemente testacee, zampe rosso-brune. Microreticolazione assente, punteggiatura fine sul capo, microscopica su pronoto ed elitre.

Capo: punteggiatura costituita da punti piccoli e superficiali, distanti tra loro 2-4 volte il proprio diametro; clipeo nettamente incavato, linea clipeale assente; mandibole piccole, occhi sporgenti, massima larghezza del capo al loro livello (fig. 3); 3° antennomero 1,35 volte più lungo del 2° e lungo quanto il 4° + 5° (fig. 4). Organo di Hamann: solo solco nel 9° e 10° antennomero.

Pronoto: punteggiature microscopica e poco visibile, punti distanti 8-12 volte il proprio diametro; 1,4 volte più largo del capo, poco trasverso (la/lu = 1,37) e molto convesso (la/alt = 1,32); margine anteriore poco curvo, profilo laterale molto largamente arrotondato (fig. 16). Misure holotypus: lungh. 1,20 mm, largh. 1,65 mm, alt. 1,25 mm.

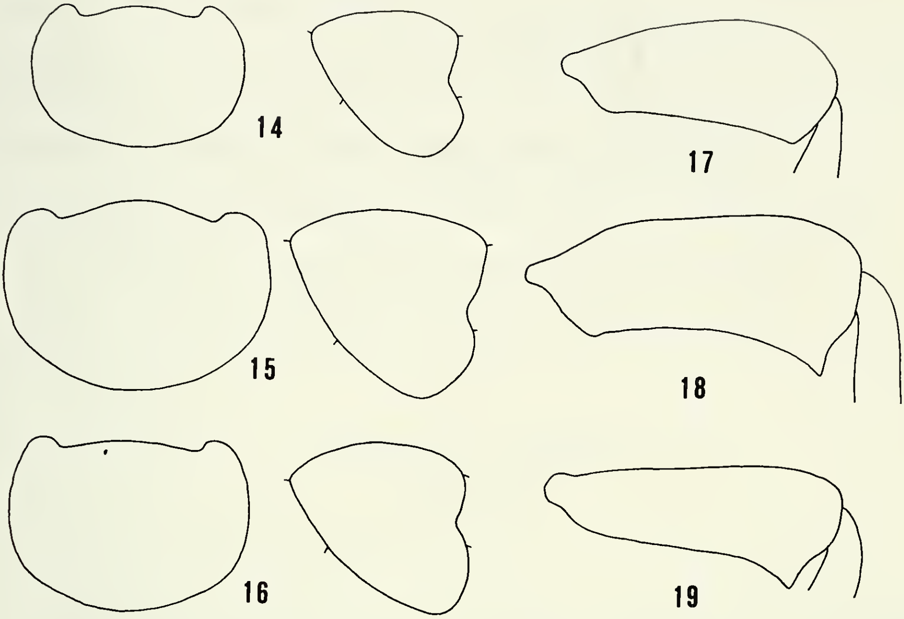
Elitre: sono presenti solo vaghe tracce di microreticolazione nel paratypus a colorazione più chiara; punteggiatura assente, superfice elitrale percorsa da lunghi, irregolari e superficiali solchi; appena più strette del pronoto, poco più larghe che lunghe (la/lu = 1,06) e discretamente convesse (la/alt. = 1,77); profilo laterale con angolo omerale molto lieve e largamente arrotondato ed iniziante verso la metà delle elitre; strie suturali assenti. Misure holotypus: lungh. 1,50 mm, largh. 1,60 mm, alt. 0,90 mm.

Ali metatoraciche assenti. Meso e metasterno: carena mediana netta, linee laterali assenti, linee femorali complete.

Zampe: metafemori del ♂ con lieve dente subdistale (fig. 19). Formula tarsale: ♂ 5-5-4, ♀ sconosciuta.

Armatura genitale maschile (figg. 12, 13): Edeago di forma molto allungata, con parte prossimale a uncino, margini laterali sinuosi verso l'apice, questo fortemente incavato; parameri esili e arrotondati all'apice.

Note comparative: le specie del gruppo a cui appartiene *A. merkli* – microreticolazione e linea suturale assente – sono generalmente endemiche e molto omogenee per cui in tavola dicotomica sono divise per area geografica; precisato quanto innanzi va rilevato che le specie geograficamente più vicine sono quelle nipponiche e, precisamente, *A. fornicatum* Hlisn. (1964: 228), *A. sublaevigatum* Port. (1908: 23) e *A. japonicum* Port. (1927: 90) stante la uguale colorazione delle clava antennale e assenza di ribordo anteriore



Figg. 14-19.

Profili dorsali e laterali del pronoto in: 14, *Agathidium coreanum* n. sp.; 15, *A. oblongum* n. sp.; 16, *A. merkli* n. sp. Metafemore del ♂ in: 17, *A. coreanum* n. sp.; 18, *A. oblongum* n. sp.; 19, *A. merkli* n. sp.

sul capo; se ne differenzia per la forma del capo, il minore rapporto 3°/2° antennomero e pronoto/capo, assenza di ali metatoraciche, dimensioni nettamente maggiori.

Holotypus ♂: Corea del Sud, Mt. Kayasan, 16.IX.1987, leg. Besuchet, n. 6666 in coll. Mueso di Ginevra.

Paratypus: stessi dati dell'holotypus, 1 ♂ n. 6667 in coll. Museo di Ginevra, 1 ♂ n. 6668 in coll. Angelini; Corea del Nord, Kangwon Prov., Kumgang-san, Onjong-ri, 400 m, n. 1339, 19.VI.1988, leg. Merkl & Szél, 2 ♂ n. 6670, 6671 in col. Museo di Budapest, 1 ♂ n. 6672 in coll. Angelini.

Note ecologiche: vaglio di foglie morte e legno marcio.

Distribuzione: Corea del Nord e del Sud.

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Revue suisse Zool.	Tome 99	Fasc. 2	p. 439-463	Genève, juin 1992

Larinotinae – A new subfamily of Trogossitidae (Coleoptera), with notes on the constitution of Trogossitidae and related families of Cleroidea

by

Stanislaw Adam SLIPINSKI*

With 65 figures

ABSTRACT

Larinotinae – a new subfamily of Trogossitidae (Coleoptera), with notes on the constitution of Trogossitidae and related families of Cleroidea. – A new subfamily – Larinotinae – is erected to include three genera from the Indo-Australian Region: *Larinotus* Carter & Zeck, 1937 transferred here from Trogossitidae, Egoliinae; *Colydiopeltis* gen. n. (type species: *C. burckhardti* sp. n.) and *Parapeltis* gen. n. (type species: *P. australicum* sp. n.). The larva of *Larinotus umblicatus* Carter & Zeck is described and figured. Keys to families of Cleroidea, and subfamilies of Trogossitidae based on adults and larvae are provided. Trogossitidae, as currently recognized, includes groups formerly recognized as the families Peltidae, Lophocateridae and Trogossitidae.

INTRODUCTION

The superfamily Cleroidea, as defined by CROWSON (1964), includes beetles that have been attributed in the past to many other groups such as "Malacodermata", "Clavicornia" and the Cleroidea itself. There has been general agreement concerning the definition of the superfamily, though the constitution of the families and their relationships are still disputed (CROWSON 1970; LAWRENCE 1982; LAWRENCE & NEWTON 1982).

The major problem within the Cleroidea is the constitution of Trogossitidae and related taxa. CROWSON (1964) divided the old family Trogossitidae into supposedly fungivorous-floricolous Peltidae and predaceous Trogossitidae s. str. The latter has been further subdivided (CROWSON 1970) into two families, Lophocateridae and Trogossitidae. This division has been questioned by BARRON (1971) and LAWRENCE (1982) who preferred

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* Entomology Research Laboratory, Montana State University, Bozeman, MT 59717. USA, on a leave from Institute of Zoology, Polish Academy of Sciences. Wilcza 64, 00-679 Warszawa, Poland.

the broader definition of Trogossitidae. Since little evidence supports Crowson's family concept, I follow more recent authors in this paper.

The discovery of a new genus in Thailand that could not be satisfactorily placed within Peltidae or Trogossitidae has prompted a re-examination of the currently recognized family-group taxa within Trogossitidae, that led to this project.

A newly outlined group (Larinotinae) is tentatively placed within the redefined Trogossitidae, since no phylogenetic analysis is available to allow confident placement of this taxon. Data from larval stages of Decamerinae and Rentoniinae are essentially missing, because descriptions of these larvae (CROWSON 1964, 1966) are based on dubious identifications. The larval diagnosis of Egoliinae given by CROWSON (1970) is confirmed here by further and more precisely associated larvae from Australia provided by J. F. Lawrence (Figs 59-65). The project in progress by K. Majer and J. Kolibac (J. Kolibac, personal communication) on the reclassification of the superfamily Cleroidea may later shed more light on the relationships of cleroid taxa.

REVISED KEYS TO FAMILIES OF CLEROIDEA

ADULTS

1. Species wingless with very short metasternum and wide, metepisterna jointly as wide as metasternum; pronotum arcuately prominent over head, deeply sinuate laterally with long acute front angles .... PHYCOSECIDAE
— Species usually winged with long metasternum and narrow metepisterna, head large and not concealed; if apterous, head exposed and pronotal angles different 2
2. Procoxae transverse, not projecting above level of prosternal process; antenna always clubbed; .... TROGOSSITIDAE
— Procoxae distinctly to strongly projecting above level of prosternal process; antenna often not clubbed 3
3. Antenna with distinct 3-segmented club; tarsi without lobed segments; claws simple; gular sutures well-separated 4
— If antenna with well-marked club, tarsi with lobed segments or other characters different 5
4. Tibia with spines on outer edge; hypomera of prothorax with pockets by front angles of coxal cavities; aedeagus with divided tegmen; male tarsal formula 4-5-5. .... ACANTHOCNEMIDAE
— Tibia without spines at outer edge; hypomera without pockets; tegmen undivided; male tarsal formula 5-5-5 .... PHLIOPHILIDAE
5. Antenna never with distinct club; procoxal cavities widely open externally; tarsi rarely with lobed segments, if so eversible lateral glands present on prothorax and at least some abdominal segments; claws usually more-or-less split or toothed or with membranous appendages; gular sutures well-separated; elytral punctures confused..... .... MELYRIDAE
— Antenna more-or-less clubbed, if not, tarsi lobed below and procoxal cavities closed externally; claws usually simple, never with membranous appendages; usually at least tarsomere III with ventral lobes; prothorax and abdomen never with eversible lateral glands 6
6. Gular sutures confluent; tarsi without lobed segments; antenna without distinct club; procoxae strongly projecting; protibia with spines on outer edge .... CHAETOSOMATIDAE

— Gular sutures separated; at least protarsi with widened or lobed segments, if not, antennae with distinct 3-segmented club; protibia never with spines on outer edge .... CLERIDAE

LARVAE

1. Mandible with lacinia mobilis represented by a single or apically bifid elongate fringed structure 2
— Mandible with lacinia mobilis absent or represented by 2-3 slender, backwardly projected spines 3
2. Hypostomal rods present, extending to the posterior edge of the head; abdominal segments with lateral pigmented, setiferous sclerites but without gland openings; head with 6 stemmata on each side .... PHYCOSECIDAE
— Hypostomal rods absent: abdominal segments usually with gland openings, stemmata less than 6 .... MELYRIDAE
3. Frontal sutures characteristically shaped, sharply angled in middle ..... PHLIOPHILIDAE
— Frontal sutures straight or arcuate never angled 4
4. Head capsule ventrally firmly closed; closure uniform not divided into separate, longitudinal sclerites; mouth parts protracted 5
— If head with distinct sclerotized ventral closure, it consists of separate, longitudinal sclerites; mouth parts retracted .... TROGOSSITIDAE
5. Hypostomal rods complete and parallel with two sutures between them delimiting a distinct post-labial sclerite .... CHAETOSOMATIDAE
— Hypostomal rods incomplete to absent, never with separate sclerite bounded by sutures between them .... CLERIDAE

REVIEW OF THE SUBFAMILIES OF TROGOSSITIDAE

As currently recognized, the family Trogossitidae includes CROWSON's (1964, 1970) Peltidae and Lophocateridae. Lophocaterinae may be an intermediate between Trogossitinae and Peltinae. Adults of Lophocaterinae share many of the diagnostic characters and some habits of Peltidae, while their larvae possess an almost completely closed head capsule, moderately elongate maxillary stipes and apparently articulated mala (at least in larva of *Grynocharis* Thomson, S.A. Slipinski, unpublished). Lophocaterinae in both larval and adult stages show great variability in their mouth parts (e.g. mandibular mola, maxillary lacinia with spines and hooks), partially overlapping diagnostic characters of peltines and trogossitines.

KEY TO SUBFAMILIES OF ADULT TROGOSSITIDAE

1. Tibial spurs absent .... LARINOTINAE
— Tibial spurs present 2
2. Procoxal cavities externally closed 3
— Procoxal cavities externally open 5
3. Mandible without mola; antenna nearly always 10 or 11-segmented with markedly asymmetrical 2 or more segmented club .... TROGOSSITINAE
— Mandible with mola; antennal club usually symmetrical 4

4. Body broadly oval, flattened; elytra with costae and tubercles; mesocoxal cavities externally open, antenna 11-segmented; protochantins fully exposed .... CALITINAE
— Body elongate, subcylindrical, elytra without costae; mesocoxal cavities almost closed outwardly by sterna; antenna 9 or 10-segmented; protrochantins partially hidden .... EGOLIINAE
5. Protibia with single spur; antennal club markedly asymmetrical ...... LOPHOCATERINAE
— Protibia with 2 very unequal spurs; antennal club symmetrical 6
6. Form very convex and rounded, clambid-like; procoxal cavities internally closed .... RENTONIINAE
— Form never very convex and rounded, not clambid-like; procoxal cavities internally open 7
7. Mesocoxae distinctly separated, sternal process between them never much longer than wide; lacinia with strong apical hook but no spur on mesal surface ...... PELTINAE
— Mesocoxae indistinctly separated, sternal process very narrow; lacinia with spur on mesal surface; apical hook present or absent 8
8. Lacinia with apical hook; mandibular mola asperate; tegmen divided; labial palps separated at base .... PROTOPELTINAE
— Lacinia without apical hook; mandibular mola not clearly asperate; tegmen undivided; labial palps approximate at base .... DECAMERINAE

Key to subfamilies of larval Trogossitidae

1. Abdominal tergite IX transversely divided, with a small tooth or process between bases of urogomphi .... LOPHOCATERINAE
— Abdominal tergite IX not transversely divided and without inter-urogomphal process 2
2. Maxillary palps 2-segmented, labial palps 1-segmented .... (supposed larva of Rentoniinae)
— Maxillary palps 3-segmented, labial palps 2-segmented 3
3. Mandible with small anterior, mola-like tubercle ... (supposed larva of Decamerinae)
— Mandible without mola 4
4. Head capsule open ventrally behind labium; maxillary mala not articulated 5
— Head capsule closed ventrally behind labrum; maxillary mala with ventral sclerite on inner basal part that is apparently articulated to stipes (fig. 63) 8
5. Abdominal tergite IX without pigmented sclerite, with very minute urogomphi (fig. 52); head with strong single endocarina .... LARINOTINAE
— Abdominal tergite IX with strong paired urogomphi and usually with pigmented sclerite, if the sclerite is absent median endocarina absent 6
6. Head without endocarina; frontal sutures almost straight .... PELTINAE
— Head with median endocarina; frontal sutures sinuate 7
7. Abdominal tergites VI-VIII with pigmented lateral sclerotisations; mala with uncus on inner edge; antennal segment III about as long as II.................. PROTOPELTINAE
— Abdominal tergites VI-VIII without lateral pigmented sclerotisations; mala without uncus; antennal segment III much shorter than II .... CALITINAE
8. Stemmata 3 on each side; dorsal sclerite of tergite IX bordered by raised rim (fig. 69) .... EGOLIINAE
— Stemmata 5 on each side; dorsal sclerite of tergite IX without a raised rim.............. .... TROGOSSITINAE

PELTINAE

This groups is equivalent to the Peltinae of CROWSON (1964) and is Holarctic in distribution. The following genera belong here: *Ostoma* Laicharting; *Peltis* Kugelann and *Thymalus* Latreille. *Protopeltis* Crowson, originally attributed here, was subsequently (CROWSON 1970) moved to its own subfamily Protopeltinae. Other genera usually listed under Peltinae probably belong to Lophocaterinae or Decamerinae. Larvae of Peltinae are unique among trogossitids because their median endocarina are obsolete or reduced to a short Y-shaped structure (paired endocarinae present in *Thymalus* Latr.), and stemmata are often reduced or absent. There is no apparent synapomorphy for the group, unless the reduction of larval median endocarina is proved to be such a character.

LOPHOCATERINAE

This group is treated here as defined by CROWSON (1970). It is primarily tropical and subtropical. Larvae, because the abdominal tergite IX is transversely divided and bearing inter-urogomphal process, are distinct from both Peltinae and Trogossitinae. The larval head capsule is almost entirely closed ventrally, and the maxillary mala is apparently articulated as it is in trogossitines. Adult Lophocaterinae are not easily separated from Peltinae and Decamerinae. The only character that could be used as a synapomorphy for lophocaterines is the strong and usually curved single apical spur on the front tibia. Decamerinae differ from Lophocaterinae by having a symmetrical 3-segmented club that is not markedly flattened. The mandibular mola and lacinial armature vary considerably in this group.

Judging from the external characters of an adult *Lycoptis americana* (Motschulsky) (BARRON 1975), this genus was correctly assigned to Lophocaterinae by CROWSON (1970). Protibia of *Lycoptis* Casey bears a single, inconspicuous straight spur on the inner-apical angle and two small spines on the outer-apical one; there are also 2-3 spines on the outer margin. All the characters listed above agree with Lophocaterinae, except that the protibial spur is more strongly reduced and straight in *Lycoptis* than it is in other Lophocaterinae. Prosternum and mesosternal structures of *Lycoptis* are extremely similar to those in *Lophocateres* Oliff, which also support this placement, although the larva would be necessary for a more definite solution.

The following genera are confirmed as belonging to Lophocaterinae: *Lophocateres* Oliff; *Grynocharis* Thomson; *Promanus* Sharp; *Grynoma* Broun; *Floricateres* Crowson and *Lycoptis* Casey.

LARINOTINAE subf. n.

Type genus: *Larinotus* Carter and Zeck, 1937

This subfamily is proposed here for three genera *Colydiopeltis* gen. n., *Parapeltis* gen. n., and *Larinotus* Carter & Zeck. This group is distinct from all subfamilies because of a lack of the tibial spurs (fig. 14) and apparently 4-segmented tarsi. Both of these characters seem to be apomorphic and may be regarded as synapomorphies for Larinotinae. Additional characters that may be synapomorphies for this group are reduced number of antennomeres and the larval abdominal tergite IX without a sclerotized plate and bearing minute, downturned urogomphi. Prior to the phylogenetic analysis of the entire family complex, the values of the characters used here to combine *Larinotus* with *Colydiopeltis* and *Parapeltis* are not certain. The two latter genera show some characters in the adult stage (larvae are unknown) that are somewhat transitional towards Protopeltinae and Lophocaterinae, and the lack of the protibial spurs may prove to be derived independently in these groups. It is also impossible now to decide how to place Larinotinae within Trogossitidae. This could not be decided without prior phylogenetic analysis of the entire complex. The Larinotinae may include two additional taxa (J. Kolibac personal communication): *Necrobiopsis* Crowson and *Lycoptis* Casey. I have examined both the genera and in my opinion these could not be included within Larinotinae. *Necrobiopsis* Crowson is apparently similar to *Larinotus* but has protibia with two unequal spurs, clearly 5-segmented tarsi; prosternal process strongly expanded apically; elongate palpi and membranous ligula, and sparsely setose dorsum, which agree with the Egoliinae. *Lycoptis* Casey probably belongs in the Lophocaterinae (see p. 443). The inclusion of these genera within Larinotinae would almost certainly make that taxon paraphyletic.

KEY TO GENERA OF LARINOTINAE

1. Body parallel-sided, subcylindrical (fig. 46); antennal club 2-segmented; antennal insertions partially exposed from above; winged [Australia] .... *Larinotus*
— Body more-or-less oval, weakly convex (fig. 1); antennal club 1-segmented; antennal insertions hidden from above; wingless 2
2. Procoxal cavities externally closed, protrochantin concealed (fig. 44); meso- and metacoxae only slightly transverse and outwardly closed (fig. 45); tarsi clearly 4-segmented (fig. 39); antennal club narrow (fig. 43) [Australia]................. *Parapeltis*
— Procoxal externally open, protrochantin exposed (fig. 9); meso- and metacoxae transverse and outwardly open (fig. 11); tarsi 5-segmented, but tarsomeres I and II partially fused (fig. 14); antennal club wide and asymmetric (fig. 4) [Thailand] .... *Colydiopeltis*

Colydiopeltis gen. n.

Type species: *Colydiopeltis burckhardti* sp. n.
Gender: neuter
Etymology: the proposed name is a combination of a prefix Colydio- with the name *Peltis* to indicate external similarities of the beetle to some Colydiidae (Synchitini) and Peltinae.

DESCRIPTION

Body short, oval (fig. 1), moderately convex, dorsum almost dull, covered by whitish encrustation; apterous; vestiture of moderately long, yellowish or whitish, squamiform setae.

Head (fig. 2) much narrower than prothorax, transverse, deflexed. Eyes small, reduced, each consisting of 10-15 coarse facets, partially covered from above by frontal extensions. Fronto-clypeal suture absent, anterior margin of clypeus straight. Labrum (fig. 7) trapezoidal, heavily sclerotized; mesal arms of tormae projecting mesally, labral rods invisible. Mandible (fig. 6) bidentate apically with well-developed prostheca and mola; molar surface feebly convex and irregularly ridged (fig. 5), with weakly elevated, crenulate bars along ridges. Maxilla (fig. 8) with broad lacinia bearing apical hook and spine on mesal edge, galea broad densely hairy apically; maxillary palps 4-segmented,

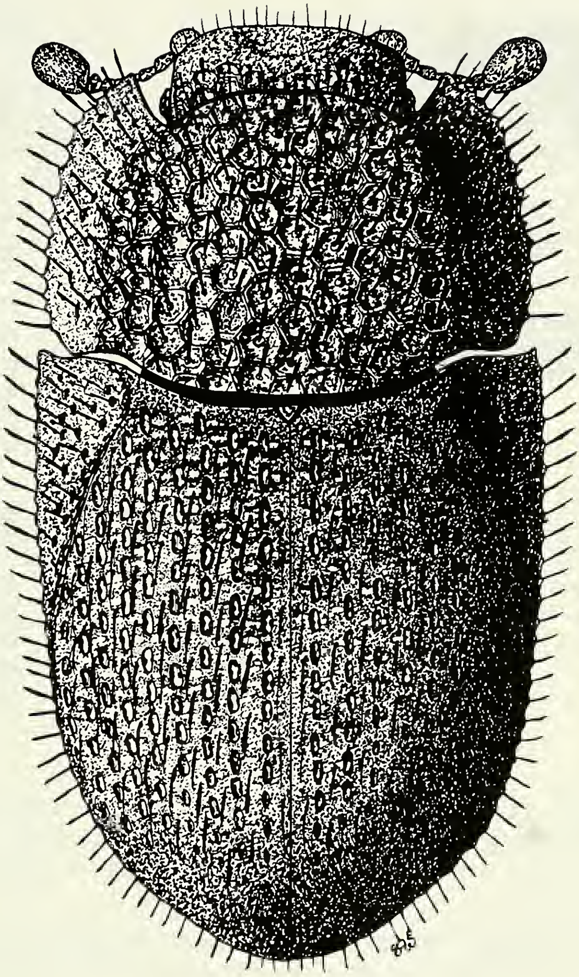
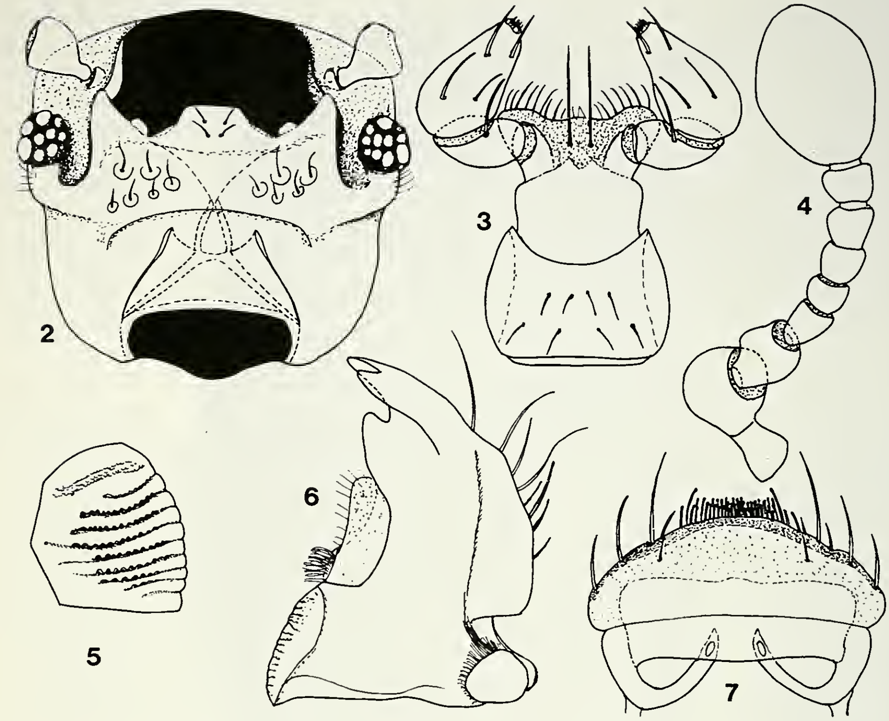


FIG. 1.

Colydiopeltis burckhardti sp. n.

terminal palpomere longest, slightly flattened with several sensilla apically. Labium (fig. 3) with mentum trapezoidal and emarginate anteriorly; ligula expanded and setose; labial palps 3-segmented; apical palpomere with 5-7 stout peg sensilla near apex. Antenna (fig. 4) short, 8-segmented with flattened, asymmetrical club, insertion not visible from above, hidden by frontal extensions. Antennal grooves on ventral face well-developed, reaching scarcely behind eyes. Pregular region with transverse impression located just behind mouth parts, extending laterally to meet temple on each side. Gular sutures scarcely visible



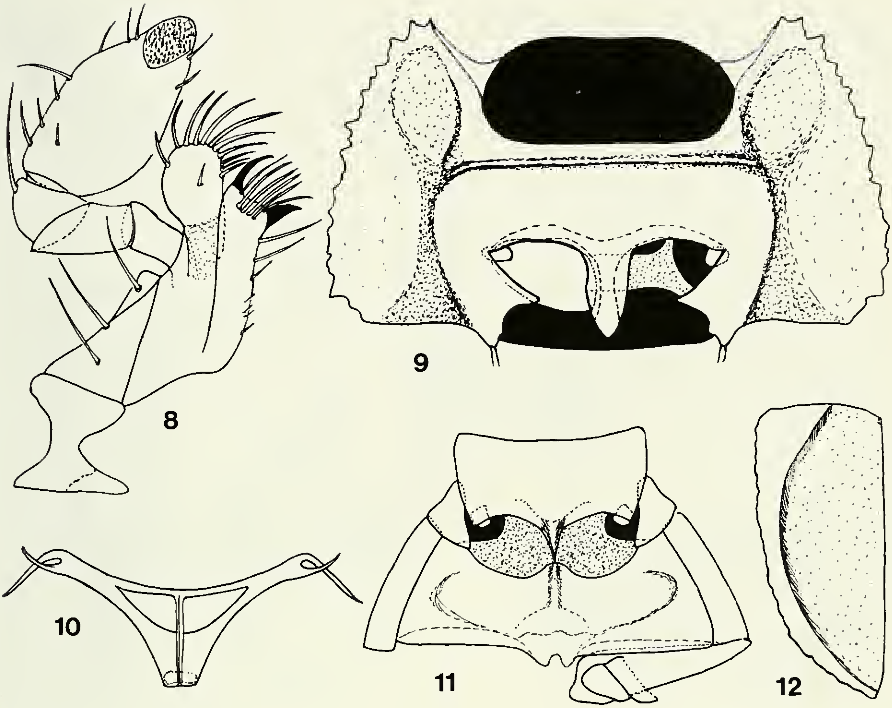
Figs 2-7.

Colydiopeltis burckhardti sp. n., adult male: 2 - head, ventral; 3 - labium, ventral; 4 - antenna; 5 - molar part of mandible, inner view; 6 - left mandible, ventral; 7 - labrum, dorsal.

(fig. 2), widely separated and converging anteriorly. Tentorium with corpotentorium narrow, almost straight; anterior arms short, converging anteriorly, each with long fine tendon.

Prothorax (fig. 9) strongly transverse with sides widely explanate; dorsal surface with irregular polygonal tubercules. Procoxae transverse with trochantin exposed, their cavities widely open externally, partially closed internally; procoxal extensions long and narrow. Prosternal process narrow, weakly pointed apically, grooved medially on dorsal surface. Transverse carina just behind anterior margin of prosternum moderately developed and extending laterally to meet concave hypomera.

Pterothorax (fig. 11). Mesosternum carinate medially between coxae; mesocoxal cavities laterally open with partially exposed trochantins, coxae transverse. Metasternum in midline as long as ventrite I, carinate anteromedially, transversely concave laterally. Hindcoxae markedly transverse, closely approximate medially, extending laterally to meet elytral epipleura. Metendosternite as in fig. 10. Legs (figs 14, 32). Trochantero-femoral attachment of normal, rather elongate type; femora swollen



FIGS 8-12.

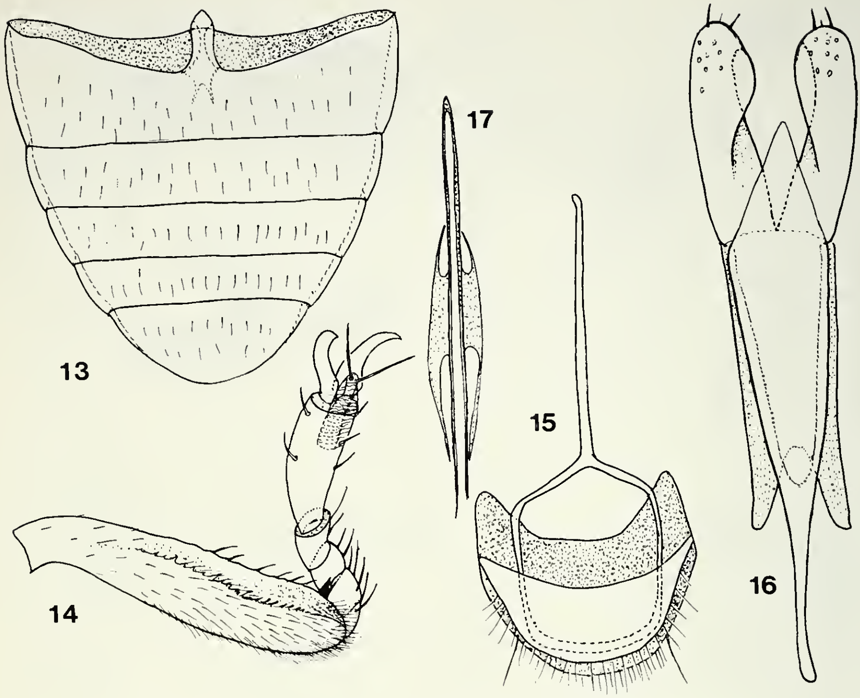
Colydiopeltis burckhardti sp. n., adult male: 8 - left maxilla, ventral; 9 - prothorax, ventral; 10 - metendosternite, dorsal; 11 - pterothorax, ventral; 12 - right elytron, ventral.

near middle; protibia with fine spines at outer edge, without articulated spurs on inner apical margin; tarsi 5-5-5, but often apparently 4-segmented because tarsomeres I and II are partially fused; empodium bisetose.

Elytra fused along suture; with complete epipleura (fig. 12), each with 9 rows of strial punctures and posthumeral impression, the edges crenulate or denticulate. Scutellum small, pentagonal.

Abdomen (fig. 13) with 5 visible, freely articulated, sternites of approximately equal length; without internal apodemes; ventrite I without femoral lines. Intercoxal process of ventrite I narrow and acuminate apically. Abdomen with 7 pairs of functional spiracles.

Aedeagus (figs 16, 41) symmetrical, of the cucujoid type; tegmen double with long Y-like ventral piece and dorsal piece laterally strengthened by rods; parameres fused or almost free and apparently articulated; median lobe narrow, elongate with paired dorsal struts. Sternite VIII and IX of male as in fig. 15. Sternite VIII of female with long, basally articulated spiculum gastrale (fig. 22); tergite VIII as in fig. 21. Ovipositor (fig. 18) with



Figs 13-17.

Colydiopeltis bruckhardti sp. n., adult male: 13 - abdomen, ventral; 14 - protibia and tarsus; 15 - abdominal tergite and sternite VIII ; 16 - aedeagus, dorsal; 17 - median lobe.

well-developed styli (fig. 19) and divided coxites. Spermatheca (fig. 20) connected to bursa by a long spermathecal accessory gland.

Distribution: Thailand.

Habitat: all known specimens have been extracted from forest litter by mass-sampling methods.

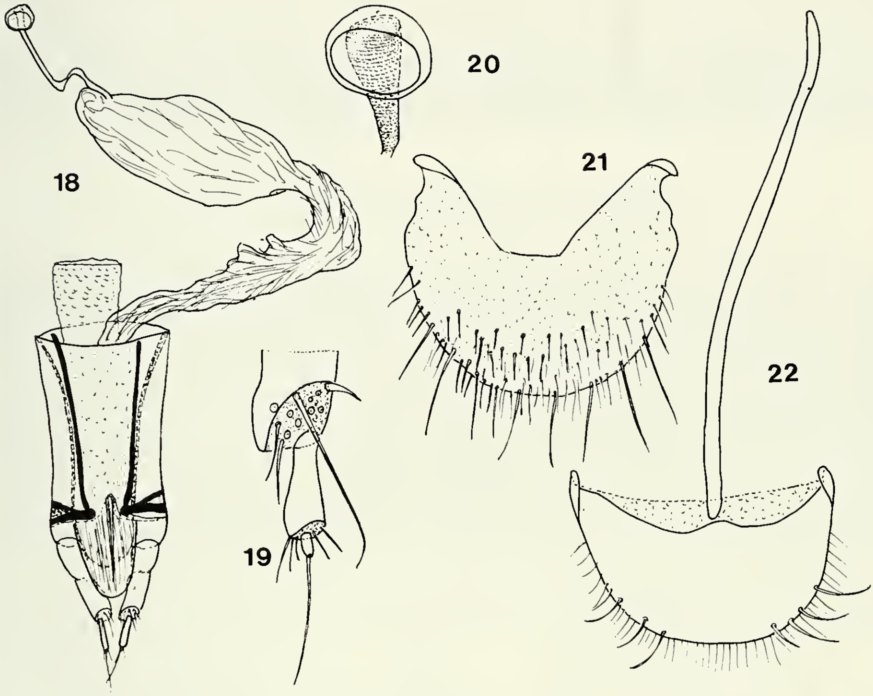
Key to the species of *Colydiopeltis*

1. Body elongate (fig. 24); elytra 2.26-2.31 x as long as wide; dorsal setae short and distinctly squamiform (fig. 27); pronotal disk in lateral portion, weakly emarginate in anterior third .... *loebli*, sp. n.

— Body broadly-oval (figs 1, 23); elytra no more than 1.18 x as long as wide; dorsal setae longer and indistinctly squamiform; pronotal disk not emarginate laterally 2

2. Dorsal setae longer, slender and acuminate apically (fig. 25); aedeagus as in fig. 16; pronotal and elytral sides almost straight; pronotal tubercles in middle part about as wide as scutellum at base ....*burckhardti*, sp. n.

— Dorsal setae shorter, widened apically, slightly squamiform (fig. 26); aedeagus as in fig. 41; pronotal and elytral sides more strongly arcuate; pronotal tubercles in middle part about 2 x as wide as scutellum at base .... *compactum*, sp. n.



FIGS 18-22.

Colydiopeltis burckhardti sp. n., adult female: 18 - female genitalia; 19 - apical coxite and stylus; 20 - spermatheca; 21 - tergite VIII, dorsal; 22 - sternite VIII, ventral.

Colydiopeltis burckhardti sp. n. (figs 1-22, 25, 35)

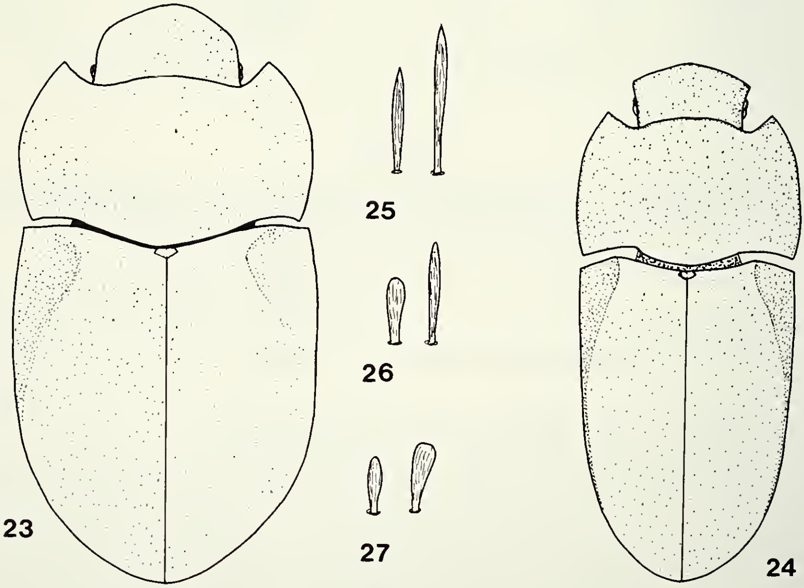
Length 1.8-1.9 mm. Reddish-brown to brown, dull; vestiture of erect, yellowish, apically pointed setae (fig. 25); setae in middle portions of pronotum and elytra of similar length and shape to those along pronotal and elytral margins. Pronotum about 0.5-0.6 x as long as wide, widest almost at base (fig. 1), arcuately narrowing anteriorly; sides widely explanate but not concave or upturned at edges that are denticulate; disk strongly convex medially, abruptly sloping towards margins; closely polygonally tuberculate, tubercles flat, each with central setigerous puncture; laterally tubercles becoming larger and more irregular, and reach almost explanate parts of pronotum; in middle part tubercles about 2 x as wide as base of scutellum. Elytra 1.1-1.2 x as long as wide, widest at humeral angles, weakly, arcuately narrowing apically, rounded at their apices; each elytron with strial punctures much smaller than pronotal tubercles, their interspaces raised and forming irregular, transverse tubercles with setigerous punctures, seta length approximately 1.1-1.5 x larger than puncture diameter. Aedeagus as in figs 16, 17.

HOLOTYPE: Thailand: Chiang Mai, Doi Inthanon, 1650 m, 7.XI.1985, D. Burckhardt & I. Löbl (MHNG).

PARATYPES, 35: same data as holotype (MHNG; IZPAN); same data but 1720 m (MHNG; IZPAN); same data but 2450 m, 4.XI.1985 (MHNG; IZPAN); same locality, 1700 m, 17.XII.1986, P. Schwendiger (MHNG); same locality, 2000 m, 2.I.1981, Deharveng & Gouze (MHNG; IZPAN); Chiang Mai, Doi Chiang Dao, 1200 m, 21.XII.1980, same collectors as above (IZPAN).

Colydiopeltis compactum sp. n. (figs 23, 26, 34, 41)

Length 1.7-2.0 mm; body broadly oval (fig. 23), brown and feebly shiny. Dorsal setae similar to *C. burckhardti* but blunt apically; those on pronotal disk distinctly squamiform and about 0.6 x as long as those along pronotal and elytral margins and on elytral disk (fig. 26). Antenna as in fig. 34. Pronotum 0.52-0.56 x as long as wide, widest near base, and arcuately narrowing anteriorly (fig. 23); disk convex medially and gradually sloping towards widely explanate sides; margins crenulate; discal tubercles as in *burckhardti* but smaller, in median part about as wide as scutellum and becoming obsolete on sloping parts and more irregular; explanate part irregularly transversely strigose or weakly channeled starting from irregular pores. Elytra 1.1-1.2 x as long as wide, and 1.95-2.0 x as long as pronotum; setae arranged on all interspaces between punctures that are only slightly convex; strial punctures about 0.5 x as large as pronotal tubercles in middle



FIGS 23-27.

Colydiopeltis spp., adult; 23, 24 - body outline; 25-27 - pronotal (left) and elytral (right) setae. 23, 26 - *C. compactum* sp. n., 24, 27 - *C. loebli* sp. n., 25 - *C. burckhardti* sp. n.

of pronotum; intervals irregular, flat; post humeral impression weaker than in *burckhardti*. Aedeagus as in fig. 41.

HOLOTYPE: Thailand: NE Bangkok, Khao Yai National Park, Khao Khieo, 1150 m, 28.XI.1985, D. Burckhardt & I. Löbl (MHNG).

PARATYPES, 125: same data as holotype (ANIC; BMNH; MHNG; IZPAN; USNM; collections of R.A. Crowson, M.A. Ivie and J. Pakaluk).

Colydiopeltis loebli sp. n. (Figs 24, 27, 32, 33)

Length 1.5-1.65 mm. Body elongate, almost parallel-sided (fig. 24); brown, feebly shiny. Dorsal setae distinctly squamiform (fig. 27); those along anterior margin of frons, pronotal and elytral sides are about 1.8 x as long as those on pronotal and elytral disk, and are narrower; setae on elytral disk visible only along intervals 1st. (apically); 5th and 8th. Antenna as in fig. 33. Pronotum 0.6 x as long as wide, widest at basal third and weakly narrowing anteriorly; disc convex medially and abruptly sloping laterally then narrowly explanate; edges crenulate; disk shallowly emarginate in anterior part, that is often obscured by an encrustation covering whole body; explanate margins narrow and irregularly transversely channeled, the channels starting from 5 large pits on a sloping part; discal tubercles irregular and about as wide as scutellum at base. Elytra 1.4 x as long as wide, and 1.25 x as long as pronotum; intervals 5th and 8th at least medially convex and setose; strial punctures 0.6-0.8 x as large as pronotal tubercles in middle part of pronotum; elytral seta length 0.5-0.7 larger diameter of strial puncture. Prosternal process comparatively narrower, reaching far behind coxae and acute apically as compared to *burckhardti* and *compactum*.

HOLOTYPE: Thailand: Phetchaburi, Kaeng Krachan National Park, 200 m, 16.XI.1985, D. Burckhardt & I. Löbl (MHNG).

PARATYPES, 45: same data as holotype (MHNG; IZPAN); same data but 450 m, 18.XI.1985 (MHNG; IZPAN); Prov. Kanchanburi, Sai Yok Nat. Park, 100 m, 21.VII.1987, P. Schwendiger (MHNG; IZPAN).

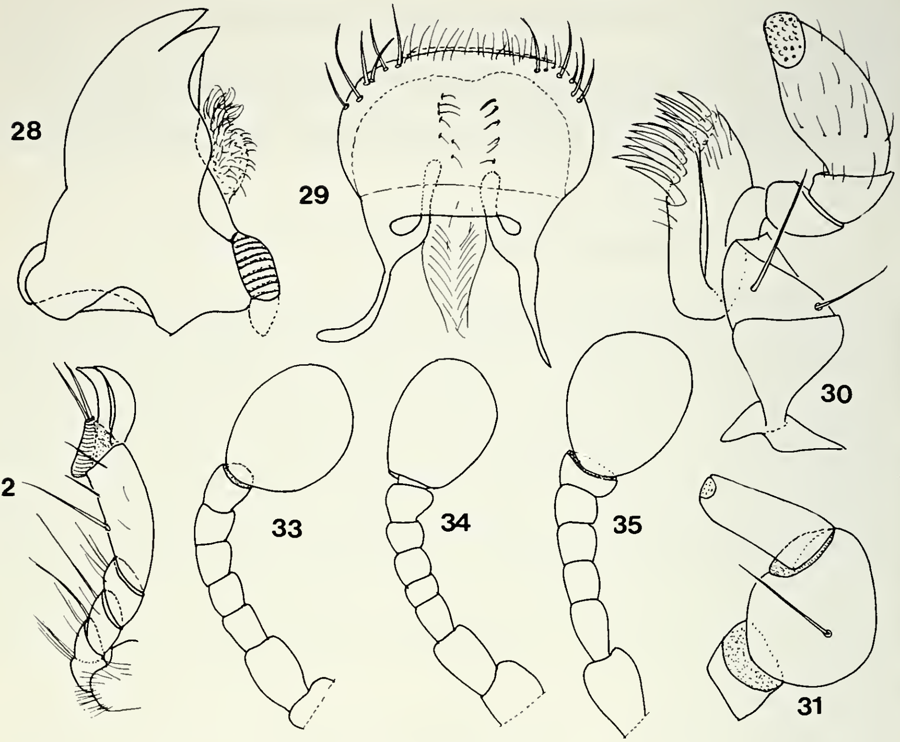
Parapeltis gen. n.

Type species: *Parapeltis australicum* sp. n.
Gender: neuter
Etymology: The proposed name should be treated as a combination of the prefix para- with the name *Peltis*.

DESCRIPTION

Body elongate-oval (fig. 36), moderately convex; apterous; surface dull; vestiture of short, yellowish squamiform setae (fig. 37).

Head (fig. 42) narrower than prothorax, transverse, weakly deflexed. Eyes small, slightly prominent. Fronto-clypeal suture absent; anterior margin of clypeus straight. Labrum (fig. 29) trapezoidal, moderately sclerotized; mesal arms of tormae projecting mesally; labral rods invisible. Mandible (fig. 28) bidentate apically with well-developed, fringed prostheca and transversely ridged mola. Maxilla (fig. 30) with broad lacinia



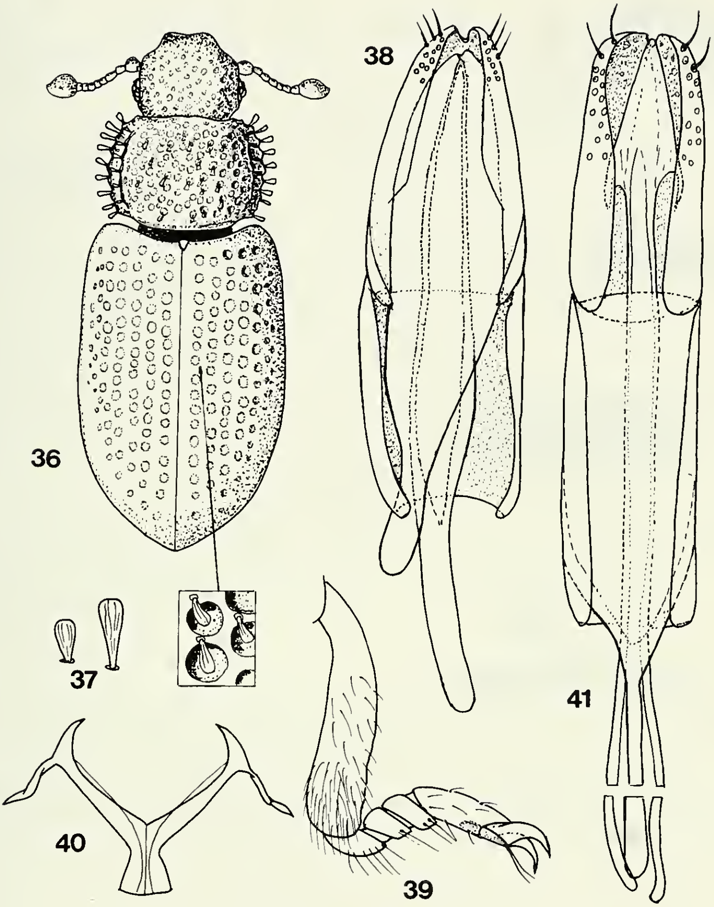
FIGS 28-35.

28-31 - *Parapeltis australicum* sp. n.; 32-33 - *Colydiopeltis loebli* sp. n., 34 - *C. compactum* sp. n., 35 - *C. bruckhardti* sp. n. 28 - left mandible, dorsal; 29 - labrum-epipharynx; 30 - right maxilla, ventral; 31 - labial palps; 32 - female tarsus; 33-35 - seven apical antennomeres.

bearing apical indistinct hook and several spines on inner face. Labium very similar to *Colydiopeltis*. Antenna (fig. 43) 8-segmented with insertion concealed from above. Antennal groove on ventral side reaching far behind posterior margin of eye. Tentorium, pregular impressions and gular sutures (fig. 42) as in *Colydiopeltis*.

Prothorax (fig. 44) transverse, sides feebly explanate, the edges crenulate; dorsal surface irregularly tuberculate, setose. Procoxae transverse, trochantin concealed; procoxal cavities closed externally, internally open. Prosternal process almost parallel-sided, truncate apically. Transverse carina behind anterior margin of prosternum weak but present. Hypomera weakly concave.

Pterothorax (fig. 45). Mesosternum weakly carinate medially between coxae, mesocoxal process very narrow; mesocoxal cavities outwardly open; mesotrochantin not exposed. Metasternum in midline as long as ventrite I. Hindcoxae weakly transverse, only slightly wider than midcoxae; metepisterna unusually wide, jointly almost as wide as metasternum, anteriorly fused to the sternum. Metendosternite as in fig. 40. Legs (fig. 39) with trochanter elongate; femora slightly swollen; protibia without apical spurs, finely crenulate at outer edge; tarsi 4-segmented; bisetose empodium present.



Figs 36-41.

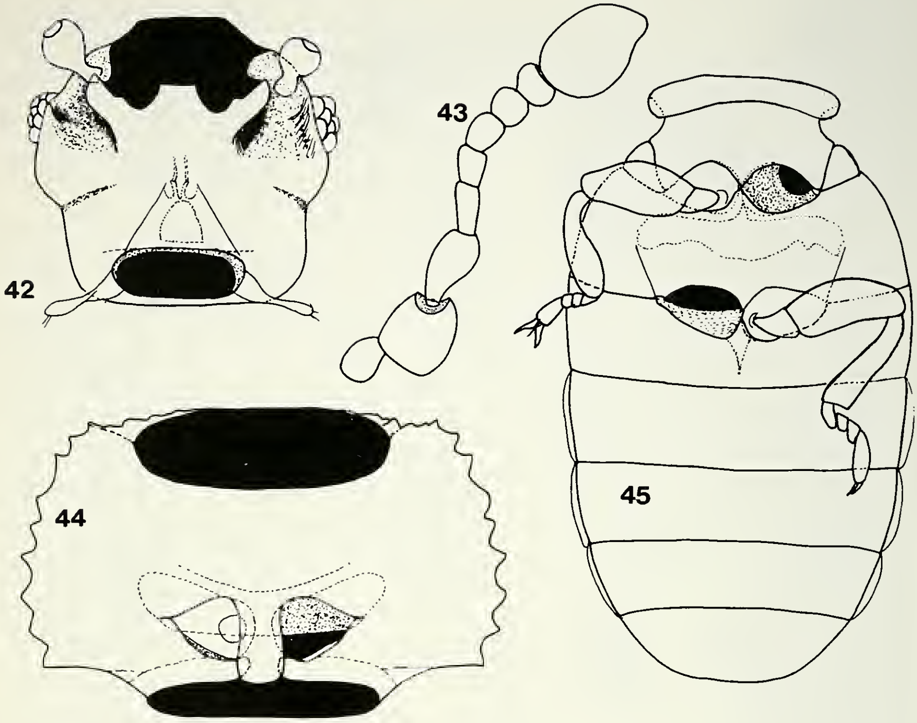
36-40 - *Parapeltis australicum* sp. n.; 41 - *Colydiopeltis compactum* sp. n. 36 - body outline; 37 - pronotal (left) and elytral (right) setae; 38 - aedeagus, dorsal; 39 - protibia and tarsus; 40 - metendosternite, dorsal; 41 - aedeagus, dorsal.

Elytron with epipleural keel narrow but complete; dorsal side with 9 rows of strial punctures; posthumeral impression weak. Scutellum pentagonal.

Abdomen (fig. 45) with 5 visible sternites of approximately equal length, freely articulated and without internal apodemes. Intercoxal process of ventrite I narrow and acute apically. 7 pairs of functional spiracles.

Aedeagus, and associated terminalia as in *Colydiopeltis* (fig. 38). Ovipositor not examined.

Distribution: Australia (Queensland).



FIGS 42-45.

Parapeltis australicum sp. n., adult, male: 42 - head, ventral; 43 - antenna; 44 - prothorax, ventral; 45 - pterothorax and abdomen, ventral.

Parapeltis australicum sp. n. (Figs 28-31, 36-40, 42-45)

Length 1.2 mm. Body reddish-brown to brown; vestitute of yellowish outstanding squamiform setae (fig. 37), setae on elytral and pronotal margins comparatively 2 x longer than those on dorsum. Pronotum 0.6 x as long as wide, widest before middle, arcuately narrowing anteriorly and posteriorly; sides explanate but not concave or upturned at edges, the edges faintly denticulate. Disk convex medially, with weakly raised paramarginal carina on each side and shallow longitudinal impression on inner side of the carinae; surface irregularly punctate and setose. Elytra 1.4 x as long as wide, and 2.7 x as long as pronotum, widest near middle, arcuately narrowing apically; lateral margins invisible from above except for posthumeral part. Each elytron with 9 rows of punctures, strial punctures markedly larger than pronotal punctures, longitudinally separated by about 0.5 their diameter; setae on intervals almost as long as puncture diameter; intervals flat. Aedeagus as in fig. 38.

HOLOTYPE: Australia, Queensland, Brisbane, Mt. Coottha, 8.VIII.1966, R.A. Crowson; from damp gully, leaf litter in mainly *Eucalyptus* woodland (ANIC).

PARATYPES: 8, same data as holotype (ANIC, MHNG, IZPAN, R.A. Crowson, col.); 82, QLD: 15.29S 145.16 E, Mt. Cook Nat. Park, 10-12.V.1981, A. Calder & J. Feehan, berlesate ANIC 731, rain forest litter (ANIC; IZPAN).

Larinotus Carter and Zeck

Larinotus Carter & Zeck, 1937: 186. Type species, by monotypy: *Larinotus umblicatus* Carter & Zeck, 1937.

Nebophilus Crowson, 1970: 14. Type species, by original designation: *Nebophilus hirsutus* Crowson, 1970. – Synonymized by Lawrence 1980: 307.

This genus differs from both *Parapeltis* and *Colydiopeltis* by its cylindrical body (fig. 46), antennal insertions almost exposed from above and the antennal club 2-segmented. Adults and larvae of *L. umblicatus* have been found in rotten wood beneath resupinate fungi and in fungusy bark sample. Adult characteristics (figs 46-51) are provided by CARTER & ZECK (1937) and by CROWSON (1970). As supplementary information it should be added that the antennal club is not completely divided medially (fig. 49); the lacinial apical hook is bifid (fig. 48) and the membranous ligula is absent (fig. 47). Adults of this species are very similar to *Necrobiopsis* Crowson (Egoliinae), but in the latter genus the protibia has well-developed spurs on its outer-apical edge, the ligula is membranous, the prosternal process is strongly expanded and dorsal setae are stiff and sparse.

Distribution: Australia (Queensland).

DESCRIPTION OF LARVA:

Measurements (in mm): Length 5.8; head length 0.49, width 0.68; prothorax length 0.32, width 0.80; mesothorax length 0.38, width 1.1; metathorax length 0.40, width 1.18.

Body elongate, subcylindrical, slightly bent in middle (fig. 52); color white, head capsule and tips of urogomphi well sclerotized, brown; dorsal and ventral sclerotized plates absent; abdominal tergites I-VIII with dorsal ampullae (fig. 53); vestiture consisting of sparse, moderately long, simple setae. Spiracles annular-biforous (figs. 54-55) situated laterally on mesothorax and abdominal segments I-VIII, with bicameral air tubes directed dorsally.

Head: Head capsule about 0.7 x as long as wide, ventrally open; each side with 5 stemmata arranged as in fig. 52. Epicranial stem short, with long single median endocarina (fig. 59), reaching forwardly to the clypeus; frontal arms almost straight, joined basally to epicranial stem. Antenna (fig. 60) short and partially retraced; relative length of antennomeres I:II:III as 11:9:16; conical sensory appendage situated laterally to antennomere III, and about 0.8 x as long as that segment. Fronto-clypeal suture entire, but weak; clypeus bearing median anterior shallow emargination filled by small labrum. Labrum with 4 long setae on each side and several sensilla arranged as in fig. 58, additional pair of sensilla situated on epipharynx far below labral tormae in middle. Mandibles (fig. 61) stout and meeting at base; apex bidentate; mola absent; lacinia mandibularis represented by two posteriorly directed spines. Ventral mouth-parts protracted. Maxillary cardo markedly transverse; stipes about 3 x as long as cardo; mala bearing inner basal sclerite, that is not clearly articulated ventrally (fig. 63); maxillary palps 3-segmented borne on large palpiger, last palpomere with single peg-like seta; maxillary articulating area absent. Labium with prementum at base at least as wide as maxillary cardo, narrowing apically; labial palps 2-segmented. Hypopharynx (fig. 57) simple, sclerotized, consists of anteriorly emarginate and markedly narrowing posteriorly

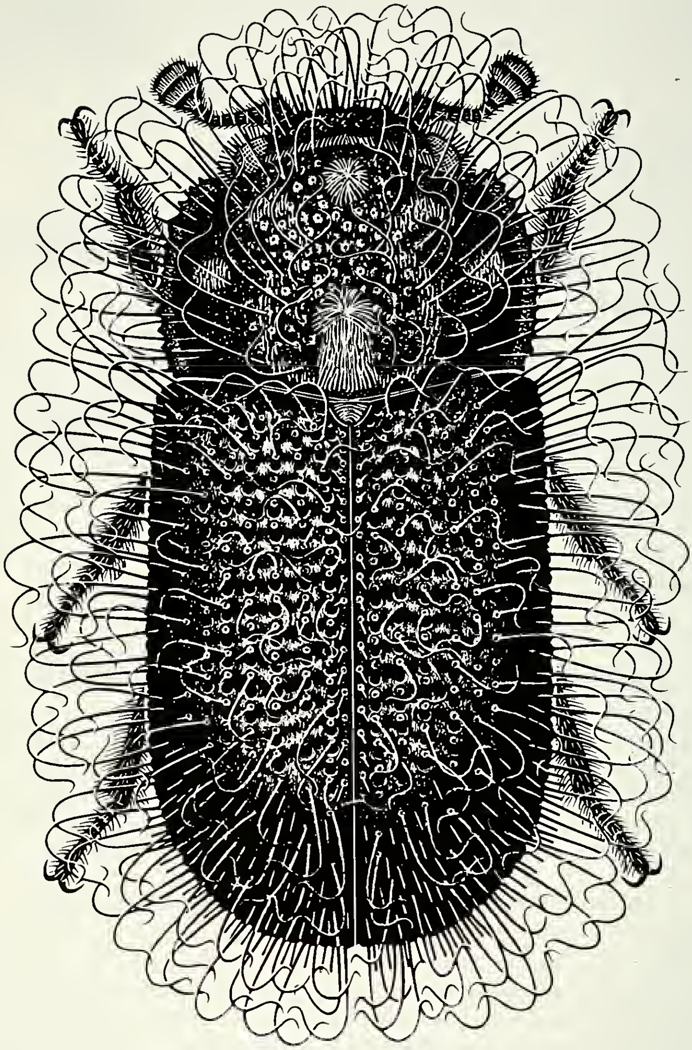
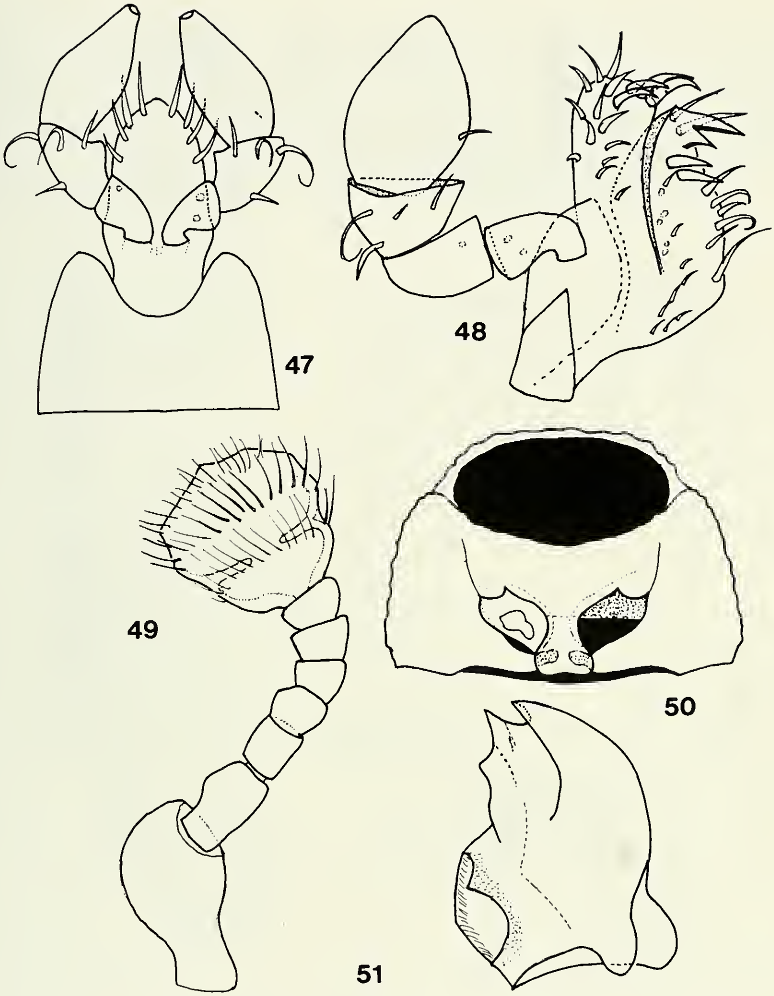


FIG. 46.

Larinotus umblicatus Carter & Zeck.

plate that is fixed to the hypopharyngeal bar, and bearing several small anteriorly directed denticles in medial part. Hypostomal rods moderately long, divergent posteriorly.

Thoracic segments without dorsal ampullae or sclerotized areas. Legs relatively short, widely separated, with tarsungulus bearing single seta (fig. 62). Abdominal tergite IX without sclerotized plate, shallowly concave and bearing two downturned urogomphi

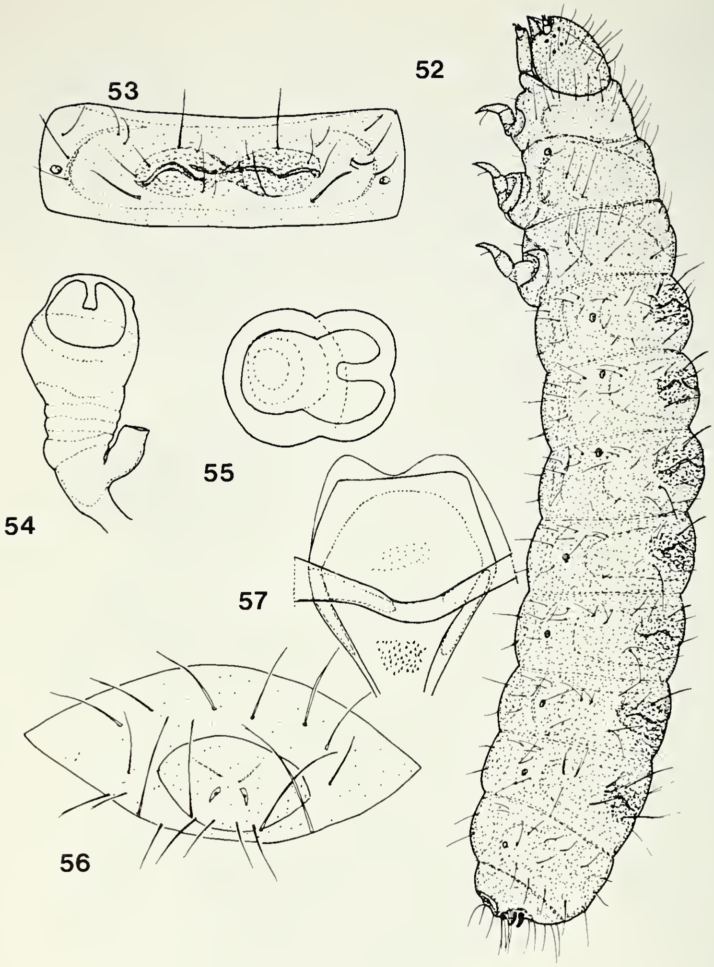


FIGS 47-51.

Larinotus umblicatus Carter & Zeck, adult, female: 47 - labium, ventral; 48 - right maxilla, dorsal; 49 - antenna; 50 - prothorax, ventral; 51 - left mandible, ventral.

(figs 52, 56); segment X almost circular, small and posteroventral. Chaetotaxy of abdominal tergites as in fig. 53.

Material examined: 2 larvae: AUSTRALIA: N. Queensland, 11 km N. of Daintree River Ferry, 11 December 1982, J. Doyen. In rotten wood beneath resupinate fungi.



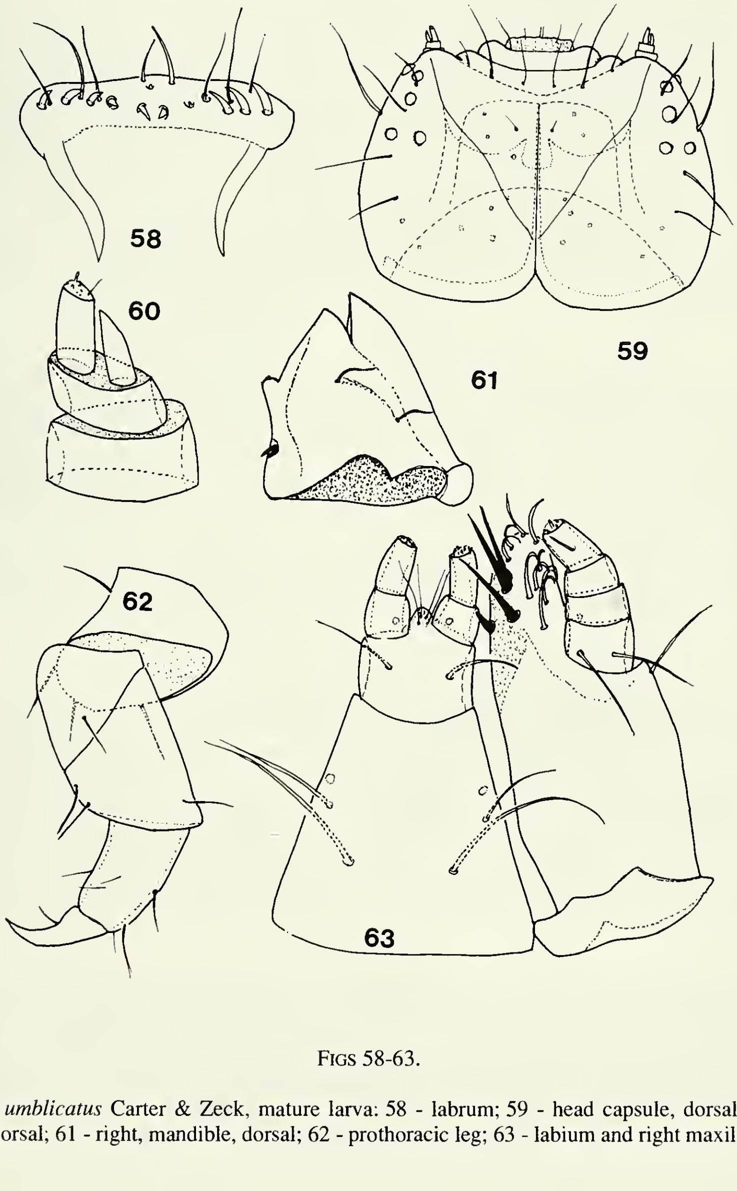
Figs 52-57.

Larinotus umblicatus Carter & Zeck, mature larva: 52 - lateral view; 53 - abdominal tergite I; 54, 55 - 1st. abdominal spiracle; 56 - abdominal terga VIII, IX, dorsal; 57 - hypopharynx, ventral.

The *Larinotus* larva described above differs from Egoliinae (figs 59-65), and Trogossitinae by having the head capsule ventrally open, the maxillary mala without an articulated sclerite and tergite IX without a sclerotized plate and bearing only minute downturned urogomphi. *Larinotus* larvae differ from the larvae of Peltinae, Protopeltinae and Calitinae because of the IX abdominal tergite lacking a sclerotized plate, reduced urogomphi, and the head has a complete median endocarina combined with almost straight frontal sutures.

The ventrally open head capsule and 5 stemmata on each side preclude derivation of this larval type from that of Egoliinae, where this genus was placed by Crowson (1970).

Among closely related taxa the entire median endocarina is present only in the larva of *Protopeltis viridescens* (Broun) (Crowson 1964), and supposed larva of Rentoniinae (Crowson 1966). The Rentoniinae larva has 2-segmented maxillary palps and peculiar urogomphi on a common base, while the larva of *Protopeltis* has strongly sclerotized tergite IX bearing hooked urogomphi. If the occurrence of a median endocarina, as postulated here, is a basic character for Cleroidea, there is no character to support the close relationship between *Larinotus*, *Protopeltis* and the supposed Rentoniinae larva.



Figs 58-63.

Larinotus umblicatus Carter & Zeck, mature larva: 58 - labrum; 59 - head capsule, dorsal; 60 - left antenna, dorsal; 61 - right, mandible, dorsal; 62 - prothoracic leg; 63 - labium and right maxilla, dorsal.

PROTOPELTINAE

This subfamily includes only *Protopeltis* Crowson (1964) with two species from New Zealand. Crowson originally attributed this genus to Peltinae, then moved it to Rentoniinae (1966), and finally elevated it to a subfamily in 1970. The status of this genus is unclear. Larval characters suggest this is close to Rentoniinae and Larinotinae, while adult structures are more or less intermediate between Lophocaterinae, Decamerinae and Peltinae.

DECAMERINAE

This exclusively New World subfamily includes three genera from Central America and Chile. The subfamily was outlined by CROWSON (1964), and BARRON'S (1971) inclusion of Decamerinae within Peltinae is not accepted here. Adults of Decamerinae differ from Peltinae having the mandibular mola closely tuberculate, the maxillary lacinia not bearing an apical hook, and their floricolous habits. *Ernoxya* Reitter (= *Ostomodes* Reitter) will be removed from Decamerinae to Lophocatherinae basing on its larva associated with adults by John Doyen (J.F. Lawrence, personal communication).

The following genera are included (key see CROWSON 1964): *Antixoon* Gorham; *Decamerus* Solier (= *Peltostoma* Reitter) and *Diontolobus* Solier (= *Micropeltis* Redtenbacher).

RENTONIINAE

CROWSON (1966) proposed this subfamily for minute clambid-like beetles from New Zealand and subsequently (1970) added species from Australia and Chile. The general appearance of these beetles is very odd and they are immediately separated from all other subfamilies of Trogossitidae. The systematic position of this group requires additional research and associated larvae. The undescribed forms are widely distributed in southern South America (up to Brazil), Australia, New Zealand and New Caledonia (I. Löbl and S.A. Slipinski, unpublished).

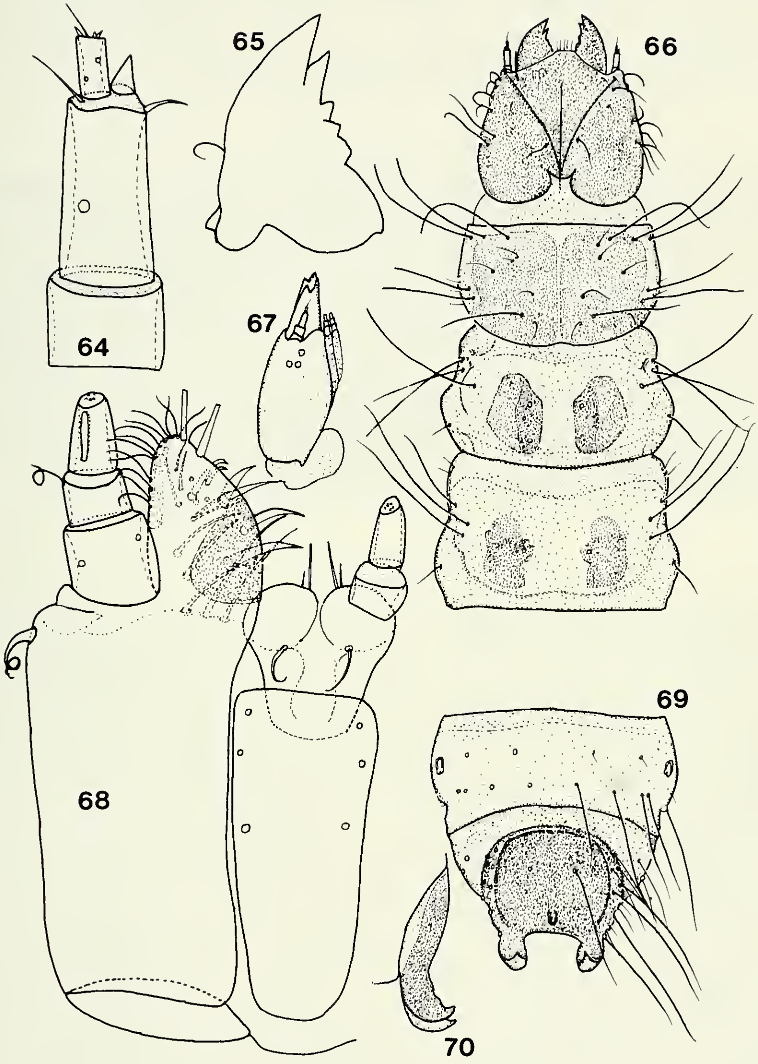
The following genera are included: *Australiodes* Endrödy-Younga; *Rentonellum* Crowson; *Rentonium* Crowson; *Rentoniidium* Crowson and *Parentonium* Crowson.

CALITINAE

This subfamily consists a single genus, *Calitys* Thomson, distributed in the Holarctic. Two species from Africa were attributed to this genus, but this needs confirmation. *Calitys* has been classified as a peltid as well as a trogossitid because of its externally closed procoxal cavities and broadly-oval, peltid-like body. The larva of *Calitys* (BÖVING & CRAIGHEAD 1931, CROWSON 1964) shares a ventrally open head capsule and unarticulated mala with Peltinae and Protopeltinae. It differs from Peltinae in having well-developed median endocarina and sinuate frontal sutures, and from *Protopeltis* because of apically divided urogomphi, and abdominal terga VI-VIII without lateral pigmented sclerotisations.

EGOLIINAE

This group corresponds with CROWSON'S (1970) definition, and comprises four south temperate genera (Chile, Australia). *Larinotus* Carter & Zeck (= *Nebophilus* Crowson), is moved to Larinotinae. This subfamily occupies a somewhat intermediate position between Peltinae and Trogossitinae. The larval structures (figs 64-70) are clearly trogossitid-like, with very long stipes and a markedly transverse cardo, the mala bearing a basal articulated sclerite, and the head capsule ventrally closed, with hypostomal rods subparallel and



FIGS 64-70.

Egoliinae larva from Tasmania, Lake St. Clair, 25-27 Jan. 1980, J.F. Lawrence & T. Weir, under bark and in rotten logs: 64 - right antenna, dorsal; 65 - right mandible, ventral; 66 - head and thorax dorsal; 67 - head lateral; 68 - labium and right maxilla, ventral; 69 - abdominal tergites VIII-IX, dorsal; 70 - urogomphi lateral (setae omited).

extending almost to head posterior edge. Adults share with trogossitids two apical spurs on the protibia, externally closed procoxal cavities and narrowly elongate body. Because the adult mandible has a distinct molar, Egoliinae were placed in Peltidae by CROWSON (1964).

The following genera are classified in Egoliinae: *Egolia* Erichson; *Acalanthis* Erichson; *Necrobiopsis* Crowson, and *Paracalanthis* Crowson.

TROGOSSITINAE

This is the largest and most diverse subfamily, and most of its species are found in tropical regions. Adults are characterized by the front coxal cavities externally closed with the prosternal process wide and expanded apically, the mesocoxal cavities externally widely open, the antennal club asymmetrical and the mandible without a molar. Larvae of Trogossitinae (BÖVING & CRAIGHEAD 1931; NIKITSKY 1974; MAMAEV et al. 1977), because of the ventrally closed head capsule, the elongate stipes and markedly transverse cardo, and mala apparently articulated, are very similar to Egoliinae. Trogossitinae larvae differ from Egoliinae in having 6 instead of 3 stemmata and the sclerite on tergite IX unbordered. From a phylogenetic point of view Egoliinae and Trogossitinae may constitute sister taxa.

Genera examined: *Acrops* Dalman; *Airora* Reitter; *Corticotomus* Sharp; *Cylindrella* Sharp; *Gymnochila* Erichson; *Leperina* Erichson; *Melambia* Erichson; *Nemosoma* Latreille; *Phanodesta* Reitter; *Temnoscheila* Westwood; *Tenebroides* Piller & Mitterpacher.

ACKNOWLEDGMENTS

Drs. Roy A. Crowson (Glasgow University), Ivan Löbl (Muséum d'Histoire Naturelle, Geneva - MHNG), Michael A. Ivie (Montana State University) and John F. Lawrence (Australian National Insect Collection, Canberra - ANIC) are acknowledged for providing adults and larvae for this study. I thank R.A. Crowson, M.A. Ivie, J. Littlefield, J. Kolibac, J. Pakaluk and C. Seibert for critically reading this manuscript and providing valuable comments and suggestions. Special thanks go to Roy A. Crowson for sharing his extensive knowledge of Cleroidea and for many hours of interesting discussions. The keys to larval and adult families of Cleroidea are largely based on drafts provided by R. Crowson, who initially was co-author of this paper, but withdrew because of disagreement with ideas presented here.

None the less I am deeply indebted to Dr. R. Crowson for stimulating discussion of these beetles; any errors of fact or interpretation are, of course, my own. The illustration of *Larinotus umblicatus* (Carter & Zeck) by Sybil Monteith was provided by John F. Lawrence. I thank Peter Hammond and Malcolm Kerley (The Natural History Museum, London - BMNH) for their assistance during my visits to their Institution. Duplicates of the specimens studied are retained in the collection of the Institute of Zoology, PAS, Warsaw (IZPAN). Some paratypes are also deposited in the collection of the Smithsonian Institution, Washington, D.C. (USNM) and private collections of R. A. Crowson, M.A. Ivie and J. Pakaluk. This is contribution J-2701 of the Montana Agricultural Experimental Station.

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REVUE SUISSE DE ZOOLOGIE

Tome 99 — Fascicule 2

REVUE SUISSE DE ZOOLOGIE

Volume 99 — Number 2

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1889b. Note sur quelques Héliozoaires. *Archs. Sci. phys. nat. Genève* (3) 22:524-539.
MERTENS, R. und H. WERMUTH. 1960. Die Amphibien und Reptilien Europas. *Kramer. Frankfurt am Main*, XI+264 pp.

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