REVUE SUISSE

DE

ZOOLOGIE

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ANNALES

DE LA

SOCIÉTÉ SUISSE DE ZOOLOGIE

ET DU

MUSÉUM D'HISTOIRE NATURELLE
DE LA VILLE DE GENÈVE

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Comité de lecture

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

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

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

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Revue suisse de Zoologie 108 (1): 3-10; mars 2001

Un *Abraeus* Leach nouveau du Japon (Coleoptera, Histeridae)

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[2] The Hokkaido University Museum, Hokkaido University,
(N10, W8, Sapporo), 060-0810 Japan.

A new species of *Abraeus* Leach from Japan (Coleoptera, Histeridae). - *Abraeus (Abraeus) loebli* sp. n. is described from Japan.

Mots-clés: Coleoptera - Histeridae - *Abraeus* Leach - espèce nouvelle - Japon.

Dans un petit lot d'Histeridae, envoyé récemment pour étude par notre ami commun S. Mazur, se trouvait un exemplaire unique (en assez mauvais état) d'un *Abraeus (Abraeus)* sp. récolté au Japon en 1980 par I. Löbl (Genève).

Cet individu, s'ajoute en fait à une petite série de trois autres exemplaires déjà isolés localement par l'un d'entre nous (M. Ô.) et considérés comme appartenant à une espèce nouvelle dont nous donnons ci-dessous la description:

Abraeus (Abraeus) loebli sp. n. Figs 1-17

Holotype ♂: Hirayama, Shirataki-mura, Hokkaido, Japan, 20.VII. to 5.VIII. 1993, S. Hori leg., conservé au SEHU (Systematic Entomology, Hokkaido University) Sapporo, Japon.

Paratypes: (Japon: Hokkaido). 1 ♂, Hirayama, Shirataki-mura, 9 to 20.VII.1993, S. Hori leg. (Collection Y. Gomy). 1 ♀, Jyozankei, Sapporo, 16.VII.1988, M. Ôhara leg. (SEHU).

(Japon: Honshu).1 ♀, Nikko National Park, Konsei pass, 1500 m. Gumma pref., 15.VII.1980, I. Löbl leg. (Muséum d'histoire naturelle de la Ville de Genève, Suisse).

Description: (réalisée à partir de l'exemplaire paratype ♀ conservé au Muséum de Genève).

Espèce qui se distingue immédiatement des autres espèces eurasiatiques d' *Abraeus* (s.str.) par sa forme (Figs 1 et 2), beaucoup plus ovalaire et par un dimorphisme sexuel spectaculaire (Figs 4 et 9), non encore signalé dans le genre.

Corps ovalaire comme chez les espèces du genre *Anapleus* Horn (nettement moins arrondi que chez les autres espèces), modérément convexe. Brun foncé, brillant sur le disque. Pattes, scapes et funicules antennaires sensiblement de la même couleur, massues éclaircies par une dense et fine pubescence dorée. Scape long, renflé en massue et finement ponctué; premier article du funicule environ deux fois plus long

Manuscrit accepté le 16.10.2000

que large, second article environ trois fois plus long que large, les 5 autres articles petits et réguliers, ne s'élargissant pas vers la massue.

Tête de taille normale (Fig. 6). Front légèrement convexe, à ponctuation dense (points séparés par 1/2 à 1 de leurs diamètres environ), plus claisemée sur le disque frontal. Encoches d'insertion antennaire très légèrement surélevées. Epistome convexe, sans séparation visible avec le front, à ponctuation peu nette, se perdant dans un dense réseau alutacé. Yeux peu bombés, peu visibles de dessus, se dégageant en arête tranchante et aiguë antérieurement.

Pronotum (Figs 1 et 2) deux fois plus large que long à la base (1,20 mm / 0,60 mm); convexe, caractérisé par un dense réseau alutacé sur la moitié antérieure et les côtés, seul le disque apparaît comme brillant, la ponctuation y est dense et assez régulière (points séparés par 1/2 à 1 de leurs diamètres environ), se renforçant légèrement vers la base. Bords latéraux très enveloppants, en nette position épipleurale. L'arête externe est sinueuse, l'arête interne (strie marginale) largement bisinuée, renforcée en gouttière finissant en angle très aigu au sommet. Le bord antérieur du pronotum n'est donc pas marginé. Base en arc large et bisinué, à peine entaillée par quelques petits points mais caractérisée par son centre nettement rétro-angulé, prenant presque la place du scutellum qui est lui-même très peu visible.

Elytres (Figs 1 et 2) pris ensemble convexes, plus larges aux épaules que longs au milieu (1,33 mm / 1,15 mm); bourrelet latéral peu sensible, très émoussé; ponctuation dense, plus grosse que celle du pronotum mais avec la même disposition; le dense réseau alutacé réapparaît dans le tiers sommital et masque un peu une partie de la ponctuation. On note la présence de 3 ou 4 strioles élytrales obliques, mal définies dont l'interne, plus nette, au centre de l'élytre, atteint la base. Epipleures non striés, à ponctuation dense et parfois confluente formant de courtes strioles obliques.

Propygidium (Fig. 11) très densément alutacé masquant une ponctuation plus ou moins régulière, un peu plus espacée que sur les élytres. Pygidium (Fig. 11) très finement mais très densément ponctué; la ponctuation parfois confluente dans la région sommitale.

Lobe prosternal absent (Fig. 4). Très courte mentonnière trapézoïdale nettement rebordée, bombée au milieu, grossièrement ponctuée sur fond alutacé. Prosternum (fig. 4) proprement dit indifférencié de la mentonnière, avec des stries prosternales basales, obsolètes, courtes, peu visibles et légèrement divergentes; avec une ponctuation semblable à celle de la mentonnière sur fond alutacé. Mésosternum (Fig. 4) subtriangulaire, bien caractérisé par son large lobe émoussé pénétrant dans la base du prosternum; strie marginale à peine visible seulement sur les côtés; ponctuation forte et dense, régulièrement disposée. Suture méso-métasternale peu visible, rembrunie, sans ligne ponctuée crénelée. Métasternum (Fig. 4) avec une fine ligne longitudinale peu visible, à ponctuation forte, régulière et très dense (points sub-tangents). Strie métasternale latérale (Fig. 10), courte, peu visible, limitée au tronçon interne, soulignée par des gros points peu différents de ceux du métasternum. Plaque métapostcoxale avec le même type de points que le métasternum (Fig. 10).

Tibias antérieurs très caractérisés (Figs 7 et 8), dilatés en larges palettes triangulaires dont les bords externes portent de courtes épines. Tibias intermédiaires et

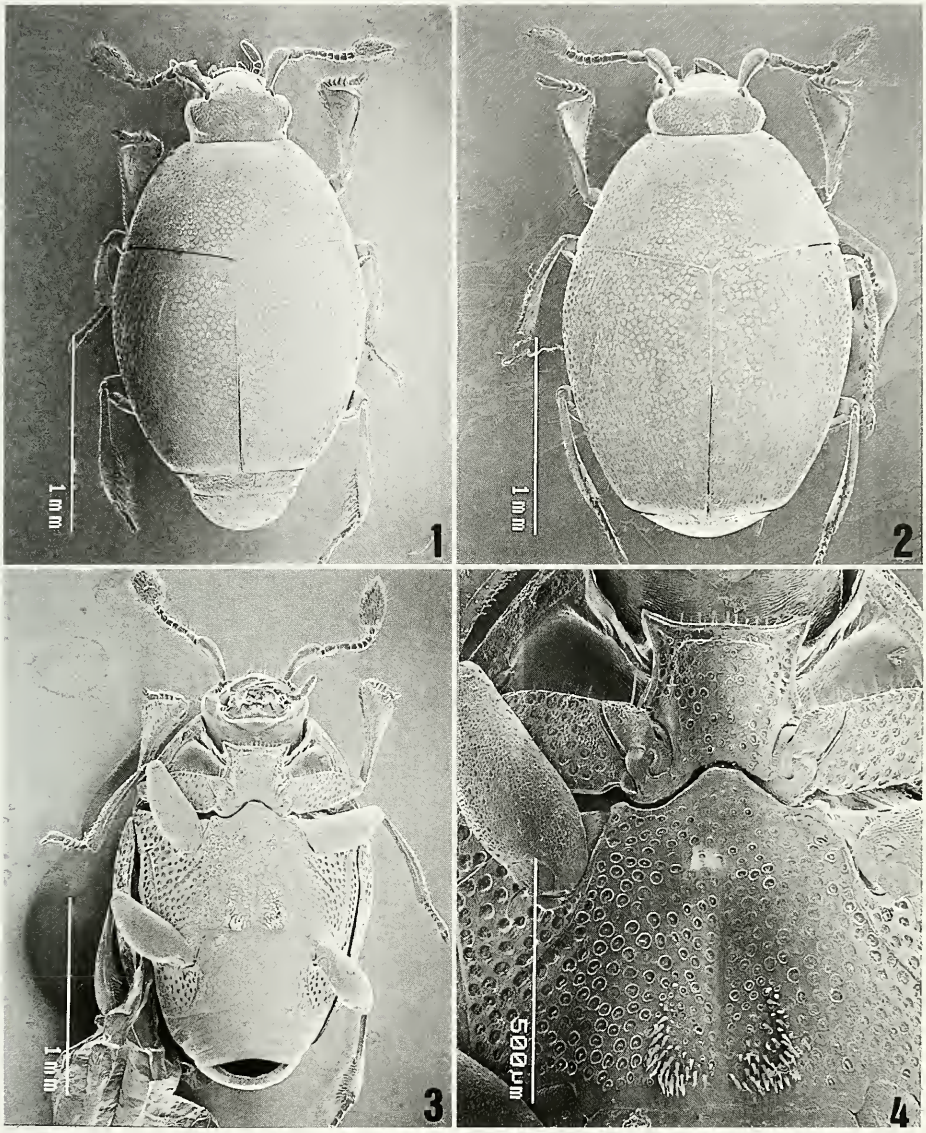

PLANCHE 1

1.- Adulte, vue dorsale. Holotype ♂; 2.- *idem*, ♀; 3.- Adulte, vue ventrale, ♂; 4.- Prosternum et méso-métasternum, vue ventrale, ♂.

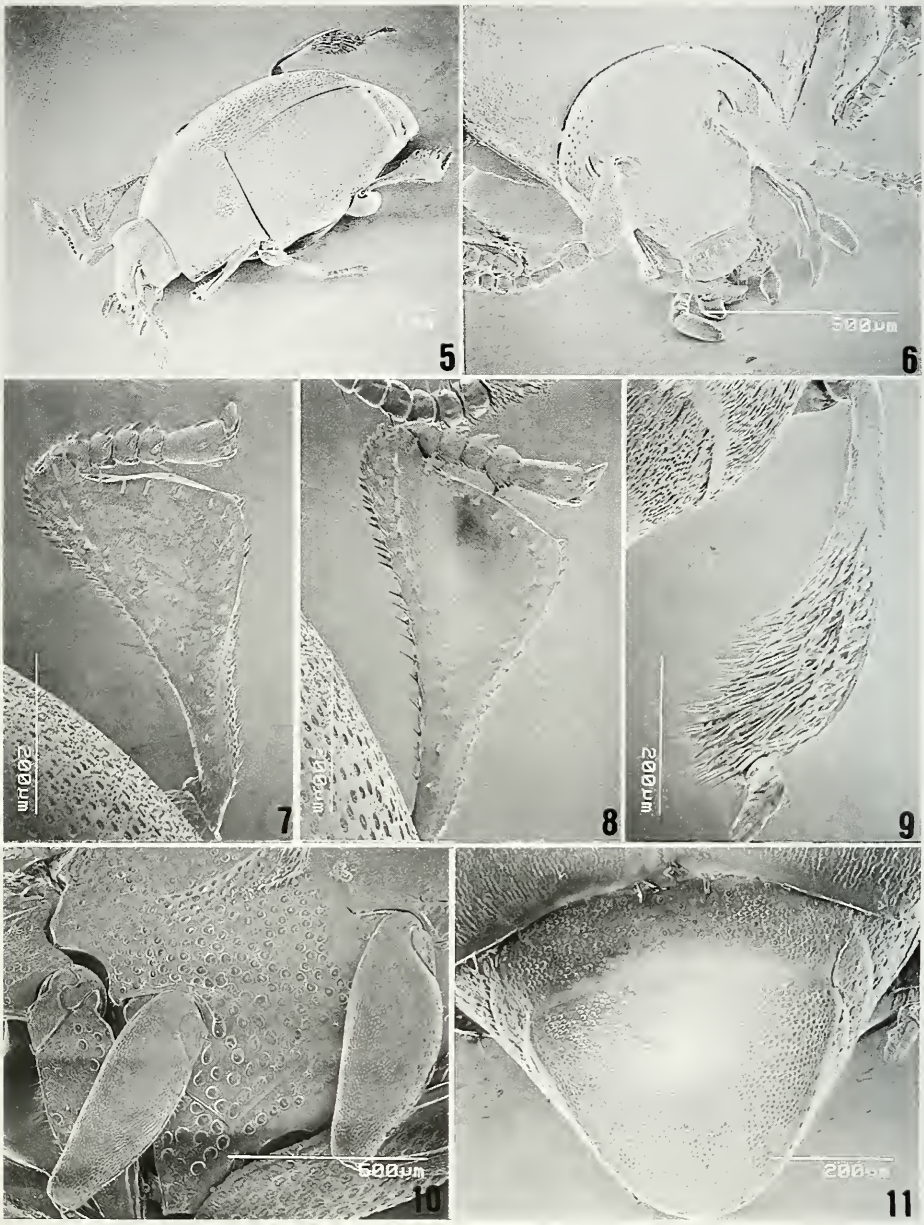

PLANCHE 2

5.- Adulte, vue oblique. Holotype ♂; 6.- Tête, vue frontale, ♂; 7.- Protibia, vue dorsale, ♂; 8.- *idem*, ♀; 9.- Métatibia, vue dorsale, ♂; 10.- région latérale du disque du métasternum, vue oblique, ♂; 11.- Propygidium et pygidium, vue caudale, ♂.

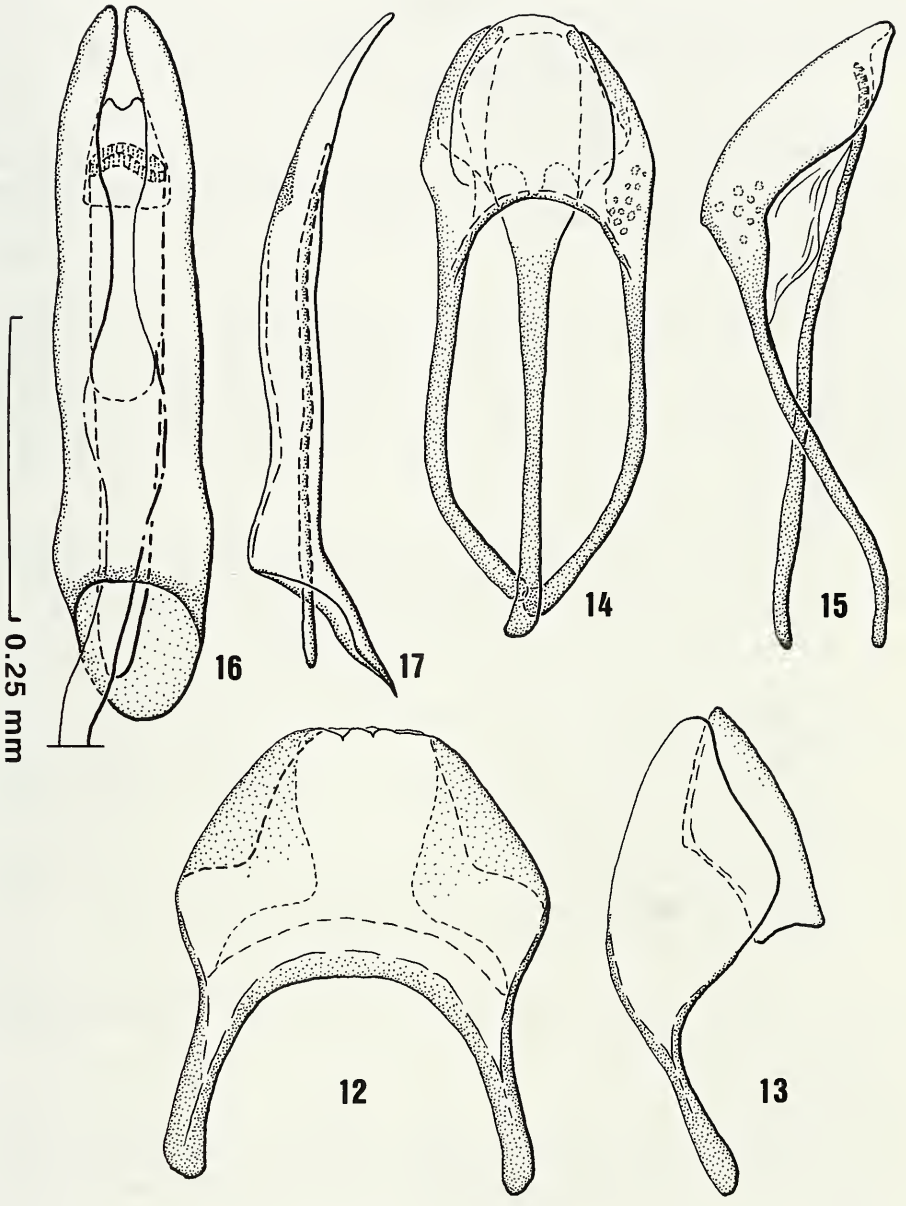

PLANCHE 3

12-17. Genitalia, Holotype ♂. 12.- Huitième tergite et sternite abdominaux, vue dorsale; 13.- *idem*, vue laterale; 14.- Neuvième et dixième tergites et spicule, vue dorsale; 15.- *idem*, vue laterale; 16.- Aedeagus, vue dorsale; 17.- *idem*, vue laterale.

postérieurs grêles avec de courtes épines aux arêtes externes. Les tibias postérieurs sont courbes, en amorce de torsade.

Long: 1,73 mm (tête et pygidia exclus); large: 1,33 mm.

Dimorphisme sexuel.

Mâle: disque intercoxal du métasternum portant, dans sa moitié sommitale, de courtes soies groupées symétriquement de part et d'autre de la ligne médiane, plus nombreuses et plus longues postérieurement (fig. 4).

Face interne des tibias postérieurs avec une brosse de longs poils dressés (fig. 9).

Mesures: (m: mâle, n=2; f: femelle, n=2): APW: m, 0.50 - 0.53; f, 0.53; PPW: m, 1.10; f, 1.18 - 1.20; PL: m, 0.55 - 0.58; f, 0.60; EL: m, 1.00 - 1.03; f, 1.13 - 1.15; EW: m, 1.18 - 1.25; f, 1.33; PROL: m, 0.13 - 0.15; f, 0.15; PROW: m, 0.55 - O.60; f, 0.63; PYL: m, 0.23 - 0.35; f, 0.28 - 0.40; PTL: m, 0.50 - 0.53; f, 0.45 - 0.50; MTSL: m, 0.50 - 0.53; f, 0.48 - 0.50; MTTL: m, 0.55; f, 0.53 - 0.58; PPL: m, 1.53 - 1.75; f, 1.83 - 2.13; PEL: m, 1.58 - 1.80; f, 1.73.

Signification des abréviations utilisées:

PPL: longueur entre les angles antérieurs du pronotum et l'apex du pygidium.

PEL: longueur entre les angles antérieurs du pronotum et l'apex des élytres.

APW: largeur entre les angles antérieurs du pronotum.

PPW: largeur entre les angles postérieurs du pronotum.

PL: longueur du pronotum au milieu.

EL: longueur des élytres au niveau de la suture.

EW: largeur maximum des élytres.

PROW: largeur maximum du propygidium.

PROL: longueur du propygidium.

PYL: longueur du pygidium.

PTL: longueur du protibia.

MSTL: longueur du mesotibia.

MTTL: longueur du metatibia. (Voir aussi: Ôhara, 1994: 8, fig.2).

Derivatio nominis: Espèce dédiée en hommage très amical au Dr Ivan Löbl du Muséum d'histoire naturelle de la Ville de Genève (Suisse), à qui on doit cette intéressante capture.

Remarques

La découverte de cette nouvelle espèce d'*Abraeus* est très intéressante. Non seulement elle enrichit la faune nipponne d'un élément remarquable, mais elle étend considérablement la répartition géographique de ce sous-genre qui comprend donc aujourd'hui cinq espèces:

- *Abraeus (Abraeus) perpusillus* (Marsham, 1802): Europe, Caucase, Asie mineure, Afrique du nord.
- *Abraeus (Abraeus) roubali* Olexa, 1958: Slovaquie, Hongrie, Turquie, France.
- *Abraeus (Abraeus) areolatus* Reitter, 1884: Caucase, Iran.

- *Abraeus (Abraeus) bolteri* J.L. Le Conte, 1880: Californie, Washington, Colombie britannique. Canada (Alberta).
- *Abraeus (Abraeus) loebli* Gomy et Ôhara, 2000: Japon.

Abraeus (s.str.) loebli est bien caractérisé par sa forme très ovalaire qui le fait prendre, à première vue pour un *Anapleus* Horn. C'est d'ailleurs dans un lot d'espèces appartenant à ce genre que l'exemplaire du Museum de Genève est parvenu à l'un d'entre nous (Y.G.) ! M. Secq (1997) écrit de son côté, en note infrapaginale: "D'après ce que j'ai pu constater, la morphologie dorsale d'*A. bolteri* ressemble à s'y méprendre aux espèces du genre *Anapleus* Horn, pour éviter cette confusion il est nécessaire de vérifier l'absence ou la présence du lobe prosternal". C'est donc de cette dernière espèce que se rapproche *A. loebli*. Elle s'en différencie entre autre par l'extraordinaire dimorphisme sexuel jamais signalé à notre connaissance.

L'absence de dimorphisme sexuel chez *A. bolteri* a pu être vérifiée, tout spécialement, par l'étude de deux couples de cette espèce, grâce à l'obligeance de nos amis histéridologues américains: Yves Bousquet et Peter Kovarik.

Les Abraeinae Abraeini n'étaient jusqu'alors représentés dans la faune japonaise que par deux espèces de *Chaetabraeus* Portevin (Ôhara, 1994; Gomy, 1984) et par une espèce de l'étonnant genre *Macroabraeus* Ôhara, 1999.

Le tableau des genres d'Abraeinae donné par M. Ôhara (1994:204 et 1999:126) doit donc être modifié comme suit:

4 (3) Pronotum smooth, without line. Prosternal process with no excavation. Mesosternum and metasternum separated by meso-meta sternal suture . . . . . Tribe Abraeini Portevin, 1929

4a (4b) Body oval and convex.

4aa (4 ab) Body black and densely furnished with short hairs . . . . . Genus *Chaetabraeus* Portevin, 1929

4ab (4 aa) Body castaneous and without hairs . . . . . Genus *Abraeus* Leach, 1817

4b (4a) Body cylindrical and slightly depressed medially. Dorsal surface without hair . . . . . Genus *Macroabraeus* Ôhara, 1999

REMERCIEMENTS

Nous remercions très cordialement notre ami S. Mazur de nous avoir envoyé pour étude le matériel ayant permis de reconnaître cette espèce et de la décrire, M. S. Hori (Hokkaido Historical Museum, Ebetsu) pour le don des 2 exemplaires ♂ capturés, MM. Y. Bousquet et P. Kovarik pour l'étude des ♂ d'*A. bolteri* et M. I. Löbl pour la relecture du manuscrit.

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Revue suisse de Zoologie 108 (1): 11-30; mars 2001

Taxonomie, Morphologie und Verbreitung der Masken-Schlanknatter *Coluber* (s. l.) *collaris* (Müller, 1878)

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[3] 3, rue du Lac, CH-1207 Genève, Suisse (Anschrift für Schriftentausch).

Taxonomy, morphology and distribution of the red headed whip snake *Coluber* (sensu lato) *collaris* (Müller, 1878). - *Zamenis dahlii collaris* Müller, 1878 is the oldest available name for the red headed or Müller's whip snake. Following the principle of priority, it replaces *Z. d. rubriceps* Venzmer, 1919. A lectotype is designated for *Coluber* (sensu lato) *collaris* (Müller). This monotypic eastern Mediterranean species has been recorded from the littoral of the Black Sea in Bulgaria south of Burgas, the coastal areas of Turkey, and the Levant as far as southern Jordan. The number and arrangement of certain head scales, and in particular the preoculars and temporals, are variable. Usually, there are 19 longitudinal rows of dorsal scales at midbody followed by lateral and paravertebral reduction levels; specimens from southwestern Anatolia mostly have 17 rows on the anterior half and at midbody, and paravertebral reductions. Ventral and subcaudal values follow a west-east cline; the highest counts occur in Near East populations. *C. collaris* differs from its sister species, *C.* (s. l.) *najadum* (Eichwald, 1831), in body scale counts and details of the colour pattern.

Key-words: *Coluber* (sensu lato) - *C. collaris* - *C. najadum* - *C. rubriceps* - taxonomy - nomenclature - lectotype - morphology - distribution.

EINLEITUNG

Während langer Zeit wurde die hier zu besprechende Art mit der Schlanknatter *Coluber* (sensu lato) *najadum* (Eichwald, 1831) verwechselt, oder die beiden wurden als konspezifisch betrachtet (z.B. Boulenger, 1893; Mertens & Müller, 1940). Bis zum Erscheinen der Liste der Amphibien und Reptilien Europas von Mertens & Müller (1928) figurierte *C.* (s. l.) *collaris* im herpetologischen Schrifttum als *Zamenis dahlii* (Schinz, 1835), einem Synonym von *C. najadum*. Die zur Zeit (z.B. Rehák & Obst, 1993) benutzte wissenschaftliche Bezeichnung für die Masken-Schlanknatter ist *Coluber* (s. l.) *rubriceps* (Venzmer, 1919).

Manuskript angenommen 03.10.2000

Müller (1878) beschrieb *Zamenis dahlii collaris* aus Beirut und der Umgebung von Tel Aviv. Die gut vierzig Jahre später erfolgte Beschreibung von *Z. d. rubriceps* aus dem Cilicischen Taurus (Bolkar Dağ) durch Venzmer (1919) beruht auf der gleichen Form. Mertens (1940) hielt *Coluber collaris* (Müller) für präokkupiert und betrachtete *C. najadum rubriceps* (Venzmer) als "syrisch-palästinische Rasse" der Schlanknatter. Baran (1976) revalidierte *Coluber rubriceps* und wies diese Art erstmals von europäischem Gebiet in der Türkei nach. In der Folge berichteten Bartošik & Beškov (1979) und andere über Funde von der bulgarischen Schwarzmeerküste. Diese Vorkommen beschrieb Rehák (1985) als *C. r. thracius*.

MATERIAL UND METHODE

Die Methodik zur Ermittlung der morphologischen Daten sowie Definitionen der in dieser Arbeit verwendeten Termini sind anderswo beschrieben (Schätti, 1988). Die grafische Auswertung der Ventral- und Subcaudaldaten erfolgte mit StatView 4.5 (Abacus). Die Dorsalformeln geben die Anzahl Längsreihen auf der Höhe des zehnten Ventrale, in der Körpermitte und unmittelbar vor dem Anale an. Die Lage der Reduktionen ist in Prozenten der Gesamtzahl der Ventralia angegeben (% Ve); es handelt sich um gemittelte Werte aus den Daten der rechten und linken Körperseite. In diesem Zusammenhang stehen die Bezeichnungen 'hoch' und 'tief' als Kürzel für paravertebrale resp. laterale Ab- oder Zunahmen. Längenangaben setzen sich aus der Kopf-Rumpflänge (KRL) und der Schwanzlänge (SL) zusammen. Die Termini Ozellen resp. Augenflecken stehen für kreisförmige Flecken mit einem dunklen (meist schwarzen, zuweilen leicht bräunlichen) Kern, um den ein deutlicher weisser Saum verläuft. Die Anzahl der Maxillarzähne wurde nur auf dem rechten Oberkiefer ermittelt; die restlichen Bezahnungswerte (Dentale, Palatinum, Pterygoid) basieren auf kleinen Stichproben. Die Länge des Hemipenis in situ (Lage des Apex) und die Insertion des *M. retractor penis magnus* ist u.a. als Prozentsatz der Subcaudalia (% Suc) festgehalten. Die bei einigen Fundorten angegebenen Koordinaten stammen aus dem Times Atlas (1990, 8. Aufl.) und den Gazetteers des United States Board on Geographic Names ('Syria' 1983 und 'Lebanon' 1970).

Das untersuchte Material ist im Anhang zusammengestellt und stammt aus folgenden Sammlungen: American Museum of Natural History, New York (AMNH); The Natural History Museum [ehemals British Museum (Natural History)], London (BMNH); California Academy of Sciences, San Francisco (CAS); Field Museum of Natural History, Chicago (FMNH); Museum of Comparative Zoology, Cambridge (MCZ); Muséum d'histoire naturelle, Genève (MHNG); Muséum national d'histoire naturelle, Paris (MNHN); Staatliches Museum für Tierkunde, Dresden (MTKD); Naturhistorisches Museum, Basel (NHMB); Naturhistorisches Museum, Wien (NMW); Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt/Main (SMF); Zoological Museum, University of Tel Aviv (TAU); Zoologisches Museum und Forschungsinstitut Alexander Koenig, Bonn (ZFMK); Zoologji Kürsüsü, Ege Üniversitesi, Bornova-Izmir (ZDEU); Institut für Systematische Zoologie, Museum für Naturkunde (Zoologisches Museum der Humboldt-Universität), Berlin (ZMB);

Zoologisches Museum der Universität, Zürich (ZMZ). Die Typenserie von *Coluber rubriceps thracius* war trotz mehrmaliger Nachfrage für eine Untersuchung leider nicht zugänglich.

SYNONYMIE

Psam.[mophis] Dahlii ("Fitz.") [partim]. - Schlegel, 1837: 215 ("Savigny").
Tyria Dahlii "Fitzinger". - Rüppell, 1845: 18 ("Syrien").
Zamenis Dahlii [partim]. - Duméril *et al.*, 1854: 693 ("type de Savigny?"); Jan, 1863b: 65 (Beirut, "Egitto").
Zamenis dahlii "Schleg."[el]. - Günther, 1865: 489 (Mount Tabor, coll. Tristram).
Zamenis Dahlii. - Jan & Sordelli, 1876: 9, Taf. 6.3 ("Beyrouth, Syrie. - Musée de Milan").
Zamenis dahlii var. *collaris* (non *Coluber collaris* Ménétries, 1832) F. Müller, 1878: 599 [667]. - "Palästina" (Beirut [NHMB 1166, Lectotypus, hoc loco], "Jaffa" [Yafo, Tel Aviv]).
Zamenis Dahli [sic] *collaris*. - Boettger, 1879: 63 ("Jaffa"); Boettger, 1880: 153 (Haifa, Beirut).
Zamenis dahlii. - Lortet, 1883: 185, Taf. 19.4 (Beirut, Lattakièh [Latakia]); Tristram, 1884: 143 ("Palestine").
Zamenis dahlii [partim]. - Boulenger, 1893: [381] 397 (Mt. Tabor, Günther, 1865).
Zamenis dahlii. - Boulenger, 1896: 623 (Mt. Tabor, BMNH 93.11.30.23); Škorpil, 1897: 22a (Sozopol); Anderson, 1898: 250 [270], Fig. 10 [Savigny, 1829]; Werner, 1898: 221 (Mersin, ZMB 19913).
Zamenis dahli [partim]. - Boettger, 1898: 44 ("Syrien" [Rüppell, 1845], "Jaffa, Syrien").
Zamenis Dahlii [partim]. - Werner, 1902: 1097 ("var. *collaris* Müll. [...] bei Constantinopel" [Hadımköy], NMW 35042); Werner, 1907: 426 ("*Zamenis dahli* Fitzinger", vgl. Fussnote 4); Schreiber, 1912: 710 ("*Coluber Dahlii* Sav."[igny]); Boulenger, 1913: 177, Taf. 5, Fig. 20 ["after Sordelli"] ("Syria").
Zamenis dahli. - Barbour, 1914: 89 (at-Tafilah, Jerusalem, MCZ 9857, 177296).
Zamenis dahlii [partim]. - Nikolskij, 1916: 92 ("Palestina", coll. Romanov 1896).
Zamenis dahlii var. *rubriceps* Venzmer, 1919: 107. - "Cilicischer Taurus, Bulghar Dagh"[1].
Zamenis dahlii var. *collaris* [partim]. - Venzmer, 1922: 54 (Gülek, vgl. Fussnote 1).
Zamenis Dahlii. - Boulenger, 1923: 54 (Baalbek [BMNH 1909.4.20.46], Bekaa, Ataïbé [al-Utaybah]).
Zamenis dahli [partim]. - Werner, 1926: 345 (vgl. Werner, 1907 und Kommentar).
Coluber najadum [partim]. - Mertens & Müller, 1928: 46 ("Syrien").
Coluber najadum. - Flower, 1933: 809 ("Sarona, near Jaffa", BMNH 1927.8.12.62-65, vgl. Fussnote 5).
Coluber najadum collaris. - Werner, 1935: 227 ("Syrien" [Libanon], u.a. Baalbek, NMW 20137).
Coluber Dahlii. - Angel, 1936: 114 (Beirut, MNHN 1935.357).
Coluber najadum collaris. - Werner, 1938: 83 (vgl. Kommentar).
Coluber najadum [partim]. - Schmidt, 1939: 73 (Mt. Scopus [Umgebung von Jerusalem], Miqwe Yisrael, FMNH 28583-84); Werner, 1939: 221 ("Syrien", u.a. fide Boettger, 1880; Boulenger, 1923); Mertens & Müller, 1940: 50 ("Syrien", Rüppell, 1845; Boettger, 1898).
Coluber najadum rubriceps. - Mertens, 1940: 248 ("syrisch-palästinische Rasse").
Coluber n. najadum [partim]. - Clark & Clark, 1973: 51 (Yakaçık, CAS 105950); Truttnau, 1975: [179] Abb. 97.

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[1] Die Angabe, wonach die aus zwei "erwachsenen Stücken" bestehende Typenserie von *Zamenis dahlii rubriceps* aus der Umgebung von Ulukışla in der Provinz Niğde stammen soll (Baran, 1976), beruht auf einem Missverständnis. Der grösste Teil der von Venzmer gesammelten Amphibien und Reptilien stammt aus der Nähe von Gülek (37°12'N 34°48'E) zwischen Pozantı und Tarsus (Venzmer, 1918, 1922). Die beiden Syntypen von *rubriceps* fehlen in den von uns untersuchten Sammlungen und müssen als verschollen gelten.

Coluber rubriceps. - Baran, 1976: 44, Fig. 11, Tab. 6-7 (u.a. Habipler Köyü [Metris, ZDEU 27.1973], Kadirli [ZDEU 24.1963], Savaştepe [ZDEU 133.1957], Zincirlihüyük [ZMB 14376.1-3, 26679.1-5]; "Armouin" [BMNH 1957.1.13.19-21, vgl. Fussnote 2], Baalbek [Werner, 1935], Beirut [NMW 20125.1-4], Latakia [NMW 20146.5], Nablus [Palästina], Tripoli, as-Sarafand [Libanon], Umgebung von Tel Aviv ["Rasel ain Suriye"]); Bartošik & Beškov, 1979: 39 (Ropotamo [Fluss] bei Arkutino); Başoğlu & Baran, 1980: [102] 105, 176 [185], Fig. 54 [Fundort 38], Taf. III.A (Metris, Baran, 1976); Bartošik *et al*., 1981: 55 (Arkutino [Ropotamo], Losenec); Obst, 1981: 178, Abb. 2 (Primorsko).

? *Coluber najadum*. - Hraoui Bloquet, 1981: 98 (Libanon)[2].

Coluber rubriceps. - Baran, 1982: 54 (Kısırbelek Köyü, Cizre, ZDEU 99.1977).

? *Haemorrhois* [sic] *najadum dahli* [partim]. - Welch, 1983: 68 (nov. comb. ["Israel"]).

Coluber najadum. - Disi, 1985: 40 ("Jordan" [checklist]).

Coluber rubriceps. - Esterbauer, 1985: 31 (Bayt Jinn, Hadar, Harfa, Majdal Shams [Golan]); Hallmann, 1985: 275 (Verhalten).

Coluber rubriceps thracius Rehák, 1985: 277, Fig. 1-2. - "Arkutino (near the left bank of the Ropotamo river close to its opening into the Black Sea), Bulgaria" (Paratypen aus Arkutino und Akhtopol).

Coluber najadum. - Matuschka, 1986: 181 (Haifa [Wirt von *Caryospora najadae*]).

Coluber r. rubriceps. - Teynié, 1987: 13 (Çatalan [Adana]).

Coluber rubriceps. - Disi *et al*., 1988: [43] 44 (Alal, Anjarah, Aqraba, Ayl ["Ael"], Dair, Dair Abu Said, Ibbin [Ibeen], Irbid, Juabyha, Maan); Baran, 1990: 123 ([Insel] Yılan Adası, ZDEU 137.1985); Esterbauer, 1992: 42, Fig. 11 [Hadar] (al-Kab, Khan Uraynibah); Sivan & Werner, 1992: 202 ("Mt. Hermon", 2200 m).

Coluber r. rubriceps. - Rehák & Obst, 1993: 162, Abb. 36-38 (Handbuch).

Coluber r. thracius. - Rehák & Obst, 1993: [160] 162 (Handbuch).

Coluber rubriceps. - Amr *et al*., 1994: 45 (Shawbak, Ayl); Mienis, 1994: 8 (Nezer Sereni [31°55'N 34°50'E, Nahrung von *Halcyon smyrnensis* (L.)]); Amr *et al*., 1995: 130 ("Dlaghah, 35 km W Maan"); Lahav & Dmiel, 1996: 135 [Israel]; van der Winden *et al*., 1997: Tab. 1, Abb. 6 (Umgebung von Silifke [Göksu-Delta]).

BEMERKUNGEN ZUR TAXONOMIE, NOMENKLATUR UND SYSTEMATIK

Die älteste Referenz für diese Art findet sich in einem der Tafelbände zum naturhistorischen Teil der Description de l'Egypte [...] (Savigny, 1829: Taf. 4, Fig. 4.1-3)[3]. Es handelt sich um eine Gesamtansicht und zwei Abbildungen des Kopfes einer "Couleuvre" ohne lateinische Bezeichnung und Erwähnung im Text (Geoffroy, 1827; vgl. Duméril *et al*., 1854; Mertens & Müller, 1933).

Bei *Tyria* resp. *Zamenis dahlii* "Fitzinger" (z.B. Schlegel, 1837; Rüppell, 1845; Jan, 1863b; Boettger, 1879; Werner, 1898, 1902, 1907, 1926; Barbour, 1914) handelt es sich um ein nomen nudum aus Fitzingers (1826) Neuer Classification der Reptilien (Strauch, 1873; Mertens & Müller, 1928). In Wirklichkeit basiert der Artname auf *Coluber dahlii* Schinz, 1835, einem Synonym von *C. najadum* (Eichwald).

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[2] Hraoui Bloquet (1981) meldet *Coluber najadum* aus der Umgebung von Beirut (Akabe [Akaïbé], Bayt Shabab, Hadath) nördlich bis Byblos (Jubayl, 34°07'N 35°39'E) sowie aus dem gebirgigen Hinterland des Jabal Lubnan (Biskinta, Faraya, Jabal Sannin), der Provinz Bekaa (al-Biqa: Terboul) und dem südlichen Landesteil (al-Miyah wa Miyah, 33°32'N 35°23'E und Nab as-Safa, 33°45'N 35°42'E). Dieses Material gehört überprüft was die spezifische Zuordnung betrifft. Das gemeinsame Vorkommen von *C. najadum* und *C. collaris* im Libanon belegen beispielsweise BMNH 1957.1.13.17-18 aus "Armouin" (*C. najadum*, coll. P. + C.H.B. Cott, vgl. Baran, 1976).

[3] Das Erscheinungsdatum des Tafelbandes von Savigny ist unklar (vgl. Sherborn, 1897; ICZN 1987), und wir folgen der Datierung auf 1829 bei Boulenger (1893).

Mertens (1940) glaubte, dass *Zamenis dahlii collaris* Müller, 1878 durch *Coluber collaris* Ménétries, 1832 (= *Eirenis collaris*) präokkupiert sei und etablierte Venzmers (1919) *rubriceps* als wissenschaftliche Bezeichnung für die Masken-Schlanknatter. Bei *C. collaris* (Müller) handelt es sich jedoch um ein sekundäres Homonym. Im übrigen ist die Festlegung der Typusart von *Eirenis* Jan, nämlich *C. collaris* Ménétries (design. Jan, 1863a), "höchst problematisch" (Schmidtler & Schmidtler, 1978; vgl. Docenko, 1989).

Ungeachtet dem Umstand, dass *Coluber collaris* (Müller) seit Werner (1938) in der einschlägigen Literatur kaum mehr in Erscheinung tritt, ist dies der nach dem Prioritätsprinzip gültige Name; insbesondere erfüllt *rubriceps* die Anforderungen an ein nomen protectum im Sinne von Art. 23.9 des 'Code' (ICZN, 1999) nicht. Diese Ansicht scheint im übrigen auch der Autor dieses Artnamens zu teilen. Jedenfalls führte Venzmer (1922) *rubriceps* in seinem Verzeichnis der Herpetofauna von Kleinasien nicht mehr auf; als einziges Taxon von Schlanknattern figuriert dort "*Zamenis dahlii* Fitz. var. *collaris* Müll.".

Müller (1878) lagen bei der Beschreibung dieser Art zwei Syntypen vor, ein juveniles Exemplar aus Israel (Umgebung von Tel Aviv ["Sarona bei Jaffa"], NHMB 1167, nicht untersucht) sowie ein adultes Männchen aus "Beirut" (NHMB 1166). Letzteres designieren wir hiermit zum Lectotypus von *Coluber* (sensu lato) *collaris* (Müller).

Obwohl die verwandtschaftlichen Beziehungen innerhalb der paläarktischen "Zornnattern" (*Coluber* sensu lato) nicht restlos geklärt sind (z.B. *Zamenis andreana* Werner) stehen zwei Punkte ausser Frage. Zum einen gehören sie nicht zur nearktischen Gattung *Coluber* Linnaeus, 1758 (Schätti, 1986, 1987). Zum andern bilden *C.* (s. l.) *collaris*, *C. najadum* und eine noch unbeschriebene Spezies aus dem Zagros Gebirge (Iran, Schätti et al. in prep.) die Schwestergruppe der Saharo-Sindischen Arten um *Platyceps rhodorachis* (Jan) (Schätti, 1993; Utiger pers. Mitt.). Die typische Art dieser Gattung ist *P. subfasciatus* Blyth, 1860, ein jüngeres Synonym von *Coluber ventromaculatus* Gray. Zur Zeit laufende Abklärungen werden zeigen, ob die *najadum*-Gruppe zusammen mit *Platyceps* spp. in eine Gattung gehört.

Aus nicht näher erläuterten Gründen, wahrscheinlich aber in Anlehnung an Schreiber (1912), betrachteten Mertens & Wermuth (1960) *Zamenis dahlii* var. *collaris* sensu Werner (1907) als ein Synonym von *Coluber najadum* (Eichwald) und schränkten den ursprünglichen Fundort für dieses vermeintliche Taxon auf "Dalmatien" ein (vgl. Darevskij & Ščerbak, 1993)[4]. Es besteht jedoch kein Zweifel, dass sich beispielsweise die Zitate von *Z. dahlii* var. *collaris* resp. *C. najadum* var. *collaris* bei Werner (1902, 1935, 1938) auf die hier besprochene Art beziehen.

Die gewählte deutsche Bezeichnung Masken-Schlanknatter nimmt Bezug auf ein markantes, zuverlässiges und im Feld leicht feststellbares Merkmal (vgl. Venzmer, 1922). Die aus dem wissenschaftlichen Artnamen abgeleitete Bezeichnung

[4] Wir konnten die Erstausgabe von Kreffts Handbuch für Terrarianer nicht ausfindig machen. In der Datierung dieses Werks auf 1907 folgen wir Mertens & Wermuth (1960); zu beachten gilt, dass Schreiber (1912) als Erscheinungsjahr 1908 angibt. Unsere Bemerkungen basieren auf Werners (1926) Text in der zweiten Auflage des fraglichen Buches.

Halsband-Schlanknatter leistet Verwechslungen mit Zwerg- oder Halsbandnattern der Gattung *Eirenis* Vorschub. Im übrigen finden sich zuweilen auch bei dem häufig mit *Coluber collaris* verwechselten *C. najadum* ein oder mehrere Halsbänder (siehe Vergleich mit *C. najadum*).

ABB. 1
Coluber collaris, MHNG 2447.74, ? (vgl. Abb. 4).

MORPHOLOGIE

Pholidosis. *Coluber collaris* besitzt in der Regel acht Supralabialia, von denen das vierte und fünfte das Auge berühren; das vorletzte ist am grössten. Zwei der untersuchten Exemplare (MTKD 24090, 25991) haben durch Verschmelzung der hintersten Schilder beiderseits bloss sieben Supralabialia. Dies ist auch beim Lectotypus (NHMB 1166) auf der einen Seite (rechts) der Fall. FMNH 153122 hat neun Supralabialia, wobei das fünfte und sechste ans Auge grenzen. Das Subokulare ist einfach und klein. Das Präokulare ist unpaar oder doppelt, letzteres zum Beispiel bei CAS 105950, MTKD 22437, 23938, NMW 35042 (links), ZDEU 99.1977, 137.1985, 31.1988, 29.1990, 122.1992, 91.1993 und ZMB 26679.1-2. In der Regel mit zwei Postokularia (Lectotypus rechts nur eines), das obere meist deutlich grösser, sowie zehn (zuweilen neun) Sublabialia. Die vorderen Inframaxillaria sind kürzer (gelegentlich gleich lang) und breiter als das hintere Paar, welches caudal normalerweise durch zwei (drei, selten ein oder vier) Reihen Schüppchen getrennt ist.

Normalerweise mit zwei Temporalia in der ersten und zwei oder drei in der zweiten Reihe. Gelegentlich liegt das obere vordere Temporale als kleines Schildchen am vorderen oder hinteren Ende des unteren auf (z.B. MTKD 20972-73, SMF 18203 resp. MTKD 25234, 26688 und weitere Exemplare). Einfache vordere Temporalia kommen zum Beispiel bei MTKD 24090 und 25991 sowie einseitig im Falle von NMW 35042 und SMF 18210 vor. Bei NMW 20125.1 ist das obere vordere Temporale beiderseits mit dem Parietale verschmolzen. MHNG 1358.92 hat beiderseits je nur ein vorderes und hinteres Temporale (vgl. auch Schmidt, 1939). Bei MTKD 5701 reicht das Parietale seitlich bis zum unteren Postokulare, und das obere hat keinen Kontakt zu den Temporalia. TAU 5049 und TAU 12321, ebenfalls mit zwei vorderen Temporalia, besitzen zusätzlich eine langgezogene und schmale Schuppe am lateralen Rand der Parietalia.

Ventralia insgesamt 185-221 (♂♂ 185-211, ♀♀ 196-221), Anale geteilt, 79-121 paarige Subcaudalia (84-116 resp. 79-121)[5]. Bei den Ventralia ist ein ausgeprägter Sexualdimorphismus feststellbar (Abb. 2-3). Die tiefsten Ventralwerte finden sich im westlichen Antatolien und Thrakien (vgl. Unterarten). Bulgarische Exemplare besitzen am wenigsten Subcaudalia. Populationen aus dem östlichen Mittelmeerraum weisen am meisten Ventralia und Subcaudalia auf.

Amr *et al.* (1994) melden zwei Exemplare (wahrscheinlich ♂♂) aus dem südlichen Jordanien (Shawbak, Ayl) mit 205-207 Bauchschuppen; die Subcaudalwerte (65, 98) sprechen für unvollständige Schwanzspitzen. Der von Disi *et al.* (1988) gemeldete Höchstwert von 223 Ventralia (wahrscheinlich ♀) schliesst möglicherweise ein oder mehrere Präventralia ein. Das von Baran (1976) gemeldete Minimum von 191 für Weibchen beruht auf BMNH 1927.8.12.65 (vgl. Fussnote 5). Bereits Flower (1933) erwähnte dieses Tier aus der Umgebung von Tel Aviv ("remarkable for having only 199 ventral shields"). Es besitzt 190 normale sowie 14 nur jeweils zur Hälfte ausgebildete Ventralia (C. McCarthy *in litt.*); das Geschlecht gehört überprüft. Das Maximum bei ♂♂ (214) wurde bei NMW 20125.2 aus "Beirut" ermittelt.

Die Dorsalia weisen unpaare Apikalgrübchen auf; sie sind, soweit wir feststellen konnten, einzig im lateralen Rumpfbereich von MTKD 22401 teilweise doppelt. Die Dorsalformel lautet im Normalfall 19-19-15. Die meisten untersuchten Exemplare aus Europa weisen die Reduktionsfolge 'tief-hoch' auf. MTKD 22437 reduziert im hintersten Teil des Rumpfes (92% Ve) lateral auf 14 Dorsalia. MTKD 24090 und 25991 (♂, ♀) fallen aus dem üblichen Rahmen, indem bei ihnen eine Reduktion auf 17 Dorsalia im Halsbereich auftritt, die vor der Körpermitte (16-36% Ve) wieder kompensiert wird; beim Männchen (MTKD 24090) finden sich in der Körpermitte erneut nur 17 Schuppenreihen (Reduktion bei 43% Ve); alle diese Zu- und Abnahmen liegen lateral (resp. 'tief'). Auf dem hinteren Teil des Rumpfes folgen

[5] Abgesehen von Exemplaren mit unbekanntem Geschlecht oder zweifelhafter Herkunft sowie unvollständigen Tieren (z.B. MCZ 9857) umfasst die Auswertung (Abb. 2-3) das im Appendix erwähnte Material mit Ausnahme von BMNH 1927.8.12.65. Barans (1976) Maximalwert der Subcaudalia (128) für Weibchen stammt von einem Exemplar, welches im Staatlichen Museum für Naturkunde in Stuttgart deponiert ist ("SM a 3551 [Yafa]"). Es war für eine erneute Untersuchung leider nicht erhältlich. Neben der Anzahl Subcaudalia gehören dessen Geschlecht und Zugehörigkeit (? *Coluber najadum*) in jedem Falle nochmals überprüft.

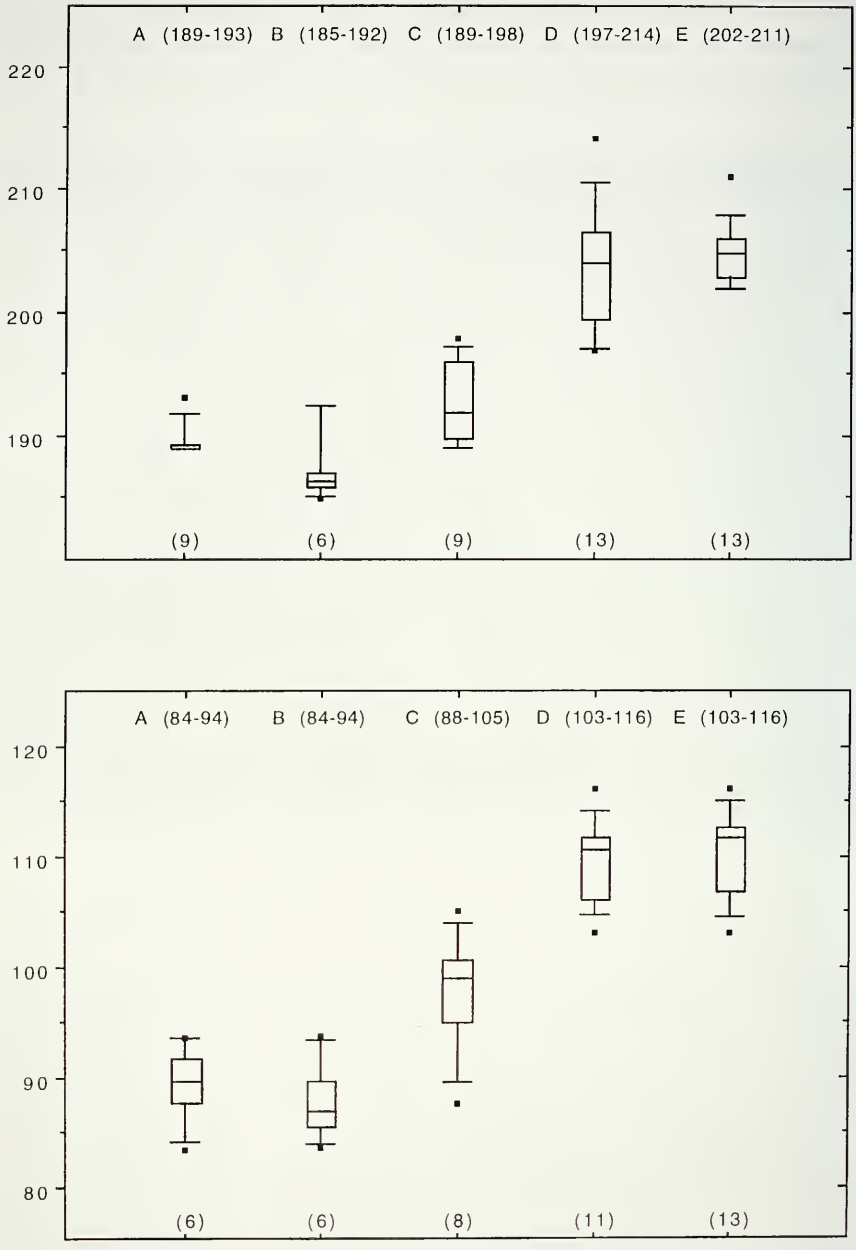

ABB. 2

Ventralia (oben) und Subcaudalia (unten) bei *Coluber collaris* (♂♂). Gruppe A: Thrakien (Bulgarien, Türkei); B: West Anatolien; C: südliches Anatolien; D: Libanon, NW Syrien; E: Israel, Jordanien, Palästina. Numerische Werte (oben, in Klammern), statistische Angaben (Mittelwert sowie 10, 25, 75 und 90% der Population und Extrema) und Stichprobengrösse (N).

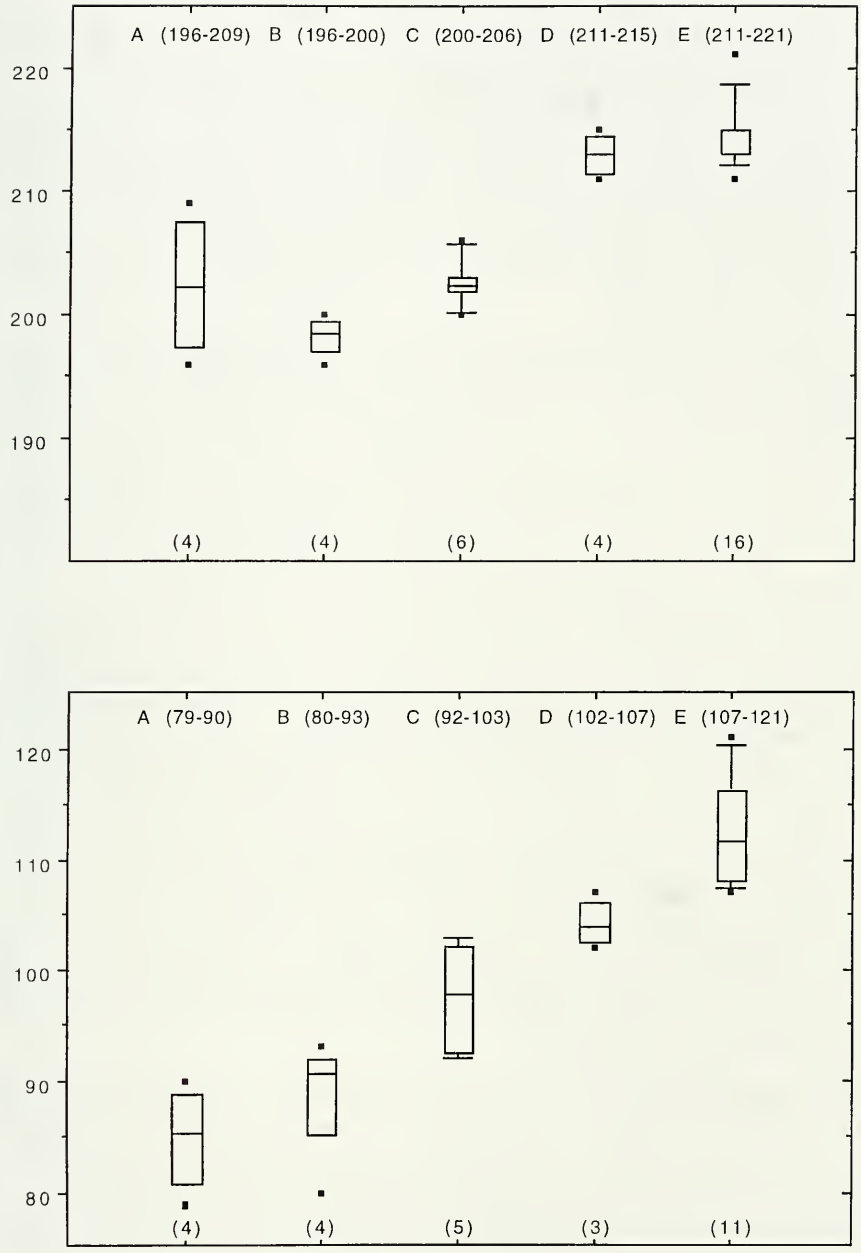

ABB. 3
Ventralia (oben) und Subcaudalia (unten) bei *Coluber collaris* (♀♀, Erklärung vgl. Abb. 2).

zwei (♂, 'tief-hoch') resp. drei Reduktionen (♀, 'tief-hoch-tief') auf 15 resp. 13 Dorsalia im Bereich zwischen 67-74% Ve (♂) resp. 54-93% Ve (♀). Rehák (1985) meldet 21 Schuppenreihen in der Körpermitte für ein Weibchen aus Bulgarien.

Auch bei asiatischen Populationen kommen zwei oder drei Reduktionen in variabler Reihenfolge vor. AMNH 62812 reduziert die Anzahl Längsreihen der Dorsalia bei 94% Ve paravertebral auf 14. MHNG 2447.74 mit dem Muster 'hoch-tief-hoch' zwischen 63-91% Ve, sowie zwei weitere Männchen (BMNH 1909.4.20.46, SMF 18202) mit der Abfolge 'tief-hoch-hoch' (58-91% Ve) weisen 13 Dorsalia vor dem Anale auf. SMF 18201 ('hoch-tief-hoch', 63-93% Ve) erhöht bei 96% Ve paravertebral auf 15 Längsreihen.

MTKD 26690 (♀) reduziert im vorderen Teil des Rumpfes auf 17 Dorsalia. Sieben weitere Individuen aus Südwestanatolien weisen bereits am Hals nur 17 Längsreihen Dorsalia auf. Drei Weibchen aus diesem Gebiet (ZDEU 140.1991, 122.1992, 91.1993) mit 17-17-15 Dorsalia reduzieren im Bereich 64-65% Ve durch Verschmelzungen der paravertebralen Reihen (7 und 8). In dieses Schema passt auch ZDEU 142.1991 (♂) mit einer Reduktion bei 67% Ve. Ein anderes Männchen (ZDEU 29.1990) reduziert bei 93% Ve paravertebral auf 14 Schuppenreihen; ZDEU 1.1997 weist zwei 'hohe' Abnahmen zwischen 65-93% Ve auf. ZDEU 141.1991 mit 17-17-11 Dorsalia reduziert nach dem Muster 'hoch-hoch-tief' bei 61, 91 und 96% Ve.

Längen und Proportionen. Die mit Abstand längsten Exemplare stammen aus dem südlichen Teil des Areals und erreichen eine KRL von 810 mm (MTKD 20972, ♂, Schwanz unvollständig) resp. eine Gesamtlänge von 630 + 247 mm (MHNG 2447.75, ♀). Die Maximalmasse in Europa (Bulgarien) betragen 520 +182 mm (MTKD 22437, ♂) resp. 470 + 143 mm (MTKD 25991, ♀), in der Türkei ca. 530 mm KRL (CAS 105950, ♂, Schwanz unvollständig) und 433 + 160 mm (MTKD 26688, ♀).

Rehák & Obst (1993) melden eine Maximallänge von 1120 mm ("MTKD-Beleg von Jerusalem"). Für bulgarische Populationen verzeichnet Rehák (1986) ein Gesamtmass von 710 mm; Bartošik *et al.* (1981) sichteten ein Exemplar von ca. einem Meter ("long de 100 cm environ"). Das Verhältnis SL/KRL beträgt bei adulten Tieren aus Bulgarien und Thrakien (Türkei) 0.34-0.38 (♂♂) und 0.29-0.36 (♀♀), in Anatolien 0.36-0.42 resp. 0.33-0.41 und bei Populationen aus dem Nahen Osten 0.39-0.46 resp. 0.38-0.42. Bei Exemplaren mit einer KRL unter 250 mm liegen die Werte insgesamt zwischen 0.30 und 0.40.

Färbung und Zeichnung. Der Pileus sowie die lateralen Partien des Kopfes sind gräulich oder grünlich (oliv), bei asiatischen Exemplaren zuweilen rostfarben ("*rubriceps*", vgl. Venzmer, 1919). Charakteristisch ist ein schwarzer Freno-Temporalstreifen, der scharf von den grösstenteils cremefarbenen Supralabialia abgegrenzt ist. Bei MTKD 24090 fehlt dieser Streifen im Temporalbereich, und bei zwei untersuchten Exemplaren aus Israel (MHNG 2447.74, MTKD 20972) ist die Maske relativ undeutlich ausgeprägt (vgl. Esterbauer, 1992: Fig. 11). Die Iris ist rötlich braun (Rehák, 1986).

Der Rumpf ist dorsal gräulich (stahlfarben), rehbraun, ocker oder olivfarben; lateral, und im hinteren Bereich auch dorsal, ist der Körper manchmal rötlich braun.

Die einzelnen Schuppen tragen gelegentlich einen deutlichen rotbraunen, median verlaufenden Längsstrich, während die Ränder einen gräulichen Blauton aufweisen (z.B. MTKD 25991).

Typisch ist eine markante schwarze Nackenbinde, die cranial und caudal von einem hellen (meist gelblichen) schmalen Rand eingefasst ist. Der kopfwärts gelegene Rand ist leicht konkav, sichelförmig ausgebuchtet oder bildet einen Keil, dessen Spitze nach hinten zeigt; die seitlichen Schenkel werden nach vorne schmaler und verschmelzen häufig mit der Gesichtsmaske (Abb. 1). Bei ZMB 26679.3 stossen die hellen Ränder der vordersten ozellenartigen Makel vertebral eng zusammen, ohne sich aber zu einer eigentlichen Binde zu vereinigen.

Hinter dem Nackenband folgen im dorsalen und lateralen Bereich scharf abgegrenzte schwarze runde Punkte oder feine Flecken von viereckiger Form. Diese sind asymmetrisch entlang der Wirbelsäule angeordnet, wobei v.a. jene im Halsbereich häufig von einem hellen Saum eingefasst sind. Diese Augenflecken sind meist auf das vordere Drittel des Rumpfes beschränkt und werden nach hinten spärlicher und tendenziell kleiner, ohne ersichtliche Regel bezüglich Grösse, Form oder Lage .

In einigen Fällen verschmelzen die Ozellen unmittelbar hinter der Nackenbinde zu einem weiteren Querband (z.B. BMNH 93.11.30.23, MHNG 1358.91, 2447.74) oder das dritte Fleckenpaar bildet ein zusätzliches Band (BMNH 1909.4.20.46, MTKD 23938, 26690 und ZDEU 137.1985), das zuweilen schräg über den Hals verläuft und dessen Ränder zum Teil sattelförmig resp. in Form einer Sanduhr ausgebuchtet sind. Bei MHNG 2447.75 folgen auf die obligate vorderste Binde zwei Halsbänder, die allerdings vertebral nicht vollständig geschlossen sind. Erwähnenswert sind ferner zwei Jungtiere aus Israel resp. "Jerusalem" (FMNH 56479, 177296) mit praktisch identischem Muster; bei ihnen verlaufen hinter der Nackenbinde drei punktförmige Kleckse quer über den Rumpf und danach folgt ein "Querband", welches nur dorsal ausgebildet ist.

Gegen die Körpermitte treten an Zeichnungselementen, falls überhaupt, nur noch feine schwarze Punkte auf; in einigen Fällen reichen diese bis über das 150. Ventrale hinaus (z.B. MTKD 22418). Vereinzelt kommen einige extrem feine Punkte bis zur Schwanzbasis vor (z.B. BMNH 1909.4.20.46, ZDEU 137.1985, 122.1992). Bartošik *et al.* (1981) melden zwei Exemplare aus Bulgarien mit dorsolateraler Punktierung bis zum Ansatz des Schwanzes; eines davon weist im übrigen zwei Halsbänder auf. Bei einem der beiden vermutlich verschollenen Syntypen von *Zamenis dahlii rubriceps* (vgl. Fussnote 1) finden sich spärliche feine Punkte entlang der "Rückenlinie bis auf die Gegend der Schwanzwurzel"; das zweite Exemplar weist keinerlei Fleckung nach der Nackenbinde auf (Venzmer, 1919).

Die Unterseite des Kopfes und der Bauch sind zeichnungslos. Die Färbung variiert von cremefarben bis kräftig gelb, wobei gegen den Schwanz zu ein rötlicher Anflug auftreten kann.

Bezahnung und Hemipenis. Das Maxillare trägt 13-15 Zähne, die beiden hintersten sind in der Regel grösser und durch ein Diastema getrennt. Dieser Zwischenraum ist variabel (eng bis sehr deutlich) und der letzte Zahn laterad versetzt. Von 40 unter-

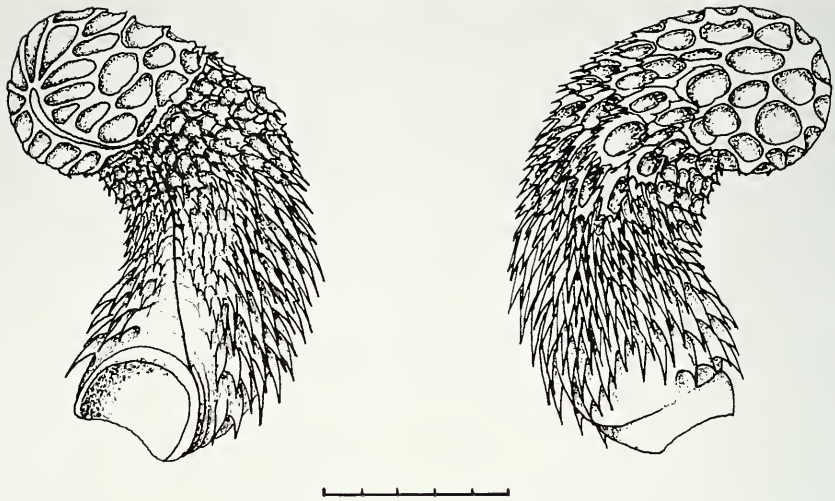

ABB. 4

Hemipenis von *Coluber collaris* (MHNG 2447.74). Linie entspricht 5 mm (Zeichnung H. Laubscher).

suchten Exemplaren weisen die meisten 11+2 (16) resp. 12+2 (22) sowie zwei (inkl. Lectotypus) 13+2 Maxillarzähne auf. Die Werte für die Bezahnung des Palatinum, Pterygoid und Dentale betragen 7-9, 13-16 und 14-17.

Der Apex des Hemipenis reicht in situ zum sechsten bis zehnten Subcaudale (5,1-11,4% Suc). Die Insertion des *M. retractor penis magnus* liegt zwischen den Subcaudalia 25 bis 34 (22,8-36,5% Suc). Basal ist das Organ mit Stacheln bewehrt, deren Grösse distal abnimmt. Der Apex ist frei von Stacheln und mit wabenartigen Gruben durchsetzt (Abb. 4).

VERBREITUNG

Das Areal von *Coluber collaris* umfasst die bulgarische Schwarzmeerküste südlich von Burgas, Thrakien (Türkei), die anatolische Westküste sowie die südliche Levante einschliesslich der westlichen Gebiete Jordaniens.

In Europa wurde die Art bislang im Mündungsgebiet des Ropotamo bei Arkutino (nördlich von Primorsko), um Akhtopol (42°06'N 27°56'E), Losenec bei Mičurin (42°09'N 27°51'E) und Primorsko (42°16'N 27°46'E) festgestellt (Bartošik & Beškov, 1979; Bartošik *et al.*, 1981; Obst, 1981; Rehák, 1985, 1986). Die Meldung von "*Zamenis Dahlii* Fitz." aus der Umgebung von Sozopol (42°23'N 27°42'E) durch Škorpil (1897) bezieht sich wahrscheinlich auf *Coluber collaris* (Bartošik *et al.*, 1981). Zwei der untersuchten Exemplare (NMW 35042, ZDEU 27.1973) stammen aus dem europäischen Teil der Provinz Istanbul (Baran, 1976).

Der nördlichste bekannte Fundort im asiatischen Teil des Areals liegt bei Savaştepe (39°20'N 27°38'E) in der Provinz Balıkesir (Baran, 1976). Weitere Vor-

kommen im westlichen Anatolien sind u.a. aus der nördlichen Umgebung von Izmir (Menemen) bekannt. *Coluber collaris* ist auch vom kleinen Eiland Yılan Adası ("Schlangeninsel") vor Kalkan (36°16'N 29°25'E) gemeldet (Baran, 1990) und scheint zumindest in küstennahen Waldgebieten des Festlands weit verbreitet zu sein.

Auffällig ist das Fehlen von Meldungen aus dem Inneren von Anatolien, wo *Coluber collaris* möglicherweise nicht vorkommt. Von der Südküste liegen Nachweise ab Silifke ostwärts bis in Höhen von 1000 m vor. Bei dem von Baran (1982) verzeichneten Exemplar aus der Umgebung von Cizre (37°21'N 42°11'E, Provinz Mardin) im Dreiländereck Irak-Syrien-Türkei handelt es sich um den bislang am weitesten östlich gelegenen Fund für diese Art.

Im westlichen Syrien kommt *Coluber collaris* landeinwärts bis in die Umgebung des Buhayrat al-Utaybah (Salzsee Ataïbé, 33°31'N 36°37'E) vor, in Jordanien östlich bis in die Gegend um Amman und südwärts bis Ayl (30°13'N 35°32'E) und Maan (30°11'N 35°45'E) (Disi *et al.*, 1988; Amr *et al.*, 1994), wo diese Art stellenweise massenhaft vorkommt (Amr *et al.*, 1995). In der Levante erreicht *C. collaris* bis 2200 m ü. M. (Sivan & Werner, 1992).

Boulengers (1913) Angabe, wonach die Masken-Schlanknatter in Unterägypten vorkomme (vgl. auch Werner, 1907; Nikoskij, 1916; Mertens & Müller, 1928 und andere), hat ihren Ursprung in der Abbildung des Tieres bei Savigny (1829), das während der Expedition der französischen Armee in den Jahren 1798-1801 gesammelt wurde. Während Anderson (1898) die Art für das Gebiet östlich des Nils nicht ausschliessen wollte ("may be confined to a limited area of N.E. Egypt"), bezweifelten Steinheil (1913), Werner (1938) und Mertens (1940) ein Vorkommen in Ägypten. Flower (1933) vermutete, dass Savignys (1829) Exemplar aus dem Nahen Osten stammt ("may have been brought from Syria or Palestine").

UNTERARTEN

Rehák (1985) beschrieb *Coluber rubriceps thracius* auf Grund von insgesamt elf Exemplaren aus der Umgebung von Arkutino an der bulgarischen Schwarzmeerküste (vgl. Material und Methode). Diese sollen sich durch "a relatively small number both of ventrals and subcaudals and a relatively shorter tail"[6] sowie "a frequent incidence of three praeocularia and seven upper labials" auszeichnen.

Die Typenserie von *Coluber rubriceps thracius* (sieben ♂♂, vier ♀♀) hat gemäss Beschreibung 187-203 Ventralia (♂♂ 187-191, ♀♀ 200-203) und 79-91 Subcaudalia (84-90 resp. 79-91). Neun Exemplare weisen drei Präokularia auf (Rehák, 1985); einige, inklusive der Holotypus (♂), haben teilweise sieben Supralabialia, während die Nominatform gemäss Rehák & Obst (1993) deren acht oder neun besitzen soll. Letztere vermerken zudem 186 Ventralia als Minimum bei Männchen aus Bulgarien.

[6] Die von Obst (1981) erwähnten "niedrigen Werte der Ventralia und Subcaudalia" sowie Schwänze von 13 resp. 50 mm Länge stammen von MTKD 5701 und "1534" (= 15434, vgl. Obst, 1981: Abb. 2) aus Primorsko; wir haben bei diesen Exemplaren (♂♂) 189-193 Ventralia, mindestens 86-88 Subcaudalia (Schwanzspitze evtl. fehlend) und eine SL von 103 resp. 162 mm festgestellt.

Die tiefsten Ventralwerte (185 für ♂, 196 für zwei ♀♀) stellten wir bei Exemplaren aus der südwestlichen türkischen Provinz Muğla (ZDEU 141.1991, mit 94 Subcaudalia) resp. Izmir (ZDEU 91.1993, 80 Subcaudalia) sowie in Thrakien (ZDEU 27.1973, 90 Subcaudalia) fest. Ein Männchen aus der Umgebung von Savaştepe (ZDEU 133.1957) besitzt 187 Ventralia und 84 Subcaudalia. Insbesondere bei Männchen sind keine Unterschiede in der Anzahl Subcaudalia zwischen Populationen aus der westlichen Türkei und Bulgarien auszumachen.

Rehàks (1985: Fig. 1) Abbildung des Holotypus von *Coluber rubriceps thracius* belegt, dass das Subokulare mit den Präokularia mitgezählt wurde. Sein Vergleichsmaterial beruht zur Hauptsache auf den von Baran (1976) gemeldeten Werten, und offensichtlich sichtete Rehák (1985) kaum asiatisches Material. Wir konnten im untersuchten Material lediglich bei drei Exemplaren aus Bulgarien (MTKD 15434, 22437 und 23938) zwei (echte) Präokularia feststellen. Im übrigen kommt diese Konfiguration auch bei asiatischen Populationen vor. Was die Supralabialia betrifft, so finden sich auch ausserhalb Europas überwiegend acht Supralabialia (vgl. Pholidose).

Die europäisch-westanatolischen Populationen unterscheiden sich zwar in den Ventralia als auch den Subcaudalia von jenen des Nahen Ostens. Dabei besitzen Tiere aus dem südlichen Anatolien intermediäre Werte; ganz allgemein folgen diese beiden Merkmale einem von Westen nach Osten verlaufenden Gradienten (Abb. 2-3). Deshalb sowie aus den oben erwähnten Gründen verzichten wir hier auf eine formelle systematische Berücksichtigung für die westlichen Vorkommen.

VERGLEICH MIT *COLUBER NAJADUM*

Die Verbreitungsgebiete von *Coluber collaris* und *C. najadum* überschneiden sich in den küstennahen und tiefer gelegenen Gebieten von Anatolien sowie den mediterranen Regionen in Syrien und im Libanon (vgl. Fussnote 2). In der Türkei kommen die beiden Arten unter anderem in der Provinz Izmir (Selçuk), um Gülek (Bolkar Dağ) und bei Gaziantep zusammen vor.

Rehák & Obst (1993) bezeichnen *Coluber collaris* als "[...] in Gestalt und Färbung recht ähnlich *C. najadum*, mit dem sie auch häufig verwechselt wurde." Diese beiden Autoren verstehen unter der "var. *collaris*" eine Zeichnungsform von *C. najadum*, die im gemeinsam bewohnten Gebiet der beiden zur Frage stehenden Arten "überwiegend (oder ausschliesslich?) [...] als Doppelgänger" von *C. collaris* (Müller) auftritt, und vermuten darin den Grund für manche Falschmeldung. Frühere Verwechslungen und aktuelle Probleme bei der Bestimmung von Schlanknattern (z.B. Mulder, 1995) haben ihre Ursache aber hauptsächlich in anhaltenden nomenklatorischen Verwirrungen und der nicht zuletzt bei *C. najadum* beträchtlichen intraspezifischen Variabilität der Färbung und Zeichnung.

In Tat und Wahrheit lassen sich *Coluber collaris* und *C. najadum* auf Grund gewisser auch im Feld leicht nachprüfbarer Merkmale problemlos unterscheiden. Charakteristisch für *C. collaris* sind die durch das Auge verlaufende Maske und die Nackenbinde sowie eine Halszeichnung aus Ozellen, deren Abstände grösser sind als

der Durchmesser der einzelnen Augenflecken. Bei *C. najadum* fehlt der Freno-Temporalstreifen und die Prä- und Postokularia sind hell (meist weisslich)[7]. Allenfalls vorhandene Bänder in der Nackenregion heben sich undeutlich von der Grundfärbung ab, und die vorderen lateralen Augenflecken sind, falls vorhanden, mehr oder weniger symmetrisch zu beiden Seiten des Halses angeordnet und grösser als der Abstand zwischen zwei aufeinander folgende Ozellen (vgl. Başoğlu & Baran, 1980: Taf. II.D und III.A; Obst, 1981: Abb. 1-2). Schliesslich besitzen bspw. west- und südanatolische *najadum* stets mehr Ventralia (♂♂ 205-221, ♀♀ 216-231) und Subcaudalia (120-137 resp. 125-137) als *collaris* aus dem gleichen Gebiet. Zumindest im europäischen Areal und in Anatolien lassen sich die beiden Arten zudem auf Grund ihrer Maximallängen auseinanderhalten - Exemplare von über einem Meter KRL kommen offenbar nur bei *najadum* vor.

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[7] Vgl. Abb. 1, die Fotografien bei Sura (1981), Obst *et al.* (1984) und Gruber (1989) sowie die Abbildungen in Rehák (1985: Fig. 1-2) oder Rehák & Obst (1993: Abb. 36). Im übrigen hob bereits Venzmer (1922) die erwähnten Merkmale zur Unterscheidung von *C. collaris* und *C. najadum* hervor.

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ANHANG (untersuchtes Material: von den mit einem Sternchen [*] versehenen Exemplaren liegt nur ein reduzierter Datensatz [v.a. Ventral- und Subcaudalwerte] vor; weitere Beschuppungswerte wurden nicht ermittelt, und insbesondere fehlt eine detaillierte Analyse der Schuppenreduktion).

BULGARIEN: MHNG 2447.76 (Akhtopol, ♂, coll. Rehák); MTKD 5701, 15434 (Primorsko, ♂♂, Fritzsche), MTKD 22401 (Arkutino, ♂, Heyden), MTKD 22418, 22430 (Mündung des Ropotamo, ♂♂, Schmidt & Rudloff), MTKD 22437 [♂], 22614 [♀], 23938 [♀] (Arkutino, Loos & Wrzesinksy), MTKD 24090, 25991 (Ropotamo, ♂♀, Schenkewitz). ISRAEL inkl. PALÄSTINA: BMNH 93.11.30.23 (Mt. Tabor, 32°41'N 35°24'E, ♂, Tristram), BMNH 1923.10.12.37 (Yafo [Tel Aviv], juv. ♀, Buxton), *BMNH 1927.8.12.62-65 (Tel Aviv ["Sarona"], ♂, ♀♀ [vgl. Material und Methode, Morphologie sowie Fussnote 5]); FMNH 28583 (Mt. Scopus, ♀, Haas), FMNH 28584 (Miqwe Yisrael, ♀, Haas); MCZ 56479 (Rehevot, sad. ♀, Haskelberg), MCZ 177296 (Jerusalem, juv. ♂); MHNG 1358.90 (Jerusalem, ♂, Aharoni), MHNG 1358.91-92 (Yad Mordekhay, ♂♀ [coll. Kramer]), MHNG 2447.74-75 (30 km nördl. Tel Aviv, ♂♀, leg. Mendelssohn); MTKD 20972-73 (Umgebung von Jerusalem, ♂♂, St. Michel); NHMB 17533 ("Israel", ♂, Delatina); SMF 18201-05 (Jerusalem, 3 ♂♂, 2 ♀♀, Simon), SMF 18209-10 (Yafo, ♂♀, v. Heyden), SMF 65147-48 (Beit Shean, ♀♀, Zinner); TAU R5049 (Ramla, ♂), TAU R12321 (Tel Chanan, ♀, Golan). JORDANIEN: *FMNH 48516 (zwischen Amman und al-Qatranah, ♂); MCZ 9857 (at-Tafilah, ♂, Phillips & Mann [Fussnote 5]). LIBANON: AMNH 62812 (Nahr [Fluss] Antilyas, 33°55'N 35°35'E, ♂); BMNH 1909.4.20.46 (Bekaa, Baalbek, ♂, Gadeau de Kerville), BMNH 1957.1.13.19-21 ("Armouin", ♂♂, ♀, Cott [vgl. Fussnote 2]); FMNH 153122 (Bekaa, Zahle, Tel El Amara, ♂, Hoogstraal et al.); MNHN 1935.357 ("Beirut", ♂, Pallary); NHMB 1166 ("Beirut", ♂, Lectotypus [hoc loco], "Gesch. v. Dr. F. Müller 1876"); NMW 20125.1-4 ("Beirut", ♂♂, ♀, juv., don. Steindachner 1876), NMW 20137 (Baalbek. ♀, Werner); ZMZ 122337, 122339 ("Beirut", ♂♂ [1875, 1878]). SYRIEN: NMW 20146.5 (Latakia, ♀, Leuthner); MTKD 25748 ("Golanhöhen", ♂, Weissinger). TÜRKEI: CAS 105950 (Yakaçık [Payas], 36°40'N 36°10'E, ♂, Clark & Clark); MTKD 25234, 26688 (Mersin, ♂♀, Radspieler), MTKD 26690 (Selçuk, ♀); NMW 35042 (Hadımköy, Thrakien, ♂, don. Steindachner 1894); *ZDEU 133.1957 (Savaştepe, ♂), *ZDEU 24.1963 (Kadirli, Çınar Köyü [Adana], ♀), *ZDEU 27.1973 (Habipler Köyü [Metris], Thrakien, ♀), ZDEU 99.1977 (Kısırbelek Köyü. Cizre, ♀), ZDEU 137.1985 (Yılan Adası, Kalkan, ♂), ZDEU 31.1988 (Büyükeceli, Mersin, ♂), ZDEU 29.1990 (Menemen, ♂), ZDEU 140.1991 (Çandır, Muğla, ♀), ZDEU 141.1991 (Ekincik, Muğla, ♂), ZDEU 142.1991 (Kavakarası, Muğla, ♂), ZDEU 122.1992 (Belevi, Selçuk, ♀), ZDEU 91.1993 (Gümüldür, Izmir, ♀), ZDEU 1.1997 (Letoon, Eşen, Fethiye, ♀), *ZDEU 12.1997 (Kaş, ♀); ZFMK 30506 (Taurus [Bolkar Dağ], ♂, Gutsche); ZMB 14376.1-3 (Zincirlihüyük [Gaziantep], ♂♂, ♀, v. Luschan), ZMB 19913 (Mersin, ♂, Holtz), ZMB 26679.1-5 (Zincirlihüyük, 2 ♂♂, 3 ♀♀, v. Luschan). Übriges Material: ZMB 13788 ("Palästina", ♀, Rothe); ZMZ 120332 ("Cairo", juv., 1875).

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Notes sur des Diploures Rhabdoures (Insectes, Aptérygotes) n°2: *Octostigma spiniferum* sp. n. (Projapygoidea, Octostigmatidae) de Java (Indonésie) – *Diplura Genavensia* XXV –

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New data on some Diplura Rhabdura (Insecta, Apterygota) n°2: *Octostigma spiniferum* sp. n. (Projapygoidea, Octostigmatidae) from Java (Indonesia) – *Diplura Genavensia* XXV –. Description of *Octostigma spiniferum* sp. n. from Bogor Botanical Garden in Java. This species is characterized by its chetotaxy and the two rows of spiniform setae on the inner side of the cerci.

Key-words: Taxonomy – Diplura – Projapygoidea – Octostigmatidae – Java – Indonesia – new species.

INTRODUCTION

La famille des Octostigmatidae a été définie par Rusek (1982) pour l'espèce *Octostigma herbivorum* Rusek des îles Tonga.

Une seconde espèce, *O. sinense* Xie & Yang a été décrite de Chine, provinces de Guangdong et du Yunnan (Xie & Yang, 1991)[2].

Au cours de sa mission entomologique en Insulinde en 1987, l'équipe du Département des Arthropodes et d'Entomologie I du Muséum d'histoire naturelle de Genève, dirigée par le Dr B. Hauser, a pu capturer dans le Jardin botanique de Bogor à Java, 3 spécimens qui représentent à mon avis une nouvelle espèce d'*Octostigma* que je décris ci-après: *O. spiniferum* sp. n.

Ces spécimens très contractés au départ, ont été traités par le Dr B. Hauser qui a pu les regonfler partiellement, leur montage, suivant la technique des deux lamelles porte-objet (Lienhard, 1994), m'a permis de faire toutes les observations utiles à leur étude. Néanmoins, l'état de contraction de l'holotype, par ailleurs plus ou moins tordu sur lui-même, ne permettant pas d'illustrer de façon correcte les différents éléments nécessaires à la description de l'espèce, j'ai préféré représenter en majorité ceux de l'exemplaire dont le sexe n'a pu être déterminé, mais pratiquement sans déformation; bien entendu la description qui suit tient compte des trois spécimens.

Ces trois préparations sont conservées dans la collection du Muséum d'histoire naturelle de Genève.

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[2] voir Derivatio nominis, p. 35.

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DESCRIPTION

On pourra se reporter à Pagés 1951 et 1953 pour la nomenclature de la chétotaxie des tergites abdominaux.

Octostigma spiniferum sp. n.

Matériel étudié[3]: **Holotype:** ♀ ad. de 1, 70 mm: Indonésie: Java: Bogor, Jardin Botanique dans la partie "Nursery" sous des pots de fleurs et surtout sous les dalles du chemin entre les serres du fond, 260 m; 28.XI.1987; leg. B. Hauser (Sar-87/31); paratypes: 1 sexe? de 1, 39 mm, 1 ♀ de 1, 58 mm: Indonésie: Java: Bogor, Jardin Botanique, sous des pierres près du "Guest House", env. 250 m; 24.XI.1987; leg. B. Hauser (Sar-87/9).

TÊTE

Vertex: Beaucoup plus pileux sur l'aire centrale délimitée par les bases des antennes et celle de la suture métopique que chez *O. herbivorum* ou les *Anajapyx* (cf. Pagés, 1997); toutes les soies sont simples, même les plus longues.

Front: 2 assez courtes soies.

Clypéus: 1 longue soie.

Labre: identique à celui d'*O. herbivorum*, la chétotaxie de son bord libre plus simple que chez *Anajapyx vesiculosus* Silv..

Antennes: 23 articles chez le plus jeune individu, 24 chez la ♀ de 1, 58 mm et 26 à l'antenne droite de la ♀ holotype, la gauche étant brisée au niveau de l'article 15; l'augmentation du nombre d'articles en fonction de la taille et du développement postembryonnaire est connu chez d'autres Rhabdoures, mais il n'y a pas de règle absolue et il peut s'agir ici du hasard des récoltes en des biotopes relativement éloignés les uns des autres; *O. sinense* se distinguerait des deux autres espèces par la forte amplitude de la variation du nombre d'articles: 24 à 31; malgré le petit nombre d'exemplaires la répartition des trichobothries antennaires présente de nombreuses anomalies à partir du 8ème article; la répartition de base semble être la suivante: articles 1-4 = 0; 5-6 = 3; 7 = 3 dont 1 piriforme; 8 = 3; 9-10 = 2; 11 = 1; 12 = 2; 13 = 0; 14 = 2; 15 = 1; 16 et seq. = 0; *O. spiniferum* s'écarte donc des deux autres *Octostigma* connus par le petit nombre d'articles possédant des trichobothries: 14 (5ème-18ème) chez *O. herbivorum*, 13 (5ème-17ème) chez *O. sinense*, 11 (5ème-15ème) chez *O. spiniferum*; cette grande instabilité dans l'équipement sensoriel antennaire peut, peut-être, s'expliquer en tenant compte du fait qu'*Octostigma* est, à mon avis, plus primitif qu'*Anajapyx* par bien des caractères; on note les irrégularités suivantes: chez l'individu le plus jeune l'article 9 n'a qu'1 trichobothrie, les 11ème et 15ème aucune; chez la ♀ de 1, 58 mm l'article 8 a 2 sensilles à l'antenne droite au lieu de 3 et l'article 15 de l'antenne gauche en est dépourvu; quant à la ♀ holotype l'article 13 en a une à l'antenne droite et 2 à la gauche, l'article 14 par contre en a 2 à droite et

[3] D'après la liste des stations de récoltes de la "Mission entomologique à Singapour, Indonésie (Bali et Java) et Malaysia (Sarawak)" en 1987 établie par le Dr B. Hauser.

1 à gauche; il semble donc que chez les Octostigmatidés, comme chez les Anajapygidés, (Pagés, 1997), la répartition des trichobothries n'ait pas la fixité pratiquement absolue qui est la règle chez les formes plus évoluées de Diploures.

Pièces buccales: Mandibules et maxilles typiques du genre; on notera cependant que les dents des mandibules sont, semble-t-il, nettement plus aiguës chez *Octostigma* que chez *Anajapyx* et la prostheca beaucoup plus simple chez ce dernier genre. Labium conforme à la fig. 5 de Rusek (1982); par rapport à *Anajapyx* (Pagés, 1997) on peut remarquer quelques petites différences comme par exemple au lobe interne *Octostigma* est pourvu d'une petite soie antérieure suivie d'une minuscule sensile sétiforme, alors que c'est l'inverse chez *Anajapyx*; de même il n'y a que 2+2 soies sur le submentum d'*Anajapyx* alors qu'il y en a 3+3 assez longues chez *Octostigma*. Les palpes sont réduits à des mamelons assez saillants chez *O. spiniferum*, pourvus typiquement de seulement quatre sensilles, les deux plus externes bacilliformes, les deux internes subsétiformes, assez fines à apex mousse; chez la ♀ holotype le palpe droit montre en plus une longue sensille sétiforme, trois fois plus longue que les autres. Processus palpiforme et pli oral typiques de la famille.

Thorax

Pronotum: 4+4 *M*, les 1+1 médians antérieurs, 1+1 postérieurs et les 1+1 latéraux intermédiaires assez courts avec une barbule, les 1+1 sublatéraux intermédiaires en présentant 2; chez la ♀ holotype les 1+1 latéraux intermédiaires portent plusieurs barbules, mais leurs embases sont apparement indifférenciées.

Mésonotum: 8+8 *M*, les médians antérieurs et postérieurs courts avec une barbule, les submédians postérieurs et sublatéraux postérieurs assez longs avec une barbule, les autres *M* longs avec au moins deux barbules; 6-7+6-7 soies courtes.

Métanotum: 7+7 *M*, 1+1 médians postérieurs courts, en fourche ainsi que les 1+1 sublatéraux subantérieurs, les autres assez longs ou longs avec 1 ou 2 barbules; environ 10-12+10-12 soies courtes.

Pattes: assez courtes, peu pileuses, sauf le tarse pourvu d'une vingtaine de soies, les tergales assez longues, les sternales nettement plus longues dont les 2-3 plus distales, plus épaisses, aiguës, atteignant l'extrémité des griffes antérieures; tous les tibias sont pourvus, face sternale, des deux calcars habituels, mais peu différenciés et lisses; comme chez *Anajapyx* il n'y a pas d'unguiculus différencié aux PI, celui des PII et PIII fortement saillant et bien détaché des griffes, très aigu; griffe postérieure égale aux 3/5 de la longueur du tarse, à environ 1, 5 fois la griffe antérieure et à 2, 7 fois celle de l'unguiculus; les pelotes tarsales ne montrent aucune différenciations particulières.

Abdomen

Tergite 1: 5+5 *M* (A_1, $B_{1\text{-}3}$, B_5), B_4 indifférencié pourvu d'une courte barbule subapicale comme B_1 et B_5, les autres en ayant 2 ou 3.

Tergite 2: 7+7 *M*, A_3 nuls, A_1 et B_5 avec 1 barbule, les autres avec 2 ou 3 longues barbules.

Tergites 3 à 7: 8+8 *M* avec au moins 2 barbules, même les B_1 qui sont courts.

Tergite 8: 5+5 *M* postérieurs, les 1+1 médians courts et en fourche, les autres longs à 2 ou 3 longues barbules; de nombreuses soies courtes, lisses.

Urite 9: Comme chez *Anajapyx* il n'y a pas chez *Octostigma* de limite entre le tergite et les sternopleurites (Pagés, 1989); sur l'anneau ainsi formé *O. spiniferum* porte 7+7 *M* postérieurs assez longs avec 2-3 barbules à l'exception des 1+1 médians tergaux et des 1+1 médians sternaux qui sont assez courts et en fourche; une trentaine de soies simples, surtout nombreuses face tergale.

Tergite 10: 1+1 *M* submédians subpostérieurs longs à deux barbules, 3 + 3 soies assez longues le long de la base des cerques.

Valvule supra-anale: 2+1+2 soies courtes dont 1+1+1 apicales, la médiane plus longue que les autres.

Sternite 1: 5+5 *M* assez courts, les 2+2 latéraux antérieurs et intermédiaires avec deux fortes barbules, les 3+3 autres avec une barbule subapicale. Appendices subcoxaux typiques avec les deux soies habituelles, sauf chez le plus jeune individu où la courte est absente.

Sternites 2-7: Préscutum: 5-7+5-7 *M* longs à 1 à 3 barbules. Scutum: 6+6 *M*, les médians antérieurs et les postérieurs médians et submédians assez courts, fourchus, les autres avec au moins 2 barbules; chez la ♀ holotype le sternite 7 est pourvu sur son côté gauche d'un *M* supplémentaire, antérieur submédian, long, avec une courte barbule subapicale.

Sternite 8: 2+2 *M* postérieurs, les 1+1 médians fourchus, plus courts que les deux autres qui présentent deux barbules; de nombreuses soies courtes, localisées principalement sur l'aire centrale du sternite; Rusek (1982) a signalé que les ♀ d'*Octostigma* ont seulement 2+2 *M*, alors que les ♂ en présentent 3+3; ce caractère sexuel secondaire était inconnu chez les Propajygoidea; il n'existe pas chez les Anajapygidae (cf. Pagés, 1997: figs 27 et 49).

Sternite 10: 4+4 *M* longs à 1 à 3 fines barbules; 10-12 +10-12 soies courtes.

Styles 1 à 7: avec 4+4 soies, dont l'apicale et la subapicale longues et deux soies assez courtes ou courtes, l'une représentant la soie médiane antérieure en position externe, l'autre, insérée au même niveau, mais en position postérieure; cette chétotaxie paraît propre aux *Octostigma*.

Vésicules exsertiles: typiques aux sternites 2 à 7.

Papille génitale ♀: du type Anajapygidae (cf. Pagés, 1961).

Cerques

Comme chez *O. herbivorum*, ceux d'*O. spiniferum* sont constitués d'un article basal très court, suivi d'un complexe résultant de la fusion de plusieurs articles, auquel font suite trois articles séparés, le cerque se terminant par l'exutoire finement plissé de la glande préanale. Chez *O. sinense* il y aurait un complexe peu important suivi de cinq articles séparés.

En tenant compte des remarques que j'ai faites (Pagés, 1997) sur la segmentation des cerques d'*Anajapyx* il est possible de décrire ceux d'*O. spiniferum* et leur chétotaxie de la façon suivante.

Une base très courte portant trois longues soies dont deux externes et une médio-sternale ainsi que deux minuscules sensilles sétiformes; une ligne d'autotomie la sépare du reste du cerque. Vient ensuite le complexe d'articles fusionnés que j'interprète ainsi: à sa base un demi-verticille de cinq longues soies externes correspondant au demi-verticille D d'*Anajapyx*; lui succède un certain nombre de verticilles complets alternativement de soies longues (= L), ou de soies courtes (= C): 3 L et 2 C chez le plus jeune individu, 4 L et 3 C chez l'holotype; dans les L, les deux soies latérales internes sont transformées en épines longues, très épaisses, arquées vers leur apex qui est très aigu et leurs embases sont situées au sommet d'un mamelon fortement saillant; entre les épines de chaque paire, exactement sur la ligne médiane, une très courte soie qui semble correspondre aux "short, thickened spines" des ♂ d'*O. herbivorum* (Rusek, 1982: fig. 10); les autres phanères du complexe sont normaux, simples, seules 2 soies longues de D et 1-2 autres du second verticille de soies L présentent 1 à 2 barbules. A la suite de ce complexe trois articles individualisés, chacun avec 1 L et 1 C, sont pourvus d'épines identiques à celles des articles fusionnés.

Affinités

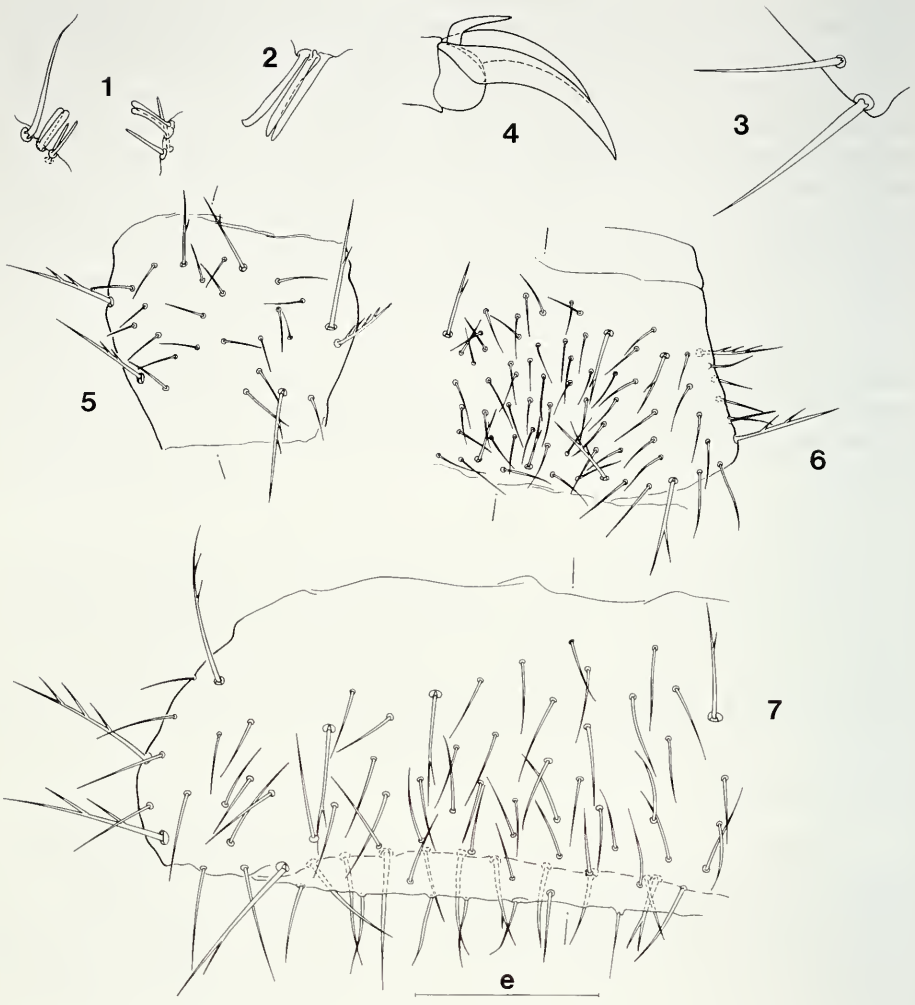
Octostigma herbivorum Rusek et *O. spiniferum* sp. n., sont très voisines l'une de l'autre; la chétotaxie des sclérites permettra de les séparer aisément, ainsi que l'équipement sensoriel des antennes et la double rangée de fortes épines sur la face interne des cerques qui pourrait être une autapomorphie propre au moins aux ♀ de *spiniferum*. Ces deux espèces diffèrent profondément d'*O. sinense* Xie & Yang par de nombreux caractères chétotaxiques et morphologiques.

Derivatio nominis

spinifer, *-era*, *-erum*: épineux, allusion aux soies spiniformes des cerques. Rusek (1982) donne comme éthymologie pour *Octostigma* n. gen.: "The name of the new genus is derived from its possession of 8 thoracic spiracles." Il n'en indique pas le genre grammatical, or *stigma* est du genre neutre en latin; il s'ensuit que les noms spécifiques *herbivora* et *sinensis* doivent être modifiés en *herbivorum* Rusek et *sinense* Xie & Yang.

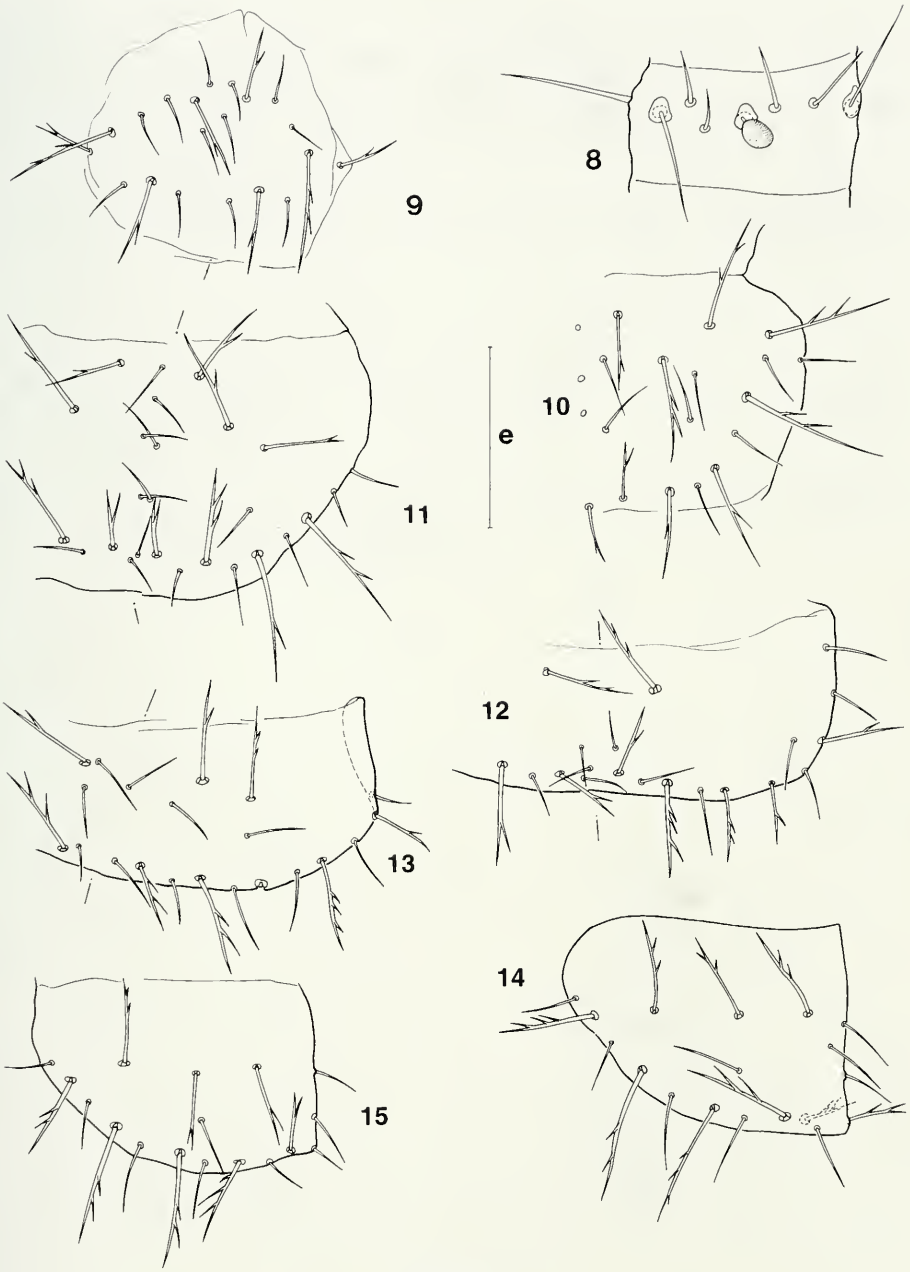
REMERCIEMENTS

Je remercie Mme Juriens-Cottet qui a mis au net mon manuscrit ainsi que Mlle F. Marteau et M. G. Roth qui ont reproduit sur calque mes dessins originaux. Enfin toute ma reconnaissance va au Dr B. Hauser qui s'est occupé de la mise au point définitive de cette note.



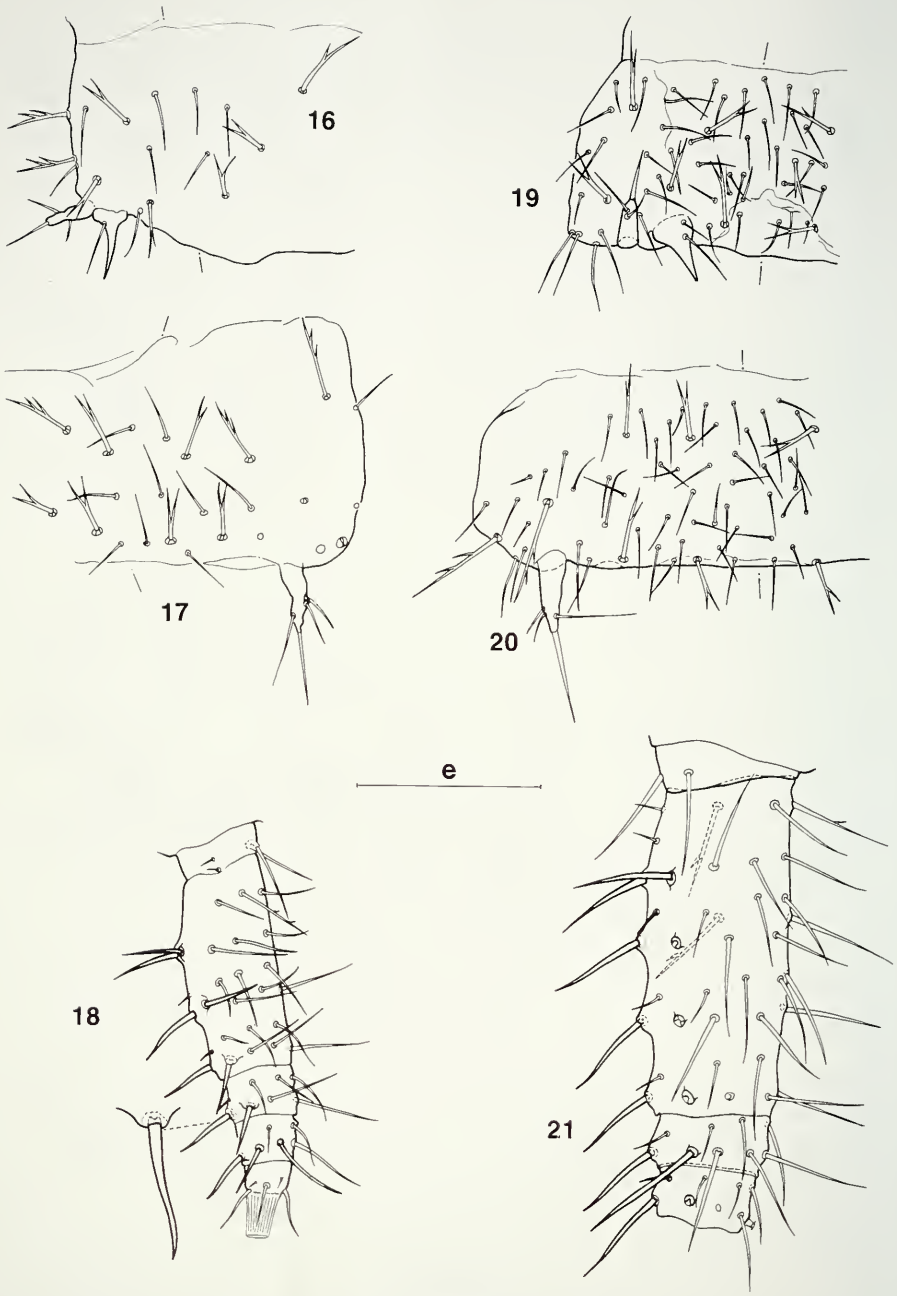
FIGS 1-7

Octostigma spiniferum sp. n., ♀ holotype. -1. Palpes labiaux, e = 24 µm. -2. Processus palpiforme droit, e = 24 µm. -3. Calcars du tibia de la PIII gauche, e = 35 µm. -4. Prétarse de la PIII droite, e = 35 µm. -5. Pronotum, e = 101 µm. -6. Urotergite 6, e = 105 µm. -7. Urotergite 7, e = 67 µm.



FIGS 8-15

Octostigma spiniferum sp. n., ♀ paratype. -8. 7ème article de l'antenne gauche, vue tergale, e = 35 µm. Sexe?, paratype. -9. Pronotum, e = 67 µm. -10. Mésonotum, e = 67 µm. -11. Métanotum, e = 67 µm. -12. Urotergite 1, e = 67 µm. -13. Urotergite 2, e = 67 µm. -14. Urotergite 6, e = 67 µm. -15.Urotergite 7, e = 67 µm.



FIGS 16-21

Octostigma spiniferum sp. n., sexe ?, paratype. -16. Urosternite 1, e = 67 µm. -17. Urosternite 3, e = 67 µm. -18. Cerque droit, face tergale, e = 109 µm, et détail d'une soie spiniforme, e = 35 µm. ♀ holotype. -19. Urosternite 1, e = 158 µm. -20. Urosternite 7, e = 158 µm. -21. Cerque gauche, face sternale, e = 90 µm.

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Neue japanische Arten der Gattung *Stenus* Latreille (Coleoptera: Staphylinidae) 266. Beitrag zur Kenntnis der Steninen

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New Japanese species of the genus *Stenus* Latreille (Coleoptera: Staphylinidae).- Description of 8 new species of the genus *Stenus* Latreille from Honshu, Japan: *Stenus (Hypostenus) cygnipenis* sp. n., *S. (H.) dainichi* sp. n., *S. (H.) fujiensis* sp. n., *S. (H.) fujimontis* sp. n., *S. (H.) geisha* sp. n., *S. (Hemistenus) nachiensis* sp. n., *S. (Hypostenus) wakayamanus* sp. n., *S. (Nestus) wasamatanus* sp. n. including a list of further species records from Honshu, Japan.

Key-words: Coleoptera – Staphylinidae – Steninae – taxonomy – Japan.

EINLEITUNG

Nachdem im letzten Jahrzehnt die Steninen Japans von meinem lieben Freund Shun-Ichiro Naomi intensiv studiert und eine große Zahl neuer Arten beschrieben worden sind, war es für mich überraschend, dass ich selbst 1999 während eines fünfwöchigen Japanaufenthaltes in drei Sammelwochen eine Reihe weiterer neuer Arten entdecken konnte, und das auch noch in der zum Sammeln ungünstigen Zeit Juli-August und nur in drei Bezirken (Kinki, Chûbu und Kantô). Man erkennt daraus, dass die *Stenus*-Fauna Japans immer noch nicht vollständig erfasst ist und wir mit zahlreichen weiteren Arten zu rechnen haben. Und das ist auch kein Wunder, wenn man sich das Relief dieses Landes und seine ungeheure Erstreckung von der holarktischen bis in die orientalische Faunenregion vor Augen hält.

Trotzdem halte ich es für bemerkenswert, dass ich allein auf dem häufig besuchten Mt. Fuji drei neue Spezies feststellen konnte. Die Gattung *Stenus* erweist sich in Japan als besonders artenreich in der Untergattung *Hypostenus*. Es handelt sich dabei um Edaphon-bewohnende, meist brachyptere Arten mit einem äußerlich recht einförmigen Habitus. Zum Glück bieten aber sowohl die männlichen als auch die weiblichen Genitalien sichere Unterscheidungsmerkmale, wobei es bei den Männchen darauf ankommt, den Aedoeagus genau zu untersuchen: vor allem die Gestalt der Ausstülpeinrichtung des Innensacks und auch der Paramerenbau inklusive –Beborstung bilden wichtige Charaktere, die jeweils beschrieben werden sollten.

Manuskript angenommen 11.09.2000

Für einen Europäer ohne Japanischkenntnisse ist es zur Zeit noch schwierig, sich in den naturnahen Gebieten und Gebirgen Japans zurechtzufinden. Während meines Japanaufenthaltes wurde ich dabei von den Kollegen Drs. Toshio Kishimoto, Munetoshi Maruyama und Shûhei Nomura und vor allem von meinem Freund Naomi geleitet und begleitet, wofür ich auch an dieser Stelle sehr herzlich danken möchte. Ein besonderer Dank gebührt auch der Universität von Hokkaido, die mir in ihrer Station Wakayama Experimental Forest, Hirai, in deren naher Umgebung ich zwei neue Spezies finden konnte, großzügige Gastfreundschaft gewährt hat. Im Folgenden verzeichne ich meine Funde und beschreibe die neuen Taxa.

Die Holotypen sämtlicher neuen Arten befinden sich im Muséum d'histoire naturelle, Genève, Paratypen ebendort, in coll. Puthz und in coll. Naomi.

Wie in meinen anderen Arbeiten gelten auch hier die folgenden Abkürzungen: aE = average distance between eyes, mittlerer Augenabstand; HT = Holotypus; lEl = greatest length of elytra, größte Elytrenlänge; lE = length of eyes, Augenlänge; lP = length of pronotum, Pronotumlänge; lS = length of suture, Nahtlänge; PM = proportional measurements; PT = Paratypus; wEl = greatest width of elytra, größte Elytrenbreite; wH = width of head, Kopfbreite; wP = width of pronotum, Halsschildbreite.

SYSTEMATIK

Dianous shibatai Sawada

Material: 1 ♀: Tochigi Pref., oberhalb Oku-Nikko, 1500 m, Weg zum Lake Marunuma, deciduous forest, 29.VII.1999.

Bemerkung: Von dieser Art waren bisher nur zwei Exemplare aus den Präfekturen Nagano und Yamagata bekannt, der neue Fund zeigt, dass die Art auch in den Zwischengebieten lebt.

Stenus alienus Sharp

Material: Zahlreiche Exx.: Tochigi Pref., Oku-Nikko, Sand-Kies-Fläche neben Bach, 29.VII.1999; 1 ♂: Gunma Pref., Marunuma, 1300 m, Seeufer, 30.VII.1999.

Bemerkung: Eine weit in Japan und China verbreitete Art.

Stenus anthracinus Sharp

Material: 1 ♀: Wakayama Pref., oberhalb Nachi-san, ca. 350 m, an Felsblöcken in einem Bach, 13.VII.1999; 3 ♂♂, 1 ♀: Wakayama Pref., oberhalb Hirai, ca. 300 m, rechter Seitenbach des Hirai-Flusses, an großen Felsen, 16.VII.1999.

Bemerkungen: Im Gelände habe ich diese Art für einen *Dianous* gehalten, weil sie ebenso an großen, überrieselten Felsblöcken jagt. In Japan weit verbreitet, aber noch nicht aus der Wakayama Präfektur gemeldet. Im Zoologischen Museum Kopenhagen befinden sich weitere 3 Stücke von Kamikochi, Nagano Pref.. Ob die Art auch in China vorkommt (Li, 1985), scheint mir fraglich.

Stenus juno Paykull

Material: 1 ♀: Tochigi Pref., Oku-Nikko, Schilf am Seeufer, 29.VII.1999; 6 ♂♂, 1 ♀: Gunma Pref., L. Marunuma, 30.VII.1954, K. Sawada (coll. Puthz).

Bemerkung: Diese holarktische Art ist erst 1991 von Hokkaido für Japan nachgewiesen worden. Die hier mitgeteilten Funde sind die ersten, die von Honshu publiziert werden. Im Zoologischen Museum Kopenhagen befinden sich noch 3 Exemplare aus Kamikochi, Nagano Pref.

Stenus lewisius Sharp

Material: 4 ♂♂, 5 ♀♀: Gunma Pref., Marunuma, 1300 m, Seeufer, 30.VII.1999.

Bemerkung: Eine in Japan häufige Art, deren Vorkommen in Kyushu jedoch der Bestätigung bedarf.

Stenus (Nestus) wasamatanus sp. n. Fig. 1

Material: ♂-Holotypus und 6 ♂♂, 6 ♀♀-Paratypen: Honshu: Nara Pref., Mt. Wasamata-yama, ca. 1150 m, Gesiebe in Laubwald, 11.VII.1999 (zusammen mit *S. sawadaiellus* Naomi & Puthz und *S. syugen* Naomi), Puthz.

Beschreibung: Länge: 3,0-3,6 mm (Vorderkörperlänge: 1,6 mm). Brachypter, schwarz, schwach glänzend, grob und dicht punktiert, überall genetzt, kurz beborstet. Fühlerbasis schwarz, restliche Glieder gebräunt. An den Kiefertastern das 1. Glied und die Basis des 2. Gliedes gelb, Rest des 2. Gliedes und 3. Glied braun bis dunkelbraun. Beine kastanienbraun bis dunkelbraun, Knie geschwärzt. Clypeus und Oberlippe schwarz, ziemlich dicht beborstet.

PM des HT: wH: 30; aE: 19; wP: 24,3; lP: 25; wEl: 31,4; lEl: 24; lS: 19.

Männchen: Schenkel stark gekeult, Mittelschienen mit Apikaldorn, Hinterschienen mit starkem Präapikalzahn. Metasternum flach eingedrückt, ziemlich grob, dicht punktiert. Vordersternite ziemlich grob und sehr dicht punktiert, 7. Sternit in der hinteren Mitte mit ziemlich schmalem Eindruck, darin noch etwas dichter als an den Seiten punktiert und beborstet, Hinterrand deutlich ausgerandet. 8. Sternit mit tiefem, etwa ovalem Längseindruck, dieser proximal unpunktiert, im Übrigen äußerst fein und dicht punktiert und beborstet, Hinterrand mit schmaler Ausrandung etwa im hinteren Neuntel. 9. Sternit apikolateral gesägt-gezähnt. 10. Tergit abgerundet. Aedoeagus ähnlich dem des *S. satushin*, die Apikalpartie des Medianlobus (Fig. 1) mit zwei stumpfen Ventrolateralzähnen, Ausstülpspange mit seitlichen Höckern.

Bemerkungen: Diese neue Art gehört in die Gruppe des *Stenus humilis* Erichson, die in Japan durch eine Reihe außerordentlich ähnlicher, meist brachypter Spezies vertreten ist, welche sich meist nur durch den Aedoeagus trennen lassen. Vermutlich gehören mehrere dieser Arten zu polytypischen Spezies, was aber erst verifiziert werden kann, wenn lückenlose Aufsammlungen aus den verschiedenen Gebirgen vorliegen und man zum Beispiel prüfen kann, inwieweit hier klinale Tendenzen ausgeprägt sind.- Unter den bisher bekannten Taxa der genannten Gruppe ähnelt die neue Art besonders dem von Shikoku beschriebenen *S. satushin* Naomi & Puthz. Die Beschreibung kann wegen prinzipieller Ähnlichkeit der brachypteren Taxa dieser Gruppe kurz gehalten werden. *Stenus wasamatanus* sp. n. unterscheidet sich von den übrigen brachypteren japanischen Vertretern seiner Gruppe durch seinen Aedoeagus, von einigen Arten auch durch die ventralen Sexualcharaktere des Männchens.

Stenus melanarius verecundus Sharp

Material: 1 ♀: Tochigi Pref., Oku-Nikko, schlammiges Flussufer, 29.VII.1999; 3 ♀♀: Gunma Pref., Marunuma, 1300 m, Seeufer, 30.VII.1999.

Bemerkung: Diese Subspezies des holarktischen *S. melanarius* ist in Japan weit verbreitet und reicht südlich bis nach Kyushu.

Stenus oisami Naomi & Puthz

Material: 11 ♂♂, 11 ♀♀: Honshu: Yamanashi Pref., Mt. Fuji Nord-Seite, schmaler Laubwaldstreifen neben der Subaru-line, 2050 m, Gesiebe von Laub und Moos zwischen Felsen und Baumstämmen, 1.VIII.1999; 5 ♂♂, 6 ♀♀: Shizuoka Pref., Mt. Fuji Ost-Seite, kleine Schlucht mit Erlen, Birken, *Sorbus*, *Polygonum* und Farnen am Ende der Azami-line, 2000 m, 2.VIII.1999.

Bemerkung: Diese große, rötlich gefärbte Art ist 1994 nach einem Männchen vom Mt. Fuji beschrieben worden. Die neuen Funde zeigen, dass sie auf dem genannten Berg in größerer Höhe weit verbreitet und offenbar nicht selten ist.

Stenus (Hypostenus) wakayamanus sp. n. Figs 2-4

Material: ♀-Holotypus und 4 ♂♂, 5 ♀♀-Paratypen: Honshu: Wakayama Pref., Umg. Hirai, deciduous forest mit eingestreuten Zedern an der alten Straße oberhalb des Ortes, ca. 300 m, 14.VII.1999; weitere PTT: 3 ♂♂, 3 ♀♀: Umg. Hirai, deciduous forest mit eingestreuten Nadelbäumen an der neuen Straße rechts des Hirai-Flusses unterhalb Hirai, Laub-Moos-Farn-Gesiebe, 14.VII.1999; 2 ♂♂, 2 ♀♀: Wakayama Pref., oberhalb Nachi-san, 350 m, deciduous forest, 13.VII.1999; 1 ♂: Near In-you waterfall, bei Mt. Nachi, 300 m, 13.VII.1999; 3 ♂♂, 1 ♀: Wakayama Pref., Kizetsu-kyo, Tanabe-shi, 150 m, deciduous forest, 15.VII.1999; 1 ♂, 1 ♀: Wakayama Pref., Toragamine-toge, Minabegawa-mura, 590 m, deciduous forest, 15.VII. 1999; 1 ♀: Nara Pref., Mt. Wasamata-yama, ca. 1150 m, Laubgesiebe, 11.VII.1999, alle lg. Puthz.

Beschreibung: Länge: 3,5-5,2 mm (Vorderkörperlänge: 1,8-2,2 mm). Brachypter, schwarz mit deutlichem Bronzeschimmer, mäßig glänzend, Kopf mäßig grob und ziemlich dicht punktiert, Pronotum grob und dicht, Elytren sehr grob und dicht punktiert, Abdomen mäßig grob bis mäßig fein und ziemlich dicht punktiert, Beborstung kurz, anliegend. Fühler gelb, die Keule gebräunt. Kiefertaster gelb. Beine bräunlichgelb, die Schenkel zur Spitze kaum dunkler, Tarsengliedspitzen angedunkelt. Clypeus schwarz, Oberlippe braunschwarz, beide dicht beborstet. 3. Abdominalsegment nur proximal bis zur Stigmenöffnung mit Seitenrandung. 10. Tergit breit abgerundet.

PM des HT und, in Klammern, von zwei ♀♀ vom selben Fundort und von einem ♀ von Kizetsu-kyo: wH: 36 (37; 39; 43); aE: 19 (19; 21; 21); wP: 26,5 (28; 29,5; 32); lP: 27,5 (30; 30,5; 32); wEl: 31 (34; 35; 37); lEl: 29 (31; 31; 33); lS: 20 (21; 20; 23).

Männchen: Schenkel leicht gekeult. Beine sonst ohne Auszeichnungen. Vordersternite wenig fein und mäßig dicht punktiert, 7. Sternit in der hinteren Mitte etwas feiner und deutlich dichter als an den Seiten punktiert und beborstet. 8. Sternit mit flacher Apikalausrandung etwa in hinteren Zweiundzwanzigstel (67:3). 9. Sternit (Fig. 4). Aedoeagus (Fig. 3), der Medianlobus vorn mit winziger häutiger Spitze, Ausstülphaken kräftig, median verbunden. Parameren apikal stark ver-

schmälert und mit zwei Borstengruppen, einer Gruppe mit 3-4 stärkeren und einer zweiten mit 6-7 feineren, randständigen Borsten.

Weibchen: 8. Sternit apikal breit abgerundet, in der Mitte kaum vorgezogen. Valvifer apikolateral mit langem, starkem Zahn. Spermatheka (Fig. 2) aus zwei Reservoiren und einem ganz kurzen, breiten, umgebogenen Rohr bestehend.

Bemerkungen: Diese neue Art gehört in die Umgebung des *Stenus indubius* Sharp und ist hier die Schwesterart des *S. ohishii* Naomi. Sie sieht ihm und anderen Arten derselben Verwandtschaftsgruppe äußerlich zum Verwechseln ähnlich und ist selber in Größe und Punktierung durchaus variabel, so dass beim gegenwärtigen Kenntnisstand ihre sichere Identifizierung nur mit Hilfe der Sexualcharaktere möglich ist. Die Beschreibung des Exoskeletts kann deshalb kurz gehalten werden. *Stenus wakayamanus* sp. n., der in der namensgebenden Präfektur weit verbreitet scheint, unterscheidet sich von seinen Nahverwandten sowohl durch seinen Aedoeagusbau als auch durch seine Spermatheka. Der Aedoeagus erinnert an den des *S. ohishii* Naomi, ist jedoch deutlich schmäler und vorn gerade (nicht rundlich) verengt, die Spermatheka besitzt, bei prinzipiell sehr ähnlichem Bau, ein kürzeres Endstück (vgl. Puthz, im Druck). Ich habe zuerst vermutet, dass die neue Art mit *S. fugu* Hromádka identisch sein könnte, der vom Mt. Nachi beschrieben wurde; jedoch besitzt *S. fugu* laut Beschreibung einen schmäleren Kopf und ein anders gestaltetes 8. Sternit, wie mir auch Kollege Naomi bestätigt.

Stenus (Hypostenus) geisha sp. n. Figs 5-7

Material: ♀-Holotypus und 1 ♀-Paratypus: Honshu: Yamanashi Pref., Mt. Fuji Nord-Seite, schmaler Laubwaldstreifen neben der Subaru-line, 2050 m, Gesiebe von Laub und Moos zwischen Felsen und Baumstämmen, 1.VIII.1999, Puthz (zusammen mit *S. oisami* Naomi und *S. sharpi* Bernhauer & Schubert).

Beschreibung: Länge: 3,5-4,2 mm (Vorderkörperlänge: 1,9 mm). Brachypter, schwarz mit braunem Anflug, schwach schimmernd, Vorderkörper grob und sehr dicht, Abdomen grob bis fein, ebenfalls sehr dicht punktiert, überall dicht genetzt, Beborstung kurz, anliegend. Kiefertaster gelb, Fühler und Beine rötlichgelb, Knie kaum, Fühlerkeule und Tarsengliedspitzen leicht verdunkelt. Clypeus schwarz, Oberlippe dunkelbraun, heller gesäumt, beide dicht beborstet. 3. Abdominalsegment in den basalen zwei Dritteln mit angedeuteter Seitenrandung, 10. Tergit abgerundet.

PM des HT: wH: 37; aE: 19; wP: 28; lP: 28; wEl: 35; lEl: 31; lS: 23.

Männchen: unbekannt.

Weibchen: 8. Sternit breit abgerundet, in der Hinterrandmitte sehr schwach vorgezogen. Valvifer (Fig. 7). Spermatheka (Fig. 5). In der Abdomenspitze außerdem, häutig umgeben, ein längliches, unscharf abgegrenztes, stärker sklerotisiertes Sklerit (Fig. 6).

Kopf breiter als die Elytren, Stirn ziemlich breit mit zwei tiefen Längsfurchen, Mittelteil gut so breit wie jedes der Seitenstücke, breitrund kräftig erhoben, deutlich das Augeninnenrandniveau überragend. Punktierung seitlich mäßig grob und sehr dicht, zum Mittelteil hin flacher und weitläufiger, der mittlere Punktdurchmesser entspricht etwa dem mittleren Querschnitt des 3. Fühlergliedes, Punktzwischenräume

seitlich überall kleiner als die Punktradien, am Mittelteil manchmal so groß wie die Punkte. Fühler schlank, aber kurz, zurückgelegt bis ins hintere Pronotumdrittel reichend, vorletzte Glieder deutlich länger, aber weniger als 1,5 x so lang wie breit. Pronotum so lang wie breit, seitlich in den vorderen zwei Dritteln kräftig konvex, hinten deutlich konkav eingezogen; längs der Mitte eine deutliche, lange, schmale Mittelfurche, die in ihrer Längmitte kurz breiter wird und daselbst auf winziger Fläche eine etwas mehr als punktgroße unpunktierte, aber genetzte Partie zeigt; seitlich auch mehrere Unebenheiten. Punktierung grob und sehr dicht, manchmal leicht rugos, der mittlere Punktdurchmesser etwas gröfler als der größte Querschnitt des 3. Fühlergliedes, erreicht aber nicht ganz den apikalen Querschnitt des 2. Fühlergliedes, Punktzwischenräume, außer direkt in der Mitte, überall deutlich kleiner als die Punktradien. Elytren trapezoid, schmäler als der Kopf, deutlich breiter als lang, Schultern abgeschrägt, Seiten nach hinten kräftig erweitert, im hinteren Viertel deutlich eingezogen, Hinterrand tiefrund ausgerandet. Nahteindruck in den vorderen zwei Dritteln breit und tief, Schultereindruck tief, ein weiterer Längseindruck in der hinteren Außenhälfte. Punktierung deutlich gröber als am Pronotum, ebenfalls sehr dicht, aber kaum rugos, der mittlere Punktdurchmesser entspricht etwa dem basalen Querschnitt des 2. Fühlergliedes. Abdomen mit mäßig tiefen basalen Quereinschnürungen der ersten Segmente, 7. Tergit mit rudimentärem apikalem Hautsaum (brachyptere Art). Punktierung überall sehr dicht, vorn so grob wie neben den Augen, nach hinten kontinuierlich feiner werdend, auf dem 7. Tergit sind die Punkte noch fast so groß wie eine Augenfacette, 10. Tergit fein und weitläufig punktiert. An den schlanken Beinen sind die tief gelappten Hintertarsen etwa 2/3 schienenlang, ihr 1. Glied ist etwas kürzer als die drei folgenden zusammengenommen, erheblich länger als das Klauenglied.

Bemerkungen: Diese neue Art ähnelt äußerlich vor allem dem *S. kumoma* Naomi. *Stenus geisha* sp. n. – ich nenne ihn so, weil von ihm bisher nur Weibchen vorliegen – unterscheidet sich von *S. kumoma* Naomi durch erheblich dichter punktiertes, matteres Abdomen und schmälere, weniger auffällige Mittelfurche des Pronotums sowie durch seine Spermatheka, von *S. inaequatus* Puthz durch robusteren Bau, noch dichter punktiertes Abdomen sowie weniger grob und überwiegend getrennt punktiertes Pronotum (die Spermatheka der verglichenen Art ist bisher unbekannt).

Stenus bicara Naomi

Material: 3 ♂♂: Tochigi Pref., Okukinu, ca. 1200 m, deciduous forest, 27.VII.1999; 2 ♂♂, 2 ♀♀: Tochigi Pref., oberhalb Oku-Nikko, 1500 m, Weg zum Lake Marunuma, deciduous forest, 29.VII.1999.

Bemerkung: Diese Art ist aus der Tochigi-Präfektur beschrieben und dort offenbar immer wieder gesammelt worden. Freund Löbl brachte vom Fundort der Typen 6 ♂♂, 6 ♀♀, 14.VII.1980, mit.

Stenus (Hypostenus) fujimontis sp. n. Figs 8-11

Material: ♂-Holotypus und 1 ♂, 1 ♀-Paratypen: Honshu: Shizuoka Pref., Mt. Fuji Ost-Seite, Mischwald an der Azami-line, 1400 m, 2.VIII.1999, Puthz; 1 ♀-Paratypus: ibidem, Naomi.

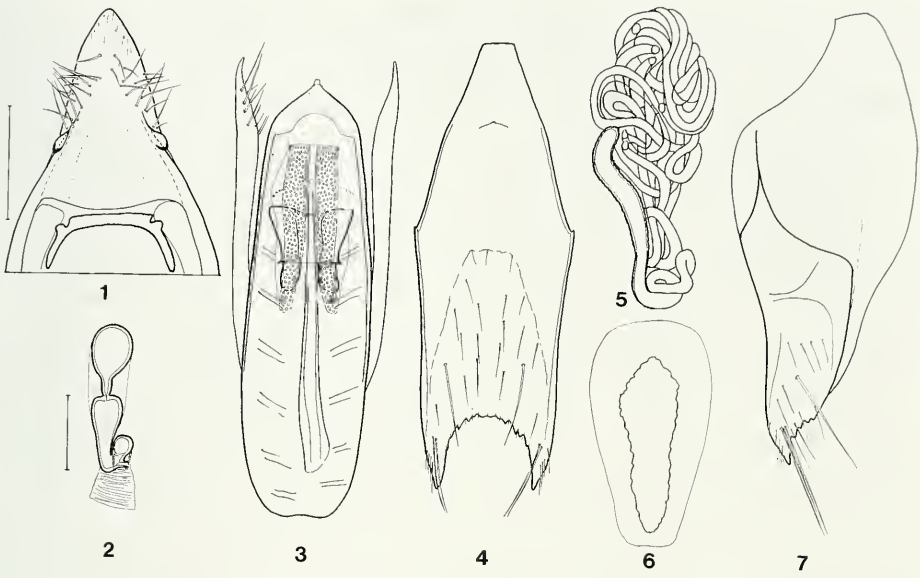


FIG. 1-7

Apikalpartie des Aedoeagus von ventral (1), Ventralansicht des Aedoeagus (3), 9. Sternit des ♂ (4), Valvifer (5), Spermatheka (2, 6) und weibliches Abdominalendsklerit (6) von *Stenus (Nestus) wasamatanus* sp. n. (1, PT), *S. (Hypostenus) wakayamanus* sp. n. (2-4, PTT), *S. (H.) geisha* sp. n. (5-7, HT).- Maßstab = 0,1 mm.

Beschreibung: Länge: 2,7-3,2 mm (Vorderkörperlänge: 1,5-1,6 mm). Brachypter, schwarz mit bräunlichem Anflug, schwach glänzend, überall ziemlich grob bis grob und sehr dicht punktiert, Beborstung kurz, anliegend. Kiefertaster gelb. Fühler und Beine rötlichgelb, Fühlerkeule, Knie und Tarsengliedspitzen gebräunt. Clypeus schwarz, Oberlippe dunkelbraun, heller gesäumt, beide ziemlich dicht beborstet. 3. Abdominalsegment nur in seinen basalen zwei Dritteln mit angedeuteter Seitenrandung. 10. Tergit abgerundet.

PM des HT: wH: 30,2; aE: 15,5; wP: 23; lP: 23; wEl: 26; lEl: 24; lS: 17.

Männchen: Beine ohne Auszeichnungen. Vordersternite mäßig grob und sehr dicht punktiert, 7. Sternit in der hinteren Mitte kaum abgeflacht, dichter als an den Seiten punktiert und beborstet. 8. Sternit (Fig. 10). 9. Sternit (Fig. 9). Aedoeagus (Fig. 8), Parameren mit 9-11 apikalen Borsten.

Weibchen: 8. Sternit zur Hinterrandmitte deutlich stumpfwinklig vorgezogen. Valvifer apikolateral lang-spitz. Spermatheka (Fig. 11).

Kopf deutlich breiter als die Elytren, Stirn mäßig breit mit tiefen Längsfurchen, Mittelteil deutlich breiter als jedes der Seitenstücke, stark und breit rund erhoben, deutlich das Augeninnenrandniveau überragend. Stirnpunktierung seitlich mäßig grob und dicht, der mittlere Punktdurchmesser entspricht etwa dem mittleren Querschnitt des 3. Fühlergliedes, Punktzwischenräume meist kleiner als die Punkt-

radien, Stirnmitte deutlich weitläufiger punktiert, die Punktabstände können hier größer als die Punkte werden. Fühler schlank, kurz, zurückgelegt nicht ganz den Pronotumhinterrand erreichend, vorletzte Glieder etwas länger als breit. Pronotum so lang wie breit, vorn seitlich kräftig konvex, hinten stark konkav eingeschnürt, uneben: eine lange Mittelfurche erstreckt sich fast über die gesamte Länge, seitliche Schrägeindrücke sowohl in der Vorder- als auch in der Hinterhälfte. Punktierung ziemlich grob und bis auf die Längsmitte der Mittelfurche überall sehr dicht, aber nicht rugos, der mittlere Punktdurchmesser ist so groß wie der mittlere Querschnitt des 3. Fühlergliedes, die genetzten Punktzwischenräume kleiner als die Punktradien. Elytren trapezoid, schmäler als der Kopf, breiter als lang, Schultern abgeschrägt, Seiten nach hinten mäßig stark erweitert, im hinteren Viertel mäßig eingezogen, Hinterrand tiefrund ausgerandet. Oberseite vergleichsweise eben: Naht- und Schultereindruck flach, ein hinterer Aufleneindruck unterschiedlich tief ausgeprägt. Punktierung deutlich gröber als am Pronotum, sehr dicht, aber auch fast überall getrennt, mittlerer Punktdurchmesser so groß wie der basale Querschnitt des 2. Fühlergliedes. Abdomen zylindrisch, basale Quereinschnürungen der ersten Segmente mäßig tief, 7. Tergit mit rudimentärem apikalem Hautsaum (brachytere Art). Punktierung von vorn bis hinten überall sehr dicht, vorn gut so grob wie neben den Augen, nach hinten erheblich feiner, die Punkte des 7. Tergits so groß wie eine Augeninnenrandfacette, 10. Tergit fein und wenig dicht punktiert. Beine mäßig schlank, Hintertarsen etwa 2/3 schienenlang, ihr 1. Glied wenig kürzer als die drei folgenden zusammengenommen, erheblich länger als das Klauenglied, 4. Glied tief gelappt. Die gesamte Oberseite ist dicht genetzt, die Netzung kann in der Stirnmitte aber sehr flach werden.

Bemerkungen: Diese neue Art ähnelt dem *S. taoi* Naomi. *Stenus fujimontis* sp. n. unterscheidet sich – bei gleicher Größe – von *S. taoi* Naomi äußerlich schwer durch etwas feinere Punktierung der Stirnseiten und wenig feiner, aber getrennt punktierte Elyten, sicher durch die Sexualcharaktere. Von *S. fujiensis* sp. n. kann man ihn sicher nur durch seine Sexualcharaktere trennen (s. u.).

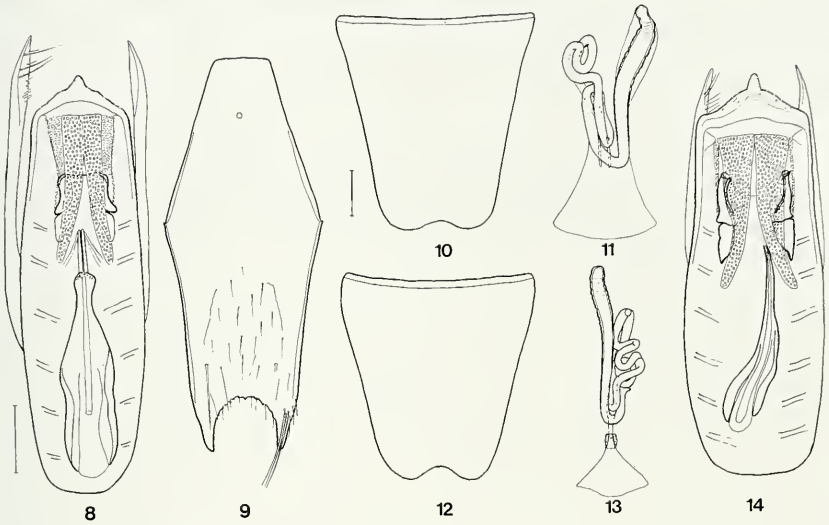
Stenus (Hypostenus) fujiensis sp. n. Figs 12-14

Material: ♂-Holotypus und 5 ♂♂, 2 ♀♀-Paratypen: Honshu: Yamanashi Pref., Mt. Fuji Nord-Seite, Ende der Subaru-line, 2200 m, *Rhododendron-Vaccinium*-Birken-Erlen-Lärchen-Kiefern-Wald, Gesiebe, 1.VIII.1999, Puthz; 1 ♂, 1 ♀-Paratypen: Shizuoka Pref., Mt. Fuji Ost-Seite, kleine Schlucht mit Erlen, Birken, *Sorbus*, *Polygonum* und Farnen am Ende der Azami-line, 2000 m, 2.VIII.1999, Puthz; 2 ♂♂, 2 ♀♀-Paratypen, ibidem, leg. Naomi; (zusammen mit *S. oisami* Naomi & Puthz).

Beschreibung: Länge: 2,7-3,5 mm (Vorderkörperlänge: 1,5-1,6 mm).

Männchen: Beine ohne Auszeichnungen. Vordersternite mäßig grob und dicht auf glänzendem Grund punktiert, 7. Sternit in der hinteren Mitte flach, aber deutlich, eingedrückt und daselbst etwas dichter als an den Seiten punktiert und beborstet. 8. Sternit (Fig. 12). 9. Sternit apikolateral mit spitzem Zahn. Aedoeagus (Fig. 14), Parameren mit 5-7 apikalen Borsten.

Weibchen: 8. Sternit zur Hinterrandmitte deutlich stumpfwinklig vorgezogen. Valvifer apikolateral lang-spitz. Spermatheka (Fig. 13) mit einem stärker gewundenen dünneren Schlauchteil als bei *S. fujimontis* und mit kürzerem Endstück.



FIGS 8-14

Ventralansicht des Aedoeagus (8, 14), 8. Sternit (10, 12) und 9. Sternit (9) des ♂ (9), Spermatheka (11,13) von *Stenus (Hypostenus) fujimontis* sp .n. (8-11, PTT) und *S. (H.) fujiensis* sp. n. (12-14, PTT).- Maßstab = 0,1 mm.

Bemerkungen: Diese neue Art ist der vorigen zum Verwechseln ähnlich, unterscheidet sich aber von dieser und allen anderen bekannten Arten klar durch ihre Sexualcharaktere. Eine Beschreibung des Exoskeletts hätte nur wiederholenden Charakter, weshalb ich auf die des *S. fujimontis* verweise. *Stenus fujiensis* sp. n. unterscheidet sich von *S. fujumontis* durch das beim Männchen deutlich eingedrückte 7. Sternit, die tiefere Ausrandung des 8. Sternits und den Aedoeagus, vom Weibchen desselben, wie oben angegeben, von *S. taoi* Naomi trennt man ihn ebenfalls (schwer) durch feinere Kopf- und Elytrenpunktierung und durch die Sexualcharaktere.

Stenus kasumi Naomi

Material: 2 ♂♂: Tochigi Pref., Okukinu, ca. 1200 m, deciduous forest, 27.VII.1999; 1 ♂, 1 ♀: Tochigi Pref., oberhalb Oku-Nikko, 1500 m, Weg zum Lake Marunuma, deciduous forest, 29.VII.1999.

Bemerkung: Diese Art ist aus der Tochigi Pref. vom Mt. Maeshirane nach einem Männchen beschrieben worden, von Löbl ebenfalls in einem Stück am Konsei Pass gesammelt worden (Puthz, 1993) und in der genannten Präfektur offenbar weiter verbreitet.

Stenus sawadaiellus Naomi & Puthz

Material: 2 ♀♀: Gunma Pref., oberhalb Marunuma, 1350 m, deciduous forest, Gesiebe, 30.VII.1999.

Bemerkung: Diese Art ist nach wenigen Stücken aus den Präfekturen Nagano und Gifu beschrieben worden.

Stenus asyura Naomi

Material: 1 ♂: Kanagawa Pref., Kamiyu bei Hakone, deciduous forest, 850 m, 3.VIII. 1999.

Bemerkung: Aus der Yamanashi Präfektur beschrieben, aber weiter verbreitet: Im Naturhistorischen Museum Wien befinden sich noch 1 ♂, 3 ♀♀ von Okayama, Sauter (ex coll. Scheerpeltz).

Stenus syugen Naomi

Material: 4 ♂♂, 5 ♀♀: Nara Pref., Mt. Wasamata-yama, ca. 1150 m, Gesiebe in Laubwald, 11.VII.1999.

Bemerkung: Nach wenigen Exemplaren aus der Wakayama Präfektur beschrieben, aber weiter nach Norden verbreitet.

Stenus jukata Hromádka

Material: 3 ♂♂, 2 ♀♀: Wakayama Pref., Toragamine-toge, Minabegawa-mura, 590 m, deciduous forest, 15.VII.1999.

Bemerkung: Aus der Wakayama Präfektur beschrieben und bisher auch nur von dort bekannt.

Stenus spec. (*cephalotes*- Gruppe)

Material: 1 ♀: Wakayama Pref., Umg. Hirai, deciduous forest mit eingestreuten Zedern an der alten Straße oberhalb des Ortes, ca. 300 m, 14.VII.1999.

Bemerkung: Eine kleine Art der *cephalotes*-Verwandtschaft, die ich nach einem einzigen Weibchen nicht beschreiben will.

Stenus (Hypostenus) dainichi sp. n. Fig. 19

Material: ♂-Holotypus: Honshu: Wakayama Pref., oberhalb Nachi-san, 350 m, deciduous forest, 13.VII.1999, Puthz (zusammen mit *S. nachiensis* sp. n.) (Labium bei O. Betz).

Beschreibung: Länge: 2,7-3,2 mm (Vorderkörperlänge: 1,5 mm). Brachypter, Kopf schwarz, Abdomen schwarzbraun, Pronotum und Elytren dunkelbraun, Kopf mäßig fein und dicht punktiert, Pronotum ziemlich grob und sehr dicht, Elytren grob und sehr dicht punktiert, Abdomen wenig wenig (vorn) bis fein (hinten) und dicht punktiert. Beborstung kurz, anliegend. Fühlerbasis gelb, die Keule etwas gebräunt. Kiefertaster gelb. Beine bräunlichgelb, Knie und Tarsengliedspitzen kaum dunkler. Clypeus schwarzbraun, Oberlippe dunkelbraun, heller gesäumt, mäßig dicht beborstet. 3. Abdominalsegment ohne deutliche basale Seitenrandung. 10. Tergit abgerundet.

PM des HT: wH: 31,5; aE: 16; wP: 23,5; lP: 23,5; wEl: 27; lEl: 24; lS: 18.

Männchen: Beine und Vordersternite ohne besondere Auszeichnungen. 7. Sternit in der hinteren Mitte leicht abgeflacht und daselbst sehr fein und dicht

punktiert und beborstet. 8. Sternit mit flacher Ausrandung etwa im hinteren Zweiundzwanzigstel (66:3). 9. Sternit apikolateral mit langem, hellem, spitzem Zahn. Aedoeagus (Fig. 19), Parameren an ihren Spitzen mit einer Gruppe von 3 stärkeren und 6/7 etwas schwächeren Borsten.

Weibchen: unbekannt.

Kopf deutlich breiter als die Elytren, Stirn wenig breit mit deutlichen Längsfurchen, Mittelteil gut so breit wie jedes der Seitenstücke, breitrund erhoben, überragt etwas das Augeninnenrandniveau. Punktierung mäßig fein, der mittlere Punktdurchmesser so groß wie der basale Querschnitt des 3. Fühlergliedes, Punktabstände seitlich wiederholt größer als die Punktradien, aber nur selten punktgroß, Mittelteil etwas weitläufiger punktiert, aber nicht geglättet. Fühler schlank, zurückgelegt bis ins hintere Pronotumdrittel reichend, vorletzte Glieder wenig länger als breit. Pronotum so lang wie breit, seitlich kräftig gewölbt, vorn stark konvex, hinten flach konkav, oberseits eine deutliche, mittlere Längsfurche und, weniger deutlich, seitliche Schrägeindrücke. Punktierung ziemlich grob und sehr dicht, mittlerer Punktdurchmesser so groß wie der mittlere Querschnitt des 3. Fühlergliedes, Punktzwischenräume kleiner als die Punktradien, nur direkt in der Längsmitte etwas größer. Elytren trapezoid, breiter als lang, Schultern abgeschrägt, Seiten lang erweitert, im hinteren Viertel mäßig eingezogen, Hinterrand tief ausgerandet. Der deutliche Schultereindruck setzt sich lang nach hinten fort, neben der Naht sind die Elytren auf ihrer gesamten Länge nur abgeflacht, nicht eingedrückt. Punktierung grob und sehr dicht, allenfalls seitlich ein wenig rugos, der mittlere Punktdurchmesser entspricht etwa dem basalen Querschnitt des 2. Fühlergliedes, Punktabstände kleiner als die Punktradien. Abdomen zylindrisch, basale Quereinschnürungen der ersten Segmente mäßig tief, 7. Tergit mit rudimentärem apikalem Hautsaum (brachyptere Art). Punktierung vorn fast so grob wie neben den Augen, fast etwas dichter, nach hinten immer feiner werdend, aber deutlich bleibend und überall dicht; auf dem 7. Tergit sind die Punkte so groß wie eine innere Augenfacette, ihre Abstände kleiner als die Punkte; Punktierung des 10. Tergits sehr fein und weitläufig. Beine ziemlich kräftig, Hinterschienen etwa 2/3 schienenlang, ihr 1. Glied etwas kürzer als die drei folgenden zusammengenommen, erheblich länger als das Klauenglied, 4. Segment tief gelappt. Die ganze Oberseite ist dicht genetzt, auf der Stirn, vor allem aber ihrem Mittelteil, beginnt die Netzung zu erlöschen.

Bemerkungen: Diese neue Art gehört in die weitere Verwandtschaft des *Stenus cephalotes* Sharp und ähnelt hier stark dem *S. himiko* Naomi. *Stenus dainichi* sp. n. – ich wähle für ihn den Namen einer buddhistischen, den gesamten Kosmos repräsentierenden Gottheit – unterscheidet sich von *S. himiko* Naomi äußerlich schwer durch gröbere Elytrenpunktierung und fast erloschene Netzung seiner Stirn, sicher durch den Aedoeagus. Von den anderen ihm ähnlichen Arten trennt man ihn ebenfalls durch seine Sexualcharaktere, zum Beispiel durch die nur im Spitzendrittel beborsteten Parameren. Genitaliter ähnelt er dem *S. oblongulus* Naomi, dessen Ausstülphaken aber eine ganz andere Gestalt zeigen und dessen 3. Abdominalsegment seitlich vollständig gerandet ist.

Stenus cygnipenis sp. n. Figs 15-18

Material: ♂-Holotypus und 4 ♂♂, 12 ♀♀-Paratypen: : Honshu: Wakayama Pref., Umg. Hirai, deciduous forest mit eingestreuten Zedern an der alten Straße oberhalb des Ortes, ca. 300 m, 14.VII.1999, Puthz.

Beschreibung: Länge: 3,0-3,7 mm (Vorderkörperlänge: 1,6-1,7 mm). Brachypter, Kopf schwarz, Abdomen braunschwarz, Pronotum und Elytren mittelbraun, mäßig glänzend, Kopf und Abdomen mäßig fein bis fein punktiert, Pronotum und Elytren ziemlich grob und sehr dicht punktiert, kurz, anliegend beborstet. Fühlerbasis gelb, die Keule gebräunt. Kiefertaster gelb. Beine bräunlichgelb, Knie und Tarsengliedspitzen kaum verdunkelt. Clypeus schwarzbraun, Oberlippe schwarzbraun, heller gesäumt, Beborstung mäßig dicht. 3. Abdominalsegment nur basal mit angedeuteter Seitenrandung. 10. Tergit abgerundet.

PM des HT: wH: 33; aE: 16; wP: 25; lP: 25,5; wEl: 29; lEl: 26; lS: 19.

Männchen: Schenkel kräftig gekeult, Schienen und Tarsen breiter als beim Weibchen. Metasternum breit eingedrückt, mäßig fein und dicht auf fast glattem Grund punktiert und abstehend beborstet. 3.- 5. Sternit median feiner und dichter als an den Seiten punktiert und abstehend beborstet. 6. Sternit mit breitem, etwa halbkreisförmigem Eindruck in der Hinterhälfte, darin sehr fein und dicht punktiert und beborstet, Hinterrand ohne Ausrandung. 7. Sternit mit sehr breitem, sehr tiefem Eindruck, die kielförmig erhobenen Seiten nach hinten vorgezogen, Hinterrand breit und tief ausgerandet, Punktierung und Beborstung des Eindrucks sehr fein und sehr dicht. 8. Sternit am Hinterrand mit sehr flacher Ausrandung etwa im hinteren Sechsundzwanzigstel (52:2). 9. Sternit apikolateral mit hellem, sehr spitzem Zahn. Aedoeagus (Fig. 15, 16), Innensack stark sklerotisiert, zweifach gebogen, an die Gestalt eines Schwanenhalses erinnernd (Name!), Parameren apikal mit 9-13 Borsten.

Weibchen: 8. Sternit zur Hinterrandmitte deutlich stumpfwinklig vorgezogen. Valvifer (Fig. 18). Spermatheka (Fig. 17).

Variabilität: Die Färbung kann bei einzelnen Stücken etwas variieren, so können Pronotum und Elytren dunkler braun sein und sich manchmal nur wenig vom insgesamt dunkleren Abdomen unterscheiden.

Bemerkungen: Diese neue Art gehört in die schwierige Verwandtschaft des *Stenus rufescens* Sharp und steht hier den Arten *S. testaceopiceus* Bernhauer, *S. wasabi* Hromádka und *S. nakanei* Hromádka sehr nahe. *Stenus cygnipenis* sp. n. unterscheidet sich von *S. testaceopiceus* Bernhauer durch flacher ausgerandetes 8. Sternit des Männchens, anders gestaltete, längere Ausstülphaken des Aedoeagus und kürzeren, stärker sklerotisierten Innensack desselben sowie durch im Verhältnis zum stärker sklerotisierten Endstück derselben kürzeren Schlauchteil seiner Spermatheka, von *S. wasabi* Hromádka und *S. nakanei* Hromádka durch dunklere Färbung von Kopf und Abdomen, etwas feinere Elytrenpunktierung und beim Männchen durch fehlende Eindrücke an den Sterniten 4 und 5, flachere Ausrandung des 8. Sternits, andere Ausstülphaken und stärker sklerotisierten Innensack des Aedoeagus, beim Weibchen durch kürzeres, stärker sklerotisiertes Endstück der Spermatheka.

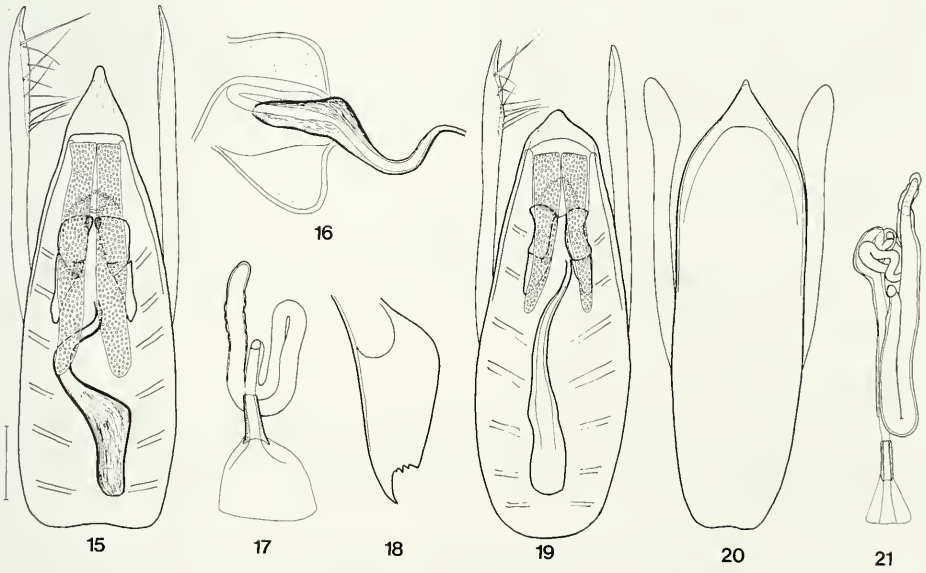
Stenus (Hemistenus) nachiensis sp. n. Figs 20, 21

Material: ♂-Holotypus und 1 ♀-Paratypus: Honshu: Wakayama Pref., oberhalb Nachi-san, 350 m, deciduous forest, 13.VII.1999, Puthz; 1 ♂-Paratypus: Near In-you waterfall, bei Mt. Nachi, 300 m, Laubgesiebe nahe Bach, 13.VII.1999, Puthz (zusammen mit *S. dainichi* sp. n.).

Beschreibung: Länge: 3,2-4,1 mm (Vorderkörperlänge: 1,7-1,8 mm). Brachypter, schwarz mit schwachem bräunlichem Anflug, stark glänzend, Kopf mäßig grob und weitläufig punktiert, Pronotum und Elytren grob, sehr dicht, zum Teil rugos punktiert, Abdomen vorn kräftig und weitläufig, hinten so gut wie erloschen punktiert, Beborstung des Abdomens dünn, lang, abstehend. Fühler, Kiefertaster und Beine gelb, Fühlerkeule gebräunt, Schenkelspitzen leicht angedunkelt. Clypeus schwarz, Oberlippe schwarzbraun, beide lang und schütter beborstet. Abdomen sehr dünn, zum Teil erloschen gerandet. 10. Tergit abgerundet.

PM des HT: wH: 33; aE: 15; wP: 25; lP: 25; wEl: 30; lEl: 27,5; lS: 20.

Männchen: Vordersternite ohne Auszeichnungen. 8. Sternit mit sehr flacher Apikalausrandung etwa im hinteren Zweiundzwanzigstel (66:3). 9. Sternit apikolateral mit spitzem Zahn. Aedoeagus (Fig. 20), Apikalpartie des Medianlobus erheblich breiter als bei *S. sugiei*, Innenbau sehr ähnlich, Parameren apikal mit zwei Gruppen langer, starker Borsten (9+15; 10+14; 10+16).



Figs 15-21

Ventralansicht des Aedoeagus (15 ,19, 20), Lateralansicht des ausgestülpten Innensacks (16), hintere Valviferpartie (18), Spermatheka (17, 21) von *S. (Hypostenus) cygnipenis* sp. n. (15-18, PTT), *S. (H.) dainichi* sp. n. (19, HT) und *S. (Hemistenus) nachiensis* sp. n. (20, 21, PTT).- Maßstab = 0,1 mm.

Weibchen: 8. Sternit am Hinterrand abgerundet, zur Hinterrandmitte nicht erkennbar vorgezogen. Valvifer apikolateral spitz. Spermatheka (Fig. 21), der des *S. sugiei* sehr ähnlich, das stärker sklerotisierte Endstück kürzer.

Bemerkungen: Diese neue Art gehört in die Gruppe des *Stenus cirrus* L. Benick und ist die Schwesterart des *S. sugiei* Naomi. In dieser Gruppe fällt sie durch ihre schlanke Gestalt und das nahezu erloschen punktierte Abdomen auf. *Stenus nachiensis* sp. n. unterscheidet sich von *S. sawadaianus* Hromádka, *S. sugiei* Naomi, *S. longisetosus* Puthz, *S. domburi* Hromádka und *S. cirriformis* Naomi durch feiner und weitläufiger punktierte Abdomenspitze (man vergleiche vor allem das 7. Tergit), von *S. yashiro* Naomi & Puthz durch bedeutendere Größe und unebenere Elytren, von *S. sakaii* Naomi & Puthz durch schlankere Gestalt sowie stärker unebene Elytren, von allen durch die Sexualcharaktere. Beim ♂-Holotypus ist die Seitenlinie des 5. Abdominalsegments in der Mitte so gut wie erloschen, nicht so beim ♀-Paratypus und beim ♂-Paratypus von In-you: ein Beispiel dafür, dass die traditionellen Untergattungsgrenzen sogar innerhalb einer Art fragwürdig werden können.

Stenus* cf. *uneme Naomi

Material: 1 ♀: Wakayama Pref., Kizetsu-kyo, Tanabe-shi, 150 m, deciduous forest, 15.VII.1999.

Bemerkung: Dieses Weibchen läßt sich äußerlich nicht sicher von dem von Shikoku beschriebenen *S. uneme* unterscheiden. Auch die Spermatheka ähnelt demselben sehr stark, ist aber nicht mit der des *S. uneme* identisch. Kollege Naomi besitzt das zugehörige Männchen und hält das Tier für eine neue Art oder Unterart, die er bei Gelegenheit beschreiben wird.

Stenus bosatsu Naomi

Material: 2 ♀♀: Kanagawa Pref., Kamiyu bei Hakone, deciduous forest, 850 m, 3.VIII.1999.

Bemerkung: Aus den Präfekturen Yamanashi und Niigata beschrieben, in Kanagawa zu erwarten gewesen.

Stenus sharpi Bernhauer & Schubert

Material: 1 ♂: Gunma Pref., oberhalb Marunuma, 1350 m, deciduous forest, Gesiebe, 30.VII.1999; 1 ♂, 1 ♀: Yamanashi Pref., Mt. Fuji Nord-Seite, schmaler Laubwaldstreifen neben der Subaru-line, 2050 m, Gesiebe von Laub und Moos zwischen Felsen und Baumstämmen, 1.VIII.1999.

Bemerkung: Diese mir auch aus Korea, dem Primorje-Gebiet Russlands und von Sachalin bekannte Art ist in Japan weit verbreitet, aber aus den beiden oben genannten Präfekturen meines Wissens noch nicht mitgeteilt worden.

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Description of a new subspecies of *Erebia cassioides* (Reiner & Hohenwarth, 1792) (Lepidoptera: Nymphalidae: Satyrinae) from Bulgaria

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Description of a new subspecies of *Erebia cassioides* (Reiner & Hohenwarth, 1792) (Lepidoptera: Nymphalidae: Satyrinae) from Bulgaria. - *Erebia cassioides centrorilica* ssp. n. from Rila Mountains, Bulgaria is described and figured. It is compared with other subspecies known from the Balkan Peninsula and especially with the closest *E. cassioides macedonica* Buresch, 1918 and *E. cassioides kinoshitai* Beshkov, 1996. The recent distribution of *E. cassioides* (Reiner & Hohenwarth, 1792) in the mountains of Balkan Peninsula is displayed as a typical example of Glacial disjunction. Some bionomical notes are given.

Key-words: Satyrinae - *Erebia* - new subspecies - taxonomy - Bulgaria - Europe.

INTRODUCTION

The Common Brassy Ringlet, *Erebia cassioides* (Reiner & Hohenwarth, 1792), is a characteristic representative of the Bulgarian high montane and alpine fauna. It also occurs in the mountains of Spain, France, Switzerland, Austria, Italy, Bosna and Herzegovina, Yugoslavia, Albania, Macedonia, Greece and Rumania. The Bulgarian part of the species range consists of three well separated geographically groups of colonies: in Stara Planina Range, Rila and Pirin Mountains (Fig. 1). The recent distribution can be considered as a typical example of Glacial disjunction.

Taxonomically the species is polytypic; formerly four endemic subspecies were known from the Balkan Peninsula. *Erebia cassioides illyrica* Lorković, 1953 occurs in Bosna and Hercegovina (Maglić), Montenegro (Volujak, Durmitor, Žljeb) and North Albanian Alps; *Erebia cassioides illyromacedonica* Lorković, 1953 occupies Macedonian mountains Šar, Korab, Jakupica and Pelister; *Erebia cassioides macedonica* Buresch, 1918 is known from Pirin and *Erebia cassioides kinoshitai* Beshkov, 1996 from Stara Planina. The taxon inhabiting Central Pindos Range (Athamanon Mts) in Greece remains unnamed.

The occurrence of the species in Rila Mountains has been well known for many years but paradoxically specimens from this region have been considered great rarity (showing even a total absence in public collections). In 1998 during my visit to

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Central Rila Mountains a fine series of specimens was collected. Additional material was gathered in 2000 in NW Rila. In a subsequent examination and comparison with specimens of the closest taxa from other mountains the taxon inhabiting Rila has also been found different taxonomically. Here it is described and named as follows.

Terminology concerning external anatomy used here follows the standard one already used by Higgins (1975), Higgins & Riley (1984), Tolman & Lewington (1997), etc. All the measures were taken with the help of a stereomicroscope MBS-10.

Acronyms used:

CIZS	Institute of Zoology, Sofia, Bulgaria
CSAS	Stanislav P. Abadjiev, Sofia, Bulgaria
CSBS	Stoyan Beshkov, Sofia, Bulgaria
MHNG	Muséum d'histoire naturelle, Geneva, Switzerland
NMNH	National Museum of Natural History, Sofia, Bulgaria

Erebia cassioides centrorilica ssp. n. Figs 2-3, 6, 8, 10, 13

Type locality: Bulgaria: [Central] Rila Mts: [SW slope of] Suha Vapa [Peak]: 2450 m (holotype label, see below).

Type material:

Holotype ♂, with labels: (1) printed (on white paper) "BULGARIA / Rila Mts / Suha Vapa 2450 m / 13.VIII.1998 / S. Abadjiev leg."; (2) printed (on red paper), double framed "HOLOTYPE ♂ / Erebia cassioides / centrorilica / subsp. nov. / [line] / S. Abadjiev det. 2000" (MHNG).

Paratypes 24 ♂♂, 4 ♀♀ of which: 1 ♂, 1 ♀ with data labels same as in the holotype, but from 2200 m, and with additional rows "[line] / S. Abadjiev coll. 1277 (1278 respectively)"; 2 ♂♂ with labels: same as above, but from 2350 m, and in the last row "S. Abadjiev coll. 1331 (1332 respectively)"; 5 ♂♂, 1 ♀ with data labels same as in the holotype with additional rows "[line] / S. Abadjiev coll. 1311 (1312, 1322, 1324, 1325 and 1327 respectively)"; 2 ♂♂ with data labels same as in the holotype; 1 ♂ with labels: (1) printed (on white paper) "Bulgaria, Rila Mts, / Dzhanka, 2400 m, / 03.VIII.1996, / S. Beshkov & / J. Nowacki leg.", (2) printed (on light green paper) with handwritten inscriptions [here italicised] "Green. prep. / No. *6./03.III.97* / S. Beshkov", (3) handwritten (on yellow paper) "E. cassioides / macedonica / Buresch. 1918"; 1 ♂ with labels: (1) printed (on white photo paper) " BULGARIA, Rila mount. / Granthar hut, 2180 m. / 29.08.1987 / St. Beschkow leg.", (2) handwritten (on white paper) "Gen. prep. 2./ / 06.III.1995 / Beshkov"; 1 ♂ with labels: (1) printed (on white photo paper) "Bulgaria, Rila Mt. / under Kanarata Top / 2500 m. / 30.VIII.1987 / S. Beshkov leg.", (2) handwritten (on white paper) "Gen. prep. 4./ / 06.III.1995 / Beshkov"; 1 ♂ with labels: (1) printed (on white photo paper) "Bulgaria, Rila Mt. / under Angelov Vrah / Top, 2600 m. / 31.VIII.1987 /S. Beshkov leg.", (2) handwritten (on white paper) "Gen. prep. 6./ / 06.III.1995, / Beshkov"; 1 ♀ with labels: (1), printed (on white photo paper) "Bulgaria, Rila Mt. / under Angelov Vrah / Top, 2600 m. / 31.VIII.1987 / S. Beshkov leg.", (2) handwritten (on white paper) "Gen. prep. 8./ / 06.III.1995, / Beshkov"; 3 ♂♂, 1 ♀ with labels: printed (on white paper) "BULGARIA / Rila Mts / [above Rilski Manastir] / VIII.1987 / [R. Radev] leg."; 2 ♂♂ with data labels: printed (on white paper) "BULGARIA / Rila Mts / Tcherni Ridge 2300 m / 24.VII.2000 / Dr S. Abadjiev leg. / [line] / Dr S. Abadjiev coll. 1762 (1763 respectively)"; 4 ♂♂ with labels: same as above, but from 2400 m, and in the last row "Dr S. Abadjiev coll. 1764 (1765), 1766, 1767 respectively)"; 1 ♂ with label: same as above, but lacking last 2 rows; all the paratypes with printed (on red paper), double framed "PARATYPE ♂ (♀ repectively) [1] ([2-28] respectively) / Erebia cassioides / centrorilica / subsp. nov. / nov. / [line] / Abadjiev det. 2000" (paratypes 1-10, 22-27 in CSAS, paratypes 11, 28 in CIZS, paratype 12 in MHNG, and paratypes 13-21 in CSBS).

Etymology: Toponymycal name, compound word derived from "central" and "Rila".

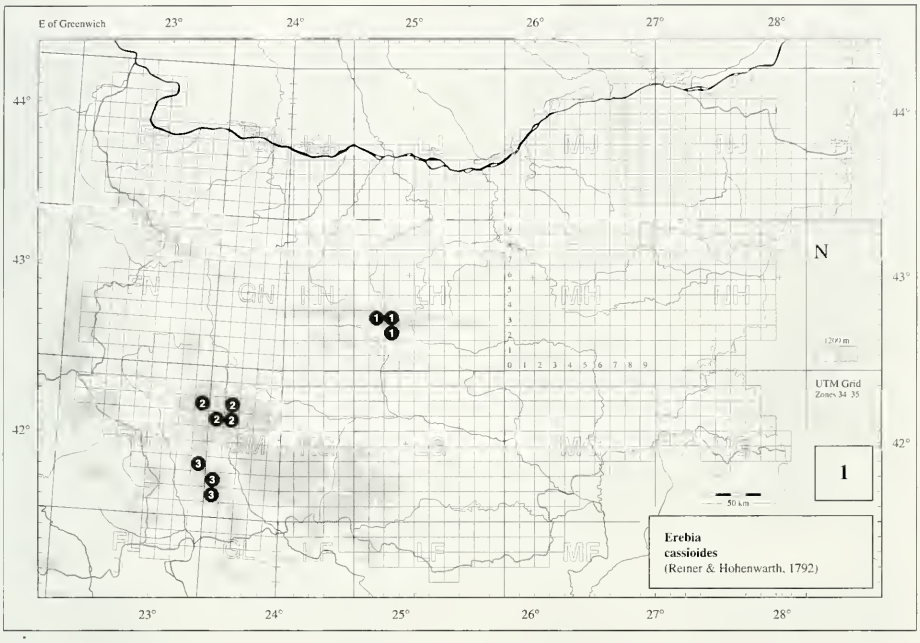


FIG. 1

Provisional distribution map of *Erebia cassioides* (Reiner & Hohenwarth, 1792) in Bulgaria.

(1) *E. cassioides kinoshitai* Beshkov, 1996 - LH13: Levski: 1780-2100 m (Beshkov, 1995: 202; Beshkov, 1996: 112, 116-119; Abadjiev, 1995: 136); LH22: Ravnets: 1900-1920 m (Beshkov, 1995: 202; Beshkov, 1996: 112-113, 116-117, 119-122; Coutsis *et al.*, 1997: 170-171); LH23: Botev: 2000 m (Buresch & Tuleschkow, 1929: 229: "*Erebia tyndarus balcanica* Rbl."; Lorkovic, 1957: 108, Taf. III; Beshkov, 1995: 202), Golyam Kupen: 1900 m (Beshkov, 1996: 119), Krastsite: 1820 m (Beshkov, 1996: 117, 119), Zhaltets: 2000 m (Beshkov, 1996: 113, 118-119, 122).

(2) *E. cassioides centrorilica* ssp. nov. - FM97: Tcherni Ridge: 2300-2400 m (Abadjiev, 1995: Pl. II, 113); GM06: Angelov Vrah: 2600 m (Beshkov, 1996: 112, 116, 118), Kanarata: 2500 m (Beshkov, 1996: 112, 116, 118); GM16: Dzhanka: 2400 m (Varga & Slivov, [1977]: 173; Beshkov & Nowacki, 1998: 46-47), Granchar Chalet: 2180-2700 m (Coutsis *et al.*, 1997: 170-171), Suha Vapa (Varga & Slivov, [1977]: 173; Abadjiev, 1993: 55); GM17: Ovcharets (Varga & Slivov, [1977]: 173: Abadjiev, 1993: 55).

(3) *E. cassioides macedonica* Buresch, 1918 - FM93: Kamenititsa Circus; GM01: Kamenitsa: 1800-2000 m (Lehmann, 1990: 125; Busse & Ockruck, 1991: 16); GM02: Banderitsa (Varga & Slivov, [1977]: 173), Bezbog: 2350-2450 m (Karisch & Eckert, 1989: 95; Abadjiev, 1997: 72), Popovo Ezero: 2300-2500 m (Buresch, 1918: 227; Buresch, 1921: 189, 191; Buresch & Iltschew, 1921: 63, 73; Buresch & Tuleschkow, 1929: 230; Warren, 1936: 294, Pl. 90: Abadjiev, 1993: 55; Abadjiev, 1995: Pl. XV; Beshkov, 1996: 112, 116, 118, 120; Abadjiev, 1997: 72), Vihren (Varga & Slivov, [1977]: 173).

DESCRIPTION

♂ (Figs 2-3): right forewing length - average 15.5 mm, 15.0 mm in the holotype; wing upperside dark brown with greenish reflection; forewing apex slightly rounded; subapical fulvous-red patch not extending to cell but usually extending to vein 3 and enclosing twin, white-pupilled ocelli; forewing underside brown to fulvous; submarginal line dark brown; postdiscal band dark brown, wide and well-defined in spaces 4-6; postdiscal fascia fulvous, encloses the ocelli; hindwing upperside with fulvous-red postdiscal marks enclosing usually 3 well developed ocelli; underside ground colour silvery-gray finely dotted with brown; submarginal fascia not well defined; postdiscal fascia with usually 2 small ocelli; discal band darker, brown-greyish.

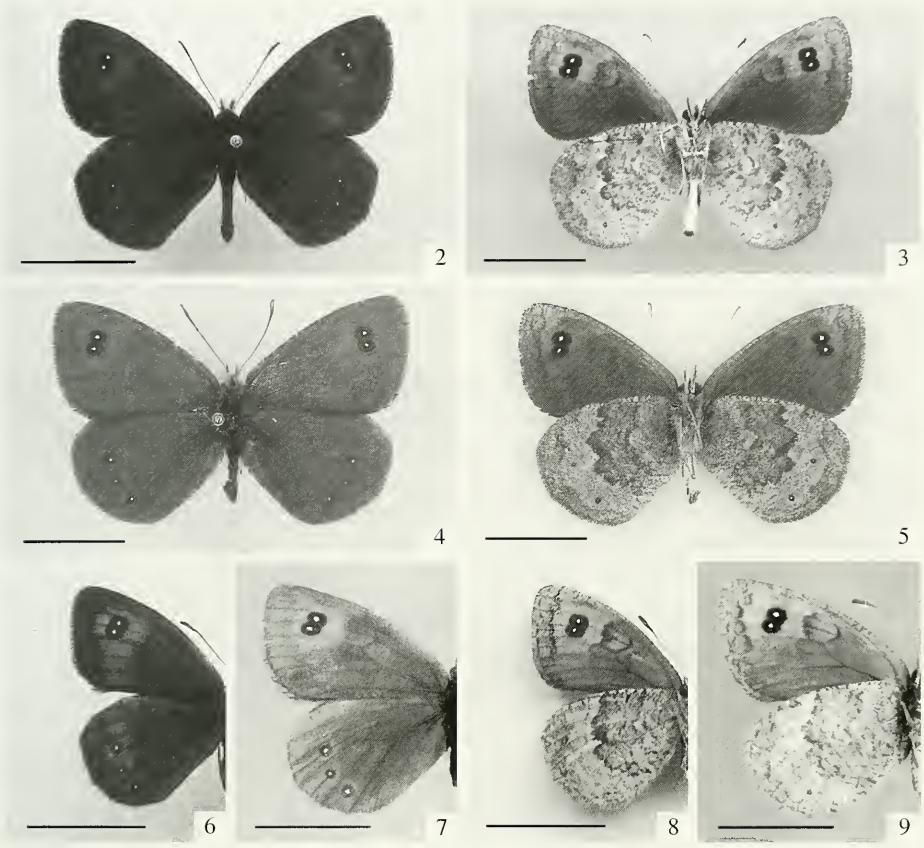
♀ (Figs 6, 8): right forewing length - average 15.5 mm; wing pattern as in male; upperside forewing subapical fulvous-red patch not extending to cell; submarginal line on the forewing underside dark brown and sharpened; postdical band clearly visible in spaces 1-3; hindwing underside ground colour lighter.

♂ *genitalia* (Fig. 10): uncus shorter than tegumen; gnathos slender, curved, shorter than uncus; saccus elongated, vinculum curved; aedoeagus short (but longer than valva), sclerotized in the middle; valvae on the costal part with a big proximal tooth; apically followed by another tooth (smaller than first one); apically valva rounded, usually with 2 small costal teeth; ♂ genitalia are illustrated also in Beshkov (1996: 118: Figs 32 [paratype 16] - 33 [paratype 15]) as "*Erebia cassioides macedonica* (Buresch, 1918) [sic]".

♀ *genitalia* (Fig. 13): sterigma with an Y-shaped clape of the lamella antevaginalis, the basis is twisted once ventrally and symmetrically laterally, the part before the furcation large, but equal is size before and after furcation, apex of the Y-shaped clape bifid, both parts of furcation long, forming an U-shaped structure; lamella antevaginalis with 2 lateral lobes, sclerotized, twisted near ostium bursae; ductus bursae short; ostium bursae sclerotized; corpus bursae with 2 longitudinal signa, each one composed by about 30 radial sclerotizations.

Variability: This subspecies is variable in forewing length (13.6-17.0 mm in ♂; 14.5-15.8 mm in ♀). Instead of the usual subapical fulvous-red patch extension to vein 3 in 1/3 of the males a small fulvous-red patch also present in space 2; in half of the females the subapical fulvous-red extends to vein 1. In 21% of the males ocelli number on the hindwing upperside is 4. The postdiscal fascia on the hindwing underside in 11% of the males is with 1 ocellus: in additional 4% with 3 ocelli.

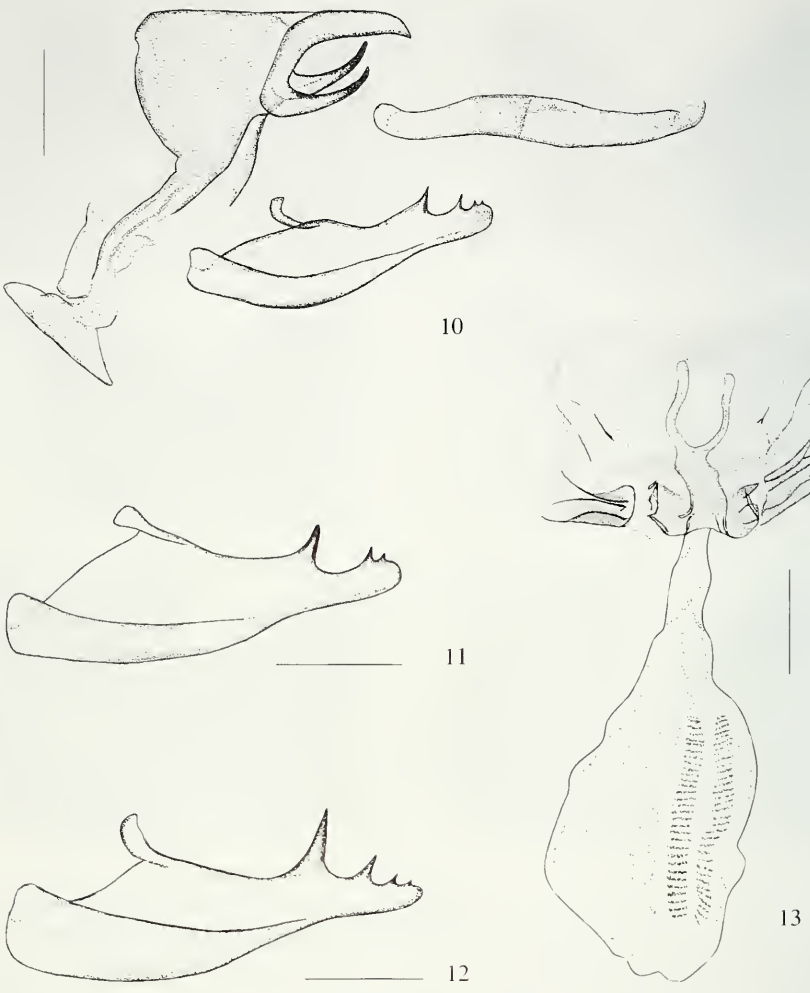
Differential diagnosis: *E. cassioides centrorilica* ssp. nov. can be distinguished from its nearest relatives by the following differential features: forewing (especially in ♂) is not pointed as in *kitoshitai*; ocellation is not so strongly developed as in *illyrica* and *illyromacedonica*: dark brown postdiscal band on the underside of the forewing in ♂ wider and better-defined in spaces 4-6 than in *macedonica* (cf. Figs 3 and 5); submarginal line on the underside of the forewing in ♀ sharpened (Fig. 8), in *macedonica* usually blurred (Fig. 9); postdiscal band on the underside of the forewing in ♀ clearly visible in spaces 1-3, a feature usually absent in *macedonica*; "Uncus/



FIGS 2-9

(2) *E. cassioides centrorilica* ssp. n., holotype ♂, upperside, Bulgaria: Rila Mts: Suha Vapa: 2450 m: 13.VIII.1998: S. Abadjiev leg. (MHNG); (3) same, paratype ♂ [28], underside, Bulgaria: Rila Mts: Tchermi Ridge: 2400 m: 24.VII.2000: S. Aadjiev leg. (CIZS); (4) *E. cassioides macedonica* Buresch, 1918, syntype ♂, upperside, Bulgaria: Pirin Mts: Popovo Ezero: 2400 m: 16.VII.1915: I. Buresch leg. (NMNH); (5) same, underside; (6) *E. cassioides centrorilica* ssp. n., paratype ♀ [10], upperside, same data as in holotype (CSAS); (7) *E. cassioides macedonica* Buresch, 1918 ♀, upperside, Bulgaria: Pirin Mts: Kamenititsa Circus: 21.VII.1982: A. Slivov leg. (CIZS); (8) same as Fig. 6, underside; (9) same as Fig. 7, underside. Scale lines: 10 mm.

Subuncus-Längenindex" in *illyrica* and *illyromacedonica* is 75 (Lorkovic, 1957: 77), in *macedonica* - 75, in *kinoshitai* - 55, in *centrorilica* ssp. nov. - 65; "Höhenindex des dorsalen Valvenvorsprungs" in *illyrica* is 10, in *illyromacedonica* - 13 (Lorkovic, 1957: 76), in *macedonica* - 10, in *kinoshitai* 16, in *centrorilica* ssp. nov. - 17; the difference in size of the first 2 costal teeth is better-developed in *kinoshitai* and *macedonica* (Figs 11, 12); apically valva is more rounded than in *kinoshitai*; it bears 2 small apical teeth (Fig. 10), in *macedonica* - usually 1 (Fig. 11); Y-shaped clape of



FIGS 10-13

(10) Male genitalia of *Erebia cassioides centrorilica* ssp. n., paratype ♂ [16], Bulgaria: Rila Mts: Angelov Vrah: 2600 m: 31.VIII.1987: S. Beshkov leg., gen. slide 6./06.III.1995, Beshkov (CSBS); (11) Valva of *E. cassioides macedonica* Buresch, 1918, syntype ♂, Bulgaria: Pirin Mts: Popovo Ezero: 2400 m: 16.VII.1915: I. Buresch leg., gen. slide 3./29.II.1996, Beshkov (NMNH); (12) Valva of *E. cassioides kinoshitai* Beshkov, 1996, paratype ♂, Bulgaria: Central Stara Planina: Levski Top: 1780 m: 7.VIII.1995: S. Beshkov leg., gen. slide 1./29.II.1996, Beshkov (CSBS); (13) Female genitalia of *E. cassioides centrorilica* ssp. n., paratype ♀ [17], Bulgaria: Rila Mts: Angelov Vrah: 2600 m: 31.VIII.1987: S. Beshkov leg., gen. slide 8./06.III. 1995, Beshkov (CSBS). Scale lines: 0.5 mm.

lamella antevaginalis is with long part before the furcation in *kinoshitai*; the 2 parts are equal in size in *centrorilica* ssp. nov; the part after furcation forms a V-shaped structure in *macedonica*, rather than the U-shaped in *centrorilica* ssp. n. and *kinoshitai*.

DISTRIBUTION

The new subspecies is an endemic of Rila Mountains, Bulgaria. The colonies known are located at an altitude of 2180-2700 m. For exact localities see text explanation of Fig. 1.

BIONOMICS

Flight-period: Univolutine; flies from the end of July (24.VII, Tcherni Ridge: 2300-2400 m) till the second decade of September (18.IX, Tcherni Ridge: 2350 m) (Abadjiev *et al.*, 1999: 275: "*Erebia cassioides macedonica* Buresch, 1918").

Habitat: Reported as "... observed flying in screes formatiosn often along the alpine lakes" (Abadjiev, 1993: 55: "*Erebia cassioides macedonica* Buresch, 1918"). The biotope on the slope of Tcherni Ridge is illustrated in Abdjiev (1995: Pl. II: Fig. 2: "*Erebia cassioides macedonica*"); represents a scree with SW exposition. Similar is the habitat at the type locality Suha Vapa, where *centrorilica* ssp. n. flies on the SW rocky slope of the peak (which exactly forms a NE side of the circus of Yakoruda Lakes).

Larval hostplant and inumature stages: Unknown.

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New species of Korean *Amynthas* Kinberg, 1867 (Oligochaeta, Megascolecidae) with two pairs of spermathecae

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New species of Korean *Amynthas* Kinberg, 1867 (Oligochaeta, Megascolecidae) with two pairs of spermathecae.- Twenty new species of the genus *Amynthas* are recorded from Korea: *Amynthas piagolensis* sp. n., *Amynthas taebaekensis* sp. n., *Amynthas bubonis* sp. n., *Amynthas vicinus* sp. n., *Amynthas oviformis* sp. n., *Amynthas jindoensis* sp. n., *Amynthas jangbogoi* sp. n., *Amynthas deogyusanensis* sp. n., *Amynthas naejangensis* sp. n., *Amynthas draconis* sp. n., *Amynthas cuneatus* sp. n., *Amynthas yongshilensis* sp. n., *Amynthas alveolatus* sp. n., *Amynthas geomunensis* sp. n., *Amynthas eastoni* sp. n., *Amynthas boletiformis* sp. n., *Amynthas odaesanensis* sp. n., *Amynthas righii* sp. n., *Amynthas fasciiformis* sp. n., *Amynthas sanchongensis* sp. n. Complete descriptions of the new species are provided, including illustrations of the male pore region and spermathecae.

Key-words: Earthworms - *Amynthas* - Megascolecidae - Oligochaeta - Korea - spermathecae - taxonomy

INTRODUCTION

Most Korean earthworm species within the Megascolecidae belong to the genus *Amynthas*. This group is diverse and abundant in litter layers and soils in forests. Parts of the Korean peninsula have been studied with regard to the taxonomy of Megascolecidae (Kobayashi, 1934, 1936, 1937, 1938; Song & Paik, 1969, 1970a, 1970b, 1971, 1973). Kobayashi recorded 29 species of *Amynthas* of which 18 were new species. Kobayashi collected several at locations in Korea including what is now North Korea. Song & Paik collected 9 species of this genus, including six new species from forest areas on Dagelet Isl., Jeju Isl., Geoje Isl., Mt. Jiri, and Mt. Sopaik. All Korean Megascolecidae were originally placed in *Pheretima* Kinberg, 1867, but *Pheretima* has since been divided by Sims & Easton (1972). Species with intestinal caeca originating in xxvii and lacking both nephridia on spermathecal ducts and copulatory pouches were placed in *Amynthas*.

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Specimens were collected from 1996 to 1998, including islands and forests. Material was found from litter layers and soils in forests by digging and hand sorting from 48 locations. In this paper, 20 new to science are reported from South Korea. Korean *Amynthas* have five quantities of spermathecal pores; two pairs, three pairs, four pairs, five pairs, and none. Two pairs of spermathecal pores occur in three locations: 5/6 and 6/7, 6/7 and 7/8, 7/8 and 8/9, but all 20 new species reported here have pores in either 5/6-6/7 or 6/7-7/8. Including the species reported here for the first time, there are now 58 species of *Amynthas* known from Korea, and most are probably endemic to Korea. There is a little overlap between the area sampled for this paper and the areas covered by previous studies of Korean earthworms. This leaves substantial portions of South Korea, primarily in the Gangwon province and Gyonggi regions, unsurveyed. Thus there may be many more species yet undiscovered in other islands and mountain ranges. The type material is deposited in the Korean Institute for Biodiversity Research (KIBIO), and Muséum d'histoire naturelle, Geneva, Switzerland.

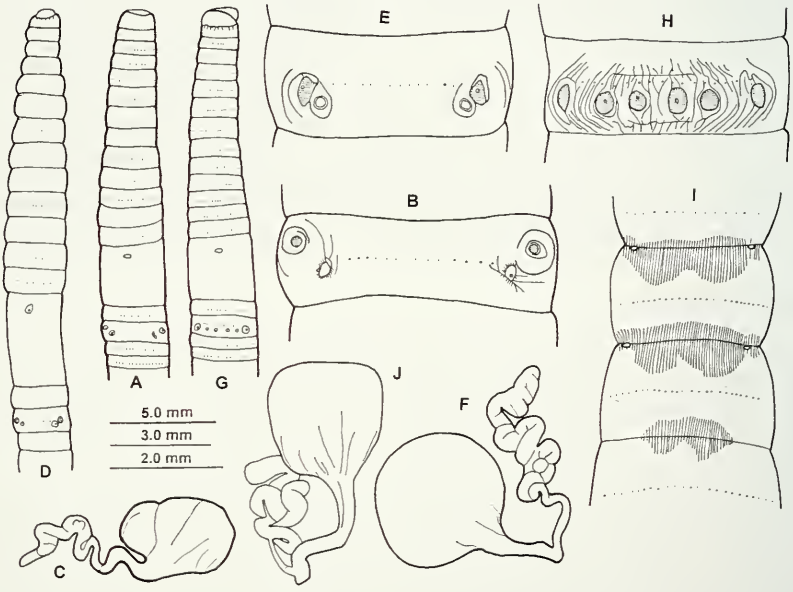

FIG. 1

A-C. *Amynthas piagolensis* sp. n. A: ventral view; B: male pore region in xviii; C: spermathecae. D-F. *Amynthas taebaekensis* sp. n. D: ventral view; E: male pore region in xviii; F: spermathecae. G-J. *Amynthas bubonis* sp. n. G: ventral view; H: male pore region in xviii; I: spermathecal pore region; J: spermathecae. Scales bars = 5 mm (A, D, G), 3 mm (C), 2 mm (B, E, F, H, I, J).

DESCRIPTIONS

Amynthas piagolensis sp. n. Figs 1A-C

Material: Holotype and 5 paratypes: Korea, Jeollanam-do, Gurye-gun, Mt. Jiri, Piagol (35° 15'-18'N, 127° 33'-35'E), 600-1000 m, litter layers in forest, 22 August 1997, Y. Hong. (KIBIO). Other material: Same data as for holotype, 28 clitellate specimens.

Etymology: The species is named for its type locality.

Diagnosis: Spermathecal pores in 5/6, 6/7, at leading edges of vi, vii. Male pores in post-setal medial to posterior edge of approximately circular thickened areas, with pre-setal, laterally placed circular genital papillae. Genital markings lacking.

Description: Dimensions 52-98 mm by 3.5-5.0 mm at segment x, 3.7-5.1 mm at xxx, 3.5-4.8 mm at clitellum; body cylindrical throughout, segments 58-78. Setae regularly distributed around segmental equators, numbering 48 at vii, 46 at xx; 13-14 between male pores, size and distance regular; setal formula AA:AB:YZ:ZZ = 3:2:3:5 at xiii. Female pore single in xiv, 0.5 mm oval shape. Prostomium epilobic, with tongue open. Light red (claret-purplish red) dorsally and yellowish ventrally, clitellum deep brownish, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male pores in post-setal slightly invaginated area medial to posterior edge of approximately circular thickened areas, each with pre-setal, laterally placed circular genital papillae. Spermathecal pores in 5/6 and 6/7, bright white spots at leading edge of vi, vii, ventrally. Genital markings not present in spermathecal segments.

Septa 5/6 thick, 6/7, 7/8 thin, 8/9, 9/10 absent, 10/11-12/13 thin. Gizzard largely in viii-x. Esophagous vertical lamellae xii, xiii. Intestine begins xv, lymph glands not found. Typhlosole absent. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxiv, each consisting of a medium size finger-shaped sac. Esophageal hearts four pairs in x-xiii. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles large in xi, xii, vesicles of xi extended into x. Prostates xviii extending to xvii-xx; having long muscular ducts with a hairpin bend, both glandular portions consist of two main lobes, each lobe divided into leaflets.

Ovaries in xiii. Paired spermathecae in vi, vii; ampulla large pouch, milky color, irregular shape, stout ducts shorter than ampulla, diverticulum coiled and kinked with short slender muscular stalk, some longer than ampulla; no nephridia on spermathecal ducts. Genital papillae in male pore invaginations with internal sessile glands medial to junctions of prostatic ducts with body wall.

Remarks: *Amynthas piagolensis* sp. n., the next ten species, and *A. reisuiensis* (Kobayashi, 1938) and *A. masatakae* (Beddard, 1892) which have spermathecal pores on 7/8, 8/9, all have simple intestinal caeca, and can thus be distinguished from other species with two pairs of spermathecae. Spermathecal pores of *A. piagolensis* sp. n. are on the anterior margins of vi and vii close to 5/6 and 6/7 ventrolaterally, but they are not intrasegmental. In this character *A. piagolensis* sp. n. is similar to *Amynthas taebaekensis* sp. n., *Amynthas bubonis* sp. n., and *Amynthas deogyusanensis* sp. n. All of them have spermathecal pores close to 5/6, 6/7. The present species appears to be

closely related to *A. taebaekensis* sp. n. from Mt. Taebaek, but it is separated easily by shape of male pore region. Genital papillae of *A. taebaekensis* sp. n. are post-setal, and *A. piagolensis*'s sp. n. papillae are somewhat protuberant.

Amynthas taebaekensis sp. n. Figs 1D-F

Material: Holotype and 2 paratypes: Korea, Gangwon-do, Taebaek-shi, Mt. Taebaek (37° 07'N, 128° 57'E), 800-1200 m, litter layers in forest, 01 September 1998, Y. Hong, (KIBIO). Other material: Same data as for holotype, 5 clitellate specimens.

Etymology: The species is named for its type locality.

Diagnosis: Spermathecal pores in 5/6, 6/7, near leading edges of vi, vii; with triangular patches. Male pore area superficial near pad centers on 0.6-0.8 mm diameter oval papillae in setal line; paired post-setal genital papillae simple eye-spot shape. Genital markings lacking.

Description: Dimensions 68-95 mm by 4.5 mm at segment x, 4.5 mm at xxx, 4.2 mm at clitellum; body cylindrical throughout, segments 57-79. Setae regularly distributed around segmental equators, numbering 59 at vii, 56 at xx; 12-16 between male pores, size and distance regular; setal formula AA:AB:YZ:ZZ = 1:1:2:3 at xiii. Female pore single in xiv, 0.4 mm oval or round shape invaginate slightly. Prostomium epilobic, with tongue open. Brownish or dark brownish dorsally and yellowish ventrally, clitellum coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; slightly constricted and long, setae invisible externally.

Male pores near lateral margins of ventrum in xviii on thickened pads; pore area slightly superficial near pad centers on 0.6-0.8 mm diameter oval papillae in setal line, pores centered. Between male pores paired post-setal genital papillae simple eye-spot shape; diameter about 0.2 mm. Spermathecal pores in 5/6, and 6/7; near leading edges of vi, vii; triangular patches of short longitudinal furrows adjacent to spermathecal pores ventrally. Genital markings not present in spermathecal segments.

Septa 5/6 and 6/7 thick, 8/9 thin, 10/11-12/13 thin with some muscle. Gizzard globular in ix-x. Intestine begins in xv, lymph glands absent. Typhlosole very small in xxvi. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxiii, each consisting of a large finger-shaped sac. Hearts three pairs in xi-xiii, ix lateral, x lacking. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles filling most of two pairs in xi, xii. Prostates xviii middle within xvii-xx; ducts thick, medium length, both glandular portions consist of two or three main lobes. Genital papillae of xviii with small sessile gland patches near prostatic ducts, gland patches triangular or quadrilateral, closely attached to surface.

Ovaries in xiii. Paired spermathecae in vi, vii; vii larger than vi; each ampulla middle voluminous pouch, thick, short ducts, diverticula with long slender muscular stalk, ectal tightly coiled section of chamber ental loosely coiled section of greater diameter; no nephridia on spermathecal ducts.

Remarks: The present species appears to be closely related to *A. piagolensis* sp. n. from Mt. Jiri, but is separated easily by shape of the male pore region and spermathecal pore patches, which are location *A. piagolensis* sp. n. Genital papillae of *A. piagolensis* sp. n. are pre-setal, as opposed to post-setal in *A. taebaekensis* sp. n.

Amynthas bubonis sp. n. Figs 1G-J

Material: Holotype and 5 paratypes: Korea, Gyungsangnam-do, Sanchong-gun, Mt. Jiri (35° 22'-25'N, 127° 50'-52'E), 600-850 m, litter layers in forest, 30 August 1997, Y. Hong, (KIBIO). Other material: Jeollanam-do, Gurye-gun, Mt. Jiri, Piagol, 600-1000 m, litter layers, 1 clitellate, 22 August 1997; Jeollabuk-do, Namwon-gun, Mt. Jiri, Manbokdae (35° 20'-22'N, 127° 31'-33'E), 1100-1400 m, litter layers, 2 clitellate, 31 August 1997; Jeollabuk-do, Jangsu-gun, Mt. Jangan, 600-850 m, litter layers, 26 clitellate, 2 aclitellate, 28 July 1998; Gyungsangbuk-do, Kimchon-shi, Mt. Hwangakg, Jikji-sa (36° 06'-08'N, 128° 00'-02'E), 200-600 m, litter layers, 17 clitellate, 1 aclitellate, 30 July 1998; Gyungsangnam-do, Hamyang-gun, Mt. Baekun, 400-700 m, litter layers, 44 clitellate, 07 August 1998; Jeollanam-do, Gurye-gun, Mt. Jiri, Nogodan (35° 16'-18'N, 127° 32'-34'E), 1000-1400 m, litter layers, 6 clitellate, 19 August 1998; Gyungsangnam-do, Sanchong-gun, Mt. Jiri, 600-1200 m, litter layers, 9 clitellate, 30 August 1997.

Etymology: The epithet *bubonis*, Latin for owl, alludes to the conspicuous genital papillae in this species.

Diagnosis: Spermathecal pores ventral on anterior edges of vi, vii, close to 5/6, 6/7; genital patches unpaired, median between spermathecal pores. Male pores at center of round male patches 0.3 mm diameter near lateral margins of xviii, lateral to 2-6 round genital papillae. Genital markings lacking.

Description: Dimensions 57-99 mm by 3.3-4.0 mm at segment x, 3.5-4.2 mm at xxx, 3.5-4.2 mm at clitellum; body cylindrical throughout and narrowed in vi, vii, segments 64-86. Setae regularly distributed around segmental equators, numbering 43 at vii, 44 at xx; 13-16 between male pores, irregular distance; setal formula AA:AB:YZ:ZZ = 2:2:2:3 at xiii. Female pore single in xiv, 0.35 mm round or oval shape slightly invaginate. Prostomium epilobic, with tongue open. Red brownish dorsally and yellowish ventrally, clitellum light coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male pores at center of round male patches 0.3 mm diameter near lateral margins of ventrum in xviii, pores white, flanked by 5-7 very small longitudinal wrinkles, convex laterally, lateral to genital papillae, the outer most one or two wrinkles lateral to male pores. Between male pores 3-5 round genital papillae (2-6 in non-type material) 0.2 x 0.2 mm darker than body wall, post-setal on transverse raised area also encompassing male pores, conspicuous slight superficial round shape, regularly spaced distance and all of similar shape, more conspicuous than male pore papillae. Spermathecal pores ventral on anterior edges of vi and vii, very close to 5/6, 6/7 respectively, about 1/3 circumference apart. Each a clear white spot, flat on top, with conspicuous opening. Genital patches unpaired, median between spermathecal pores on 5/6, 6/7, and in same area of 7/8; each patch composed of many small furrows extending across intersegment boundary, but not reaching segmental equators. Genital markings lacking.

Septa 5/6 and 6/7 thick, 11/12-13/14 thin with some muscle. Gizzard moderately globular in viii-ix. Intestine begins in xiv, lymph glands none. Typhlosole small from xxvii. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxiii, each consisting of a finger-shaped large sac. Esophageal hearts xi-xiii, connected to supra-esophageal vessel, x missing; ix lateral. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles simple, medium

size, two pairs in xi, xii. Prostates xviii centered in xvi-xx; ducts long muscular, both glandular portions consist of two or three main lobes, each with smaller divisions.

Ovaries free in xiii. Paired spermathecae in vi, vii, each ampulla large rounded to blocky; conspicuous blood vessel on ducts. Ducts longer than ampulla, diverticula with slender muscular stalk; increasing in diameter ectally; coiled; diverticulum chamber coiled, increasing in diameter towards end; no nephridia on spermathecal ducts. Genital papillae of xviii with sessile and very small stalked glands corresponding approximately in number and location to the externally visible genital papillae, resembling very small prostates in shape.

Remarks: The species has variable genital papillae. Kimchon specimens have a more variable number of genital papillae from 2 to 6, and sometimes two genital papillae are attached to one another. Also, genital papillae glands are missing in Kimchon specimens, which also sometimes have very small spermathecae. In five of 16 individuals, the anterior spermathecal patch boundary is very close to the intersegmental boundary. Jangan and Baekun specimens have patches, but very weakly developed. All Nogodan specimens lacked the median genital papillae of xviii, having only two papillae, those close to the male pore papillae. Three spermathecal pores appear intersegmental in one individual from Manbokdae.

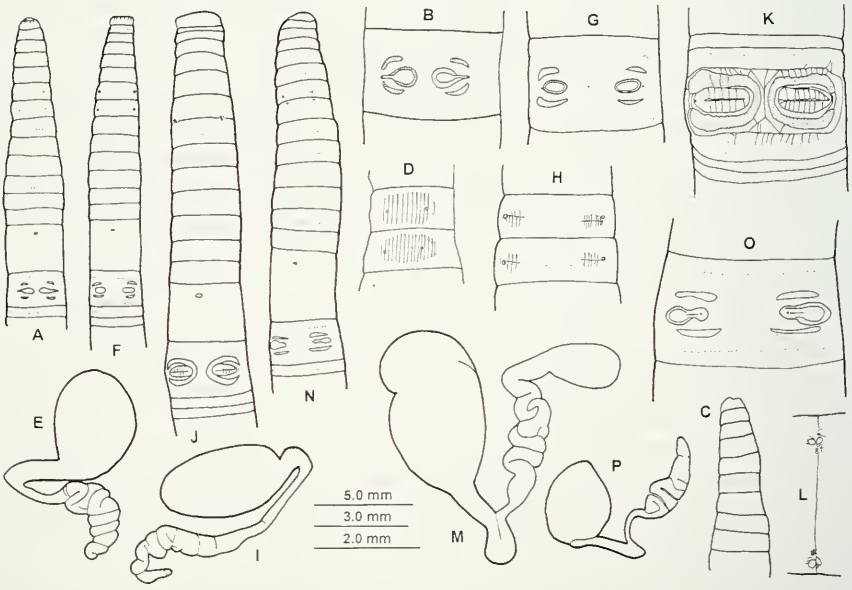

FIG. 2

A-E. *Amynthas vicinus* sp. n. A: ventral view; B: male pore region in xviii; C: lateral view, anterior of clitellum; D: spermathecal pore region; E: spermathecae. F-I. *Amynthas oviformis* sp. n. F: ventral view; G: male pore region in xviii; H: spermathecal pore region; I: spermathecae. J-M. *Amynthas jindoensis* sp. n. J: ventral view; K: male pore region in xviii; L: spermathecal pores of vi and vii; M: spermathecae. N-P. *Amynthas jangbogoi* sp. n. N: ventral view; O: male pore region in xviii; P: spermathecae. Scales bars = 5 mm (A, C, F, J, N), 3 mm (B, D, E, G, H, K, L, O, P), 2 mm (I, M).

Amynthas vicinus sp. n. Figs 2A-E

Material: Holotype and 4 paratypes: Korea, Jeollabuk-do, Jangsu-gun, Mt. Jangan (35° 37'-38'N, 127° 36'-37'E), 600-850 m, litter layers in forest, 28 July 1998, Y. Hong, (KIBIO). Other material: Same data as for holotype, 22 clitellate, 2 aclitellate specimens.

Etymology: The name *vicinus* is Latin for neighboring, which recognizes the species close relationship to *A. plantus* (Song & Paik, 1973) and *Amynthas oviformis* sp. n.

Diagnosis: Spermathecal pores in vi, vii intrasegmental; between pores flat a setal area with longitudinal furrows forming genital patch. Male pores superficial at ends of thin pale lines extending laterally from closely paired ovate discs slightly elevated. Genital markings lacking.

Description: Dimensions 67-90 mm by 3.8-4.2 mm at segment x, 3.8-4.2 mm at xxx, 4.0-4.2 mm at clitellum; body cylindrical throughout in narrow vi, vii, segments 62-99. Setae regularly distributed around segmental equators, numbering 32 at vi, 36 at vii, setae missing between spermathecal pores, 52 at xx; no setae between male pores, but not in at xviii; setal formula AA:AB:YZ:ZZ = 2:1:2:3 at xiii. Female pore single in xiv, 0.3 mm oval shape. Prostomium epilobic, with tongue open. Light brownish dorsally and yellowish ventrally, clitellum light coffee color, faintly extended beyond 13/14 and 16/17, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally, very smooth surface, dorsal pores visible.

Male pores superficial at ends of thin pale lines extending laterally from closely paired ovate discs slightly elevated; wing-shaped short bands anterior and posterior of the genital papillae have lateral ends close to line leading to male pore, curving half way around genital papillae. Paired spermathecal pores vi, vii intrasegmental, just pre-setal, ventral; small light flattened spot; between pores flat a setal area with slight longitudinal furrows forming genital patch width corresponding to 12-14 setae in adjacent segments. Genital markings lacking.

Septa 5/6, 6/7 thick, 7/8 slightly muscular, 8/9, 9/10 absent, 10/11-13/14 thin with some muscle. Gizzard globular in viii-x. Intestine begins in xiv, very small lymph glands from xxvii. Typhlosole simple fold from xxvii. Hearts in ix lateral, x-xiii esophageal. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxiii, each consisting of a straight slightly tapered sac. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles medium size, two pairs in xi, xii; vesicles of xi joined dorsally, in xii not connected. Prostates small within xvi-xx; ducts thick, short, both glandular portions consist of two or three main lobes.

Ovaries in xiii. Paired spermathecae in vi, vii; each ampulla voluminous oval pouch, ducts thick, slightly shorter than ampulla, diverticula thin, coiled except for muscular stalk, as long as ampulla, or sometimes slightly shorter than ampulla; no nephridia on spermathecal ducts.

Remarks: The present species appears to be closely related to *A. oviformis* sp. n., but is separated easily by the shape of the male pore region. The male pores of the species are connected with genital papillae, but in *A. oviformis* sp. n. they are

separated. Genital patches of the species are unpaired between spermathecal pores, but in *A. oviformis* sp. n. the patches are paired around the spermathecal pores. *A. oviformis* sp. n. is similar to *A. plantus*, in that the male pores and genital patches are separated. Also, *Amynthas vicinus* sp. n. has intrasegmental spermathecal pores, in which it is similar to *A. oviformis* sp. n., *Amynthas jangbogoi* sp. n., *Amynthas cuneatus* sp. n. and *A. plantus*. We think it is necessary to make a distinction between species whose spermathecal pores are close to intersegmental boundaries and those with spermathecal pores well within the segments. *A. vicinus* sp. n. has ventral genital patches in place of genital markings, the same as *Amynthas seungpanensis* (Song & Paik, 1970), *A. oviformis* sp. n., *A. cuneatus* sp. n., and *A. plantus*. Also, *A. vicinus* sp. n. has unpaired mid-ventral genital patches, unlike the others just mentioned, which have paired genital patches. The body wall is so thin that parasite cysts were visible without dissection, and segments vi and vii are conspicuously flattened or constricted, as in *Amynthas agrestis* (Goto & Hatai, 1899).

Amynthas oviformis sp. n. Figs 2F-I

Material: Holotype and 3 paratypes: Korea, Jeollanam-do, Wando-gun, Geomun Isl. (34° 01'-02'N, 127° 21'E), 50-100 m, soil and litter layers in forest, 06 September 1996, Y. Hong, (KIBIO). Other material: Same data as for holotype, 11 clitellate, 1 aclitellate specimens.

Etymology: This species named *oviformis*, Latin for egg, referring to the shape of the male pore region.

Diagnosis: Spermathecal pores in vi, vii intrasegmental; genital patches paired vi, vii, lateral edges surrounding spermathecal pores. Male pores near lateral margins in xviii. Genital markings lacking.

Description: Dimensions 53-105 mm by 3.6-4.0 mm at segment x, 3.6-4.1 mm at xxx, 3.2-4.3 mm at clitellum; body cylindrical throughout, segments 54-86. Setae irregularly distributed around segmental equators, numbering 34-43 at vi, 32-39 at vii, 51 at xx, invisible medial to spermathecal pores except for 3-10 setae near mid-ventral line; 0-4 setae between male pores, setal formula AA:AB:YZ:ZZ = 2:1.5:2:3 at xiii. Female pore single in xiv, 0.2-0.3 mm oval shape. Prostomium epilobic, with tongue open. Pink dorsally and yellowish ventrally, clitellum dark more red color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible, dorsal pores visible externally.

Male pores near lateral margins of ventrum in xviii, at lateral edges of paired, raised transverse oval papillae. Paired slightly curved dark bands anterior, posterior to papillae approximately on 17/18, 18/19; in some specimens bands are slightly invaginated, all bands longer than oval genital papillae. Spermathecal pores vi, vii intrasegmental, small flattened spot just pre-setal, the pore superficial, conspicuously black; genital patches paired vi, vii, lateral edges surrounding spermathecal pores, patches oval, with a few small furrows; setae lacking within patches. Genital markings lacking.

Septa 4/5 thick, 6/7-7/8 thinner but muscular, 8/9, 9/10 absent, 10/11 thin, 11/12-13/14 thin with some muscle. Gizzard globular in vii-ix. Intestine begins in xiv, one pair of lymph glands per segment from xxvii. Typhlosole simple fold from xxvii.

Hearts in ix lateral, x-xiii esophageal. Intestinal caeca simple, medium size, originating in xxvii, extending anteriorly about to xxii, each consisting of simple finger-shaped sac. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles two pairs xi, xii; pair in xi connection joined, xii separate, with many round white spots dorsally. Prostates xviii, extending to xvi-xxi; both glandular portions consist of two or three main lobes; short thick cylindrical ducts.

Ovaries in xiii. Paired spermathecae vi and vii, each ampulla a small oval pouch, slightly flattened; ducts thick, short; diverticula with long muscular stalk, ectal portion long and coiled with many small pockets in diverticulum walls, longer than ampulla; no nephridia on spermathecal ducts. Genital marking glands lacking.

Remarks: The present species appears to be closely related to *A. plantus*, but is separated easily by the shape of the male pore region, and because it differs in that the male pores are not within the genital papillae. *A. plantus* has male pores in the genital papillae, and like *A. oviformis* sp. n. has paired genital patches. The aclitellate individual lacked visible genital papillae, but has clearly visible male pores and genital papillae.

Amynthas jindoensis sp. n. Figs 2J-M

Material: Holotype and 3 paratypes: Korea, Jeollanam-do, Jindo-gun, Jindo-eup (34° 37'-38'N, 126° 19'E), 100-300 m, litter layers in forest, 22 August 1998, Y. Hong, (KIBIO). Other material: Jeollanam-do, Jindo-gun, Jindo-eup, 7 clitellate, 25 August 1998.

Etymology: The species is named for its type locality.

Diagnosis: Spermathecal pores posterior edge of vi, anterior edge of vii; pores of vi usually farther from 6/7 than pores of vii. Male pores at lateral ends of large elliptical pads. Genital markings lacking.

Description: Dimensions 78-123 mm by 4.3-5.2 mm at segment x, 4.6-5.3 mm at xxx, 4.9-5.4 mm at clitellum; body cylindrical throughout, segments 67-105. Setae regularly distributed around segmental equators, numbering 52 at vii, 61 at xx; 0 between male pores; setal formula AA:AB:YZ:ZZ=2:1:1:2 at xiii. Female pore single in xiv, 0.5 mm oval shape with split. Prostomium epilobic, with tongue open. Brownish dorsally and yellowish ventrally, clitellum medium dark coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male pores at lateral ends of large elliptical pads, each pad split by transverse groove extending from inner lateral margin of ellipse through outer medial margin. Elliptical pads surrounded by second elliptical or slightly angular open ring of darker thickened tissue; outer ring open laterally; outer rings extend almost to equators of xviii, xix. Further thickened region with or without rugosities may extend more laterally and posteriorly to 19/20. Paired spermathecal pores posterior edge of vi, anterior edge of vii; pores of vi usually farther from 6/7 than pores of vii; pores of vi are slightly more laterally placed; pores on circular porophores protruding towards 6/7. Genital markings lacking.

Septa 5/6-7/8 thick, 8/9, 9/10 absent, 10/11-12/13 with thin, some muscle. Gizzard nearly spherical viii-x. Intestine begins in xv, lymph glands from xxvii on

dorsal vessel. Typhlosole low, simple fold from xxvii. Esophageal hearts in x-xiii; ix lateral, usually one large, one small or aborted. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxii, each consisting of a middle finger-shaped sac. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles nearly filling their segments, paired in xi, xii. Prostates xviii, extending to xvi-xx, attached to tip of cecum; short muscular ducts, both glandular portions consist of three main lobes, these divided again in simple leaflets. Genital marking glands lacking.

Ovaries in xiii. Paired spermathecae in vi, vii, ducts enter body wall close to 6/7, each ampulla large, egg-shaped, ducts short, thick; diverticula slender, ectal 1/3 straight, center 1/3 with 6-8 tight kinks, ental part straight, diameter greater; longer than ampulla; no nephridia on spermathecal ducts.

Remarks: The present species appears to be related to *A. jangbogoi* sp. n., but is separated easily by the shape of the male pore region and spermathecal pore region. The location of spermathecal pores is unusual in *Amynthas*, in the that spermathecal pores of two adjacent segments appear near the same intersegmental boundary. This may be important in the systematics of Korean *Amynthas*. *A. seungpaensis* has a similar arrangement of spermathecal pores, but has only a single mid-ventral pore in each of vi and vii. Having no setae between male pores, *A. jiudoensis* sp. n. is similar to *A. vicinus* sp. n., *A. seungpaensis*, and *A. plantus* among Korean *Amynthas*. The male disc shape is unique to this species.

Amynthas jangbogoi sp. n. Figs 2N-P

Material: Holotype and 2 paratypes: Korea, Jeollanam-do, Wando-gun, Wando-eup (34° 20'-22'N, 126° 41'E), 100-600 m, litter layers in forest, 26 August 1998, Y. Hong, (KIBIO). Other material: Same data as for holotype, 2 clitellate specimens.

Etymology: Named for General Bo-Go Jang (849-935), a navy man active on the sea near Wando.

Diagnosis: Spermathecal pores in vi near segmental equator, in vii near 6/7 but not intersegmental. Male pores superficial in xviii at medial ends of paired transversely oriented bowling-pin shaped pads. Genital markings lacking.

Description: Dimensions 94-117 mm by 4.8 mm at segment x, 5.0 mm at xxx, 4.8 mm at clitellum; body cylindrical throughout, segments 85-102. Setae regularly distributed around segmental equators, numbering 51 at vii, 54 at xx; 3-8 between male pores, size and distance irregular; setal formula AA:AB:YZ:ZZ = 3:2:3:5 at xiii. Female pore single in xiv, oval shape, conspicuous. Prostomium epilobic, with tongue open. Red brownish dorsally and yellowish ventrally, clitellum with light coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible and dorsal pores open externally within clitellum.

Male pores small white spots superficial in xviii at medial ends of paired transversely oriented bowling-pin shaped pads, head of pin towards mid-ventral; anterior and posterior to the male pores are transverse dark, bands extending from just medial of male pore to lateral margin of ventrum; hardened dark grooves around pad margins. Paired spermathecal pores in vi near segmental equator, in vii near 6/7 but not intersegmental. Genital markings lacking.

Septa 5/6, 6/7 thick, 7/8 some muscle, 8/9, 9/10 absent, 10/11-12/13 thin. Gizzard in viii-x. Intestine begins in xv, very small white lymph glands from about xx. Typhlosole simple low fold from xxvii. Hearts in x-xiii esophageal; ix lateral. Intestinal caeca simple, originating in xxvii, and extending anteriorly about to xxii. each consisting of a large finger-shaped sac. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Paired seminal vesicles filling segments xi, xii. Prostates xviii extendng to xvi-xxi, short and very thick barrel shaped ducts, both glandular portions consist of three main lobes.

Ovaries in xiii. Paired spermathecae in vi and vii, vii little larger than vi, ampulla ovate, medium size, duct about as long as ampulla, diverticula with straight muscular stalk, coiled middle section and digitate end, diverticulum as long as duct-ampulla axis; no nephridia on spermathecal ducts.

Remarks: The location of the spermathecal pores in this species is very unusual, since it has one pair equatorial in vi and one pair intrasegmental but close to 6/7. This arrangement appears to be an intermediate stage between the common arrangement of spermathecal pores (intersegmental) and that seen in *A. jindoensis* sp. n. In *A. jindoensis* sp. n. the spermathecal pores of vi have moved back to be near 6/7, while in *A. jangbogoi* sp. n. these pores have only moved back to the segmental equator. Among Korean *Amynthas*, posterior shift of the spermathecal pores is only seen in these species.

Amynthas deogyusanensis sp. n. Figs 3A-C

Material: Holotype and 2 paratypes: Korea, Jeollabuk-do, Muju-gun, Mt. Deogyu (35° 53'-55'N, 127° 46'-47'E), 400-1000 m, litter layers in forest, 04 July 1998, Y. Hong, (KIBIO).

Etymology: The species is named for its type locality.

Diagnosis: Spermathecal pores in vi, vii close to 5/6 and 6/7; paired genital patches laterally vi and vii, ocher color conspicuous. Male pores superficial at median ends of seminal grooves within paired hardened male discs. Genital markings lacking.

Description: Dimensions 102-110 mm by 5.0-5.7 mm at segment x, 4.8-5.3 mm at xxx, 5.3-6.0 mm at clitellum; body cylindrical throughout, segments 104-106. Setae regularly distributed around segmental equators, numbering 6-7 at vi, 14-18 at vii; setae may be present in ocher genital patches but very hard to see, 59 at xx; 8-11 between male pores, size and distance regular; setal formula AA:AB:YZ:ZZ = 2.5:2:2:5 at xiii. Female pore single in xiv, 0.7 mm oval shape slightly invaginate. Prostomium epilobic, with tongue open. Pink brownish dorsally and yellowish ventrally, clitellum with light coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male pores superficial at median ends of seminal grooves within paired hardened male discs; disc shape resembles droplet placed with narrow end lateral, raised above body wall level, central axis with a diagonal seminal groove, lateral end posterior to medial end. Spermathecal pores in vi, vii close to 5/6 and 6/7, above mid-lateral level or 1/2 circumference apart, slightly elevated conspicuous small flat-top spot, pore opening appears black. Paired genital patches laterally vi and vii, ocher color conspicuous, 2/3 or more of body circumference.

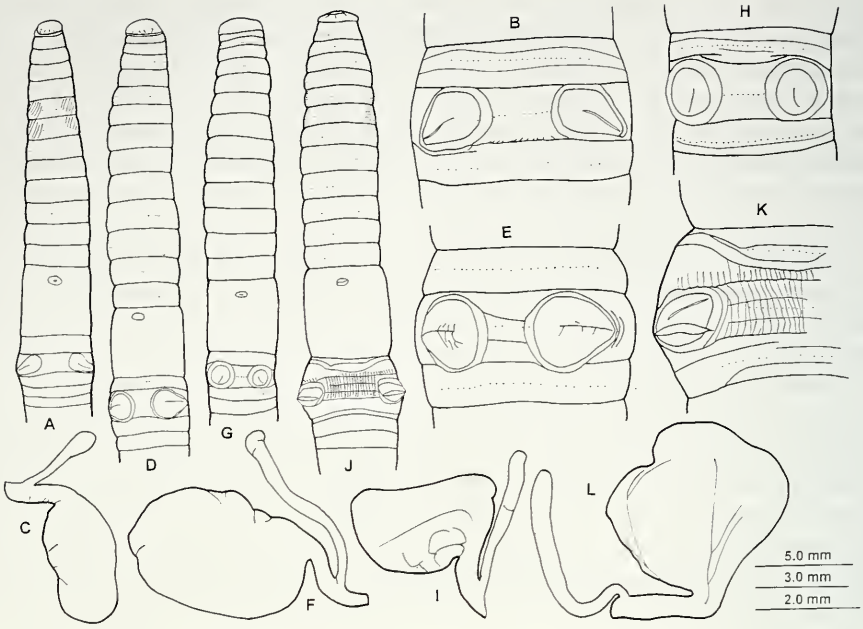

FIG. 3

A-C. *Amynthas deogyusanensis* sp. n. A: ventral view; B: male pore region in xviii; C: spermathecae. D-F. *Amynthas naejangensis* sp. n. D: ventral view; E: male pore region in xviii; F: spermathecae. G-I. *Amynthas draconis* sp. n. G: ventral view; H: male pore region in xviii; I: spermathecae. J-L. *Amynthas cuneatus* sp. n. J: ventral view; K: male pore region in xviii; L: spermathecae. Scales bars = 5 mm (A, D, G, J), 3 mm (B, E, H, K), 2 mm (C, F, I, L).

Septa 5/6 and 6/7 thick, 7/8 some muscle, 8/9, 9/10 absent, 10/11, 11/12 thick, 12/13-13/14 thin with some muscle. Gizzard globular in viii-x. Intestine begins in xv, small paired lymph glands from xxviii along dorsal vessel. Typhlosole low simple fold from xxvii. Hearts x-xiii esophageal; ix lateral, one side always larger than other. Intestinal caeca simple, originating in xxvii, and extending anteriorly about to xxiii, each consisting of a large finger-shaped sac, well developed. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles two pairs in xi, xii, well developed. Prostates xviii, divided in many long slender lobes extending to xvi-xviii, many pieces. Genital marking glands lacking.

Ovaries in xiii. Paired spermathecae in vi, vii; ampulla small pouch, ducts shorter than ampulla, diverticula club-shaped; no nephridia on spermathecal ducts.

Remarks: The species shares some characteristics of the male pore region with *Amynthas fibula ranunculus* (Kobayashi, 1936). It differs from *A. fibula ranunculus* in the orientation of the male disc droplet shape head direction and location of the male pores. All individuals of *A. deogyusanensis* sp. n. collected from the same site have similar characteristics, but droplet head direction was reversed in two indivi-

duals. Also, the species has more dorsally placed spermathecal pores, in which it is similar to *A. cuneatus* sp. n., and *Amynthas kobayashii* (Kobayashi, 1938) and *Amynthas vallis* (Kobayashi, 1936) though this last has three spermathecal pores in 5/6-7/8. Twelve of the new species with spermathecal pores in 5/6, 6/7 have no genital markings. *A. deogyusanensis* sp. n. also lacks genital markings and only has conspicuous genital patches.

Amynthas naejangensis sp. n. Figs 3D-F

Material: Holotype and 1 paratype: Korea, Jeollabuk-do, Jeongeup-gun, Mt. Naejang (35° 29'-30'N, 126° 54'E), 200-600 m, soil and litter layers in forest, 29 June 1996, Y. Hong, (KIBIO).

Etymology: The species is named for its type locality.

Diagnosis: Spermathecal pores in 5/6, 6/7 close to mid-lateral. Male field with large egg-shaped raised pads; each pad extending from 17/18-18/19. Genital markings lacking.

Description: Dimensions 116-153 mm by 6.2 mm at segment x, 6.0 mm at xxx, 6.2 mm at clitellum; body cylindrical throughout, segments 96-117. Setae regularly distributed around segmental equators, numbering 15-39 at vi, 12-42 at vii, 58-64 at xx; 5-11 between male pores, size and distance regular; setal formula AA:AB:YZ:ZZ = 3:2:2.5:4 at xiii. Female pore single in xiv, 1.0 mm oval shape. Prostomium epilobic, with tongue open. Light pink dorsally and yellowish ventrally, clitellum with light coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae only faint traces visible externally.

Male field with large egg-shaped raised pads, narrow end lateral; each pad extending from 17/18-18/19, with transverse seminal groove from approximate center of broad end of pad to just within lateral edge; male pores at medial ends of grooves. Some pads elevated towards seminal grooves, others with central ridge posterior to grooves. Paired spermathecal pores 5/6, 6/7 close to mid-lateral, inconspicuous, very small. Genital markings lacking.

Septa 5/6-7/8 thick, 8/9, 9/10 absent, 10/11-13/14 thin with some muscle. Gizzard small in viii-x. Intestine begins in xv, lymph glands from xv. Typhlosole large from xxvii. Intestinal caeca simple, originating in xxvii, extending anteriorly about to xxii, each consisting of a large finger-shaped sac with small pouches on ventral margin. Esophageal hearts x-xiii. Male sexual system holandric, testes and funnels enclosed in dorsally united, ventrally separate sacs, sac membrane xi also encloses seminal vesicles of xi. Seminal vesicles, two pairs xi and xii; enclosed in testis sac in xi. Prostates xviii extending to xvii-xix; short and thick ducts, both glandular portions consist of two or three main lobes, each lobe deeply divided into leaflets, intestine of xviii constricted by prostates. Genital papillae glands lacking.

Ovaries in xiii. Paired spermathecae in vi, viii; each ampulla pear-shaped pouch; ducts short stalks, diverticula somewhat slender and thin, shorter than ampulla, straight or slightly curved; not coiled; no nephridia on spermathecal ducts.

Remarks: The present species appears to be closely related to *Amynthas draconis* sp. n., but is separated easily by the shape of the male pore pad, shape and

direction of the seminal grooves and other characters. *Amynthas naejangensis* sp. n. is also larger than *A. draconis* sp. n.

Amynthas draconis sp. n. Figs 3G-I

Material: Holotype and 2 paratypes: Korea, Jeollabuk-do, Jangsu-gun, Waryong-ri (35° 40'-41'N, 127° 29'E), 600-700 m, litter layers in forest, 03 August 1996, Y. Hong, (KIBIO).

Etymology: The species is named for its type locality. Waryong means "dragon lying down".

Diagnosis: Spermathecal pores in 5/6, 6/7. Male pores xviii in large circular papillae, each papilla with seminal groove of variable shape, some longitudinal, some T-shape. Genital markings lacking.

Description: Dimensions 103-123 mm by 5.3-5.5 mm at segment x, 5.0-5.2 mm at xxx, 5.1-5.5 mm at clitellum; body cylindrical throughout, segments 121-125. Setae regularly distributed around segmental equators, numbering 42 at vii, 59 at xx; 7-10 between male pores; setal formula AA:AB:YZ:ZZ = 3:2:2:4 at xiii. Female pore single in xiv, 0.8 mm oval shape. Prostomium epilobic, with tongue open. Grayish dorsally and yellowish ventrally, clitellum brownish, formalin preservation. First dorsal pore 12/13 (1 individuals) or 13/14 (1 individuals). Clitellum annular xiv-xvi; setae invisible externally.

Male pores xviii in large circular papillae diameter 1.5 x 1.3 mm with outer ring 2.0-1.6 mm outside, each papilla with seminal groove of variable shape, some longitudinal, some T-shape. Paired spermathecal pores 5/6, 6/7 very faint, only recognizable in one individual. Genital markings lacking.

Septa 5/6-7/8 thick, 8/9, 9/10 absent, 10/11 thick, 11/12-13/14 thin. Gizzard in viii-x. Intestine begins in xv, lymph glands from xxvii. Typhlosole simple fold from xxvii. Intestinal caeca simple, originating in xxvii, and extending anteriorly about to xxiv, each consisting of a finger-shaped sac. Esophageal hearts four pairs in x-xiii. Male sexual system holandric, testes and funnels in ventral enclosed paired sacs in x, xi; xi sacs united dorsally. Seminal vesicles, two pairs in xi and xii; xi enclosed in testis sacs. Prostates xviii extending to xiv-xx; both glandular portions consist of five main lobes, deeply divided in slender leaflets. Genital papillae glands lacking.

Ovaries in xiii. Paired spermathecae in vi, vii; vii larger than vi; each ampulla with furrowed pouch, ducts of medium thickness, diverticula slender, digitate, with narrow stalk, shorter than ampulla; no nephridia on spermathecal ducts.

Remarks: The present species appears to be closely related to *A. naejangensis* sp. n., but is separated easily by the shape of the male pore region. The male pore disc is close to being circular.

Amynthas cuneatus sp. n. Figs 3J-L

Material: Holotype and 2 paratypes: Korea, Jeollanam-do, Gurye-gun, Mt. Jiri, Piagol (35° 15'-18'N, 127° 33'-35'E), 600-1000 m, soil and litter layers in forest, 26 July 1996, Y. Hong, (KIBIO).

Etymology: The name *cuneatus* is Latin for wedge, here referring to the shape of the male pore region.

Diagnosis: Spermathecal pores in vi, vii above mid-lateral level in dorsal half. Male field area xvii-xix complex; papillae of xviii asymmetrically oval in ventral view, wedge-shaped in longitudinal section. Genital markings lacking.

Description: Dimensions 146-151 mm by 6.1-6.6 mm at segment x, 5.8-6.4 mm at xxx, 6.6-7.0 mm at clitellum; body cylindrical throughout, segments 127-132. Setae regularly distributed around segmental equators, numbering 13 at vi, 11 at vii, 31 at viii, 74 at xx; 11-12 between male pores; these setae regularly spaced but difficult to find due to swelling and furrows between male pores; setal formula AA:AB:YZ:ZZ = 4:2.5:2.5:3 at xiii. Female pore single in xiv, invaginate 1.0 mm oval shape. Prostomium epilobic, with tongue open. Dark grayish dorsally and yellowish ventrally, clitellum reddish brown, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male field area xvii-xix complex. Paired corrugated epidermal thickenings over equatorial, post-setal two thirds of xvii; also on equatorial, pre-setal two thirds of xix; thickenings of xvii larger; the two pairs flanking large paired papillae of xviii. Papillae of xviii asymmetrically oval in ventral view, wedge-shaped in longitudinal section, with central ridge transversely placed post-setally. Anterior face of genital papillae with transverse seminal grooves lateral ends of which originate just anterior to lateral 1/3 of central ridge, then grooves extend diagonally anterior and medial to end at inner edge of dark ring marking edge of genital papillae. Male pores at medial ends of seminal grooves. Paired spermathecal pores 0.1 mm small white spots pre-setal in vi, vii above mid-lateral level in dorsal half. Ocher color genital patches 3.5-4.5 mm in vi, vii around spermathecal pores, clearly visible to naked eye, diffuse, covering 1/2 dorsal surface, separated by narrow dorsal gap, broad ventral gap.

Septa 5/6, 6/7 thick, 7/8 thinner but some muscle, 8/9, 9/10 absent, 10/11-12/13 thickly muscular. Gizzard globular in viii-x, esophagous vascularized, with vertical lamellae xii, xiii. Intestine begins xv, lymph glands from xxvii. Typhlosole in xxvii. Esophageal hearts in xi-xiii; ix lateral, x not found. Intestinal caeca simple, originating in xxvii, and extending anteriorly about to xxiii, each consisting of a finger-shaped sac, finger directed to ventral side of intestine. Male sexual system holandric, testes and funnels in ventral enclosed paired sacs in x, xi, smaller in xi. Seminal vesicles xi with one large section connected by narrow canal to smaller part adherent to posterior face of septum 10/11. Both enclosed in membrane. Seminal vesicles xii consist of lateral larger part covering medial rounded lobe resembling the testis sacs of some species. Prostates xviii, extending to xvi-xxi, each divided in 5-6 main parts, divided into long slender lobes, ducts thick, shorter than prostate gland lobe.

Ovaries in xiii. Paired spermathecae vi and vii, vii little larger than vi; each ampulla large voluminous pouch covered by membrane laced with thin blood vessels, ducts shorter than ampulla, diverticula slender, with stalk same length as spermathecal ducts, diverticulum chamber sausage-shaped, straight; no nephridia on spermathecal ducts. Genital marking glands lacking.

Remarks: The present species appears to be closely related to *Amynthas koryoensis* (Kobayashi, 1936) which also has very large male genital papillae, but in

A. cuneatus sp. n. they are wedge-shaped in longitudinal section with a central ridge transversely placed post-setally, and a diagonal groove on the anterior face of the wedge. *A. cuneatus* sp. n. also differs in the number and location of spermathecal pores.

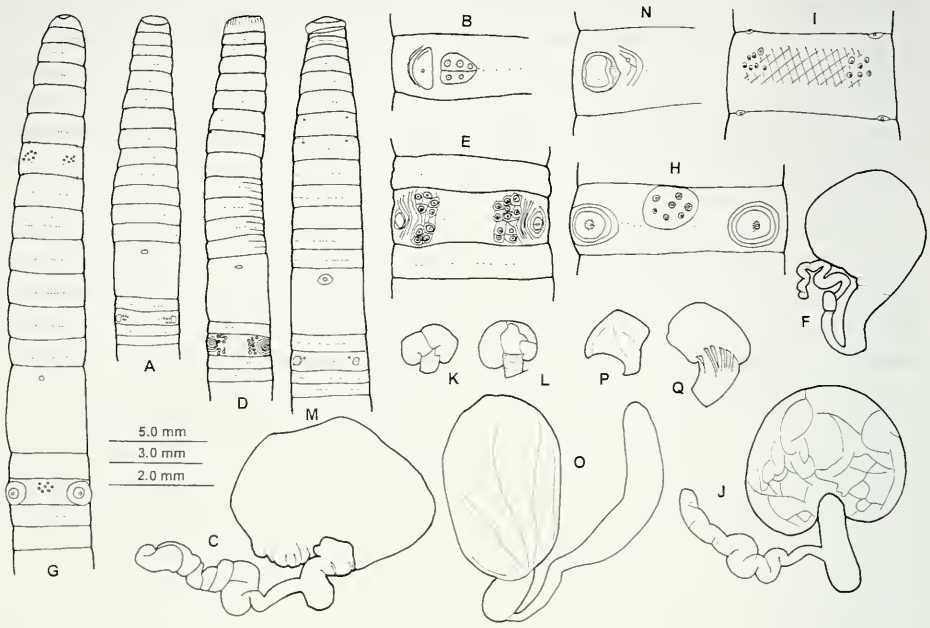

FIG. 4

A-C. *Amynthas yongshilensis* sp. n. A: ventral view; B: male pore region in xviii; C: spermathecae. D-F. *Amynthas alveolatus* sp. n. D: ventral view; E: male pore region in xviii; F: spermathecae. G-L. *Amynthas geomunensis* sp. n. G: ventral view; H: male pore region in xviii; I: spermathecal pore region; J: spermathecae; K: genital marking glands in vii; L: genital papillae glands in xviii. M-Q. *Amynthas eastoni* sp. n. M: ventral view; N: male pore region in xviii; O: spermathecae; P: genital papillae glands in xviii; Q: genital marking glands in viii. Scales bars = 5 mm (A, D, G, M), 3 mm (E, H, I, N), 2 mm (B, C, F, J, K, L, O, P, Q).

Amynthas yongshilensis sp. n. Figs 4A-C

Material: Holotype and 3 paratypes: Korea, Jeju-do, Mt. Halla, Yongshil (33° 23'-25'N, 126° 33'-35'E), 1000-1400 m, litter layers in forest, 15 August 1997, Y. Hong, (KIBIO). Other material: Same data as for holotype, 16 clitellate, 27 aclitellate specimens.

Etymology: The species is named after the type locality.

Diagnosis: Spermathecal pores in 6/7, 7/8. Male pores near lateral margins of xviii, pore superficial white spot near bright white medial margin of 0.6-0.8 mm pad; between male pores two rows of small round genital papillae. Genital markings lacking.

Description: Dimensions 60-101 mm by 4.0-5.3 mm at segment x, 4.2-5.2 mm at xxx, 4.3-5.6 mm at clitellum; body cylindrical throughout, segments 77-93. Setae regularly distributed around segmental equators, numbering 43 at vii, 41 at xx; 7-15 between male pores, some regular; setal formula AA:AB:YZ:ZZ = 5:4:5:6 at xiii. Female pore single in xiv, 0.7 mm round or oval shape. Prostomium epilobic, with tongue open. Brownish dorsally and yellowish ventrally, clitellum coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible, dorsal pores visible or invisible.

Male pores near lateral margins of ventrum in xviii, pore superficial white spot near bright white medial margin of 0.6-0.8 mm pad. Between pores two rows of small round genital papillae, 2-6 pre-setal, 2-6 post-setal in xviii. Paired spermathecal pores 6/7, 7/8 small white spot on 0.1 mm diameter circular porophore, sometimes similar appearance to male pores.

Septa 5/6, 6/7 thick, 7/8 thin, 8/9, 9/10 absent, 10/11-13/14 thin. Gizzard globular in viii-x. Intestine begins in xv, lymph glands from xxvii, small, thin. Typhlosole small in xxvi. Intestinal cecum manicate, originating in xxvii, and extending anteriorly about to xxii, each consisting of 5 finger-shaped sacs, more ventral ones becoming gradually smaller. Hearts esophageal x-xiii; lateral ix. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles paired in xi, xii. Prostates xviii within xvi-xxi, both glandular portions consist of two or three main lobes. Genital papillae of xviii with small stalked glands in two rows corresponding approximately in number to externally visible small spots; each gland with small lobes, non-muscular stalk.

Ovaries in xiii. Paired spermathecae vii, viii; each ampulla a broad slightly furrowed pouch; ducts short, diverticula with slender muscular stalk, chamber thin, coiling, as long as ampulla; no nephridia on spermathecal ducts.

Remarks: *A. yongshilensis* sp. n. and the next eight species, all of which have manicate intestinal cecum and spermathecal pores in 6/7 and 7/8, can be distinguished from the previous 11 species, which have simple intestinal caeca and spermathecal pores in 5/6 and 6/7. The present species appears to be closely related to *Amynthas alveolatus* sp. n., but is separated easily by the shape of the male pore region and genital papillae because segment xviii of *A. alveolatus* sp. n. is covered with genital papillae.

Amynthas alveolatus sp. n. Figs 4D-F

Material: Holotype and 3 paratypes: Korea, Jeju-do, Sangumburi (33° 22'-23'N, 126° 47'E), 200-300 m, volcanic crater, soil and litter layers, 17 October 1996, Y. Hong, (KIBIO). Other material: Same data as for holotype, 8 aclitellate; Jeju-do, Sangumburi, 23 clitellate, 5 aclitellate, 200-300 m, litter layers, 14 August 1997.

Etymology: The specific epithet (Latin: *alveolatus*, meaning hive) refers to the conspicuous shape of the genital papillae.

Diagnosis: Spermathecal pores in 6/7, 7/8. Male pores near lateral margins of xviii, superficial on 0.3-0.5 mm diameter round-shaped; between male pores paired pre- and post-setal groups, each group containing 2-18 circular genital papillae. Genital markings lacking.

Description: Dimensions 74-103 mm by 4.8 mm at segment x, 4.6 mm at xxx, 5.2 mm at clitellum; body cylindrical throughout, segments 69-88. Setae regularly distributed around segmental equators, numbering 42 at vii, 45 at xx; 12-18 between male pores, spacing regular; setal formula AA:AB:YZ:ZZ = 3:2:2:3 at xiii. Female pore single in xiv, 1.0 mm round or oval shape and 0.4 mm pores. Prostomium epilobic, with tongue open. Brownish dorsally and yellowish ventrally, clitellum coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male pores near lateral margins of ventrum in xviii, superficial on 0.3-0.5 mm diameter round-shaped porophore on setae line; porophore within thickened white area of 5-6 concentric furrows becoming narrower towards outer edge, some may extend into xvii, xix. Between furrowed areas surrounding male pores, paired pre- and post-setal groups, each group containing 2-18 small circular genital papillae. Paired spermathecal pores ventrally in 6/7, 7/8. No genital markings in spermathecal segments.

Septa 5/6, 6/7 thick, 7/8 thin with some muscle, 8/9, 9/10 absent, 10/11-13/14 thin. Gizzard globular in viii-ix. Intestine begins in xv, lymph glands from xv. Typhlosole very small from xxvi. Intestinal cecum manicate, originating in xxvii, and extending anteriorly about to xxiii, each consisting of one large, four small digitate divisions. Hearts esophageal x-xiii; ix lateral. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles two pairs from xi, xii extending into x. Prostates xviii extending to xvii-xx; short and thick ducts, glandular portions consist of two or three main lobes. Genital papillae of xviii with crowded overlapping small stalked glands corresponding approximately in number to the externally visible small papillae; glands mushroom shaped, stalks flattened, not muscular.

Ovaries in xiii. Paired spermathecae in vii and viii, viii flattened by gizzard, ampulla a rounded pouch with pebbly outer texture; ducts muscular, shorter than ampulla; diverticula with muscular slender stalk, kinked or coiled chamber, much shorter than ampulla; no nephridia on spermathecal ducts.

Remarks: Genital papillae numbers vary between the pre-and post-setal pairs of patches, and between members of the same pair. Some nematodes were found in the intestine, as was a long tree root fragment.

Amynthas geomuneusis sp. n. Figs 4G-L

Material: Holotype and 4 paratypes: Korea, Jeollanam-do, Wando-gun, Dongdo-ri, Geomun Isl. (34° 02'-03'N, 127° 21'E), 50-100 m, soil and litter layers in forest, 07 September 1996, Y. Hong, (KIBIO). Other material: Same data as for holotype, 15 clitellate specimens.

Etymology: The species is named after the type locality.

Diagnosis: Spermathecal pores in 6/7, 7/8. Male pores at tips of conical porophores surrounded by concentric furrows; centered between male pores pre-setal oval cluster of 7-22 small genital papillae. Pre-setal genital markings; diffuse diagonally cross-hatched zone equatorial between clusters of genital markings.

Description: Dimensions 106-158 mm by 5.8-7.0 mm at segment x, 6.0-7.5 mm at xxx, 5.8-7.5 mm at clitellum; body cylindrical throughout, segments 73-101.

Setae regularly distributed around segmental equators, numbering 55 at vii, 49 at xx; 6-21 between male pores, distance irregular; setal formula AA:AB:YZ:ZZ = 4:3:2:3 at xiii. Female pore single in xiv, 0.7 mm round pore field, 0.4 mm white pore. Prostomium epilobic, with tongue open. Brown dorsally and yellowish ventrally, clitellum brown, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible and dorsal pores visible sometimes, externally.

Male field flattened; male pores at tips of conical porophores surrounded by concentric furrows; each porophore and surrounding furrowed area 1.2-1.8 mm diameter, some furrows inconspicuous. Centered between male pores pre-setal oval cluster of 7-22 small genital papillae, papillae 0.2 mm oval white spots with darker surround. Spermathecal pores ventral in 6/7, 7/8; clear oval pores in furrows. Pre-setal genital markings, 3-7 right side, 0-14 left side of vii, circular or oval shape, like genital papillae of xviii; also 3 at vi and 1 at xix, seen in one individual; diffuse diagonally cross-hatched zone equatorial between clusters of genital markings.

Septa 5/6, 6/7 thick, 7/8 thin, 8/9 very thin, 9/10 absent, 10/11-13/14 some muscle. Gizzard globular in viii-x. Esophagous with vertical lamellae xii, xiii. Intestine begins in xv, paired lymph glands on dorsal vessel from xvi. Typhlosole low ridge from xxvii. Intestinal cecum manicate, originating in xxvii, extending anteriorly about to xxiii, each consisting of one large, 5 smaller finger-shaped sacs. Hearts esophageal x-xiii, lateral ix, one side not developed. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi; sacs of x appear to be within 10/11, but mainly pre-septal. Seminal vesicles, two pairs in xi and xii, one pair 1.8 mm round lobes projecting from those of xii. Prostates xviii rather large within xvii-xxi; glandular portions consist of two or three main lobes, ducts short, thick, widening ectally. Genital papillae of xviii with small stalked glands corresponding approximately in number to the externally visible small spots; glands single or lobed, stalks simple or with 2 or more canals, no circular muscle layer.

Ovaries in xiii. Paired spermathecae at vii, viii; each ampulla reniform, pebble textured surface, ducts slightly shorter than ampulla, muscular, widening ectally; diverticula with slender stalk, digitate kinked chamber; overall as long as duct-ampulla axis. Genital marking glands near spermathecal ducts each side in vii, stalks short, otherwise similar to glands of xviii.

Remarks: The species is similar to *A. alveolatus* sp. n. and *A. yongshilensis* sp. n., with respect to genital papillae, but it differs in size and numbers of papillae. Genital papillae are centered between male pores, rather than in paired groups, but genital markings are paired in vii. There was some parasitism, probably gregarine cysts, and many nematodes in the body cavity.

Amynthas eastoni sp. n. Figs 4M-Q

Material: Holotype and 3 paratypes: Korea, Gyungsangnam-do, Hamyang-gun, Mt. Baekun (35° 37'N, 127° 38'E), 400-700 m, litter layers in forest, 07 August 1998, Y. Hong, (KIBIO). Other material: Same data as for holotype, 10 clitellate; Jeollabuk-do, Jangsu-gun, Mt. Jangan, 600-850 m, litter layers, 1 clitellate, 8 aclitellate, 28 July 1998.

Etymology: Named for Mr. Edward G. Easton, who made many good contributions to systematics of earthworms.

Diagnosis: Spermathecal pores in 6/7, 7/8, oval area of different surface texture from 6/7, 7/8 posterior to each pore. Paired genital papillae xviii pre-setal at median edge of raised area, separate from male patches. Genital markings paired in vii, viii, pre-setal, median to spermathecal pores.

Description: Dimensions 78-120 mm by 5.0-5.5 mm at segment x, 5.0-6.6 mm at xxx, 5.2-6.1 mm at clitellum; body cylindrical throughout, segments 70-102. Setae regularly distributed around segmental equators, numbering 52 at vii, 64 at xx; 14-19 between male pores, size distance regular; setal formula AA:AB:YZ:ZZ = 4:2:3:4 at xiii. Female pore single in xiv, 1.0 mm oval shape and 0.5 mm round white pore. Prostomium epilobic, with tongue open. Brownish dorsally and yellowish ventrally, clitellum coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible and dorsal pores sometimes visible externally.

Male pores near lateral margins of ventrum in xviii, within invaginate male patches, sometimes accompanied by 2 or 3 small genital papillae; patches equatorial, 0.8 x 0.5 mm round or quadrilateral, within 2 x 1 mm elevated area. Paired genital papillae xviii pre-setal at median edge of raised area, small, clearly defined with white central pore, separate from male patches; one individual two genital papillae on each side. Spermathecal pores in 6/7, 7/8, oval area of different surface texture from 6/7, 7/8 posterior to each pore. Genital markings paired in vii and viii, pre-setal, median to spermathecal pores, superficial or slightly indented, dark circle with central white pore opening.

Septa 5/6, 6/7 thick, 7/8 thin with some muscle, 8/9, 9/10 absent, 10/11-12/13 thin. Gizzard largely globular in viii-x. Intestine begins xiv, lymph glands from about xxx, very small. Typhlosole small from xxvii. Intestinal cecum manicate, originating in xxvii, and extending anteriorly about to xxiv, each consisting of one large, 5 middle size finger-shaped sacs, the more ventral ones becoming gradually smaller. Esophageal hearts three pairs in xi-xiii, ix lateral, x absent. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles xi, xii. Prostates xviii extending to xvi-xxi; middle and thick ducts, both glandular portions consist of two or three main lobes. Genital papillae of xviii each with one stalked mushroom-shaped gland; stalk apparently composed of several non-muscular canals.

Ovaries in xiii. Paired spermathecae in vii, viii; ampulla large ovate, ducts short thick, diverticula with thin stalk, large sausage-shaped chamber, diverticulum length variable, longer or shorter than ampulla; no nephridia on spermathecal ducts. Genital marking glands in vii and viii, same structure as those of xviii but larger.

Remarks: The species is similar to *Amynthas boletiformis* sp. n., but it is distinguished by the shape of the male pore region and the genital markings. This species also has clear spermathecal patches. Genital papillae gland stalks are also different from those of *A. boletiformis* sp. n.

Amynthas boletiformis sp. n. Figs 5A-E

Material: Holotype and 2 paratypes: Korea, Jeollanam-do, Jangseong-gun, Mt. Baekam, Baekyang-sa (35° 26'N, 126° 53'E), 200-400 m, litter layers in forest, 29 June 1998, Y. Hong, (KIBIO). Other material: Same data as for holotype, 5 clitellate, 2 aclitellate;

Jeollanam-do, Jangseong-gun, Mt. Baekam, Baekyang-sa, 200-400 m, litter layers, 3 clitellate, 8 aclitellate, 17 July 1998.

Etymology: The specific epithet *boletiformis* is Latin for mushroom, which refers to shape of the larger genital marking glands.

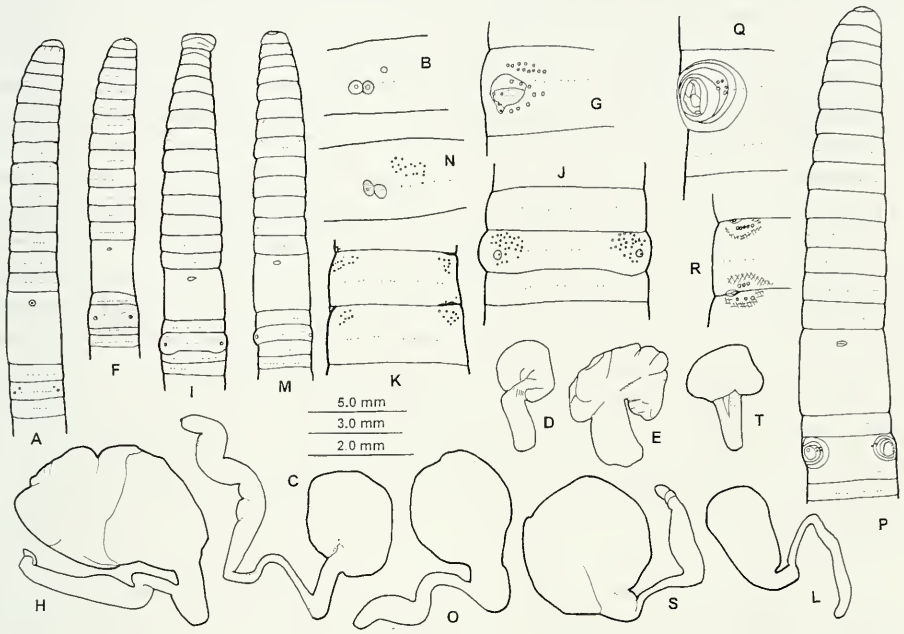

FIG. 5

A-E. *Amynthas boletiformis* sp. n. A: ventral view; B: male pore region in xviii; C: spermathecae; D: genital marking glands in viii; E: genital papillae glands in xviii. F-H. *Amynthas odaesanensis* sp. n. F: ventral view; G: male pore region in xviii; H: spermathecae. I-L. *Amynthas righii* sp. n. I: ventral view; J: male pore region in xviii; K: spermathecal pore region; L: spermathecae. M-O. *Amynthas fasciiformis* sp. n. M: ventral view; N: male pore region in xviii; O: spermathecae. P-T. *Amynthas sanchongensis* sp. n. P: ventral view; Q: male pore region; R: spermathecal pore region; S: spermathecae; T: genital marking glands in viii. Scales bars = 5 mm (A, F, I, J, K, L, M, P), 3 mm (Q, R, S), 2 mm (B, C, D, E, G, H, N, O, T).

Diagnosis: Spermathecal pores in 6/7, 7/8. Male pores lateral margins of xviii; invaginated on round area; paired equatorial papillae adjacent to male pore circle. Paired genital markings around dark spermathecal pore.

Description: Dimensions 61-86 mm by 3.5 mm at segment x, 3.9 mm at xxx, 4.1 mm at clitellum; body cylindrical throughout, segments 68-84. Setae regularly distributed around segmental equators, numbering 45 at vii, 42 at xx; 14-15 between male pores; setal formula AA:AB:YZ:ZZ = 3:2:1.5:3 at xiii. Female pore single in xiv, 0.4 mm round or oval shape and 0.1 mm white pores. Prostomium epilobic, with tongue open. Brownish dorsally and yellowish ventrally, clitellum coffee color,

formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible and dorsal pores visible sometimes externally.

Male pores lateral margins of ventrum in xviii, superficial on segmental equator; slightly invaginated on 0.15 mm diameter round area with pore visible as black dot in small white spot; paired equatorial papillae adjacent to male pore circle; papillae 0.2 mm circles with central pore. Paired genital papillae, pre-setal xviii 0.1 mm round spot with pore. Paired spermathecal pores 6/7, 7/8 near margin ventrally, clear dark color with circumference. Paired genital markings 0.05-0.1 mm area around dark pore; paired in viii (8 individuals), in vii, viii (1 individuals), absent (1 individuals).

Septa 5/6, 6/7 thick, 7/8 slightly muscular, 8/9, 9/10 absent, 10/11-13/14 thin with some muscle. Gizzard globular in viii-x. Intestine begins xv, lymph glands small from xxvii. Typhlosole small from xxvii. Intestinal cecum manicate, originating in xxvii, extending anteriorly about to xxiv, each consisting of 5 finger-shaped lobes, the more ventral ones becoming gradually smaller. Hearts xi-xiii esophageal, ix lateral, x not found. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi; but x mainly within xi. Seminal vesicles, two pairs in xi and xii, less developed. Prostates xviii extending to xviii-xxi; ducts long, muscular, widening ectally, both glandular portions consist of three main lobes, each lobe divided into leaflets. Pre-setal genital papillae of xviii with large stalked mushroom shape glands, muscular stalk, small genital papillae next to male pores with short stalks, little or no glandular development.

Ovaries in xiii. Paired spermathecae in vii, viii; viii little larger than vii; each ampulla a small pouch, ducts thick, diverticula long and slender, much longer than ampulla; no nephridia on spermathecal ducts. Genital markings of vii, viii with single large stalked gland corresponding to each externally visible spot.

Remarks: The present species has two types of genital papillae, pre-setal and adjacent to male pore, with different gland types. This differentiation between genital papillae is unique among Korean *Amynthas*.

Amynthas odaesanensis sp. n. Figs 5F-H

Material: Holotype and 3 paratypes: Korea, Gangwon-do, Pyeongchang-gun, Mt. Odae, Sangwon-sa (37° 46'-47'N, 128° 34'E), 800-1000 m, litter layers in forest, 11 July 1998, Y. Hong, (KIBIO).

Etymology: The species is named after the type locality.

Diagnosis: Spermathecal pores in 6/7, 7/8. Male field xviii composed of paired ovate to circular raised pads, each pad with short rows of 11-15 small genital papillae. Genital markings pre-setal paired sets of 5-8 in segments vii, viii.

Description: Dimensions 73-77 mm by 3.3 mm at segment x, 3.4 mm at xxx, 2.9 mm at clitellum; body cylindrical throughout, segments 81-84. Setae regularly distributed around segmental equators, numbering 60 at vii, 64 at xx; 13-15 between male pores, distance regular; setal formula AA:AB:YZ:ZZ = 2:1:2:3 at xiii. Female pore single in xiv, 0.4 mm oval shape. Prostomium epilobic, with tongue open.

Brownish dorsally and yellowish ventrally, clitellum with coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible and dorsal pores visible, externally.

Male field xviii composed of paired ovate to circular raised pads, placed sublaterally; male pores within indentations of lateral halves of pads; each pad with short rows of 11-15 small genital papillae placed pre-setally, lateral ends of rows medial to male pores; V-shaped groups of small genital papillae surround medial anterior, posterior faces of male pore indentations, the apices medial; sometimes one or two genital papillae lateral to male pore indentations. Spermathecal pores 6/7, 7/8 ventrally, conspicuous. Genital markings pre-setal paired sets of 5-8 in segments vii, viii; placed medial-ventrally to spermathecal pores; genital markings regularly spaced in short lines within each set.

Septa 5/6, 6/7 thick, 7/8 thin, 8/9, 9/10 absent, 10/11, 11/12 thin, 12/13, 13/14 thin with some muscle. Gizzard small globular in ix-x. Intestine begins in xv, lymph glands very small from xxvii. Typhlosole very small from xxvii. Intestinal cecum manicate, originating in xxvii, extending anteriorly about to xxiv, each consisting of 5 finger-shaped sacs, more ventral ones becoming gradually smaller. Esophageal hearts three pairs in xi-xiii, ix lateral. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles, two pairs xi, xii. Prostates xviii large within xvii-xx; ducts short, thick, both glandular portions consist of three main lobes, each lobe divided into leaflets; one specimen had gland right side xvii-xxiii. Genital papillae of xviii with small stalked glands corresponding approximately in number to the externally visible markings, stalks very short giving appearance of single acinous mass surrounding prostatic duct.

Ovaries in xiii. Paired spermathecae in vii, viii; viii larger than vii, mitten shape ampulla half covered with pleats, ducts thick, short; diverticula with slender stalk, chamber with wide base tapering down towards end, as long as ampulla; no nephridia on spermathecal ducts. Genital marking glands vii, viii with longer stalks, otherwise like glands of xviii; corresponding in number to external markings.

Remarks: The species is similar to *Amynthas righii* sp. n., but it differs in genital papillae group shape, having the papillae in 2-3 irregular rows. Aclitellate specimens have the same size male pores, genital markings, and genital papillae as clitellate specimens. The only difference is the lack of a clitellum.

Amynthas righii sp. n. Figs 5I-L

Material: Holotype and 3 paratypes: Korea, Jeollabuk-do, Jangsu-gun, Mt. Jangan (35° 37'N, 127° 36'E), 600-850 m, litter layers in forest, 28 July 1998, Y. Hong, (KIBIO). Other material: Same data as for holotype, 15 clitellate, 2 aclitellate; Gyungsangnam-do, Hamyang-gun, Mt. Baekun, 400-700 m, litter layers, 44 clitellate, 07 August 1998.

Etymology: Named for the late Dr. Gilberto Righi, Brazilian Oligochaetologist who died in 1999.

Diagnosis: Spermathecal pores in 6/7, 7/8; with cross-hatched oval zones surrounding pores. Male pores on oval pads, pads extend to 17/18, 18/19; genital papillae

within pads small, numerous 20-33 right, 18-33 left. Genital markings in vii, viii pre-setal, median to spermathecal pores.

Description: Dimensions 49-95 mm by 4.5 mm at segment x, 4.5 mm at xxx, 4.7 mm at clitellum; body cylindrical throughout, segments 57-96. Setae regularly distributed around segmental equators, numbering 49 at vii, 48 at xx; 16 between male pores, some regular distance; setal formula AA:AB:YZ:ZZ = 3:2:3:4 at xiii. Female pore single in xiv, 0.7 mm oval surround, 0.4 mm white pore. Prostomium epilobic, with tongue open. Light brownish dorsally and yellowish ventrally, clitellum coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae and dorsal pores invisible, externally.

Male pores on oval pads, pads extend to 17/18, 18/19; male pores on indented 0.3 mm round spots close to lateral edges of pads. Genital papillae within pads small, numerous 20-33 right, 18-33 left (two individuals had only 1-3 genital papillae with in each pad). Spermathecal pores in 6/7 and 7/8 near margin, minute, superficial but conspicuous with cross-hatched oval zones surrounding pores. Genital markings in vii, viii pre-setal, median to spermathecal pores; variable in numbers among individuals, sites; in wedge shaped or rhomboidal groups of 9-13 at vii; 9-15 at viii, rarely 1-3 in vi.

Septa 5/6 and 6/7 thick, 7/8 thin and some muscle, 8/9, 9/10 absent, 10/11-12/13 thin, 13/14 with some muscle. Gizzard small globular in viii-ix. Intestine begins xv, lymph glands very small from xxii. Typhlosole from xxxv. Intestinal cecum manicate, originating in xxvii, and extending anteriorly about to xxv, each consisting of 5-6 finger-shaped small lobes, becoming gradually smaller ventrally. Hearts xi-xiii esophageal, ix lateral, x not found. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi; sacs joined ventrally; x may be mainly in xi, hard to follow extremely thin septum 10/11. Seminal vesicles two pairs in xi, xii, well developed, with smooth-surfaced dorsal lobe. Prostates xviii within xvii-xx; short thick ducts, both glandular portions consist of two or three main lobes, each lobe divided into leaflets. Genital papillae of xviii with small stalked glands corresponding approximately in number to externally visible small spots.

Ovaries in xiii. Paired spermathecae in vii and viii; each ampulla a large berry-shaped pouch, thick short ducts drastically narrowed at body wall, ampulla flattened in viii by gizzard; conspicuous blood vessel and blood color on ampulla surface; diverticula longer than ampulla; slender stalk, larger tapered sausage shape chamber; no nephridia on spermathecal ducts. Genital marking glands paired groups in vii, viii, corresponding to external genital marking. All stalked glands of similar form; simple stalk without circular muscle, blocky to cordate glandular portion.

Remarks: The species is similar to *A. odaesanensis* sp. n., but it differs from it in the shape of the male pore region, the genital markings, the location of genital papillae within the male patches. The number of genital markings is greater than in *A. odaesanensis* sp. n., and they are more irregular in arrangement. A large leaf fragment was in the intestine, as were several nematodes. Gregarine cysts were found in some individuals.

Amynthas fasciiformis sp. n. Figs 5M-O

Material: Holotype and 3 paratypes: Korea, Jeollabuk-do, Gochang-gun, Mt. Sonun (35° 31'-32'N, 126° 34'E), 50-300 m, soil and litter layers in forest, 02 July 1998, Y. Hong, (KIBIO). Other material: Same data as for holotype, 9 clitellate; Jeollanam-do, Jangseong-gun, Mt. Baekam, Baekyang-sa, 200-400 m, litter layers, 8 clitellate, 4 aclitellate, 17 July 1998.

Etymology: This species is named for the bundles (Latin *fasciiformis*) of genital papillae glands.

Diagnosis: Spermathecal pores in 6/7, 7/8 at leading edges of vii and viii. Male pores near lateral margins of xviii; on superficial low porophore 0.3 mm diameter adjacent to small dark genital papillae. Genital markings paired groups of small spots vii, viii, median to spermathecal pores.

Description: Dimensions 62-87 mm by 4.4 mm at segment x, 4.3 mm at xxx, 4.5 mm at clitellum; body cylindrical throughout, segments 68-92. Setae regularly distributed around segmental equators, numbering 47 at vii, 48 at xx; 16-17 between male pores, size and distance regular; setal formula AA:AB:YZ:ZZ = 3:2:3:4 at xiii. Female pore single in xiv, 1.0 mm oval surround and 0.4 mm white pore. Prostomium epilobic, with tongue open. Light brownish dorsally and yellowish ventrally, clitellum with coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible and dorsal pores visible, externally.

Male pores near lateral margins of ventrum in xviii; on superficial low porophore 0.3 mm diameter adjacent to small dark genital papillae 0.2 mm diameter. Male pore areas within elevated pad on which is one pre-setal pair of oval groups of very small densely placed genital papillae, 18-21 left, 16-25 right. Spermathecal pores small white spots within lenticular area 6/7, 7/8 at leading edges of vii, viii; near mid-lateral level. Genital markings paired groups of very small spots vii, viii; median to spermathecal pores, groups oval 0.4 mm, 9-13 markings per group vii, 10-13 viii.

Septa 5/6 and 6/7 thick, 7/8 thin, 8/9, 9/10 absent, 10/11 thin, 11/12- 12/13 thin with some muscle. Gizzard globular in viii-ix. Intestine begins in xv, lymph glands small from about xx. Esophagous with vertical lamellae xii, xiii. Typhlosole small from xxvii. Intestinal cecum manicate, originating in xxvii, and extending anteriorly about to xxiii, each consisting of 5 finger-shaped lobes, becoming gradually smaller ventrally. Esophageal hearts in x-xiii, ix lateral. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi; sacs of x about half with in level of xi. Seminal vesicles small, two pairs in xi, xii. Prostates xviii large within xvi-xx; medium length thick ducts, both glandular portions consist of three main lobes, with scattered dark pigmentation small clustered. Genital papillae of xviii with stalked glands corresponding approximately in number to the externally visible small spots; glands with circular muscle in stalks, glandular parts simple; genital papillae adjacent to male pores with sessile glands medial to prostate ducts.

Ovaries in xiii. Paired spermathecae in vii, viii, viii flattened; each ampulla a large pouch, ducts thick, short, with very narrow ectal end at right angle to main duct axis; diverticula with long cayenne pepper shape chamber, slender muscular stalk, together as long as ampulla; no nephridia on spermathecal ducts. Genital marking glands corresponding in number to the external markings in paired bundles vii, viii;

each gland with long stalks containing circular muscle, glandular parts white, ovate, smooth surface.

Remarks: This species is similar to *A. righii* sp. n., but easily distinguished by the pre-setal location of the genital papillae, the shape of male pore region and the location of genital markings; in *A. righii* sp. n. genital papillae and male patches are on the same site, as are spermathecal pores and genital markings. The papillae and markings are tightly clustered in *Amynthas fasciiformis* sp. n.

Amynthas sanchongensis sp. n. Figs 5P-T

Material: Holotype and 3 paratypes: Korea, Gyungsangnam-do, Sanchong-gun, Mt. Jiri (35° 22'-25'N, 127° 48'-49'E), 600-1200 m, litter layers in forest, 30 August 1997, Y. Hong, (KIBIO). Other material: Same data as for holotype, 12 clitellate; Jeollabuk-do, Namwon-gun, Mt. Jiri, Manbokdae, 1100-1400 m, litter layers, 16 clitellate, 31 August 1997.

Etymology: The species is named after the type locality.

Diagnosis: Spermathecal pores in 6/7, 7/8 deep in furrows flanked anteriorly, posteriorly by tumid lips. Male pores on large conical porophores markedly protuberant at lateral margins of xviii; apex of porophores with lateral crescentic groove. Genital markings near 6/7, 7/8.

Description: Dimensions 88-121 mm by 5.2-6.5 mm at segment x, 6.0-7.1 mm at xxx, 5.8-6.8 mm at clitellum; body cylindrical throughout, segments 78-95. Setae regularly distributed around segmental equators, numbering 53 at vii, 48 at xx; 14-18 between male pores; setal formula AA:AB:YZ:ZZ = 2:2:3:5 at xiii. Female pore single in xiv, 0.8 mm oval surround and 0.1 mm pore. Prostomium epilobic, with tongue open. Brownish dorsally and yellowish ventrally, clitellum dark coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male pores on large conical porophores markedly protuberant at lateral margins of ventrum in xviii; apex of porophores with lateral crescentic groove; male pore at center of arc medial to groove. Upper medial faces of porophores with 4-5 small pre-setal genital papillae; which number 5 right side, 4 left side, or lacking in eight of sixteen individuals. Spermathecal pores 6/7, 7/8 deep in furrows flanked anteriorly, posteriorly by tumid lips; each lip bearing 1-3 small genital markings, or lacking in 8 of 16. Genital markings also near 6/7, 7/8; 3-6 at 6/7 and 4-5 at 7/8 right side; 3-5 at 6/7 and 4-5 at 7/8 left side, lacking in eight of sixteen individuals.

Septa 5/6, 6/7 thick, 7/8 slightly muscular, 8/9, 9/10 absent, 10/11-12/13 slightly muscular. Gizzard moderate size in viii-x. Intestine begins xv, lymph glands small from about xxvii. Esophagous with vertical lamellae xi-xiii. Typhlosole very small from xxvii. Intestinal cecum manicate, originating in xxvii, and extending anteriorly about to xxiii, each consisting of 5-6 finger-shaped lobes. Esophageal hearts x-xiii, ix lateral. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles middle size two pairs xi, xii, well developed. Prostates xviii large within xvi-xxi; duct, long, looped; ectal portion thick; both glandular portions consist of four main lobes, each lobe divided into leaflets. Genital

papillae of xviii with small stalked glands corresponding approximately in number to externally visible small spots; glandular part simple or lobed, stalks without circular muscle.

Ovaries in xiii. Paired spermathecae vii, viii; viii larger than vii; each ampulla a large lenticular pouch, may be flattened by gizzard, short thick ducts with right angle bend to very narrow ectal portion, diverticula slender cayenne pepper shape covered with small pigment spots; stalk slender, diverticula shorter than ampulla; no nephridia on spermathecal ducts. Genital marking glands of vii, viii same numbers as genital markings, glands white simple stalks, not muscular.

Remarks: The present species appears to be related to *Amynthas jiriensis* (Song & Paik, 1971), but it differs in the shape of male pore region and the genital markings. The specimens are smaller than *A. jiriensis*, and have less well-defined spermathecal patches. The species was collected from two sites in Mt. Jiri. Manbokdae specimens are smaller than Sanchong specimens, and the former are from higher altitude.

DISCUSSION

Spermathecal patches may be clearly defind as in *A. jiriensis*, otherwise there can be furrowed areas which might be spermathecal patches, but there is no distinct difference between these and moderately furrowed epidermis. Therefore, accurate diagnosis is difficult. Spermathecal or genital patches are distinctive regions around spermathecal pores. These are found in *A. vicinus* sp. n., *A. oviformis* sp. n., *A. deogyusanensis* sp. n., *A. cuneatus* sp. n., *A. seungpanensis*, and *A. plantus*. In these species there are no genital markings in the spermathecal segments. In *A. vicinus* sp. n. and *A. seungpanensis* the patches are connected, but in *A. oviformis* sp. n., *A. deogyusanensis* sp. n., *A. cuneatus* sp. n., and *A. plantus* the patches are separated by setae. There may be developmental stage differences in the extent of patches, or these differences may be characteristic of the species.

Locations, shapes, and numbers of genital markings are variable, and are important characters for species recognition. All are located on the ventral side, but they may be paired either singly or in groups, or centered on the mid-ventral line. Recall that according to the conventions adopted in this study that genital markings are those located in the segments including and anterior to the clitellum. Four species found in Korea with genital markings have them centered: *A. geomunensis* sp. n., *Amynthas hilgendorfi* (Michaelsen, 1892), *Amynthas carnosus* (Goto & Hatai, 1899), *Amynthas heteropodas* (Goto & Hatai, 1898).

Genital markings are usually round, much like the genital papillae of the male pore region. In *A. geomunensis* sp. n., the genital markings are protuberant but genital papillae are invaginate. Sizes of markings range from very small in *A. odaesanensis* sp. n. to much larger in *A. geomunensis* sp. n. Genital marking glands correspond approximately in number to the external visible markings, and they are of two types, stalked with obvious external pore, and sessile without obvious pore on the external surface of the earthworm. Although location, shape and numbers of genital marking are often variable within species, there are consistent differences between species,

making them very useful external characters for classification in *Amynthas* group. However, the function and development of genital markings need more study.

The characteristics of the male pore area are very useful for classification of *Amynthas* and have been used throughout the history of the genus. Male pores of most Korean *Amynthas* are on xviii, but *Amynthas megascolidioides* (Goto & Hatai, 1899) has them on xix, with one pair of genital papillae at xviii. Male pores are lacking in three species: *Amynthas irregularis* (Goto & Hatai, 1899), *Amynthas levis* (Goto & Hatai, 1899), *Amynthas shinkeiensis* (Kobayashi, 1938) and irregularly present or absent in four species: *Amynthas koreanus* (Kobayashi, 1938), *Amynthas vittatus* (Goto & Hatai, 1898), *A. hilgendorfi*, and *A. agrestis*. There are both male-sterile and hermaphroditic morphs of *Amynthas diffringens* (Baird, 1869). The variability can be severe, extending to the spermathecal pores in *A. koreanus*. Individuals with no male pores also lack prostate glands.

Most Korean *Amynthas* have superficial male pores. There are some with slightly invaginated male pores, but none is invaginated to the extent of forming copulatory pouches as in *Pheretima* and *Metaphire*. The invagination is more a depression or sunken zone with male pores still visible externally, and therefore the male pores are still superficial. The superficial male pores can be on a simple porophore, or as in those species with male discs, the pore is associated with large, hardened swellings that may enlarge the ventral area of xviii. These discs often have additional thickened areas around their circumference. The male disc species do not have genital papillae glands, and some disc bearing species have seminal grooves within the disc. Species with this condition are: *A. piagolensis* sp. n., *A. eastoni* sp. n., *A. boletiformis* sp. n., *A. koreanus*, *A. kobayashii*, and *A. sopaikensis,* (Song & Paik, 1973). In *Metaphire* there are developmental stages of the male pore invagination (Easton, 1979), so this possibility needs to be studied in the Korean *Amynthas*.

Most species have setae between male pores but *A. vicinus* sp. n., *A. jindoensis* sp. n., *A. seungpanensis*, and *A. plantus* do not. More material should be examined to see if this difference is consistent within species, and if it is phylogenetically informative. These four species have male field structures similar to the discs of some other Korean *Amynthas*, but here they are accompanied by distinct bands anterior and posterior to the male pads.

When the male pores are present, the genital papillae are always found. The papillae are similar to the genital markings near spermathecal pores, but are not always of the same form as genital markings. In most species, the genital papillae and genital patches have the same appearance. Numbers, size, shape, and locations are variable, and these papillae are useful characters for recognizing species.

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Cave-dwelling pseudoscorpions (Arachnida, Pseudoscorpiones) from Brazil

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Cave-dwelling pseudoscorpions (Arachnida, Pseudoscorpiones) from Brazil. - Pseudoscorpions collected in about 100 caves have been studied and 25 species of seven families identified. Two new genera - *Spelaeobochica* (Bochicidae) (type species *allodentatus* sp. n.) and *Spelaeochernes* (Chernetidae) (type species *dentatus* sp. n., with 7 other new species) - are described, together with 10 additional new species in the genera *Pseudochthonius* (Chthoniidae), *Ideoroncus* (Ideoroncidae), *Progarypus* (Olpiidae), *Cheiridium* (Cheiridiidae) and *Zaona* (Chernetidae: previously known from its type species from Florida only). *Geogarypus itapemirinensis* Feio is redescribed and transferred to the genus *Cheiridium*.

Key-words: cave fauna - taxonomy - pseudoscorpions - Brazil - new taxa.

INTRODUCTION

Knowledge of Neotropical pseudoscorpions in general, and of the cave-dwelling species in particular, is fragmentary and we do not have well founded estimates of the diversity of the pseudoscorpion fauna of any South American region, apart from perhaps the Amazon region (Adis & Harvey, 2000) and Chile (Beier, 1964). Data on cave-inhabiting pseudoscorpions from continental South America are even rarer, since only 17 species of five families have been recorded from caves in Brazil, Peru, Uruguay and Venezuela (Beier, 1959, 1969, 1970; Mahnert, 1985, 1994; Mahnert & Andrade, 1998), unidentified species in the genera *Bochica* (Bochicidae), *Lustrochernes*, *Parachernes*, *Tejachernes* (Chernetidae), and *Parawithius* (Withiidae) have been mentioned by Heurtault (1994) from caves of Venezuela and Peru. Of all these species, only two of the family Chthoniidae (*Tyrannochthonius ribeirai* Mahnert from Peru and *Pseudochthonius strinatii* Beier from Brazil) might be considered as troglobionts. The remaining species belong to various genera of the families Lechytiidae, Chthoniidae, Olpiidae, Withiidae and Chernetidae and may be considered as troglophiles.

Twelve invertebrate and one vertebrate species had been recorded from Brazilian caves during the first half of the 20th century (Trajano, 1993; Trajano & Sanchez, 1994; Pinto-da-Rocha, 1995), but a systematic biospeological survey only started in the decade of 70 following the collecting visit to caves in Sao Paulo State by Pierre

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Strinati (Geneva) (Strinati, 1971, 1975) and the discovery of 10 new invertebrate species, including the first pseudoscorpion, *Pseudochthonius strinatii*, described by Beier (1969).

It was therefore with great interest that I accepted, from 1989 onwards, a large and ever increasing collection of pseudoscorpions from Brazilian caves for study, collected by Dra Eleonora Trajano, Dr Pedro Gnaspini (Depto. de Zoologia IBUSP), Dr Ricardo Pinto-da-Rocha (Museu de Zoologia USP) and collaborating speleologists.

The holotypes and paratypes of the new species are deposited in the collection of the Museo de Zoologia of the University of Sao Paulo; some paratypes are also deposited at the Museum of Natural History of Geneva.

DESCRIPTIONS

Tridenchthoniidae

Cryptoditha cf. ***elegans*** (Beier, 1931) Figs 1-4

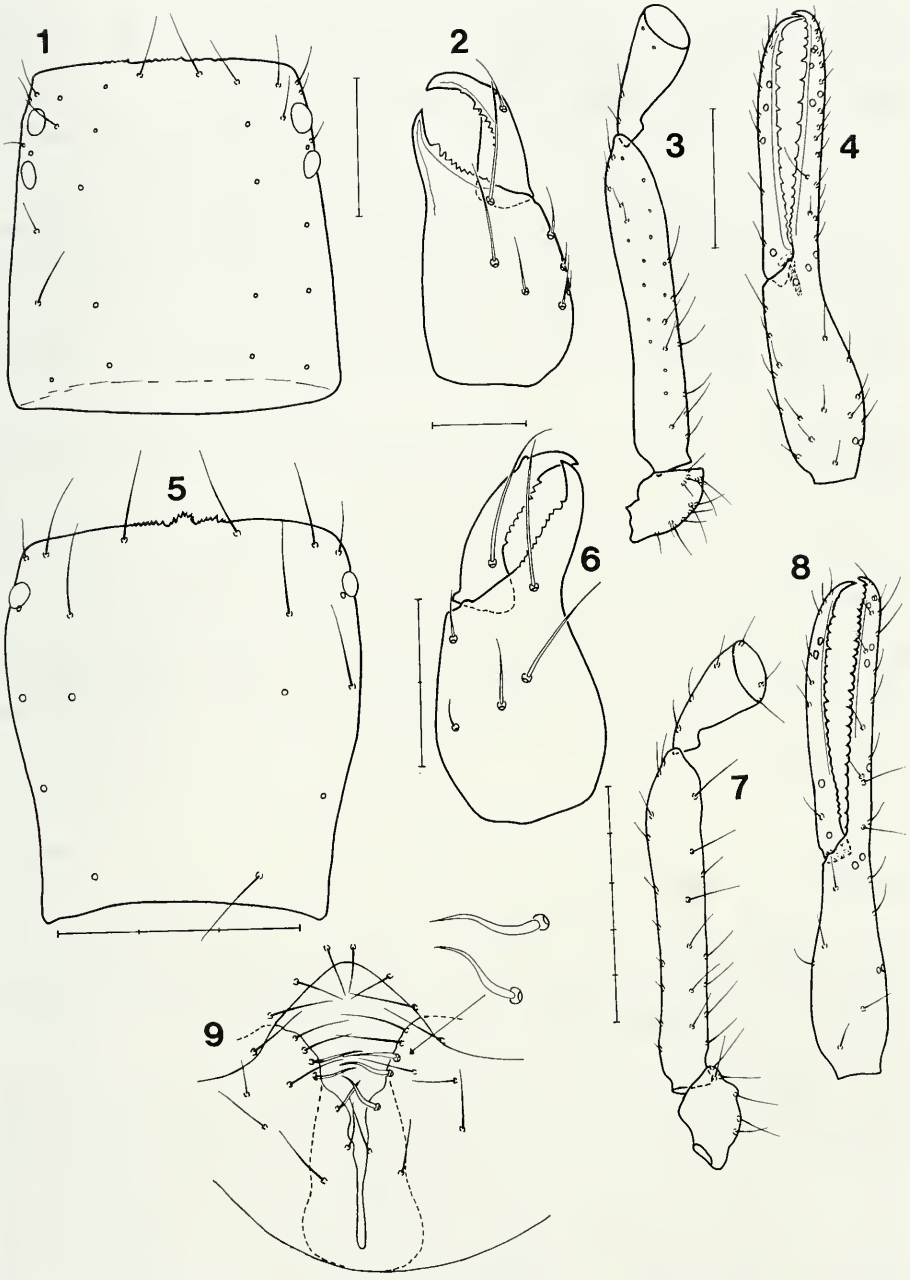
Material: Minas Gerais, Gruta de Malmeiro, Matozinhos, lg. Lilia Senna Horta, 15.X.1995: 1♀.

Description: Carapace (fig. 1) with 28 macrosetae; 4 eyes; tergites I-V 6 setae, VI 7, VII-IX 8, X 6, XI 6 (2 tactile setae); coxae I with 5, II with 3 coxal spines, intercoxal tubercle absent; Chelicera (fig. 2): 5 large and 2 accessory setae on palm, movable finger with 8 acute teeth and one small, isolated, subapical tooth; spinneret absent, flagellum 9 dentate setae. Pedipalps (figs 3-4): femur 6.2 times longer than broad, patella 2.4 times, hand 2.4 times longer than deep, chela 5.5 times, finger 1.3 times longer than hand; fixed finger with 18 mostly acute and distinctly spaced teeth, movable finger with 14 acute, basally decreasing teeth, a long sclerotized internal apodeme present at base of movable finger. Leg IV: femur+patella 3.2 times, tibia 4.7 times, basitarsus 3.5 times, telotarsus 11.4 times longer than deep, both tarsi with a long tactile seta each.

Measurements (in mm): Palps: femur 0.73/0.12, patella 0.29/0.12, hand 0.45/0.18, finger length 0.57, chela length 1.02. Leg IV: femur+patella 0.57/0.18, tibia 0.39/0.08, basitarsus 0.22/0.06, telotarsus 0.41/0.04.

Cryptoditha elegans was described from Passa Quatro (Minas Gerais) and subsequently recorded by Beier (1974) from Santa Catarina. The specimen studied here differs from the description of the type by the more slender pedipalps, lower tooth counts and larger size. Specimens identified as this species from Santa Catarina (Beier 1974), Sao Paulo and Paraguay (unpublished) are specifically distinct from the specimens from Matozinhos (e.g. they do not present a sclerotized internal apodeme at the base of the movable finger). A number of undescribed species of this genus exist in museum collections and the state of this character is unknown in *elegans*, the type specimens of which are apparently lost. Specimens are needed from the type locality of *elegans* to clarify the identity of this and the other species occurring in the area.

A tritonymph belonging to this genus, from the Gruta do Moquem (Iporanga, SP; lg. E. Trajano & P. Gnaspini, 30.VIII.1992; MZUSP 13835), cannot be identified at present.



FIGS 1-4; *Cryptoditha* cf. *elegans* (Beier) ♀; 1: carapace; 2: chelicera; 3-4: pedipalp; scale unit 0.1mm.
FIGS 5-9; *Pseudochthonius gracilimanus* sp. n. ♂; 5: carapace; 6: chelicera; 7-8: pedipalp; 9: genital opening; scale unit 0.1mm.

Lechytiidae

Lechytia chthoniiformis (Balzan, 1887)

Lechytia sp. (111); Pinto-da-Rocha, 1995: 84 (MS-15).

Material: Mato Grosso do Sul, Gruta do Curé, Bonito, lg. E. Trajano & P. Gnaspini, 17.X.1990: 1 ♀.

Tergites I-IX 6 setae (II, IX exceptionally 5), X 4, XI 6 (2 sublateral tactile setae); apical manducatory seta bifid. Pedipalps: femur 3.7 times longer than broad, patella 1.8 times, hand of chela 1.6 times longer than deep, chela 3.6 times, finger 1.3 times longer than hand; fixed finger with 4 small cuspid teeth, 6 low and large and 15 rudimentary teeth; movable finger with 3 anterior cuspid and about 17 rudimentary teeth. Leg IV: femur+patella 1.9 times, tibia 3.6 times, basitarsus 2.4 times, telotarsus 8.8 times longer than deep.

Measurements (in mm): Palps: femur 0.32/0.09, patella 0.18/0.10, hand 0.21/0.13, finger length 0.27, chela length 0.46. Leg IV: femur+patella 0.34/0.17, tibia 0.23/0.06, basitarsus 0.13/0.05, telotarsus 0.22/0.03.

The present specimen conforms to the description of Brazilian specimens of this species given by Aguiar & Bührnheim (1992) and is identical in all respects with specimens from various localities in Paraguay (males also present bifurcate setae flanking the genital opening). It belongs to the first group defined by Muchmore (1975), called the *arborea*-group by Judson (1992) and Muchmore (2000), having the apical manducatory seta bifid and tergite XI with 6 setae (2 tactile). The hypertrophied glandular pits of the telotarsi, recorded by Judson (1992) for *Lechytia natalensis* (Tullgren) and by Muchmore (2000) for *L. sakaganii* Morikawa, are also present in this species.

Chthoniidae

Pseudochthonius gracilimanus sp. n. Figs 5-9

Pseudochthonius sp. (113); Pinto-da-Rocha, 1995: 84 (BA-69, BA-72).

Material: Bahía, Gruta Azul, Iraquara, lg. E. Trajano & P. Gnaspini, 31.VIII.1991: 1♂ (holotype) 1♀ (paratype) (MZUSP 13778); Gruta do Impossivel, Palmeiras, lg. L. Senna Horta, 18.II.1996: 1♂ 2♀ (paratypes); Lapa II, Santa Rita cave system, Iraquara, lg. E. Trajano & P. Gnaspini, 21.VII.1991 (MZUSP 13782): 1D (non-type).

Description: Yellowish-brown; carapace reticulate, 1.1-1.2 times as long as broad, 2 small eyes present, anterior margin medially dentate, with a prominent dentate epistome, 18 strong setae (6/4/4/2/2); tergites III-V with round medial spot, I-V 4 setae, VI-IX 6, X 4 XI 6 (2 submedial tactile setae); apical lobe of palps 2 setae, palpal coxa 3 (1 discal seta), coxa I 5+ 2-5 dentate coxal spines, II 4-5+3-5 dentate coxal spines, III 7-8, IV 8, intercoxal tubercle absent; anterior genital operculum 7-8 setae, genital opening of male with 6 marginal (3 basal ones curved, see fig. 9) and 2 discal setae on each side; sternite III 8-10(13)+3 suprastigmal setae, IV 9-10+3-4 suprastigmal setae, V-VIII 6-8 (lateral setae shortened), IX 6, X 5 (2 tactile setae), XI 0; anal cone 0/2 setae. Chelicera (fig. 6): palm with 5 setae, fixed finger with 8-11

acute teeth (distal one slightly isolated), movable finger with 10-12 teeth, spinneret tooth-like (smaller in male), serrula exterior 16 blades, flagellum 9(?) setae (first only shortly dentate). Palps (figs 7-8): femur 6.4-6.5 times as long as broad, 1.45-1.59 times longer than carapace and 2.76-2.91 times longer than patella, chaetotaxy: 4-5/6/2/8; patella 2.0-2.2 times, hand 2.9-3.1 times as long as deep, chela 6.7-7.40 times, finger 1.24-1.39 times longer than hand. Fixed finger with 1 distal lateral tooth, 23-26 pointed, heterodont teeth and 2 flattened rounded teeth, movable finger with distally 2-3 rounded teeth, 13 acute, heterodont teeth and 10-14 rounded teeth; trichobothria: *ist* halfway between *esb* and *est*, one sensillum distal to *sb*. Leg I (male): femur 6.0 times as long as deep and 1.89 (1.77 in female) longer than patella, which is 4.1 times, tibia 6.0 times, tarsus 11.0 times as long as deep; leg IV: femur+patella 2.6-3.0 times, tibia 4.6-4.7 times, basitarsus 3.7-3.9 times (TS of tactile seta=0.33-0.36), telotarsus 11.6-11.7 times as long as deep, TS 0.10.

Measurements (in mm): Carapace 0.47-0.51/0.45-0.47; palps: femur 0.72-0.78/0.11-0.12, patella 0.25-0.27/0.12-0.13, hand 0.43-0.48/0.14-0.16, finger length 0.59-0.64, chelal length 1.02-1.10; leg I: femur 0.39-0.40/0.07, patella 0.21-0.22/0.05, tibia 0.24/0.04, basitarsus 0.24/0.04, telotarsus 0.38-0.39/0.03; leg IV: femur+patella 0.60-0.64/0.21-0.23, tibia 0.39/0.08, basitarsus 0.22-0.23/0.06, telotarsus 0.43/0.04.

The affinities of the new species are uncertain within the South American group of species characterized by the distal position of trichobothrium *ist* (halfway between *esb* and *est*) (*pulchellus* Ell., *sinuoni* Balzan, *homodentatus* Chamb., *heterodentatus* Hoff and *insularis* Chamb.). It is characterized by the straight and spaced dentition of the movable chelal finger and its palpal dimensions.

Pseudochthonius strinatii Beier, 1969 Fig. 10

Chthoniidae (110); Pinto-da-Rocha, 1995: 84 (SP-21, SP-41).
Pseudochthonius strinatii (112); Pinto-da-Rocha, 1995: 84 (SP-18).
Pseudochthonius sp. (113); Pinto-da.-Rocha, 1995: 84 (SP-02).
Pseudochthonius sp. (114); Pinto-da-Rocha, 1995: 84 (SP-21).

Material: São Paulo, Caverna Areias de Cima, Iporanga, lg. E. Trajano & P. Gnaspini, 23.III.1986 (MZUSP 13819): 1♂; Jacupiranga region, Caverna Tapagem, Eldorado, lg. E. Trajano & P. Gnaspini, 18.XI.1991(MZUSP 13823): 1♂; Caverna Morro Preto, Iporanga, lg. E. Trajano, I/II.1985 (MZUSP 10295): 1♀; same cave, in guano of frugivorous bats, lg. P. Gnaspini Netto, 31.VIII.1986 (MZUSP 10296): 1♂; Minas Gerais, Buraco (=Lapa?) do Medo, Sete Lagoas, lg. L. Senna Horta, 30.IV.1995: 1♀ 1T; Lapa Vermelha I, Pedro Leopoldo, in guano, lg. L. Senna Horta, 28.X.1995: 1T; Lapa Vermelha, Pedro Leopoldo, lg. F. Chaimowicz, without date: 1♀; Paraná, Gruta do Rocha, Adrianópolis, lg. R. Pinto da Rocha & N. Moracchioli, 10.III.1991: 1T.

Two tritonymphs from "Caverna Santana, Iporanga, SP, lg. E. Trajano, 12.VII.1985 (MZUSP 10293)" probably also belong to this species.

Description: Carapace 1.0-1.2 times as long as broad, in some specimens indistinct eye-spots (e.g. ♂ from Areais de Cima) or eyes (Caverna Morro Preto) are visible; pedipalpal femur 5.3-6.1 (♂)/5.8-6.8 (♀) times as long as broad and 2.51-2.63 (♂) (♀: 2.31-2.52) times longer than patella and 1.3 times longer than carapace; patella 2.0-2.2 (♀ 2.2-2.5) times, hand 2.1-2.3 times as long as deep, chela 6.4-7.0 times; fixed finger 2.0-2.3 times longer than hand; both fingers with 33-43 acute,

spaced teeth, those of fixed finger arranged in two slightly offset rows (like teeth of a saw), simulating heterodonty mainly in the distal half of finger. Leg I: femur 5.5-5.9 times as long as deep and 1.73-1.88 times longer than patella, which is 3.8-4.4 times as long as deep, tibia 4.8-5.6 times, tarsus 9.5-10.7 times as long as deep; leg IV: femur+patella 2.7-3.3 times, tibia 4.8-5.0 times, basitarsus 3.4 times, a longer seta near basal third, telotarsus 9.9-11.4 times as long as deep, a longer seta at its base.

Measurements (in mm) (♀ in parentheses): Carapace 0.42-0.46/0.40-0.42 (0.48-0.54/0.45-0.47); pedipalps: femur 0.57-0.66/0.11 (0.70-0.73/0.10-0.12), patella 0.22-0.25/0.11-0.12 (0.29-0.31/0.12-0.14), hand 0.25-0.31/0.12-0.14 (0.33-0.35/0.15-0.16), finger length 0.57-0.64 (0.69-0.70), chela length 0.82-0.93 (1.02-1.06); leg I (1♂, 3♀): femur 0.34/0.06 (0.38-0.39/0.07), patella 0.18/0.05 (0.21-0.22/0.05-0.06), tibia 0.19/0.04 (0.22-0.23/0.04-0.05), tarsus 0.33/0.03 (0.37-0.39/0.04); leg IV (1♂, 2♀): femur+patella 0.49/0.17 (0.56/0.17-0.21), tibia 0.32/0.07 (0.37/0.07-0.08), basitarsus 0.17/0.05 (0.20-0.21/0.06), telotarsus 0.34/0.03 (0.38-0.41/0.04).

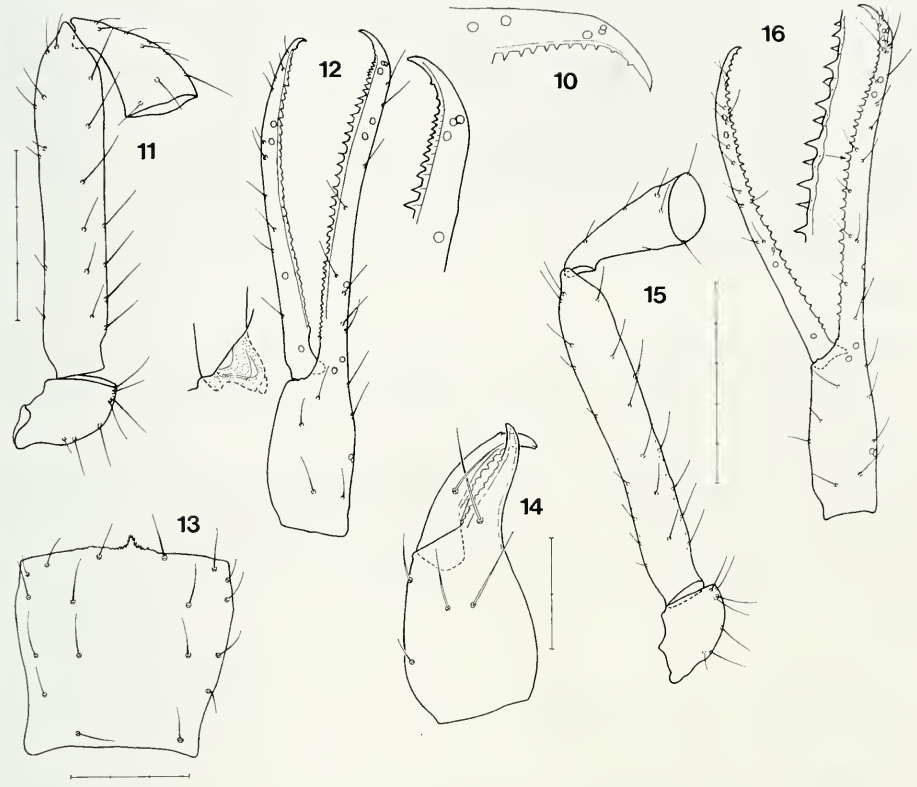
This species was described from the female holotype, collected from the "Grutas das Areias, Sao Paulo" (=Caverna Areias de Cima, Iporanga?). It is well characterized by its size, morphometrical characters of pedipalps, absence or strong reduction of eyes (see Beier, 1969) and its chelal dentition.

Pseudochthonius ricardoi sp. n. Figs 11-12

Pseudochthonius sp. (113); Pinto-da-Rocha, 1995: 84 (SP-25; MG-396).

Material: São Paulo, Caverna Água Suja, Iporanga, Vale do Betari, lg. E. Trajano & P. Gnaspini, 20.IV.1991(MZUSP 13817): 1♀ (holotype); Minas Gerais, Gruta Tamboril, Unía, lg. Gregeo, 22.V.1989 (MZUSP 13802): 1T (non-type).

Description: Yellowish-brown: carapace nearly as long as long as broad, 2 indistinct eye-spots present, anterior margin medially dentate, with a prominent dentate epistome, 16 strong setae (4/4/4/2/2) and a preocular microseta present on each side; tergites II-V with round medial spot, I-V 4 setae, VI-IX 6, X 4 XI 6 (2 submedial tactile setae); apical lobe of palps 2 setae, palpal coxa 3 (1 discal seta), coxa I 5+ 4 dentate coxal spines, II 5+5 dentate coxal spines, III 6, IV 8, intercoxal tubercle absent; anterior genital operculum 7 setae, sternite III 10+3 suprastigmal setae, IV 10+3 suprastigmal setae, V-VIII 8 (lateral setae shortened), IX 6, X 5 (2 tactile setae), XI 0; anal cone 0/2 setae. Chelicera: palm with 5 setae, fixed finger with 12 pointed teeth (distal one slightly separated), movable finger with about 10 teeth (distal one slightly isolated), spinneret tooth-like. Palps (figs 11-12): femur 5.1 times as long as broad, 1.35 times longer than carapace and 2.45 times longer than patella, chaetotaxy: 4/6/3/5; patella 1.9 times, hand 1.8 times as long as deep, chela 6.0 times, finger 2.3 times longer than hand. Fixed finger with 43 acute, apparently heterodont teeth (decreasing in size basally), about 7 teeth near *et* contiguous, movable finger with 43 retrotruncate and basally rounded teeth; trichobothria: *ist* close to *esb* (ratio distance *ist–est/ist–esb* = 1.98). Leg I: femur 5.1 times as long as deep and 1.72 longer than patella, which is 3.7 times, tibia 5.3 times, tarsus 10.1 times as long as deep; leg IV: femur+patella 2.6 times, tibia 4.5 times, basitarsus 3.2 times, telotarsus 10.6 times as long as deep, basi- and telotarsus each with a tactile seta.



FIGS 10-16

10: *Pseudochthonius strinatii* Beier, distal dentition of fixed chelal finger; 11-12: *Pseudochthonius ricardoi* sp. n. ♀, pedipalp; 13-16: *Pseudochthonius biseriatus* n.sp.; 13: carapace; 14: chelicera; 15-16: pedipalp; scale unit 0.1mm.

Measurements (in mm): Carapace 0.47/0.45; palps: femur 0.63/0.12, patella 0.26/0.14, hand 0.27/0.15, finger length 0.63, chelal length 0.90; leg I: femur 0.37/0.07, patella 0.21/0.06, tibia 0.23/0.04, tarsus 0.38/0.04; leg IV: femur+patella 0.56/0.21, tibia 0.38/0.08, basitarsus 0.20/0.06, telotarsus 0.39/0.04.

The tritonymph from Gruta Tamboril shares with the holotype the distinctive dentition of the fixed chelal finger. Carapace with prominent dentate epistome, no distinguishable eyes or eye-spots, chaetotaxy: 4+1 preocular seta/4/4/2/2, tergites I-IV 4 setae; coxal spines serrate, 3 on coxa I, 4 on II; cheliceral palm with 5 setae, both fingers with pointed teeth, those in distal part of finger well separated, spinneret small, tooth-like, serrula exterior 15 blades; palpal hand 1.8 times as long as deep (0.19/0.11mm), chela 5.8 times, length 0.62mm, finger 2.24 times longer than hand, length 0.43mm.

The basal position of trichobothrium *ist* and the retrotruncate dentition of the movable chelal finger places the new species in the group of *brasiliensis* Beier, *strinatii* Beier and *tuxeni* Mahnert (Beier, 1970; Mahnert, 1979). It shares with *tuxeni* (from Santarém, Amazonas) the distinctive dentition of the fixed chelal finger (some teeth contiguous distally), but is easily separated by its larger size (chela length 0.90mm vs. 0.41mm), higher tooth counts on the chelal finger and more slender pedipalps. All other *Pseudochthonius* species recorded from the area (*brasiliensis*, *strinatii*, *biseriatus* sp. n., *gracilimanus* sp. n.) possess clearly spaced teeth near the fingertip.

Etymology: named in honour of Dr. Ricardo Pinto-da-Rocha, Museum of Sao Paulo.

Pseudochthonius biseriatus sp. n. Figs 13-16

Material: Minas Gerais, Gruta Olhos d'Água, Itacarambi, lg. P. Gnaspini, 30.III-2.IV. 1994: 1♀ (holotype), 1♀ 1♂ (paratypes) (♀ paratype MHNG).

Description: Yellowish-brown; carapace reticulate, as long as broad, eyes absent, anterior margin with a prominent dentate epistome, 16 strong setae (4/4/4/2/2), one preocular seta present on each side; tergites whitish-yellow, III-V with round medial spot, I-II 2 setae, III 4, VI 4-6, V-IX 6, X 4 XI 4(?) (2 submedial tactile setae); apical lobe of palps 2 setae, palpal coxa 3 (1 discal seta), coxa I 5+ 3-4 dentate coxal spines, II 5+5-6 dentate coxal spines, III 7-8, IV 8, intercoxal tubercle absent; anterior genital operculum 6(♂)-8(♀) setae, genital opening of male with 6 marginal setae on each side; sternite III 9-12+3 suprastigmal setae, IV 10+3 suprastigmal setae, V-VIII 7-8(9) (lateral setae shortened), IX 6 (7), X 4-5 (2 tactile setae), XI 0; anal cone 0/2 setae. Chelicera (fig. 14): palm with 5 setae, fixed finger with 9-11 acute teeth (distal ones slightly separated), movable finger with 8-10 teeth, spinneret tooth-like (absent in male), serrula exterior about 20 blades, flagellum 9 setae (first only shortly dentate). Palps (figs.15-16): femur 6.4-6.6 times longer than broad, 1.69 times longer than carapace and 2.30-2.38 times longer than patella, chaetotaxy: 5/6/4/6; patella 2.2-2.5 times, hand 2.3-2.4 times as long as deep, chela 7.5-8.0 times, finger 2.3 times longer than hand. Fixed finger with 1 distal lateral tooth, 37-41 pointed teeth (arranged like offset saw teeth and therefore giving the impression of heterodonty), movable finger with 34-37 acute, spaced teeth; trichobothria: *ist* much nearer to *esb* than to *est* (*ist-est/ist-esb* = 1.78-2.10), one sensillum distal to *sb*. Leg I: femur 6.1-6.2 times as long as deep and 1.74-1.77 longer than patella, which is 4.2-4.5 times, tibia 4.9-5.3 times, tarsus 10.4-11.3 times; leg IV: femur+patella 3.1-3.4 times, tibia 5.0-5.2 times, basitarsus 3.5-3.8 times (TS=0.32-0.33), telotarsus 10.6-11.9 times as long as deep, with basal tactile seta.

Measurements (in mm): Carapace 0.52-0.56/0.52-0.57; palps: femur 0.87-0.95/0.13-0.15, patella 0.37-0.41/0.15-0.17, hand 0.37-0.42/0.16-0.18, finger length 0.86-0.97, chelal length 1.24-1.39; leg I: femur 0.45-0.50/0.07-0.08, patella 0.25-0.28/0.06, tibia 0.24-0.28/0.05, tarsus 0.47-0.50/0.04-0.05; leg IV: femur+patella 0.68-0.76/0.20-0.23, tibia 0.44-0.46/0.09, basitarsus 0.24-0.26/0.07, telotarsus 0.48-0.51/0.04.

The basal position of trichobothrium *ist* and the straight, spaced teeth of the movable chelal finger suggest affinities of this new troglobite(?) species with *orthodactylus* Muchmore (from Amazonia). It is characterized by the presence of only 2 setae on tergites I and II and can be easily distinguished from *orthodactylus* by its larger size and more slender pedipalps. Species of the *brasiliensis* group are characterized by the dense, retrotruncate dentition of the movable chelal finger.

Etymology: *biseriatus* (lat., in two series) refers to the arrangement of chelal teeth.

SYARINIDAE

Nannobisium beieri Mahnert, 1979

Material: Pará, Gruta Pedra Cachoeira, Altamira, lg. E. Trajano, 22.X.1988: 1♂ (MZUSP 10283); same cave, guano of insectivorous bats, lg. E. Trajano, 22.X.1988: 3 ex.

The species is known from the region of Santarém (Pará); the specimens studied are slightly larger than the type specimens, but correspond perfectly to other specimens recorded subsequently. Palpal femur 3.1 times as long as broad (0.20/0.06mm), patella 2.0 times (0.17/0.09), hand 1.4 times (0.17/0.12), finger length 0.16mm, chela 2.6 times (2.4 times without pedicel), chelal length 0.32mm; both fingers with 13 teeth. Trichobothrium *t* apically lanceolate.

IDEORONCIDAE

Ideoroncus setosus Mahnert, 1984

Material: São Paulo, Caverna Casa de Pedra, Iporanga, in guano, lg. P. Gnaspini Netto, 25.V.1986: 1♂ 1♀ (MZUSP 10305).

Known previously from the regions of Palmeirinha and Baraqueçaba (Serra do Mar), São Paulo State. The present specimens correspond well to the original description; the palpal femur (female) is 4.5 times as long as broad; there are 26 teeth on the fixed finger and 21 on the movable finger. Only 19 trichobothria are present on the left chela of the female: est_6 is lacking ($est_{5\text{-}6}$ appear during the moult from tritonymph to adult).

Ideoroncus cavicola sp. n. Figs 17-21

Ideoroncus sp. (115); Pinto-da-Rocha, 1995: 85 (PR-06; SP-18)

Material: São Paulo, Caverna Areias de Cima, Iporanga, lg. P. Gnaspini Netto, 20.XII.1986: 1♀ (holotype) (MZUSP 10301); same cave, lg. P. Gnaspini Netto, 31.VIII.1986: 1D (MZUSP 10300) (paratype); Alambari de Baixo, Iporanga, lg. R. de Andrade, 8.V.1998: 1♀ (paratype); Parana, Gruta de Lacinhas, Rio Branco do Sul, lg. P. Gnaspini Netto, 6.III.1988: 1♀ (MZUSP 10308) (non-type);

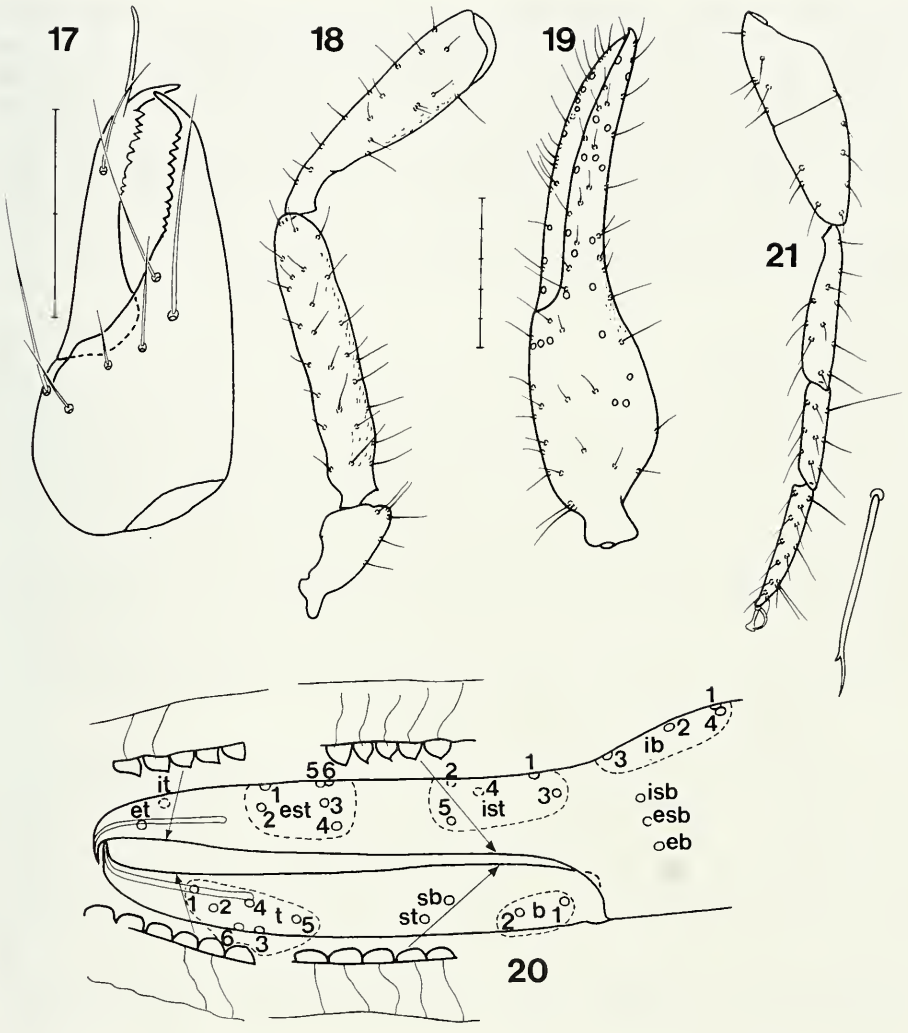
Description: Pedipalps yellowish-brown, carapace brown, tergites yellowish. Carapace 1.3 times as long as broad, laterally reticulate, granulate around eyes, anterior margin slightly protruding medially, well marked subbasal transverse furrow present; no eyes or eye-spots distinguishable, 23 setae (4-7-4-4-4); chaetotaxy of tergites: 4/6/7-8/8/8/8/8/8/8/9-10 (4 tactile setae)/10 (4 tactile setae). Apical lobe of palpal coxa 2 setae, palpal coxa granulate, 7-8 setae (1 tactile seta), I 5-6, II 5, III 4-5,

IV 5; anterior genital operculum with 6-7 medial setae (2 discal), sternite III 4, IV 5, 1 suprastigmal seta each, V-IX 8-9(10), X 9-11, XI 4-6; anal cone with 2 long dorsal and 2 shorter ventral setae. Chelicera (fig. 17): 5-6 setae on palm, both fingers with 9-12 teeth, serrula exterior with 26, serrula interior 16-18 blades, flagellum of 4 apically denticulate setae, galea long, smooth and slightly curved. Pedipalps (figs 18-20) slender, trochanter distally granulate, femur distinctly granulate, with a longer seta on dorsal side near base, 5.5-5.7 times as long as broad and 1.07-1.09 times longer than patella, which is 4.1 times, club of patella granulate, 3.1 times , hand finely granulate distally, with pedicel 2.0-2.1 times, chela with pedicel 4.2-4.5 times as long as broad, finger 1.18-1.19 times longer than hand with pedicel; fixed finger with 87 pointed teeth, movable one with 76-79 basally flattened teeth. 30 trichobothria (20+10). Leg I: femur 4.5-5.0 times as long as deep and 2.0 times longer than patella, which is 2.4-2.8 times , tibia 4.0 times (female from Alambari de Baixo 5.3 times), basitarsus 3.0 (4.4) times, telotarsus 5.1 (7.9) times as long as deep and 1.41 times longer than basitarsus; leg IV (fig. 21): femur+patella 3.0 (3.6) times, tibia 4.7 (5.3) times, basitarsus 4.1(4.4) times, with one tactile seta in basal third (TS=0.20-0.23), telotarsus 7.6 (7.8) times as long as deep and 1.25-1.29 times longer than basitarsus. Arolia as long as claws, which are slender and smooth; subterminal seta apically curved and dentate.

Measurements (in mm) (female from Alambari de Baixo in parentheses): Carapace 0.83/0.63 (0.90/0.63): Pedipalps: femur 0.98/0.18 (1.14/0.20), patella 0.90/0.22 (1.06/0.26), hand with pedicel 0.80/0.40 (0.95/0.44), chelal length 1.68 (1.98), finger length 0.95 (1.14); leg I: femur 0.50/0.11 (0.59/0.12), patella 0.25/0.10 (0.30/0.11), tibia 0.37/0.09 (0.44/0.06), basitarsus 0.25/0.08 (0.29/0.06), telotarsus 0.35/0.07 (0.41/0.05); leg IV: femur+patella 0.76/0.25 (0.85/0.23), tibia 0.53/0.11 (0.62/0.12), basitarsus 0.33/0.08 (0.38/0.07), telotarsus 0.43/0.06 (0.48/0.06).

Deutonymph: Carapace 1.4 times as long as broad (0.38/0.27mm), without eyespots, 20 setae (6-4-4-2-4); tergites I/II 4 setae, III-IX 6, X/XI 8 (4 tactile setae each). Pedipalps smooth, femur 5.0 times as long as broad (0.49/0.10), patella 3.6 times (0.41/0.11), club 2.60 times as long as broad and 2.56 times longer than pedicel, hand with pedicel 1.9 times (0.35/0.19), chela with pedicel 4.5 times, length 0.85mm, finger 1.48 times longer than hand with pedicel, length 0.52mm; 15 trichobothria (9+6).

The female from the Gruta de Lacinhas probably belongs to this species, but due to certain teratological features it is not included in the type series. It differs from the type specimens mainly in the number and shape of the chelal teeth (less pointed, perhaps due to abrasion), the position of trichobothrium *sb* directly below *st*, and by the number of setae on the cheliceral palm (5). Fixed finger of chela with 69, movable finger with 66 teeth; 30 trichobothria (fig. 20) on right chela, 32 trichobothria (22+10: *esb*-territory with 2 supernumerary trichobothria) on left chela. Tarsi of leg I more slender: basitarsus 3.8 times as long as deep (0.23/0.06), telotarsus 6.5 times (0.33/0.05); those of leg IV stouter: basitarsus 3.5 times (0.30/0.09), telotarsus 6.5 times as long as deep (0.40/0.06). The female from Alambari de Baixo shows the same palpal proportions as the holotype, but is clearly larger and has more slender legs I and IV. Without information about the variability of these characters, I see no reason to exclude it from the type series.



FIGS 17-21

Ideoroncus cavicola sp. n. ♀; 17: chelicera; 18-19: pedipalp; 20: trichobothrial pattern on chelal hand; 21: leg IV, subterminal seta enlarged; scale unit 0.1mm.

Etymology: *cavicola* (lat.) = cave-dwelling

The number of trichobothria (normally 30), the absence of eyes or eye-spots, the shape of chelal teeth and their high number in this new species are characters shared only with *I. anophthalmus* Mahnert, described from the Serra da Cantareira (São Paulo). *Ideoroncus cavicola* sp. n. is easily distinguished from *anophthalmus*, mainly by the following characters: much more slender pedipalps (e.g. femur 5.5-5.7

vs 3.3 times longer than broad), larger size (femur length 0.98-1.14mm vs 0.64mm), and the higher number of teeth of the chelal fingers. Even if the reduction or absence of eyes cannot be considered, at least in this genus, as adpatation to cave life, other troglomorphic characters (such as slender pedipalps and its size) might classify this taxon as troglobitic species. Current knowledge of this genus has been summarized by Mahnert (1984). Variability in distribution of trichobothria within territories has already been noticed in *I. divisus* Mahnert and *anophthalmus* Mahnert, but a printing error needs to be rectified: in *anophthalmus*, variability was observed in the *est*-territory, not, as indicated, in the *it*-territory (Mahnert, 1984: 665).

Bochicidae

Spelaeobochica gen. n.

Diagnosis: A member of the family Bochicidae and the subfamily Bochicinae as outlined by Muchmore (1998). Clearly differing from all other genera by following characters. No eyes present, but two, tiny, latero-ventral tubercles present on each side. Chelicera with 9 setae on palm, flagellum of 4 dentate setae. Palps slender, chela 4.1 times longer than broad; femur with glandular(?) tubercle on lateral side near distal end; trichobothrium *ib* in distal half of dorsum of palpal hand; fingers longer than hand with pedicel; accessory teeth present on internal side of both palpal fingers; venom apparatus present in both fingers. Legs slender, femur+patella of leg IV 3.8 times longer than broad; arolia shorter than claws; subterminal seta weakly forked apically.

Terra typica: Brazil, Bahia State, in caves.

Type species: *Spelaeobochica allodentatus* sp. n.

Gender: male; Bochica was one of the most important deities of the Chibcha Indians of ancient Columbia (M. Judson. in litt.)

Affinities: The new genus seems to be quite isolated within the Bochicinae. It might be related to *Antillobisium* Dumitresco & Orghidan and *Troglobochica* Muchmore (similar in number of setae in flagellum, presence of a glandular(?) tubercle on palpal femur and a high number of setae on cheliceral palm), but it is readily distinguished by the distal position of trichobothrium *ib*, the presence of accessory teeth on the palpal fingers, the distal position of the glandular(?) tubercle on the palpal femur and by the shape of flagellar setae.

Spelaeobochica allodentatus sp. n. Figs 22-29

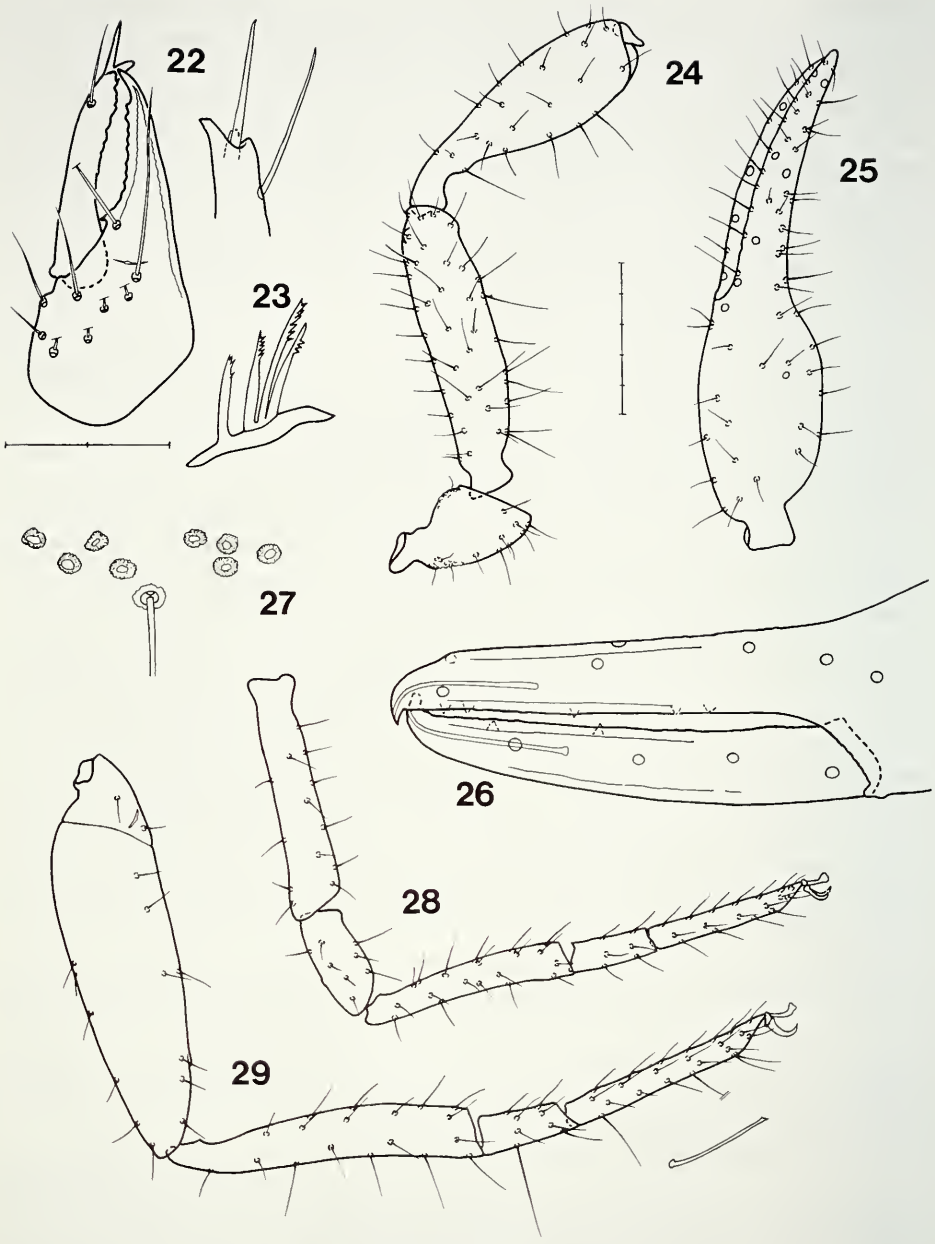
Material: Bahia, Gruta do Impossível, Palmeiras, lg. L. Senna Horta, 18.II.1996: 1♂ (holotype) 1♀ (paratype) (neither specimen well preserved, most setae have fallen off and the paratype lacks all the legs).

Description: Pedipalps, carapace, chelicerae, first coxae and first abdominal segments reddish, other parts yellowish. Tergites with more or less pronounced sclerotization along anterior margin. Vestitural setae delicate, smooth. Carapace 1.4 times longer than broad, anterior margin incurved medially, finely granulate antero-laterally, posterior half scalely-reticulate, a transverse furrow near posterior margin, no eyes, but with two, tiny, latero-ventral tubercles on each side, 6 setae on anterior and posterior margins. Chelicera (fig. 22): 9 acuminate setae on hand, each finger with 9 rounded

teeth, distal teeth of movable finger on distinct lamella, galea simple, serrula exterior 26, serrula interior 20 blades; flagellum (fig. 23) of 4 apically dentate setae; Tergites undivided, chaetotaxy: 5/6/9/11/11/13/12/13/14/16/? (probably 4 tactile setae); pleural membranes smoothly, longitudinally striate; manducatory process acute, with 2 apical setae of unequal length and two discal setae; palpal coxa scaly-reticulate, 10-11 setae, coxa I 9, II 6, III 6, IV 8 setae; genital operculum reticulate, about 13 marginal setae in the middle and about 7 discal setae, numerous tiny pores present; sternite III with 13 marginal setae and about 7 central discal setae, 2/3 setae at stigma, IV 7, 2 supra-stigmal setae, remaining sternites 12/13/13/13/12/12/about 10 (probably 6 tactile setae); with round glandular(?) organs, their number increasing from 4 (anterior sternites) to about 20 (sternite XI) (see fig. 27), anal cone with 2 pairs of setae. Genital organ of male: one smooth, short seta on each side of posterior genital plate; lateral genital sacs relatively short and of *Neobisium*-type; numerous glandular ducts opening into atrium of posterior dorsal gland; genital glands(?) well developed, grape-like. Pedipalps (figs 24-25): trochanter finely granulate basally, a rounded dorsal hump present; femur smooth, 4.2 times as long as broad, with a lateral glandular(?) hump near distal end, patella smooth, with a small protuberance at distal end of pedicel, 3.3 times, hand smooth, with pedicel 2.1 times, chela with pedicel 4.1 times longer than broad, finger 1.1 times longer than hand with pedicel; trichobothria (fig. 26): *ib* in distal half of hand dorsum, *ist* slightly proximal of *est*, *it* nearly at same level as *et*; *b-sb-st-t* nearly equidistant. Fixed finger with 69, movable finger with 77 small, contiguous, cusped teeth (basal ones broader), fixed finger on internal side with 5, movable finger with 2 accessory teeth; venom apparatus well developed in both fingers. Legs rather slender: leg I (fig. 28): femur 4.4 times longer than deep and 2.1 times longer than patella, patella 2.2 times, tibia 5.9 times, basitarsus 2.9 times, telotarsus 6.5 times longer than deep and 1.9 times longer than basitarsus; leg IV (fig. 29): femur+patella 3.8 times, tibia 6.3 times, basitarsus 2.6 times, telotarsus 7.9 times longer than deep and 2.2 times longer than basitarsus; both with a basal tactile seta (TS= 0.34 and 0.15, respectively); subterminal seta weakly forked apically, arolia undivided, shorter than smooth claws.

Measurements (in mm): Carapace 0.85/0.60 (holotype) (0.88/0.72) (paratype); Palps: femur 0.95/0.23 (0.97/0.23), patella 0.90/0.28 (0.92/0.27), hand with pedicel 0.83/0.40 (0.84/0.40), finger length 0.89 (0.92), chela length (with pedicel) 1.65 (1.70); Leg I: femur 0.44/0.10, patella 0.21/0.10, tibia 0.41/0.07, basitarsus 0.16/0.05, telotarsus 0.30/0.05; leg IV: femur+patella 0.77/0.20, tibia 0.60/0.07, basitarsus 0.19/0.07, telotarsus 0.42/0.05.

The surprising finding of this bochicin genus extends the range of the family far to the south of the South American continent; the previously known range of the cavernicolous and epigean genera and species extended from Texas and Mexico to Central America, from the Antilles to Guyana and Venezuela (Muchmore, 1998); members of the Bochicinae (as defined by Muchmore, 1998) are only known from Mexico and Central America, Cuba, Jamaica and the Lesser Antilles, one unidentified species of the genus *Bochica* has been recorded by Heurtault (1994) from a cave of Venezuela (M. Judson, in litt.).



FIGS 22-29

Spelaeobochica allodentatus gen. n.sp. n. ♂; 22: chelicera, with apical end of movable finger enlarged, lateral view; 23: flagellum; 24-26: pedipalp; 27: glandular(?) openings on sternite XI; 28-29: leg I and IV (with enlarged subterminal seta); scale unit 0.1mm.

Etymology: *allodentatus* (lat.), refers to presence of accessory teeth on chelal finger.

OLPIIDAE

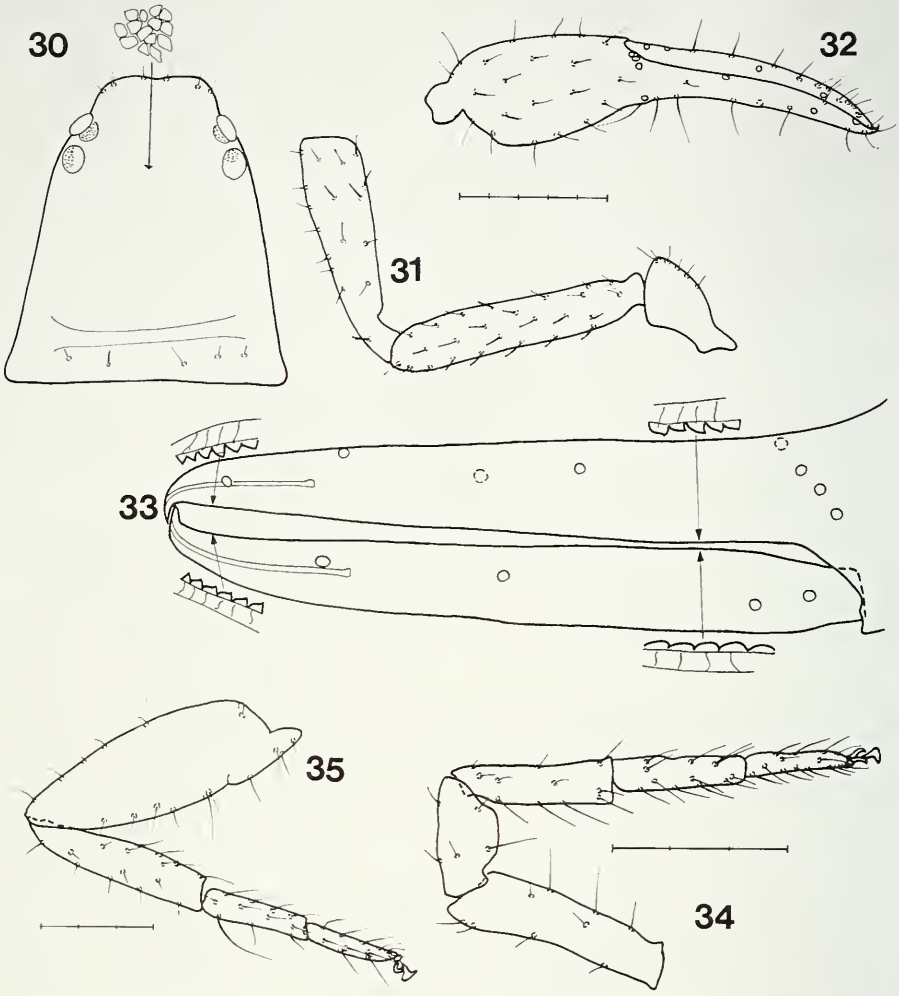
Progarypus nigrimanus sp. n. Figs 30-35

Progarypus sp. (116); Pinto-da-Rocha, 1995: 85 (SP-41).

Material: São Paulo, Caverna Santana, Iporanga, lg. E. Trajano: 28.XI.1988: 1♀ (holotype) (MZUSP 10294); same cave, lg. E. Trajano & P. Gnaspini, 8.VIII.1990: 1♀ (paratype) (MZUSP 13821).

Description: Carapace (fig.30) brown, anterior tergites yellowish-brown, posterior ones darker, pedipalps yellowish-brown, chela darker brown. Carapace triangular, 1.1-1.2 times as long as broad, anteriorly with squamose sculpturing, posteriorly reticulate, cucullus short, with an indistinct longitudinal furrow, distinct subbasal transverse furrow present; 4 large eyes; 4 setae on anterior margin, one preocular seta on each side, 4-5 setae on posterior margin (the lateral ones very short); tergites reticulate, normally with 6 (7) setae, X with 4 longer setae, XI with 4 tactile setae; apical lobe of palpal coxa with 2 marginal and 3 discal setae, palpal coxa laterally scaly, ca 23-28 setae (2 tactile), coxa I 15-19 (1 tactile seta), II 16-19 (1 TS), III 19-20, IV 22-27; anterior genital operculum medially with 5-6 marginal and 5 discal setae, sternites III/IV with 6 setae, IV with 0-1 suprastigmal seta on each side, V/VI 9-10, VII 12, VIII 10, IX 10, X 11 (2 submedial tactile setae), XI probably 2; anal cone with 0/2 setae; tracheal tubes normal, not widened. Chelicera: palm with 5 setae, fixed finger with 3 large and 2 small, subapical teeth, movable finger with tooth-like subapical lobe, galea long, with 3 apical branches, serrula exterior 18 blades, flagellum with 3 setae (first one long and thick). Pedipalps (figs 31-32): Trochanter granulate, femur scaly dorsally, 4.7-5.3 times as long as broad and 1.08-1.10 times longer than patella, which is 3.8-3.9 times as long as broad, club 3.1 times as long as broad and 3.32-3.91 times as long as pedicel, hand with pedicel 1.8-2.0 times, chela with pedicel 4.0-4.4 times as long as broad, finger 1.23-1.29 times longer than hand with pedicel; fixed finger with 70-72 pointed teeth, movable finger with 51-53 teeth, flattened in proximal half of finger. Trichobothria (fig. 33): *est* half-way between *isb* and *it*, much nearer to *ist* than to *isb* and proximal to *st*; *st* slightly nearer to *t* than to *sb*. Leg I (fig. 34): femur 3.6 times as long as deep and 1.86 times longer than patella, which is 2.0-2.1 times as long as deep, tibia 3.7-4.1 times, basitarsus 3.5-4.1 times, telotarsus 4.3-4.6 times as long as deep; leg IV (fig. 35): femur+patella 2.9-3.0 times, tibia 4.0-4.9 times, basitarsus with basal tactile seta (TS=0.16), 3.9-4.1 times as long as deep and 1.19-1.22 times longer than telotarsus, which is 4.8 times as long as deep; subterminal seta smooth, arolia undivided and longer than claws.

Measurements (in mm): Carapace 0.77-0.79/0.65-0.70; Pedipalps: femur 0.86/0.17-0.18, patella 0.78-0.79/0.20, hand with pedicel 0.68-0.71/0.34-0.38, finger length 0.87-0.89, chelal length 1.50-1.51; leg I: femur 0.39/0.11, patella 0.21/0.10-0.11, tibia 0.28-0.30/0.07-0.08, basitarsus 0.21-0.22/0.05-0.06, telotarsus 0.18/0.04; leg IV: femur+patella 0.71-0.75/0.24-0.26, tibia 0.50/0.10-0.13, basitarsus 0.28/0.07, telotarsus 0.23-0.24/0.05.



FIGS 30-35

Progarypus nigrimanus sp. n. ♀; 30: carapace; 31-33: pedipalps; 34: leg I; 35: leg IV (femur+patella without complete suture); scale unit 0.1mm.

Etymology: *nigrimanus* (lat.), refers to the dark coloured chelal hand.

Progarypus setifer sp. n. Figs 36-40

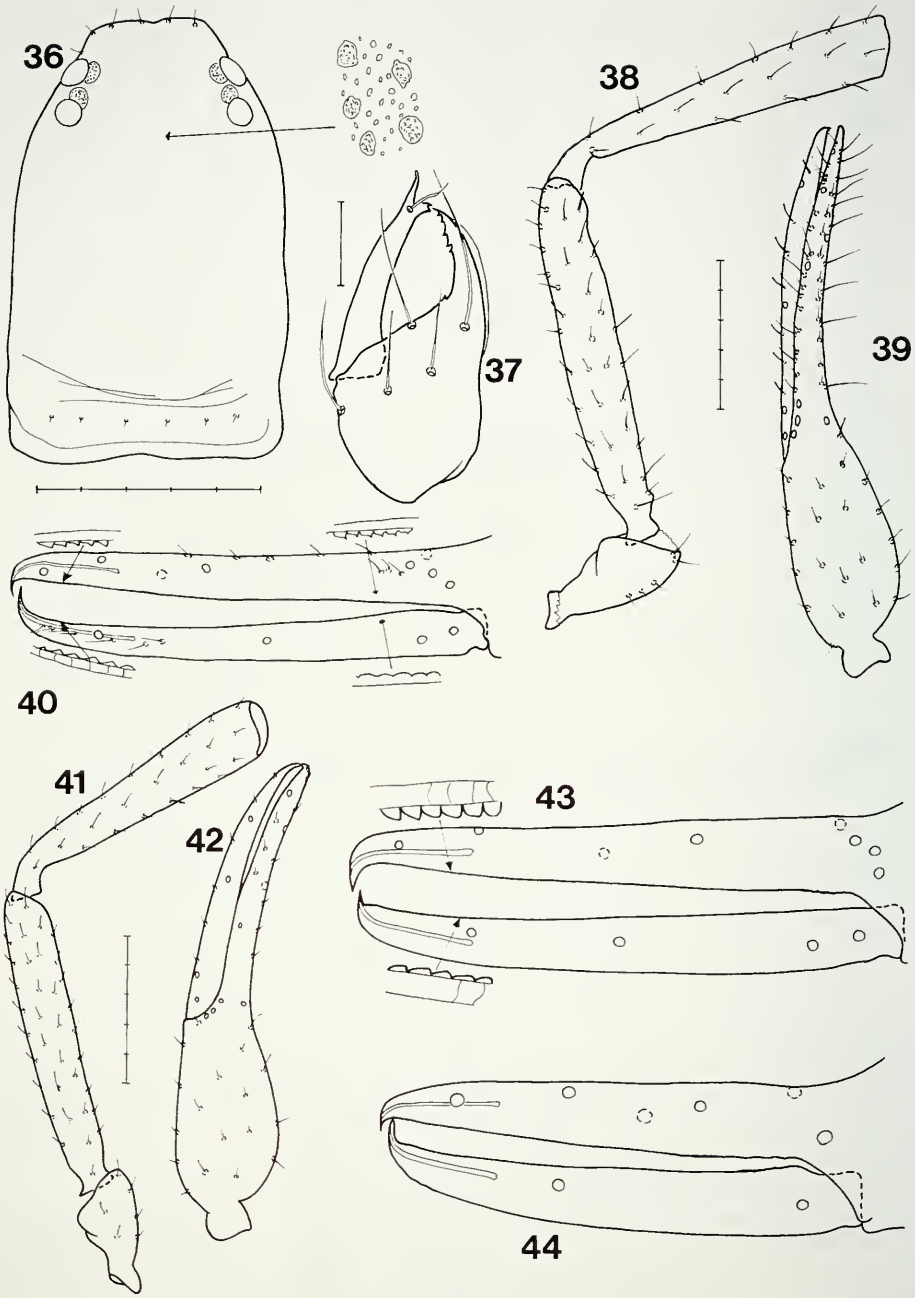
Progarypus sp. (116): Pinto-da-Rocha, 1995: 85 (MG-123, MG-199).

Material: Minas Gerais, Gruta do Janelão, Itacarambi, lg. P. Palacios-Vargas, 19.VII. 1988: 1♂ (holotype) (MZUSP 10289); Lapa dos Desenhos, Itacarambi, lg. E. Trajano, 8.VII. 1993: 1♀ (MZUSP 13845) (paratype).

Description: Carapace and pedipalps reddish-brown, tergites/sternites yellowish, carapace densely granulate: between the numerous larger granula is a clearly granulate microsculpture (appearance like ostrich leather), a short cucullus and 4 large eyes present, anterior eyes slightly larger than posterior pair, carapace (fig. 36) 1.6 times as long as broad, parallel-sided, 2-4 + 2 preocular setae on anterior margin, 5-6 on posterior one, setae small and indistinct; tergite I 4, II 5-6, III-VIII 6, IX 8 (2 sublateral tactile setae), X 8 (4 tactile setae), XI 10 (4 tactile setae); apical lobe of palpal coxa 2 marginal and 3 discal setae, palpal coxa granulate (like carapace), about 16 setae (2 tactile), coxa I 10-11, II-III 9-13, IV about 9 (male)/20 (female) (setae small, indistinct); anterior genital operculum of male with 10 marginal and 6 anterior discal setae, entrance of genital chamber with 2/2 setae, anterior genital operculum of female with 4 medial setae, sternite III/IV 9, V-IX 8-9, X 6 (2 tactile setae), IX 3; anal cone with 2/2 setae. Chelicera (fig. 37): palm with 5 setae, movable finger with slightly bilobed subapical lobe, galea with 3 apical branches, serrula exterior 18 blades, flagellum 3 setae. Pedipalps (figs 38-39): trochanter with distinct dorsal hump, coarsely granulate, femur and patella coarsely granulate, femur 6.2 times (female 4.9) as long as broad, with a short dorsal 'tactile' seta near base, patella 6.3 (4.5) times, club 5.4 (3.76) times as long as broad and 6.1 (4.87) times longer than pedicel, hand nearly smooth, with a few tiny granula near finger base, with pedicel 2.2 (1.7) times, chela with pedicel 5.4 (3.7) times as long as broad, finger 1.47 (1.27) times longer than hand with pedicel; fixed finger with 51 (39!) pointed teeth, movable finger with 39 (32) teeth (pointed only in distal fourth of finger), on fixed chelal finger two rows (one dorsal, one external) of short pinlike setae. Trichobothria (fig. 40): *eb-esb-ib-isb* at finger base, *ist-est-it-et* in distal half and distal to *st*; *ist* nearly halfway between *it* and *est*; *st* halfway between *sb* and *t*. Leg I: femur 4.7 (female 3.9) times as long as deep and 1.89 (1.87) times longer than patella, which is 2.6 (2.3) times, tibia 6.6 (5.2) times, basitarsus 5.7 (5.0) times as long as deep and 1.56 (1.40) times longer than telotarsus, which is 4.4 (5.0) times as long as deep; leg IV: femur+patella 2.8 (female 2.7) times, tibia 5.5 (4.8) times, basitarsus with a short tactile seta near its base, 5.4 (4.4) times as long as deep and 1.30 (1.21) times longer than telotarsus, which is 6.3 (5.7) times as long as deep; subterminal seta smooth, arolia undivided and longer than claws.

Measurements (in mm) of male (female): carapace 0.93/0.57 (0.95/0.61); pedipalps: femur 1.21/0.19 (1.11/0.23), patella 1.23/0.20 (1.05/0.23), hand with pedicel 0.75/0.34 (0.80/0.46), finger length 1.10 (0.98), chelal length 1.80 (1.72); leg I: femur 0.55/0.12 (0.47/0.12), patella 0.29/0.11 (0.25/0.11), tibia 0.48/0.07 (0.40/0.08), basitarsus 0.35/0.06 (0.28/0.06), telotarsus 0.22/0.05 (0.20/0.04); leg IV: femur+patella 0.88/0.31 (0.83/0.30), tibia 0.68/0.12 (0.62/0.13), basitarsus 0.41/0.08 (0.35/0.08), telotarsus 0.31/0.05 (0.29/0.05).

Etymology: *setifer* (lat.), refers to the presence two rows of pin-like setae on fixed chelal finger.



FIGS 36-44; 36-40: *Progarypus setifer* sp. n. ♂; 36: carapace, microsculpture enlarged; 37: chelicera; 38-40: pedipalp; 41-44: *Progarypus gracilis* sp. n. ♀; 41-42: pedipalp; 43: trichobothrial pattern; 44: deutonymph, trichobothrial pattern; scale unit 0.1mm.

Progarypus gracilis sp. n. Figs 41-44

Material: Minas Gerais, Gruta Periperi I, Matozinhos, lg. L.S. Horta, 15.I.1993: 1♀ (holotype) (MZUSP 13832); Gruta do Labirinto Fechado, Lagoa Santa, lg. L.S. Horta, 24.IX.1995: 1♂ 1♀ 1D; Gruta da Lapinha, Lagoa Santa, lg. L.S. Horta, 18.VII.1995: 2♂ 1♀ 1D; Gruta do Bari, Pedro Leopoldo, lg. L.S. Horta, 19.VII.1997: 1♂ (paratypes).

Description: Carapace olive, pedipalps yellowish-brown, tergites/sternites yellowish, carapace densely granulate: between the numerous larger granula is a clearly granulate microsculpture (appearance like ostrich leather), basal part (including subbasal furrow) clearly reticulate, a short cucullus and 4 large eyes present, anterior eyes slightly larger than posterior pair, carapace 1.5-1.7 times as long as broad, parallel-sided, 4 + 2 preocular setae on anterior margin, 4-6 on posterior one, setae small and indistinct; tergite I 5-6, II-IX 6 (7-8), IX 2 sublateral tactile setae, X 2 tactile setae, XI 2 lateral tactile setae; apical lobe of palpal coxa with 3 marginal and 1 discal setae, palpal coxa scaly (points of 'scales' forming granula), about 30 setae (2 tactile), coxa I 12-14, II 14-15, III 12-14, IV 15-17 (setae small, indistinct); anterior genital operculum with 6-8 medial setae (female) or 9 marginal and 6 discal setae (male), sternite III/IV 6-8, V-VIII 10-12, IX 9 (2 tactile setae), X 8, XI 4 (2 tactile setae); anal cone with 2/2 setae. Chelicera: palm with 5 setae, movable finger with broad, triangular subapical lobe, galea with 3 apical branches, serrula exterior 20 blades, flagellum 3 setae. Pedipalps (figs 41-42): trochanter with distinct dorsal hump, coarsely granulate, femur and patella coarsely granulate, femur 5.5-6.0 times as long as broad, patella 4.9-5.3 times, club 4.0-4.5 times as long as broad and 4.4-5.2 times longer than pedicel, hand smooth, with pedicel 2.0-2.3 times, chela with pedicel 4.3-5.0 times as long as broad, finger 1.2-1.3 times longer than hand with pedicel; fixed finger with a series of short pin-like setae, with 61-67 pointed teeth, movable finger with 43-51 teeth (pointed only in distal fourth of finger). Trichobothria (fig. 43): *eb-esb-ib-isb* at finger base, *ist* at same level as *st*, only *it/et* clearly distal to *st*; *ist* nearer to *it* than to *est*; *st* slightly nearer to *t* than to *sb*. Leg I: femur 4.3-4.4 times as long as deep and 2.0 times longer than patella, which is 2.2-2.3 times, tibia 4.7-5.3 times, basitarsus 4.5-4.8 times as long as deep and 1.3-1.4 times longer than telotarsus, which is 5.0-5.4 times as long as deep; leg IV: femur+patella 2.7-3.0 times, tibia 4.9-5.0 times, basitarsus with a short tactile seta near base, chaetotaxy: 'tactile seta'+3/4/4, 4.3-4.6 times as long as deep and 1.25-1.35 times longer than telotarsus, which is 5.0-5.2 times as long deep; subterminal seta smooth, arolia undivided and longer than claws.

Measurements (in mm): Carapace 0.83-0.92/0.52-0.57; pedipalps: femur 0.86-1.01/0.14-0.17, patella 0.85-1.00/0.17-0.19, hand with pedicel 0.60-0.73/0.28-0.34, finger length 0.81-0.91, chelal length 1.37-1.60; leg I (1♂2♀): femur 0.43-0.45/0.10, patella 0.21-0.23/0.10, tibia 0.36/0.07, basitarsus 0.25-0.26/0.04-0.06, telotarsus 0.19-0.20/0.03-0.04; leg IV: femur+patella 0.80/0.26-0.30, tibia 0.55-0.59/0.11-0.12, basitarsus 0.31-0.32/0.07, telotarsus 0.24-0.25/0.05.

Etymology : *gracilis* (lat.), refers to the slender, elongate palpal segments.

Progarypus liliae sp. n. Figs 45-47

Material: Bahia, Gruta dos Brejões, Morro do Chapéu, lg. Lilia S. Horta, 7.IX.1994: 1♀ (holotype).

Description: Carapace chocolate brown, pedipalps yellowish-brown, tergites/sternites yellowish, carapace smooth, a short cucullus and 4 large eyes present, anterior eyes slightly larger than posterior pair, carapace 1.6 times as long as broad, parallel-sided, 4 + 2 preocular setae on anterior margin, 4 on posterior, setae small and indistinct; tergite I 4, II-IX 6-8, XI 2 lateral tactile setae; apical lobe of palpal coxa with 3 marginal and 1 discal setae, palpal coxa smooth, about 18 setae (2 tactile), coxa I 11, II 10, III 9, IV 16 (setae small, indistinct); anterior genital operculum with 8 medial setae, sternite III/IV 6-8, V-VII 6-8, VIII-X 9 (2 tactile setae), XI 4 (2 tactile setae); anal cone with 2/2 setae. Chelicera: palm with 5 setae, movable finger with broad triangular subapical lobe, galea with 3 apical branches, serrula exterior 18 blades, flagellum 3 setae. Pedipalps (figs 45-46): trochanter with distinct dorsal hump, femur and patella smooth (some tiny isolated granules perceptible), femur 5.7 times as long as broad, patella 4.7 times, club 3.8 times as long as broad and 4.5 times longer than pedicel, hand smooth, with pedicel 2.2 times, chela with pedicel 4.8 times as long as broad, finger 1.3 times longer than hand with pedicel; fixed finger with 72 pointed teeth, movable finger with 46 teeth (pointed only in distal fourth of finger). Trichobothria (fig. 47): *eb-esb-ib-isb* at finger base, *ist* slightly distad *st*, only *it/et* clearly distal to *st*; *ist* close to *est*; *st* nearer to *t* than to *sb*. Leg I: femur 5.2 times as long as deep and 2.2 times longer than patella, which is 2.4 times, tibia 6.5 times, basitarsus 6.1 times as long as deep and 1.3 times longer than telofemur, which is 7.3 times as long as broad; leg IV: femur+patella 3.2 times, tibia 5.5 times, basitarsus with a short tactile seta near its base, 5.9 times as long as deep and 1.2 times longer than telotarsus, which is 7.7 times as long as deep; subterminal seta smooth, arolia undivided and longer than claws.

Measurements (in mm): Carapace 0.93/0.58; pedipalps: femur 1.12/0.19, patella 1.06/0.12, hand with pedicel 0.85/0.38, finger length 1.13, chelal 1.85; leg I: femur 0.53/0.10, patella 0.24/0.10, tibia 0.44/0.07, basitarsus 0.31/0.05, telotarsus 0.23/0.03; leg IV: femur+patella 0.90/0.29, tibia 0.66/0.12, basitarsus 0.40/0.07, telotarsus 0.34/0.04.

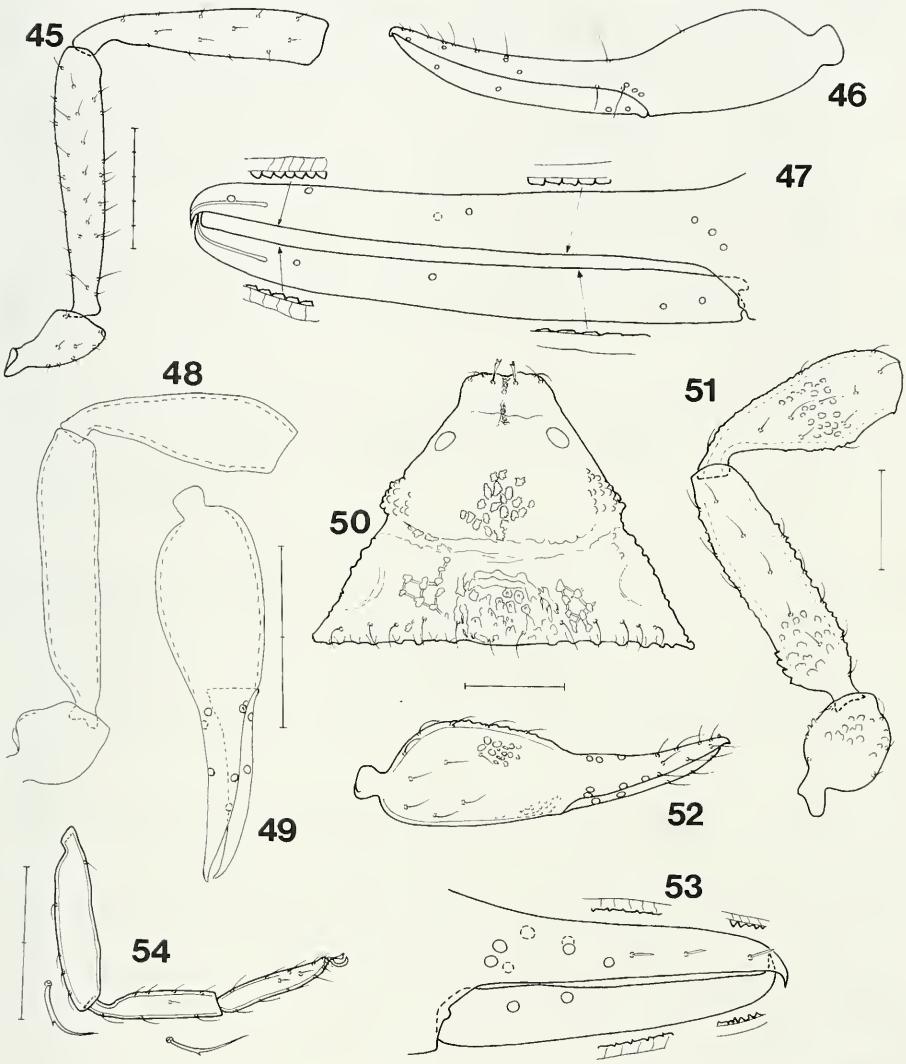
Etymology: named in honour of Miss Lilia Senna Horta, collector of many pseudoscorpions in Bahia caves.

Progarypus sp.

Progarypus sp. (116); Pinto-da-Rocha, 1995: 85 (MG-32).

Material: Minas Gerais, Gruta Bonita, Januária, lg. E. Trajano, 8.VII.1993: 1T.

This tritonymph cannot be assigned to one of the known species. It is characterized by: carapace, palpal femur and patella finely granulate, femur baso-dorsally with a tactile seta, hand smooth; palpal femur 5.2 times longer as broad (0.68/0.13mm), patella 4.4 times (0.58/0.13), hand with pedicel 1.9 times (0.48/0.26), finger length 0.64mm, chela with pedicel 4.2 times longer than broad (length 1.07mm).



FIGS 45-54

45-47: *Progarypus liliae* sp. n. ♀; 45-46: pedipalp; 47: trichobothrial pattern; 48-49: *Cheiridium itapemirinense* (Feio) ♂, pedipalp; 50-54: *Cheiridium brasiliense* sp. n. ♂; 50: carapace; 51-53: pedipalp; 54: leg IV; scale unit 0.1mm.

KEY TO *PROGARYPUS* SPECIES RECORDED FROM BRAZIL

1 Large species, palpal femur length 1.11mm (female) to 1.21mm (male); trichobothria *ist-est-it-et* in distal finger half, distal to *st*; finger 1.5 times longer than chelal hand with pedicel; movable chelal finger with 32-39 teeth . . . . . *P. setifer* sp. n.

1° Smaller species, palpal femur length 0.7-1.0 mm; at least one of trichobothria *est-ist-it-et* proximal to *st*; finger relatively shorter, at most 1.3 times longer than chelal hand with pedicel 2

2 Finger shorter than hand with pedicel; trichobothria *ist* and *est* apparently proximal to *st*; palpal femur 4.6 times (length 0.73mm), patella 3.5 times (length 0.70) longer than broad . . . . . *P. novus* Beier

2° Finger 1.2 to 1.3 times longer than chelal hand; only trichobothrium *est* proximal to *st* 3

3 Pedipalps bicoloured, chelal hand darker than femur and patella; palpal femur 4.7-5.3 times (length 0.86mm), patella 3.8-3.9 times (length 0.78-0.79mm) longer than broad; carapace anteriorly with "paving-stone" sculpture . . . . . *P. nigrimanus* sp. n.

3° Pedipalps unicolourous, hand not darker than femur and patella 4

4 Pedipalps and carapace granulate; palpal femur 5.5-6 times longer than broad (length 1.01mm), patella 4.9-5.4 times (length 0.85-1.02mm); carapace anteriorly granulate, with clear microsculpture between granula; telotarsus IV 5.0-5.2 times longer than broad . . . . . *P. gracilis* sp. n.

4* Pedipalps and carapace smooth; palpal femur 5.8 times longer than broad (length 1.12mm), patella 4.7 times (length 1.06mm), telotarsus IV 7.7 times longer than broad . . . . . *P. liliae* sp. n.

The seven previously known species of this genus were recorded in Brazil (1), Chile (2), Colombia (1), Paraguay (2) and Peru (1), all from edaphic localities. The only species previously known from Brazil (*novus* Beier, from Bahia) is not represented in this collection, and the presence of four new species suggests that the genus is widespread in South America south of the Amazon basin and more specious than might have been supposed from earlier data. None of the new species shows any adaptation to permanent cave life.

CHEIRIDIIDAE

Cheiridium itapemirinense (Feio) comb. nov. Figs 48-49

Geogarypus itapemirinensis Feio, 1941: 241, one unnumbered fig.

Material: Espirito Santo, Cachoeira do Itapemirim, lg. R. Gomes de Morais: 2 ♂ (paratypes) (2 slides, MNRJ 10402).

Short description: Carapace triangular (form generally as in *brasiliense* sp. n.), with 2 corneate eyes: someway flattened and broken longitudinally, surface granulate-reticulate; tergites divided, tergite XI visible dorsally, 8 to 10 setae on anterior half-

tergites, sculpturing as on carapace; cheliceral palm with 4 setae, serrula exterior 9 blades, flagellum of 3(?) (left chelicera of 1 specimen) or 4 (right chelicera) blades. Pedipalps (figs 48-49): femur 4.8 times longer than broad (0.31-0.32/0.06-0.07mm), patella 3.2 times (0.24-0.26/0.08), chelal hand 2.1 times (0.24/0.11: 1♂), finger length (1♂) 0.21mm, chela with pedicel 3.8 times (0.43/0.11) (2♂: 4.1 times, 0.41/0.10); teeth not visible. Trichobothria: 7 on fixed, 2 on movable finger, *b* clearly nearer to finger base than to *t*. Leg IV (one ♂): femur+patella 4.8 times (0.26/0.05), tibia 5.1 times (0.20/0.04), tarsus 6.1 times (0.18/0.03) longer than deep.

There is little doubt about the generic assessment of this epigean species. Kury & Nogueira (1999) mention one female paratype from the Rio de Janeiro collection, but I received on loan two slides, each with one mounted male specimen (on one slide the cleared specimen is difficult to observe). Feio (1941) described the male holotype and two paratypes without indicating their sex. Within the Neotropical fauna, it resembles in size and morphometric values *C. chamberlini* Dumitresco & Orghidan from two caves in Cuba, but can be distinguished by the position of trichobothrium *b* of movable chelal finger being much closer to finger base than to *t*; in *chamberlini* the basal trichobothrium (labelled as *st* by Dumitresco & Orghidan, 1981: fig. 3 E) is nearer to *t* than to the finger base.

Cheiridium brasiliense sp. n. Figs 50-54

Material: Bahia, Gruta dos Cristais I, Morro do Chapéu, "em guano do mercego frugivoro", lg. L. S. Horta, 10.IX.1994: 1♂ (holotype) 1♂ (paratype).

Description: All parts light brown; carapace (fig. 50) 0.75 times as long as broad, 2 corneate eyes; surface granulate (slightly star-like) anterior to transverse furrow, granulate-reticulate behind; a small lateral hump on each side anterior to transverse furrow; a shallow granulate depression near posterior margin, which is ornamented (as well as those of the tergites I-VII) with small but prominent granulae; setae curved, slender, with one tiny tooth, 4-5 (the two inner ones clavate) at anterior and 11-12 at posterior margin. All tergites but the last divided, chaetotaxy of half-tergites: I/II 7-8, III-VIII 9-10, IX 7, X 4, XI 4 (whole), lateral setae on IV-X. Apical lobe of palpal coxa with 2 marginal and one discal setae, palpal coxa 6 setae, coxa I/II 5, III 6-7, IV undivided, with grooved anterior margin, posterior corner enlarged; anterior genital operculum with about 24-26 setae, half-tergites with about 6-8 smooth setae plus a dentate lateral seta. Cheliceral palm with 4 smooth setae, 3 teeth on fixed finger, one large subapical tooth on movable finger; galea smooth, serrula exterior 10 lamellae, flagellum of 4 setae.

Pedipalps (figs 51-52) rather slender, granulate, femur fairly abruptly enlarged, 3.9-4.1 times, patella 2.7-2.8 times, club 2.2 times longer than broad and 4.0-4.5 times longer than pedicel, hand with pedicel 1.9-2.0 times longer than broad and 1.2 times longer than finger, chela with pedicel 3.4-3.65 times, fixed finger with 17-18 teeth (proximad *est*), movable finger with 16 teeth reaching to *t*. Trichobothrial pattern as in fig. 53, 7 trichobothria on fixed finger, 2 on movable finger. Legs: no articulation visible between femur and patella of legs; leg IV (fig. 54): femur+patella 4.4-4.6 times,

tibia 4.9-5.1 times, tarsus 5.5-6.1 times longer than deep, arolia undivided and as long as the smooth claws.

Measurements: Carapace 0.28-0.30/0.38-0.40; palps: femur 0.27-0.28/0.07, patella 0.23-0.24/0.08-0.09, hand 0.21/0.10-0.11, finger length 0.17-0.18, chelal length 0.37-0.38; leg IV: femur+patella 0.24-0.25/0.05-0.06, tibia 0.18-0.19/0.04, tarsus 0.15-0.17/0.03.

Discussion: Five species of this genus are currently recorded from the Neotropical region: *itapemirinense* (Feio) from Brazil, *andinum* Vitali-di Castri and *danconai* Vitali-di Castri from Chile, *chamberlini* Dumitresco & Orghidan from caves in Cuba and *insulare* Vitali-di Castri from Guadeloupe. The new species seems to be quite near to *itapemirinense* concerning the main characters, but differs in having slightly stouter pedipalps (femur 3.9-4.1 vs 4.8; patella 2.7-2.8 vs 3.2) and slightly smaller size (palpal femur 0.27-0.28mm vs. 0.30-0.32mm), furthermore the shape of femnur is quite different possessing a slight lateral hump near its base; it differs from *dancouai* by the more slender pedipalps (3.9-4.1 vs 3.2-3.4 times) and the presence of granula at the posterior border of the carapace and anterior tergites. *Ch. chamberlini* (from Cueva de Cativar, Cuba) is larger (palpal femur length 0.32mm), with more slender pedipalps (femur 4.6 times). The North American species *reyesi* Muchmore, from Cot Cave, Texas, is also larger, with a more slender palpal femur, but a much stouter chela (without pedicel) (2.85 vs. 3.4 times). The widely distributed species *Ch. nuuseorum* (Leach) clearly differs from the new species in the shape and measurements of the pedipalps. Within the genus *Cryptocheiridium* the species *brasiliense* n.sp. seems to be quite similar to *lucifugum* Beier from the Batu Caves (Malaya) but this latter species has even more slender pedipalps (femur of male 4.7 times, length 0.42mm) and is much bigger.

In spite of the fact that the new species has four blades in the flagellum and that also tergite XI is visible, it is placed in the genus *Cheiridium*, and not in the genus *Cryptocheiridium*, mainly because of the shape of the pedipalps, the absence of clear "spines" on the borders of carapace and anterior tergites, and the morphology of the vestitural setae (absence of exudate). It is questionable whether the number of flagellar blades (3 in *nuuseorum*, 4 in *subtropicum*, the respective type species) (Judson, 1992; in litt.) can be considered a reliable generic character. In at least two East African species (*perreti* Mahnert and *tumidum* Mahnert from Kenya), 3 or 4 blades have been counted (Mahnert, 1982), and other species placed in *Cheiridium*, such as *Cheiridium chamberlini* from Cuba (Dumitresco & Orghidan, 1981), possess 4 blades in the flagellum. Differences in the number of trichobothria on the chelal finger (8 or 9) are considered to be of generic (Schawaller, 1981) or specific (Callaini, 1985) value, but may simply be due to erroneous observations (e.g. Beier, 1955 for *Cryptocheiridium elgonense*).

Chernetidae

Spelaeochernes gen. n.

Diagnosis: A genus of the family Chernetidae. All parts fairly heavily sclerotized; carapace with two distinct transverse furrows, more or less granulate; without a

central modification (« keel ») at posterior margin ; normally two faint eye-spots present, setae clavodentate; tergites and sternites divided (except XI), last tergite with 2 lateral tactile setae, last sternite with 4 tactile setae; anal cone 2+2 smooth setae; anterior genital operculum of male with about 10 long acuminate setae, surrounded by about 40 shorter ones, that of female with about 25 biserially arranged setae; spermatheca of female with two very short sacs, united at their base; palm of chelicera with 5-7 setae, of which 1-3 are usually finely dentate; galea long, slender, with 6 or more rami, flagellum of 4 blades (one or more dentate). Pedipalps: male chelal hand of some species with an internal, more or less pronounced, setiferous protuberance at finger base, but other species with normal shape, as in female; external and internal accessory teeth present on both chelal fingers; long seta near *ist* absent; trichobothrium *ist* nearly at same level as *est*, *it* nearly at same level as *et*; *st* slightly nearer to *t* than to *sb*; venom apparatus well developed in movable finger, a very small venom duct present in fixed finger; a small number of sense-spots present between *esb* and *est*, and distad *sb*. Legs slender, femur+patella of leg IV at least 3.7 times, tibia at least 5.5 times, tarsus 6.0 times as long as deep, tarsus with a short tactile seta distad of the middle and clearly longer than breadth of tarsus, claws smooth, subterminal seta smooth, curved.

Type species: *Spelaeochernes dentatus* sp. n.

Distribution: Brazil, caves.

Of the genera possessing a flagellum of 4 blades, the new genus is similar to *Semeiochernes* Beier and *Neochelanops* Beier, which share the following characters: trichobothrial pattern, 6-7 seta on cheliceral palm, shape of galea and presence of a short "pseudotactile" seta on tarsus IV. It differs from both genera in the shape of the spermatheca (see figs 112, 113; Mahnert, 1987, fig. 25; Mahnert, 1985, figs 28-30). Muchmore (1999) redefined the genus *Chelanops* Gervais and considered *Neochelanops* a good genus. The spermatheca of *Spelaeochernes* gen. n. seems quite similar to that of *Epichernes* Muchmore (from Mexico) (Muchmore & Hentschel, 1982), but the latter genus has a long tactile seta on tarsus IV.

The genus *Rhopalochernes* Beier (type species *Chelifer ohausi* Tullgren), which has a (pseudo-)tactile seta in the distal half of tarsus IV, clearly differs from the new genus in the following characters: flagellum 3 blades (fide Beier, 1932), morphology of spermatheca (fig. 111) and trichobothrial pattern (fig. 110): *est-ist-it-et* more or less equidistant from each other, *est* clearly in basal half of fixed finger, *st* of movable finger nearer to *sb* than to *t*. The flagellum could not be studied in the syntypes of *Chelifer ohausi* (2♂ 1♀; Mus. Hamburg, Typen Kat. Nr. 260, from Brazil, Rio de Janeiro, Petropolis, in *Bromelia*): two of the specimens lacked the chelicerae and those of the third were not dissected.

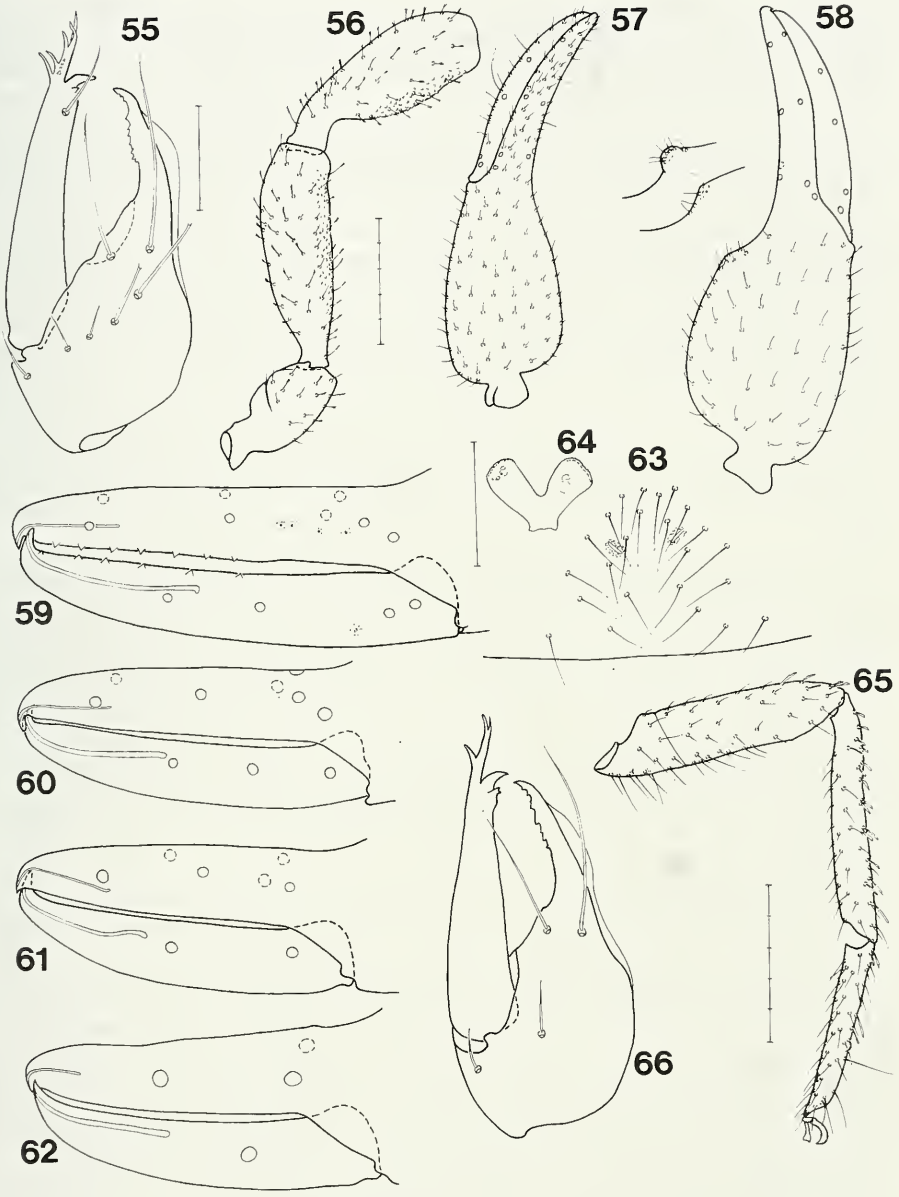
Spelaeochernes dentatus sp. n. Figs 55-66

Chelanops sp. (117); Pinto-da-Rocha, 1995: 85 (SP-02, SP-47)

Material: Paraná, Gruta de Água Boa, Almirante Tamandaré, lg. R. Pinto-da-Rocha, 4.III.1990: 1♀ (holotype) (5317), 1♂ 2♀ (5318); Almirantes Tamandaré, Gruta de Terra Boa, lg. R. Pinto-da-Rocha, 4.III.1990: 1♀ (5318); Gruta da Rocha, Adrianópolis, lg. R. Pinto-da-Rocha & N. Moracchioli, 10.III.1991: 5♂ 1♀ 1T (MZUSP 14106); Gruta Ermidia Paiol do

Alto, Adrianópolis, R. Pinto-da-Rocha & N. Moracchioli lg., 13.III.1991: 1♂ 1♀ (MZUSP 14104); Gruta do Maciel, Adrianópolis, lg. R. Pinto-da-Rocha, 6.III.1991: 6 ex. (MZUSP 14103); Gruta de Olhos d'Água, Campo Largo, 2.IX.1990. lg. R. Pinto-da-Rocha: 1♂ (5325) 1P (5314); Gruta da Lacinha, Rio Branco do Sul, lg. R. Pinto-da-Rocha, 10.I.1988: 1♀ (5316); 31.V.1987: 1T (5570); Gruta de Toquinhas, Rio Branco do Sul, lg. R. Pinto-da-Rocha, 28.VI.1987: 1♂ (5577); Gruta do Toca, Rio Branco do Sul, lg. R. Pinto-da-Rocha, 19.VIII.1989: 1D (5313); Gruta Morro de Pedra, Guaraqueçaba, lg. R. Pinto-da-Rocha, 16.VIII.1987: 3♂ (5575); Gruta do Bom Sucesso, Cerro Azul, lg. R. Pinto-da-Rocha, 3.IV.1991: 2♂ 1♀ (MZUSP 14105); Gruta Paiol de Capim, Cerro Azul, lg. R. Pinto-da-Rocha, 4.IV.1991: 1♀; São Paulo, Caverna Córrego Grande, Iporanga, in guano, lg. E. Trajano, 31.III.1983: 1♀ (MZUSP 10299); Gruta do Betari, Iporanga, lg. P. Gnaspini Netto, 15.X.1988: 1♂ (MZUSP 10303); 27.X.1986, in guano of bloodsucking bats: 2♀ (MZUSP 10302); same cave, lg. E. Trajano & P. Gnaspini, 1.VII.1992: 1♂ (MZUSP 13842); Caverna Morro Preto, Iporanga, lg. P. Gnaspini Netto, 31.VIII.1986: 1D (MZUSP 10296); Caverna Casa de Pedra, Iporanga, in guano of bloodsucking bats, lg. P. Gnaspini Netto, 25.V.1986: 1♂ 1♀ (MZUSP 10304); 15. X.1988: 1♀ 2T (MZUSP 10307); Gruta do Tatu, Iporanga, lg. E. Trajano, 17.IV.1989: 1♂; Gruta do Moquem, Iporanga, Faz. Intervales, lg. E. Trajano & P. Gnaspini: 1♀ (MZUSP 13836); Gruta do Jair, Iporanga, Fazenda Intervales, lg. E. Trajano & P. Gnaspini, 7.X.1990: 2T (MZUSP 13808); Gruta do Tufo, Iporanga, Faz. Intervales, Reg. Figueira, lg. P. Gnaspini, 16.IV.1989: 1♀; Caverna Pescaria, Iporanga, Espírito Santo region, lg. E. Trajano & P. Gnaspini, 8.IV.1990: 1♂ (MZUSP 13815); Gruta da Figuiera, Iporanga, Fazenda Intervales, lg. E. Trajano, 1.III.1990: 3♂ 1♀ 1D (MZUSP 13806); Gruta do Espírito Santo, Iporanga, Caboclos, Espírito Santo region, lg. E. Trajano & P. Gnaspini, 1.VIII.1992: 1♀ (MZUSP 13841); Gruta do Rio Preto, Guapiara, Fazenda Intervales, lg. E. Trajano & P. Gnaspini, 7.X.1992: 1♂ 1P (MZUSP 13839); Gruta dos Pianos, Guapiara, Fazenda Intervales, lg. E. Trajano & P. Gnaspini, 7. X.1992: 1♂ 1T (MZUSP 13837); Gruta Sítio das Cavernas, Ribeirão Grande, Faz. Intervales, lg. E. Trajano & P. Gnaspini, 3.IV.1992: 1♀ (MZUSP 13840); Gruta dos Meninos, Ribeirão Grande, Fazenda Intervales, lg. E. Trajano & P. Gnaspini, 3.IV.1992: 1♀ (MZUSP 13834); Caverna do Grotão, Ribeira, lg. N. Moracchioli, guano de insectivores, 9.III.1991: 4♂ 4♀ 4D 5P (MZUSP 14102); Caverna do Diabo (= Tapagem), Eldorado, lg. P. Gnaspini Netto, 14.X.1987: 1♀ (MZUSP 10307); same cave, lg. E. Trajano & P. Gnaspini, 18.XI.1991: 2♀ (MZUSP 13822) (all paratypes).

Description: Carapace 1.1-1.3 times as long as broad, 2 faint eye-spots present; subbasal transverse furrow (nearly smooth at bottom) slightly nearer to posterior border than to median furrow; pro- and mesozone smooth, other parts scarcely granulate, no central modification ("keel") at posterior margin; 4 setae at anterior and 7-11 at posterior margin, one smooth preocular seta on each side; setae short, clavodentate; tergites divided, anterior ones faintly granulate, posterior ones scaly, mostly 4-5 clavodentate setae (slightly longer on posterior tergites) at posterior border and one median and one lateral anterior seta (III-X), XI 6-8 (2 lateral tactile setae, 2 median discal setae); lobe of pedipalpal coxa with 3 marginal and 1-2 discal setae, pedipalpal coxa mediodistally finely granulate, ca. 50 setae (1 tactile seta), coxa I 15-20, II 18-26, III 22-26, IV 26-36, setae smooth; anterior genital operculum of male 34-41 setae (inner ones longer), of female (fig. 63) 19-25 setae (double-rowed), spermatheca as in fig. 64; sternites divided, faintly scaly, setae long and acuminate: one seta on each stigmal margin, normally 5-7 setae at posterior border of each half sternite, 1 lateral and 1 medial anterior setae on IV-X; XI with 8 setae (2 lateral and 2 medio-discal tactile setae); anal cone 2+2 smooth setae. Chelicera: palm with 6-7 setae (2-3 apically dentate: fig. 55), fixed finger with 5-7 larger and 2-3 tiny teeth, movable finger with tooth-like subapical lobe; galea with 6 rami, flagellum of 4 blades (anterior one



FIGS 55-66

Spelaeochernes dentatus gen.n.sp. n.; 55: chelicera ♀; 56-57: pedipalp ♀; 58: chela ♂, with different expressions of median tubercle; 59-62: trichobothrial pattern of ♀, trito-, deuto- and protonymph; 63-64: female genital operculum and spermatheca; 65: leg IV; 66: chelicera of protonymph; scale unit 0.1mm.

dentate), serrula exterior of 19-23 blades. Pedipalps (figs 56-58) densely granulate, setae dentate, those on basal parts slightly clavate, trochanter with distinct dorsal and indistinct ventral hump, femur slightly club-shaped, 3.2-3.5 times as long as broad, patella 2.6-3.0, club 1.9-2.2, hand with pedicel 1.8-2.0 (female) or 1.7-1.9 (male) times as long as broad and 1.08-1.20 times as long as finger; chela with pedicel 3.1-3.6 (female) or 3.0-3.4 (male) as long as broad, finger 1.48-1.70 (male) or 1.55-1.86 (female) longer than hand breadth; fixed finger with 56-67 marginal teeth and 6-10 exterior and 3-5 interior accessory ones, movable finger with 61-70 marginal, 6-8 external and 2-4 internal accessory teeth; nodus ramosus of venom duct proximad *t*; a few sense-spots on base of movable and fixed finger. Trichobothrial pattern (fig. 59): *ist* at same level as *est* or nearly so, *it* slightly proximad *et*, *et* much nearer fingertip than *est*, which is slightly nearer *ib* than *et* and halfway between *eb* and *et*; *st* slightly nearer *t* than *sb*.

Leg I: femur 1.5-1.8 times, patella 3.6-4.2 times as long as deep and 1.59-1.78 times as long as femur, tibia 5.4-6.3, tarsus 6.3-7.4 times as long as deep; leg IV (fig. 65): femur+patella 4.3-5.1, tibia 6.7-7.4, tarsus 6.5-7.5 times as long as deep, tarsal tactile seta distal (TS= 0.66-0.73); claws smooth, simple, subterminal seta smooth, curved.

Measurements (in mm) of females (males) (n=8/8): carapace 0.92-1.06/0.75-0.86; pedipalps: femur 0.92-1.06/0.26-0.31 (0.91-1.17/0.27-0.35); patella 0.91-1.04/0.32-0.37 (0.91-1.18/0.31-0.41), hand with pedicel 0.93-1.10/0.47-0.57 (0.91-1.11/0.49-0.65), length of pedicel 0.10-0.13, length of finger 0.79-0.97 (0.82-1.02), chelal length (with pedicel) 1.64-1.89 (1.67-2.02); leg I: femur 0.27-0.32/0.16-0.18 (0.27-0.37/0.17-0.21), patella 0.48-0.55/0.13-0.14 (0.47-0.63/0.09-0.13), tibia 0.53-0.62/0.09-0.10 (0.52-0.72/0.09-0.11), tarsus 0.48-0.54/0.07-0.08 (0.48-0.59/0.07-0.08); leg IV: femur+patella 0.83-0.97/0.18-0.21 (0.82-1.04/0.18-0.21), tibia 0.78-0.92/0.11-0.12 (0.78-1.03/0.11-0.13), tarsus 0.58-0.68/0.08-0.10 (0.58-0.71/0.08-0.10), length of tarsal tactile seta 0.13-0.17.

Tritonymph: Carapace 1.3 times as long as broad (0.75/0.55mm), nearly smooth on central surface, laterally granulate: two distinct transverse furrows present; two indistinct eye-spots present; 4 setae on anterior, 8 on posterior border, one preocular seta on each side; tergites nearly smooth (posterior ones indistinctly scaly), half tergites 3-5 setae at posterior margin, III-X with one lateral and medial anterior seta, tergite XI 6 (2 tactile setae, 2 discal setae): lobe of pedipalpal coxa 3 marginal and 1 discal setae, pedipalpal coxa granulate, 26 setae, coxa I 7, II 9, III 10, IV 12; sternite II 7 medial setae, III 3 (no suprastigmal seta), IV 3+1 suprastigmal seta on each side, V-IX 4-5 posterior setae, one lateral and one medial anterior one, X 2-3/1/1, sternite XI 7 (4 tactile setae). Chelicera: hand with 6 setae (one dentate), galea 5 rami; serrula exterior with 18 blades, flagellum 4 setae. Pedipalps granulate, femur 2.9 times as long as broad (0.58/0.20), patella 2.4 (0.55/0.22), pedicel 0.14mm, hand with pedicel 1.9 (0.58/0.30) times as long as broad and 1.06 times as long as finger, length of pedicel 0.06mm, of finger 0.55mm; chela with pedicel 3.6 times as long as broad (length 1.07mm); both fingers with 46 marginal and 2 internal accessory teeth, 5 lateral accessory teeth on fixed finger, 4 on movable finger; trichobothrial pattern as in fig. 60. Leg I: femur 1.6 times as long as broad (0.19/0.12), patella 3.3 times as long as

deep (0.30/0.09) and 1.6 times as long as femur, tibia 4.4 (0.32/0.07), tarsus 5.6 (0.34/0.06) times as long as deep; leg IV: femur+patella 3.6 times (0.55/0.15), tibia 5.5 times (0.51/0.09), tarsus 5.8 times as long as deep (0.40/0.07), tarsal tactile seta in middle (TS=0.57), length 0.13mm.

Deutonymph (n=2): Carapace 1.3 times as long as broad (0.56/0.44mm), only laterally granulate, both transverse furrows distinct, eye-spots faint, 4 setae at anterior, 6 at posterior border; chaetotaxy of half-tergites: I-III 3-4, IV-X 2 posterior setae, one lateral and one medial anterior setae, tergite XI: 6 (2 tactile setae, 2 discal setae); lobe of pedipalpal coxa 3 marginal setae, pedipalpal coxa 13 (1 tactile seta), coxa I 5, II 5-6, III 6-7, IV 7; half-sternites 2-3 posterior setae, one lateral and one medial anterior setae (V-X), sternite XI: 6 (4 tactile setae). Chelicera: hand with 5 setae (one dentate), galea 4 rami, serrula exterior 15 blades, flagellum 4 setae. Pedipalps granulate, femur 2.7 times as long as broad (0.37-0.44/0.14-0.16), patella 2.2 times (0.36-0.42/0.16-0.19), pedicel 0.10-0.12 mm, hand with pedicel 2.0 times as long as broad (0.43-0.49/0.21-0.24) and 1.1 times as long as finger, length of pedicel 0.04-0.05 mm, of finger 0.38-0.43 mm, chela with pedicel 3.6 times as long as broad (length 0.77-0.89); fingers with 38-39 marginal teeth, fixed finger with one lateral and one internal accessory tooth, none on movable finger; trichobothrial pattern as in fig. 61. Leg I: femur 1.4 times as long as deep (0.13/0.09), patella 2.5 times as long as deep (0.19/0.08) and 1.5 times as long as femur, tibia 3.4 (0.21/0.06), tarsus 4.4 (0.22/0.05) times as long as deep; leg IV (n=2): femur+patella 3.3-3.4 (0.37-0.41/0.11-0.12), tibia 4.5-4.6 (0.33-0.36/0.07-0.08), tarsus 4.7-5.0 times as long as deep (0.30-0.32/0.06-0.07), tactile seta in middle (TS=0.55-0.58), length 0.10mm.

Protonymph: Carapace 1.2 times as long as broad (0.44/0.37mm), smooth, medial furrow distinct, subbasal furrow only laterally well marked; eye-spots present, chaetotaxy: 4-6, preocular setae present; half-tergites I-X 3 posterior setae, tergite XI 4 (2 tactile setae, 2 discal setae); lobe of pedipalpal coxa 2 internal marginal setae, pedipalpal coxa 5 (1 tactile seta), coxa I-II 4, III-IV 5; half-sternite III 1, IV 2+1 suprastigmal seta, V-X 3, sternite XI 4 (4 tactile setae). Chelicera (fig. 66): hand with 4 acuminate setae, galea 3 rami, serrula exterior 13 blades, flagellum 4 setae. Pedipalps granulate, femur 2.3 (0.28/0.12), patella 2.1 (0.27/0.13), hand with pedicel 1.9 (0.32/0.17) as long as broad and 1.2 times as long as finger, length of finger 0.27mm; chela with pedicel 3.4 (length 0.58mm). Fingers with 27 marginal teeth, accessory teeth lacking; trichobothrial pattern as in fig. 62. Leg I: femur 1.5 (0.10/0.07), patella 2.3 (0.14/0.06), tibia 3.0 (0.16/0.05), tarsus 4.2 (0.18/0.04) times as long as deep; leg IV: femur+patella 3.6 (0.29/0.08), tibia 4.0 (0.24/0.06), tarsus 4.8 (0.23/0.05) times as long as deep, tarsal tactile seta in middle (TS=0.49).

Etymology: *dentatus* (lat.), refers to the hump on the internal side of male chelal hand.

Spelaeochernes altamirae sp. n. Figs 73-78

Material: Pará, Caverna de Limoeiro, Altamira-Itaituba region, Medicilândia, lg. E. Trajano, 17.X.1988: 1♀ (holotype), 1♂ 1♀ 2T (MZUSP 10286); same data, in guano of insectivorous bats: 1T 1D (MZUSP 10287); Caverna Planaltina, Medicilândia, lg. E. Trajano, 12.X. 1988, in guano of vampire bats: 1♀ (MZUSP 10285); same data: 2♂ 2♀ (MZUSP 10284) (all paratypes).

Description (characters not mentioned are similar to those observed in *dentatus* sp. n.): Body and appendages well sclerotized. Carapace 1.2-1.4 times longer than broad, broadest at middle, both transverse furrows distinct and granulate (nearly smooth in male), subbasal furrow nearer to posterior margin than to median furrow or mid-way between them (1♀); medial surface of pro- and mesozone nearly smooth, that of metazone scarcely, laterally distinctly granulate; setae 6 on anterior, 6-9 on posterior border, one preocular seta on each side. Tergites divided (except XI), anterior ones granulate, posterior ones scaly (ctenoid), setae clavodentate, not much longer on last tergites, each half-tergite with 4-5 posterior setae, XI 6-8. Pedipalpal coxa medially and laterally granulate, 30-37 setae (1 tactile seta), coxa I 9-14, II 14-17, III 16-19, IV 26-32 (setae smooth, acuminate); anterior genital operculum of female with a double row of 16-18 setae, that of male with 28 setae arranged in a two-rowed semi-circle (inner setae much longer); spermatheca with paired, very short sacs (fig. 77), genital chamber of male with 2x2 short smooth setae; sternal chaetotaxy: mostly 5-8 posterior setae (III 3, IV 1 suprastigmal setae), XI: 6-7. Intersegmental membrane undulate, pleural membrane papillose. Palm of chelicera 6-7 setae (fig. 73), 1-3 apically dentate, galea with 6 rami, serrula exterior of 18-19 blades. Pedipalps (figs. 74-75) distinctly, hand indistinctly granulate; setae short, dentate and slightly clavate; femur with short pedicel, distally not broadened, 3.7-4.2 times as long as broad, patella 3.2-3.3 times, club 2.5 times, hand with pedicel 2.0-2.3 times as long as broad and 1.08-1.14 times as long as fingers, chela with pedicel 3.6-4.2 (without 3.3-4.0) times as long as broad. Fixed finger with 51-54 marginal teeth, 1-4 lateral and one internal accessory teeth, movable finger with 51-62 marginal, 0-1 lateral and 0 internal accessory teeth. Trichobothrial pattern (fig. 76): *ist* distad *est* (1♀: both at same level), *st* slightly nearer to *st* than to *sb*; nodus ramosus between *t* and *st*, usually somewhat nearer to *t*. Leg I: femur 1.8-2.0 times as long as deep, patella 3.7-4.5 as long as deep and 1.50-1.72 times as long as femur, tibia 5.7-6.2 times, tarsus 6.8-7.5 times as long as deep; leg IV (fig. 78): lateral/dorsal setae slightly clavodentate, internal ones acuminate; femur+patella 4.5-5.0, tibia 6.9-7.6 times as long as deep and 1.21-1.34 times as long as tarsus, tarsus 6.6-7.5 times as long as deep, a short acuminate seta (as long as breadth of tarsus) in distal third (TS=0.65-0.72).

Measurements (in mm) (n: 5♀ 3♂): Carapace 0.67-0.78/0.51-0.60; pedipalps: femur 0.70-0.77/0.17-0.21, patella 0.65-0.72/0.20-0.23, pedicel 0.14-0.19, hand with pedicel 0.64-0.75/0.27-0.36, pedicel 0.07-0.10, finger length 0.59-0.66, chelal length (with pedicel) 1.16-1.36; leg I: femur 0.22-0.25/0.11-0.13, patella 0.34-0.41/0.07-0.10, tibia 0.39-0.47/0.06-0.07, tarsus 0.39-0.45/0.05-0.06; leg IV: femur+patella 0.62-0.71/0.13-0.14, tibia 0.58-0.67/0.08-0.09, tarsus 0.44-0.51/0.06-0.07, length of tarsal tactile seta 0.08-0.09.

Tritonymph: Half-tergites with 3-4 posterior setae and (III-X) one anterior lateral and medial one, sternite II with 4 (2-2) medial setae, half-sternites with 4-5 (6) marginal setae and one medial (VI) and one lateral (VIII) anterior one; palm of chelicera with 5-6 setae (one dentate), galea with 5 branches, serrula exterior 17 blades, flagellum with 4 setae (distal one dentate). Pedipalps: Femur 3.1 times as long as broad (0.49/0.16mm), patella 2.5 times (0.48/0.18), hand with pedicel 1.9 times

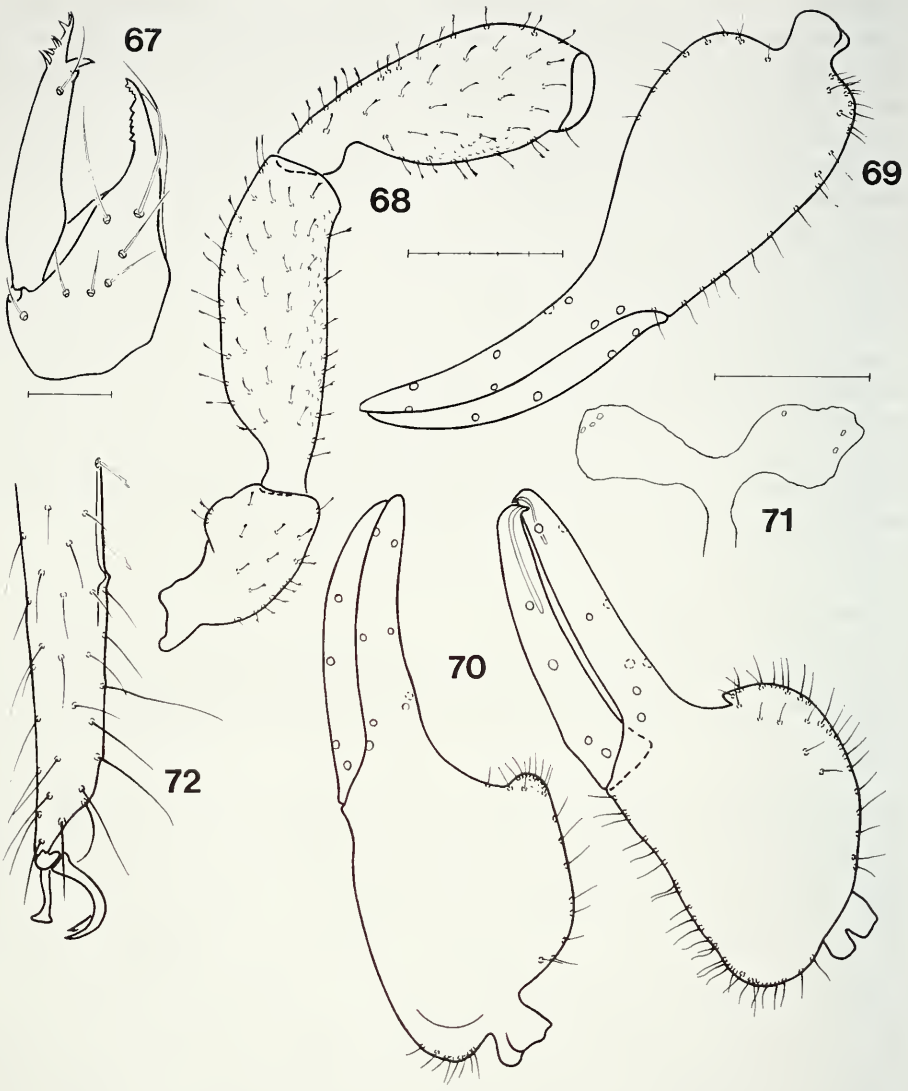
(0.50/0.26) as long as broad and 1.08 times as long as finger, finger length 0.46mm, chela with pedicel 3.5 times (length 0.92mm); fixed finger with 46 marginal teeth and one interior accessory tooth, movable finger with 47 marginal teeth, no accessory teeth. Leg I: femur 1.8 times (0.18/0.10), patella 3.3 times (0.25/0.08) times as long as deep and 1.45 times as long as femur, tibia 4.8 times (0.28/0.06), tarsus 5.7 times (0.30/0.05) as long as deep. Leg IV: femur+patella 4.3 times (0.47/0.11), tibia 6.0 times (0.42/0.07) as long as deep and 1.2 times as long as tarsus, tarsus 6.0 times (0.35/0.06), with short smooth subapical seta (TS=0.65, length 0.07mm).

Deutonymph: Carapace 1.3 times as long as broad (0.45/0.35mm), 6 setae on anterior and posterior border; half tergites I-III 3 setae, IV-IX 1 posterior, 1 lateral and 1 medial anterior seta, XI 6 (2 medial discal and 2 tactile setae); half sternites with 4-5 posterior setae. Chelicera: palm with 5 setae (one dentate), serrula exterior 14 blades, flagellum 4 setae. Pedipalps granulate, femur 2.9 times as long as broad (0.34/0.12), patella 2.4 times (0.32/0.14), hand with pedicel 2.0 times (0.38/0.19) as long as broad and 1.24 times longer than finger, finger length 0.30mm, chela with pedicel 3.6 times, length 0.66mm; fixed finger apically broken, movable finger 35 teeth, no accessory teeth. Leg IV: femur+patella 4.0 times (0.33/0.08), tibia 5.0 times (0.29/0.06), tarsus 5.5 times (0.26/0.05); length of "tactile" seta 0.06mm, TS=0.62.5.

Spelaeochernes armatus sp. n. Figs 67-72

Material: Santa Catarina, Gruta de Botuverá, Botuverá, 27°13'S/49°09'W, lg. R. Pinto-da-Rocha, 17.-19.I.1998: 1♀ (holotype), 1T 1P (MZUSP 16593); same cave, lg. R. Pinto-da-Rocha & Sessegolo, 5.-6.II.1998: 1♂ 1D (MZUSP 16595); Gruta de Botuverá II, Botuverá, lg. R. Pinto-da-Rocha & Sessegolo, 5.-6.II.1998: 1♂ (MZUSP 16594) 2T (MZUSP 16596) (paratypes).

Description: Carapace with two distinct, transverse, only slightly granulate furrows, subbasal one slightly nearer to posterior margin than to median furrow and curved backwards, median parts of pro- and mesozone smooth, otherwise coarsely granulate, 4-6 + 1 smooth preocular seta at anterior, 11-12 at posterior border (with some supplementary submarginal setae), 1.2-1.3 times as long as broad; tergites divided (except XI), anterior ones granulate, posterior ones (XI included) ctenoid-scaly, with 4-7 posterior setae, XI 8; setae on anterior tergites clavate and dentate, on XI dentate; palpal coxa laterally granulate, about 35 (1 tactile seta), coxa I 16-21, II 21-22, III 20-22, IV about 30; anterior genital operculum of male with about 35 smooth setae arranged in two rows, that of female with about 30 setae; spermatheca as in fig. 71; entrance of male genital chamber with 3 smooth setae on each side, half-sternites mostly with 6-8 (9) posterior setae, III 3 suprastigmatal setae, IV 1 suprastigmal seta, XI 8 setae, coxal and sternal setae smooth and pointed; pleural membrane granulate. Chelicera (fig. 67): palm 6-7 smooth setae (in one female two setae apically indistinctly dentate), galea 8-10 branches, serrula exterior 21-22 blades. Pedipalps (figs 68-70): trochanter, femur and patella coarsely granulate, femur gradually enlarged from pedicel, club-shaped, 3.1-3.3 times as long as broad, lateral setae slightly longer than medial ones and more clavate, patella 2.7-3.0 times, club 1.9-2.3 times as long as broad, hand nearly smooth, in male with a dorsodistal anteriad-



FIGS 67-72

Spelaeochernes armatus sp. n.; 67: chelicera; 68-70: pedipalp (69: ♀; 70: male chela in different positions); 71: spermatheca; 72: tarsus of leg IV; scale unit 0.1mm (71: 0.05mm).

directed and granulate protuberance, the ventrobasal angle of female with a setose patch, with pedicel 1.5 (♂) or 1.8-1.9 (♀) times as long as broad and 1.0-1.1 times longer than finger, fingers not gaping, 1.43 (♂) or 1.64-1.78 (♀) longer than hand breadth; chela with pedicel 2.5 (♂) or 3.1-3.4 times as long as broad; fixed finger with

58-61 marginal teeth, 9-11 external and 4-5 internal accessory teeth, movable finger with 63-67 marginal, 7-9 external and 3 internal accessory teeth. Trichobothria: *ist* and *est* at same level in middle of the finger, *it* slightly proximal to *et*, 3-4 sense-spots between *esb* and *est*, *st* closer to *t* than to *sb*, 2 sense-spots between *sb* and *st*; nodus ramosus proximad *t* and *it*. Leg I: femur 1.65-1.8 times, patella 3.5-4.1 times as long as deep and 1.6-1.7 times longer than femur, tibia 5.6-6.2 times, tarsus 6.6-6.9 times; leg IV: femur+patella 4.7-4.8 times, tibia 6.9-7.6 times, tarsus with a short tactile seta in subdistal position (TS=0.65-0.71), 6.0-7.6 times as long as deep.

Measurements (1♂; 2♀ in parentheses): Carapace 1.13/0.92 (1.01.-1.10/0.80-0.90); Pedipalps: femur 1.08/0.40 (1.00-1.07/0.31-0.33), patella 1.08/0.40 (0.99-1.07/0.34-0.38), hand with pedicel 1.03/0.70 (1.01-1.10/0.55-0.63), finger length 1.00 (0.98-1.03), chelal length with pedicel 1.74 (1.89-2.02); Leg I (♂ ♀): femur 0.33-0.34/0.18-0.21, patella 0.54-0.57/0.13-0.16, tibia 0.61-0.66/0.10-0.12, tarsus 0.55-0.59/0.08-0.09; Leg IV: femur+patella 0.91-1.01/0.19-0.21, tibia 0.90-0.95/0.12-0.13, tarsus 0.64-0.60/0.09-0.11, length of tarsal tactile seta 0.14-0.15.

Etymology: *armatus* (lat.), refers to presence of a strong protuberance on the male chelal hand.

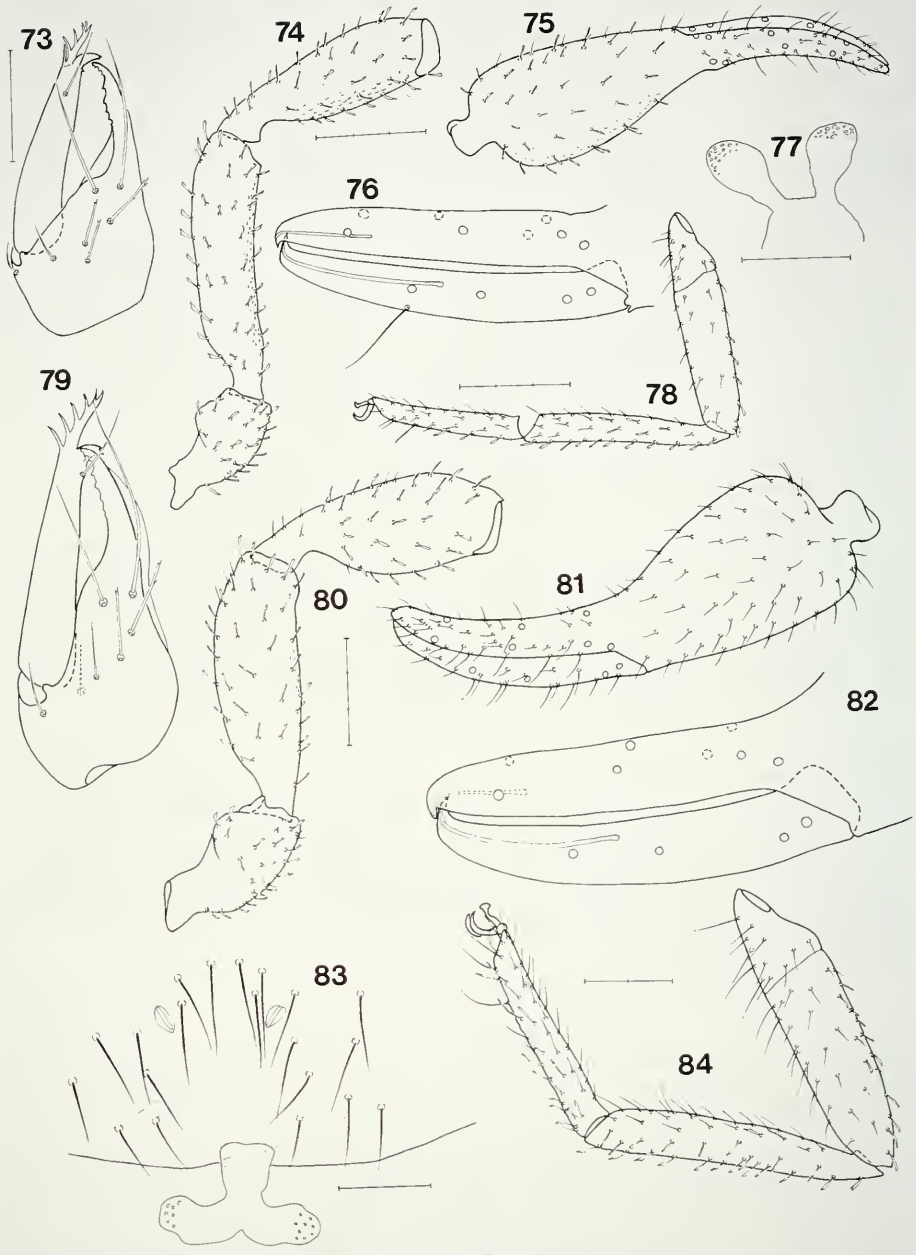
Discussion: Close affinities apparently exist between this new species and *dentatus* sp. n., as indicated by the shared presence of a more or less pronounced protuberance on the male palpal hand, a gradually enlarged palpal femur and the non-gaping chelal fingers. *Sp. armatus* can be distinguished from *dentatus* by the shape of the male chelal hand (protuberance much stronger), the setiferous basoventral corner of the hand in both sexes and the number of galeal branches (9-10 vs. 6).

Spelaeochernes bahiensis sp. n. Figs 85-90

Chelanops sp. (117); Pinto-da-Rocha, 1995: 85 (BA-72; BA-BOD, BA-POC)

Material: Bahia, Poço Encantado, Itaetê, lg. E. Trajano & P. Gnaspini, 1.IX.1991: 1♀ (holotype), 1♂ (paratype) (MZUSP 13780); Lapa do Bode, Itaetê, lg. E. Trajano & P. Gnaspini, 4.IX.1991: 1♂ 1£ (MZUSP 13779); Gruta da Gameleira, Campo Formosa, lg. L. Horta Senna, 2.I.1994: 1♂; Lapa II (Santa Rita cave system), Iraquara, lg. E. Trajano & P. Gnaspini, 5.IX. 1991: 1♂ (MZUSP 13781) (paratypes).

Description: Pedipalps and carapace reddish-brown, tergites widely divided, yellowish-brown; carapace with two distinct transverse granulate furrows, subbasal one curved backwards and nearer to posterior margin than to median furrow, coarsely granulate, no central modification at posterior border, 4 + 1 dentate preocular seta at anterior, 6-8 at posterior border; tergites divided (except I, XI), anterior ones granulate, posterior ones (XI included) ctenoid-scaly, with 4-5 posterior setae, XI 7-8; palpal coxa distally granulate, 21-30 (I tactile seta), coxa I 8-10, II 8-14, III 9-14, IV 13-21; anterior genital operculum of male with about 35 smooth setae arranged in two rows, that of female with about 20 setae; spermatheca as in fig. 89; entrance of male genital chamber with 1-3 smooth setae on each side, half-sternites mostly with 3-4 posterior setae, III 2 suprastigmatal setae, IV 1 suprastigmal seta, XI 6-8, coxal and sternal setae smooth and pointed. Pleural membrane with pointed granula. Chelicera (fig. 85): palm 5-6 setae (I or 2 indistinctly dentate), galea 6 branches, serrula exterior 18-20 blades.



FIGS 73-84

73-78: *Spelaeochernes altamirae* sp. n.; 73: chelicera; 74-76: pedipalp; 77: spermatheca; 78: leg IV; 79-84: *Spelaeochernes dubius* sp. n.; 79: chelicera (stippled: supplementary seta on right cheliceral palm); 80-82: pedipalp; 83: genital operculum and spermatheca; 84: leg IV; scale unit 0.1mm (77, 83: 0.05mm).

Pedipalps (figs 86-88): trochanter coarsely granulate, femur and patella densely granulate, femur gradually enlarged at base, club-shaped, 3.1-3.3 (♂) or 3.4-3.5 (♀) times as long as broad, lateral setae slightly longer than medial ones and more clavate, patella 2.5-2.7 (♂) or 2.75-2.9 (♀) times, club 1.8-2.0 (♂) or 2.05-2.2 (♀) times as long as broad, hand medially finely granulate, with pedicel 1.7 (♂) or 1.8-2.0 (♀) times as long as broad and 1.1-1.2 times longer than finger, finger 1.35-1.57 (♂) or 1.59-1.74 (♀) longer than hand breadth; chela with pedicel 2.9-3.1 (♂) or 3.3-3.5 (♀) times as long as broad; palpal fingers clearly gaping (movable finger curved), fixed finger with 45-50 (♂) or 51-55 (♀) marginal teeth, 6-9 external and 3-5 internal accessory teeth, movable finger with 48-51 (♂) or 56-57 (♀) marginal, 3-6 external and 2-4 internal accessory teeth. Trichobothria: *ist* and *est* more or less at same level in middle of the finger, *it* proximad *et*, three sense-spots between *esb* and *est*, *st* halfway between *sb* and *t*, one modified seta distad *st*, 2 sense-spots between *sb* and *st*; nodus ramosus proximal to *t* and near *it*. Leg I: femur 1.7-2.0 times, patella 3.8-4.8 times as long as deep and 1.62-1.78 times longer than femur, tibia 6.1-7.4 times, tarsus 6.7-8.3 times longer than deep; leg IV (fig. 90): lateral setae of femur and tibia clavate, femur+patella 4.6-5.8 times, tibia 7.3-8.8 times, tarsus 7.3-8.1 times as long as deep, with a slightly longer, smooth seta in subdistal position (TS=0.72-0.73).

Measurements (in mm): carapace 0.77-0.87/0.60-0.67; pedipalps: femur 0.72-0.87/0.23-0.28, patella 0.71-0.84/0.27-0.32, hand with pedicel 0.72-0.87/0.41-0.50, finger length 0.65-68 (♀: 0.70-0.76), chela with pedicel 1.28-1.53; leg I: femur 0.21-0.28/0.12-0.15, patella 0.37-0.50/0.10-0.12, tibia 0.42-0.55/0.07-0.08, tarsus 0.36-0.46/0.05-0.6; leg IV: femur+patella 0.64-0.84/0.13-0.16, tibia 0.61-0.80/0.08-0.10, tarsus 0.45-0.54/0.06-0.07, length of tarsal tactile seta 0.08-0.09.

Etymology : refers to the state of Bahia.

Spelaeochernes dubius sp. n. Figs 79-84

Chelanops sp. (117): Pinto-da-Rocha, 1995: 85 (SP-170, SP-VIS).

Material: São Paulo, Fazenda da Toca (sandstone cave), Serra Geral region, Analândia, lg. E. Sterlino Bergo, 1.V.1982: 1♀ (holotype); Vista da Cachoeira (sandstone cave), Serra Geral region, Ipeúna, lg. E. Trajano & P. Gnaspini, 26. X.1991: 5♂ (MZUSP 13825); Gruta Fazendão (sandstone cave), Serra Geral region, Ipeúna, lg. Santas & Bichurt, X.1977: 2 ex. (in poor condition); same cave, lg. Biaker, 8. VI.1997: 1♀ (MZUSP 16588); Gruta do Bocão, Fazenda Intervales, Iporanga, lg. P. Gnaspini Netto, 30.VII.1988: 1♀ (paratype) (MZUSP 10292); Minas Gerais, Gruta Córrego do Capão, Capim Branco, lg. L.S. Horta, 26. I.1992: 1♀; Gruta do Intoxicado, Pedro Leopoldo, em guano, lg. L.S. Horta, 1. VII.1995: 2♀ 1T 2D; Buraco (=Lapa) do Medo, Sete Lagoas, lg. L.S. Horta, 30. IV.1995: 1♀; Mato Grosso do Sul, Gruta Harmonia, Bonito, lg. E Trajano & P. Gnaspini, 22.VII.1992: 1♂ 2♀ 1D (MZUSP 13788); Gruta Pitangueiras, Bonito, lg. E. Trajano & P. Gnaspini, 16.VII.1992: 1♀ (MZUSP 13793); same cave, lg. J.J. Geoffroy, 15.IV.1998: 2♂ 1♀ (MZUSP 16583); Gruta Lago Azul, Bonito, lg. E. Trajano & P. Gnaspini, 19.X.1990: 1♂ (all paratypes).

Description: Carapace laterally granulate, two distinct, smooth transverse furrows present, subbasal one straight and slightly nearer to posterior border than to medial furrow, 4 setae + one nearly smooth preocular seta at anterior and 10 setae at posterior margin; tergites divided (except XI), anterior ones granulate, posterior ones

scaly, intersegmental membrane granulate, half-tergites with 4-6 posterior setae, XI 8; palpal coxa laterally granulate, with microsculpture, about 30 setae, coxa I 9-17, II 11-25, III 14-23, IV 24-31; anterior genital operculum of male with 32 setae (inner ones longer), that of female with about 20 setae, spermatheca as in fig. 83; entrance of genital chamber with 2-3 setae on each side, half sternites normally with 6-8 posterior setae, III with 3, IV with 1 suprastigmal seta, V-X also with a lateral and medial anterior seta, sternite XI 8 setae; pleural membrane with pointed granula, intersegmental membrane of sternites undulate. Chelicera (fig. 79): palm with 6-7 setae (normally 2 dentate; one male apparently with only smooth setae), serrula exterior normally 19-20 blades, galea with 6 branches. Palps (figs 80-81) coarsely granulate, only hand finely granulate, trochanter with distinct dorsal hump, femur gradually enlarged from pedicel, lateral seta clavodentate and longer than dentate medial setae, 3.0-3.6 times as long as broad, patella 2.5-2.9 times, club 1.8-2.1 times as long as broad and 2.4-3.0 times longer than pedicel, hand with pedicel 1.6-1.9 times as long as broad and 1.02-1.22 times longer than finger, finger 1.39-1.59 (♂) or 1.51-1.80 (♀) longer than hand breadth; chela with pedicel 2.8-3.4 times as long as broad; fixed finger with 50-66 marginal and 5-10 external and 3-4 internal accessory teeth, movable finger with 52-66 marginal, 4-6 external and 1-3 internal teeth. Trichobothria (fig. 82): ist slightly distad or proximad *est*, 3-4 sense-spots between *esb* and *est*, 0-2 near *sb*, a short slightly lanceolate seta and a sensillum distal to *st*. Leg I: femur 1.6-1.8 times, patella 3.4-4.3 times as long as deep and 1.66-1.84 times longer than femur, tibia 5.0-6.6 times, tarsus 6.1-7.9 times as long as deep; leg IV (fig. 84): femur+patella 4.1-5.0 times, tibia 6.3-7.8 times, tarsus 6.4-8.1 times as long as deep, with distinct, short tactile seta.

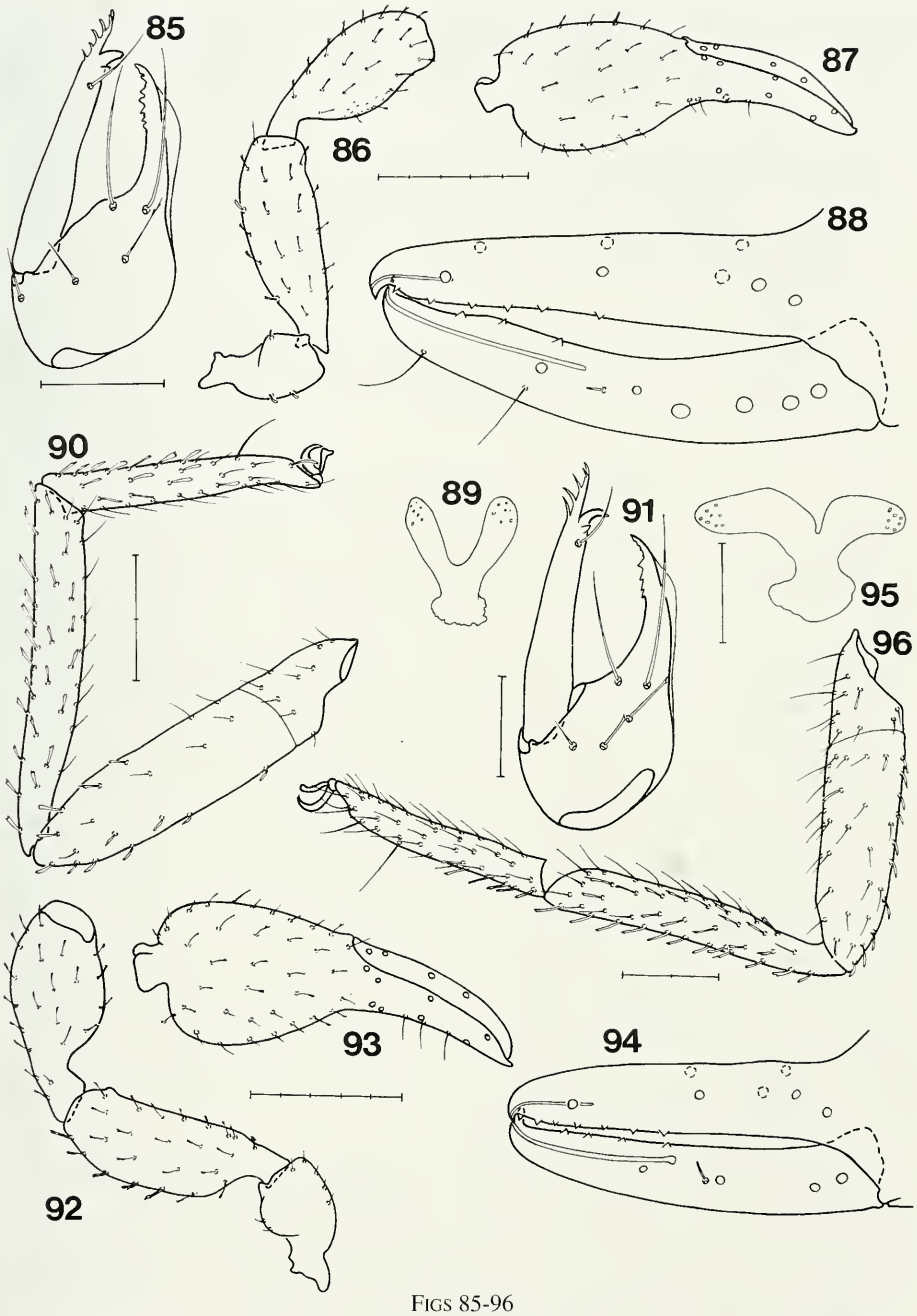
Measurements (in mm) (12♂ 9♀): Carapace 0.72-0.99/0.63-0.73; palps: femur 0.71-1.02/0.24-0.27, patella 0.69-0.93/0.24-0.35, hand with pedicel 0.66-1.04/0.40-0.60, finger length 0.66-0.94, chelal length with pedicel 1.30-1.83; leg I: femur 0.22-0.31/0.13-0.18, patella 0.37-0.55/0.10-0.14, tibia 0.41-0.62/0.07-0.10, tarsus 0.37-0.50/0.06-0.07; leg IV: femur+patella 0.66-0.90/0.15-0.19, tibia 0.65-0.88/0.10-0.12, tarsus 0.45-0.63/0.07-0.08, length of tarsal tactile seta (0.08) 0.11-0.14mm.

Etymology : *dubius* (lat.), refers to the doubts on its taxonomical identity I had in studying the first specimens.

Spelaeochernes eleonorae sp. n. Figs 91-96

Chelanops sp. (117): Pinto-da-Rocha, 1995: 85 (GO-66, MG-396).

Material: São Paulo, Gruta Sertãozinho da Baixo, Altinópolis, lg. E. Trajano, 23.III.1984: 1£ (holotype) 1♂ (paratype) (MZUSP 10290); Goiás, Gruta dos Ecos, Corumba de Goias, lg. E. Trajano, 11.IX.1988: 1♂ (MZUSP 10288); Gruta Qualquer Coisa, Pedro Bernardo, lg. Gregeo, 8.IV.1989: 2♂ 1♀; Minas Gerais, Gruta Tamboril, Unai, lg. Gregeo, 22.V.1989: 1♀ 1T (MZUSP 13801); Lapa Vermelha I, Pedro Leopoldo, in guano, lg. L Senna Horta, 28.X.1995: 1♂ 1T 1D; Lapa das Pacas, Lagoa Santa, lg. L. Senna Horta, 22.VII.1995: 1♀; Gruta da Dobra, Lagoa Santa, in guano, lg. L. Senna Horta, 20.VII.1995: 1 T; Mato Grosso do Sul, Gruta do Guaviral, Bonito, lg. E. Trajano & P. Gnaspini, 29.VII.1992: 1♀ (MZUSP 13787); Gruta do Mimoso, Bonito, lg. E. Trajano & P. Gnaspini, 18.X.1990: 2T (MZUSP 13791); Gruta do Ametista, Bonito, lg. E. Trajano & P. Gnaspini, 17.X.1991: 1♂ 1T (MZUSP 13783); Gruta



FIGS 85-96

85-90: *Spelaeochernes bahiensis* sp. n. ♀; 85: chelicera; 86-88: pedipalp; 89: spermatheca; 90: leg IV; 91-96: *Spelaeochernes eleonorae* sp. n. ♀; 91: chelicera; 92-94: pedipalp; 95: spermatheca; 96: leg IV; scale unit 0.1mm (89, 95: 0.05mm).

Vale do Prata, Bonito, lg. E. Trajano & P. Gnaspini: 2♂ (MZUSP 13797); same cave, lg. E. Trajano & P. Gnaspini, 17.VII.1992: 1♂ (MZUSP 13798); Gruta Joao Arruda, Bonito, lg. E. Trajano, 18.X.1990: 1♂ 1♀ 2T; Gruta do Curé, Bonito, lg. E. Trajano & P. Gnaspini, 17.X.1990: 1T (MZUSP 13784); Gruta Dona Matilde, Bonito, lg. E. Trajano & P. Gnaspini: 1♀ (MZUSP 13786); Gruta do São Miguel, Bonito, lg. E. Trajano & P. Gnaspini, 20.X.1990: 1♂ (MZUSP 13796); Gruta São Miguel (=Carneiro), Bonito, lg. R. Pinto-da-Rocha & Sessegolo: 4♂ 3♀ 2T (MZUSP 16592); Caverna Santa Maria, Jardim, lg. E. Trajano & P. Gnaspini, 20.VII.1991: 1♀ (MZUSP 13795); Gruta do X-Coqueiro, Jardim, lg., E. Trajano & P. Gnaspini, 28.VII.1991: 1♂ (MZUSP 13799); Abismo do Poço, Jardim, lg. E. Trajano & P. Gnaspini, 18.VII.1992: 1♂ (MZUSP 13794) (all paratypes).

Other material (non-type): Minas Gerais, Gruta Jean Louis, Sete Lagoas, lg. F. Chalmowicz, 1984: fragments.

Description: Carapace laterally granulate, with microsculpture between granula, two distinct, granulate transverse furrows present, subbasal one slightly curved backwards and half-way between posterior margin and median furrow, 4 setae + one nearly smooth preocular seta at anterior and 8-10 setae at posterior margin; tergites divided (except XI), scaly, half-tergites with 4-6 posterior setae, XI 8; palpal coxa laterally granulate, with microsculpture, about 32-37 setae, coxa I 12-15, II 13-17, III 14-18, IV 18-37; anterior genital operculum of male with 27-32 setae, that of female with a central group of 17-26 setae; spermatheca with two short tubes (fig. 95), entrance of genital chamber with 2/3 setae; half sternites normally with 5-7 posterior setae, III with 3, IV with 1 suprastigmal seta, XI 8 setae; pleural membrane with pointed granula. Chelicera (fig. 91): palm with 6-7 setae, 1 or 2 apically dentate, serrula exterior 17-20 blades, galea with 6 branches (shorter in male). Palps (figs 92-93) coarsely granulate, only hand finely granulate, femur abruptly enlarged from pedicel, (2.5)2.7-3.1 times as long as broad, lateral setae clavodentate and longer than dentate medial setae, patella 2.3-2.7 times, club 1.7-1.9 times as long as broad and 2.54-2.89 times longer than pedicel, hand with pedicel 1.6-1.8 times as long as broad and 1.09-1.26 times longer than finger, finger 1.30-1.63 times longer than hand breadth, chela with pedicel 2.7-3.2 times as long as broad; fixed finger with 45-55 marginal, 5-8 external and 3-4 internal accessory teeth, movable finger with 49-58 marginal, 4-8 external and 2-4 internal teeth. Trichobothria (fig. 94): *ist* at same level as *est*, 3 sense-spots between *esb* and *est*, 1-3 between *sb* and *st*, a short slightly lanceolate seta and a sensillum distal to *st*. Leg I: femur 1.6-1.9 times, patella 2.9-3.9 times as long as deep and 1.57-1.84 times longer than femur, tibia 4.9-6.4 times, tarsus 5.8-7.4 times as long as deep; leg IV (fig. 96): femur+patella 3.7-4.7 times, tibia 5.6-7.4 times, tarsus 6.1-7.5 times as long as deep, with distinct, short tactile seta (TS=0.66-0.71); arolia undivided, shorter than claws, subterminal seta curved and smooth.

Measurements (in mm): Carapace 0.77-0.95/0.63-0.77; palps: femur 0.69-0.98/0.25-0.32, patella 0.68-0.86/0.28-0.37, hand with pedicel 0.71-0.92/0.44-0.57, finger length 0.60-0.81, chelal length with pedicel 1.21-1.67; leg I: femur 0.21-0.28/0.14-0.17, patella 0.35-0.53/0.11-0.15, tibia 0.39-0.58/0.08-0.10, tarsus 0.36-0.47/0.06; leg IV: femur+patella 0.64-0.87/0.14-0.20, tibia 0.58-0.80/0.09-0.12, tarsus 0.45-0.60/0.07-0.08, length of tarsal tactile seta 0.10-0.13 mm.

Etymology: named for Dra Eleonora Trajano who is promoting biospeleogical research since many years.

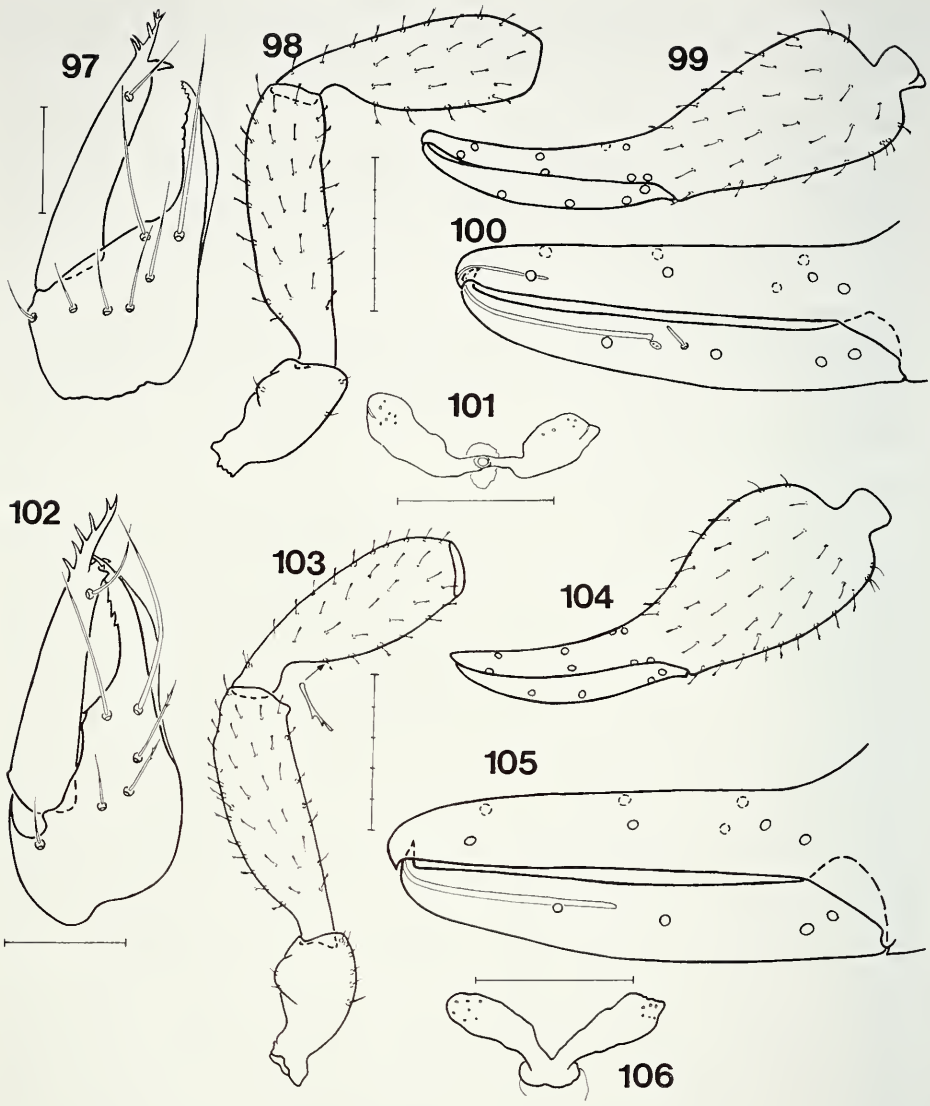
Tritonymph: Similar to adults; carapace with 6 setae at posterior margin; palm of chelicera with 5-6 setae, galea with 5 branches; palps: patella 2.2-2.3 times as long as broad (0.49/0.22mm), chela with pedicel 3.1-3.2 times (0.95/0.29-0.31).

Spelaeochernes gracilipalpus sp. n. Figs 97-101

Material: São Paulo, Gruta dos Paiva, Iporanga, Fazenda Intervales, lg. E. Trajano, X.1996: 1♀ (holotype) 1 deutonymph; same cave, on excrement, lg. R. E. Pinto-da-Rocha, 22.VIII.1998: 1♀; Gruta do Fóssil Desconhecido, Iporanga, Fazenda Intervales, lg. E. Trajano & P. Gnaspini, 8.X.1989: 1♀ (MZUSP 13807); Gruta Jane Mansfield, Iporanga, Fazenda Intervales, lg. E. Trajano & P. Gnaspini, 25.III.1989: 1♀ (MZUSP 13809); Gruta da Cabeça de Paca, Iporanga, Fazenda Intervales, lg. E. Trajano & P. Gnaspini, 17.XI.1990: 1♀ (MZUSP 13805); Gruta do Minotauro, Iporanga, Fazenda Intervales, lg. E. Trajano & P. Gnaspini, 25.II.1990: 1 T (MZUSP 13811); Gruta do Chapéu, Iporanga, Espírito Santo region, lg. E. Trajano & P. Gnaspini, 10.IV.1990: 1♂ (MZUSP 13814); Caverna Arataca, Iporanga, Espírito Santo region, lg. E. Trajano & P. Gnaspini, 28.III.1991: 1 tritonymph (MZUSP 13813); Caverna Temimina II, Iporanga, Espírito Santo region, lg. E. Trajano & P. Gnaspini, 9.IV.1990: 1♀ 2 tritonymphs (MZUSP 13816) (all paratypes).

Other material (non-type): Minas Gerais, Gruta dos Irmãos Piría, Matozinhos, lg. L. S. Horta, 14.XII.1991: 1♂ (MZUSP 13833).

Description: Carapace with two distinct transverse smooth furrows, subbasal one closer to posterior margin than to median furrow, median parts of pro- and mesozone smooth, otherwise coarsely granulate, 4-6 + 1 smooth preocular seta at anterior, 8-9 at posterior border, 1.2-1.4 times as long as broad; tergites divided (except XI), anterior ones granulate, posterior ones (XI included) ctenoid-scaly, normally with 4-6 posterior setae, XI 8; setae on anterior tergites clavate and dentate, on XI dentate; palpal coxa laterally granulate, about 35 (1 tactile seta), coxa I 18, II 23, III 28, IV about 40; anterior genital operculum with about 30 (male) smooth setae arranged in two rows, that of female with about 20 setae, spermatheca as in fig. 101; entrance of genital chamber with 3 smooth setae on each side, half-sternites mostly with 6-8 posterior setae, III 3 suprastigmatal setae, IV 1 suprastigmal seta, XI 8 setae, coxal and sternal setae smooth and pointed; pleural membrane granulate. Chelicera (fig. 97): palm 6-8 smooth setae, galea 6 branches, serrula exterior 20-21 blades. Pedipalps (figs 98-99): trochanter, femur and patella granulate, hand indistinctly granulate; femur gradually enlarged from pedicel, slightly club-shaped, 3.6-3.8 times as long as broad, lateral setae slightly longer than medial ones and more clavate, patella 2.9-3.3 times, club 2.2-2.4 times as long as broad, setae dentate, hand finely granulate, lateral margin nearly straight, with pedicel 1.9-2.1 times as long as broad and 1.1 times longer than finger, 1.7-2.0 longer than hand breadth; chela with pedicel 3.4-3.9 times as long as broad; fingers not gaping, fixed finger with 58-67 marginal teeth, 6-10 external and 2-4 internal accessory teeth, movable finger with 62-72 marginal, 4-10 external and 1-2 internal accessory teeth. Trichobothria (fig. 100): *ist* normally slightly distad *est*, *st* normally half-way between *t* and *sb*, 3-4 sense-spots between *esb* and *est*, no sense-spots between *sb* and *st*, a small lanceolate seta near *st*; nodus ramosus proximad *t* and proximad *it*. Leg I: femur 1.8-1.9 times, patella 3.8-4.2 times as long as deep and 1.6-1.7 times longer than femur, tibia 5.5-6.3 times, tarsus 6.5-7.4 times; leg IV: femur +patella 4.9-5.4 times, tibia 7.4-8.7 times, tarsus with a short tactile seta in subdistal position (TS=0.66-0.73), 6.8-7.9 times as long as deep.



FIGS 97-106

97-101: *Spelaeochernes gracilipalpus* sp. n. ♀; 97: chelicera; 98-100: pedipalp; 101: spermatheca; 102-106: *Spelaeochernes pedroi* sp. n. ♀; 102: chelicera; 103-105: pedipalp; 106: spermatheca; scale unit 0.1mm.

Measurements (1♂ 6♀): Carapace 0.87-0.98/0.68-0.77 (♂: 0.82/0.68); Pedipalps: femur 0.90-0.95/0.24-0.25 (0.82/0.22), patella 0.87-0.91/0.27-0.29 (0.77/0.26), hand with pedicel 0.88-0.94/0.42-0.48 (0.80/0.41), finger length 0.81-0.86 (0.73), chelal length with pedicel 1.60-1.69 (1.42); Leg I: femur 0.27-0.30/0.15-0.17 (0.25/0.14), patella 0.46-0.50/0.11-0.12 (0.42/0.11), tibia 0.51-0.55/0.08-0.09 (0.48/0.08), tarsus 0.48-0.52/0.06-0.07 (0.47/0.06); Leg IV: femur+patella 0.82-0.88/0.16-0.17 (0.76/0.14), tibia 0.80-0.86/0.09-0.11 (0.74/0.09), tarsus 0.58-0.64/0.07-0.08 (0.54/0.07), length of tarsal tactile seta 0.10-0.13.

Etymology : named for its slender pedipalps

The male from Minas Gerais (Gruta dos Irmãos Piría) is generally similar to the types, but is slightly smaller (length of palpal femur 0.76mm, chelal length 1.34mm) and has slightly stouter leg segments.

This species is distinguished from all other species of the genus by its elongate pedipalps (particularly the chela) and the smooth setae on the cheliceral palm.

Spelaeochernes pedroi sp. n. Figs 102-106

Material: Bahia, Gruta Milagrosa, Pau Brasil, lg. B. Soares-Santos, 17.VII.1998: 1♂ (holotype) 4♀; same cave, lg. E. Trajano, 3.VII.1997: 1♂ (MZUSP 15585); Gruta Califórnia, Pau Brasil, lg. E. Trajano, 3.VII.1997: 2♂ 1♀; same cave, coll.B. Soares-Santos, 3.X.1997: 1♂ 2♀ 1T 3D (MZUSP 16590); same cave, lg. E. Trajano, 28.X.1997: 1♀ (MZUSP 16589); Gruta Pedra Suspensa, Pau Brasil, lg. E. Trajano, 2.VII.1997: 4♂ 1♀; Gruta Toca dos Morcegos, Pau Brasil, lg. E. Trajano, 22.IX.1997: 1♂ (MZUSP 16586); same cave, lg. B. Soares-Santos, 10.II.1998: 1♀; Gruta dos Cristais I, Morro do Chapéu, in guano of frugivorous bats, lg. L. Senna Horta, 10.IX.1994: 2♂ (paratypes).

Description: Carapace with two distinct, only slightly granulate, transverse furrows, subbasal one slightly nearer to posterior margin than to median furrow and curved backwards, coarsely granulate (with exception of a small central patch on both pro- and mesozone, which appears smooth), 4 + 1 smooth preocular seta at anterior, 6-8 at posterior border, 1.2-1.3 times as long as broad; tergites divided (except XI), anterior ones granulate, posterior ones (XI included) ctenoid-scaly, with 4-5 posterior setae, XI 8; palpal coxa distally granulate (with microsculpture), about 35 (1 tactile seta), coxa I 14-21, II 16-21, III 18-21, IV about 35; anterior genital operculum with about 35 (♂) smooth setae arranged in two rows, that of female with about 20 setae, spermatheca as in fig. 106; entrance of genital chamber 2-3 smooth setae on each side, half-sternites mostly with 5-6 posterior setae, III 3 suprastigmatal setae, IV 1 suprastigmal seta, XI 8-9, coxal and sternal setae smooth and pointed; pleural membrane with pointed granula. Chelicera (fig. 102): palm 6-7 setae (normally 2-3 dentate), galea 6 branches, serrula exterior 18-20 blades. Pedipalps (figs 103-104): trochanter, femur and patella coarsely granulate, femur gradually enlarged from pedicel, club-shaped, 3.2-3.6 times as long as broad, lateral setae slightly longer than medial ones and more clavate, patella 2.8-3.0 times, club 2.0-2.3 times as long as broad, hand finely granulate medially, with pedicel 1.6-1.7 (♂) or 1.7-1.9 (♀) times as long as broad and 1.0-1.3 times longer than finger, fingers slightly gaping in basal half, 1.42-1.59 (♂) or 1.49-1.76 (♀) longer than hand breadth; chela with pedicel 2.95-3.4 times as long as broad; fixed finger with 52-61 marginal teeth, 7-10 external and 2-4 internal accessory

teeth, movable finger with 57-68 marginal, 5-9 external and 2-4 internal accessory teeth. Trichobothria (fig. 105): *ist* and *est* at same level in middle of the finger, *it* slightly proximal to *et*, 3-4 sense-spots between *esb* and *est*, *st* halfway between *sb* and *t*, a slightly modified seta distal to *st*, 2 sense-spots between *sb* and *st*; nodus ramosus proximad *t* and *it*. Leg I: femur 1.6-1.8 times, patella 3.3-4.2 times as long as deep and 1.6-1.8 times longer than femur, tibia 5.4-6.7 times, tarsus 6.0-7.6 times; leg IV: lateral setae of femur and tibia clavate, femur+patella 4.3-5.2 times, tibia 6.5-8.2 times, tarsus with a slightly longer dentate seta in subdistal position (TS=0.68-0.76), 6.0-7.7 times as long as deep.

Measurements (8♂ 8♀): Carapace 0.84-1.00/0.67-0.82; Pedipalps: femur 0.85-1.03/0.24-0.30, patella 0.82-1.02/0.27-0.34, hand with pedicel 0.84-1.00/0.45-0.57, finger length 0.72-0.91, chelal length with pedicel 1.45-1.76; Leg I: femur 0.25-0.31/0.14-0.17, patella 0.42-0.52/0.11-0.14, tibia 0.47-0.59/0.08-0.10, tarsus 0.42-0.50/0.06-0.08; Leg IV: femur+patella 0.72-0.86/0.15-0.18, tibia 0.63-0.84/0.09-0.11, tarsus 0.50-0.59/0.07-0.09, length of tarsal tactile seta 0.11-0.13.

Etymology: named for Dr Pedro Gnaspini, renowned biospeleologist and collector of an important part of the present collection.

Spelaeochernes sp. (*?dentatus*)

Material: São Paulo, Gruta do Zé Maneco, Fazenda Intervales, Iporanga, lg. P. Gnaspini Netto, 25.III.1988: 2T 1D (MZUSP 10291); Caverna da Aegla, Fazenda Intervales, Iporanga, in haematophagous bat guano, lg. E. Trajano & P. Gnaspini, 11.VII.1990: 1T (MZUSP 13804); Minas Gerais, Gruta Paredão da Fenda III, Matozinhos, lg. L. Senna Horta, 20.XII.1995: 1T. Mato Grosso do Sul, Gruta Nossa Senhora Aparecida, Bonito, lg. E. Trajano & P. Gnaspini, 16.X.1990: 2T (MZUSP 13792).

Discussion: The eight new species of *Spelaeochernes* may be placed in two groups, according to the shape of the pedipalpal femur: either abruptly (*eleonorae* and *altamirae*) or gradually enlarged from the pedicel (*dentatus* and all other species). Within the latter group, two lineages may be defined: a) species showing sexual dimorphism, the male having more or less developed protuberances on the chelal hand (*dentatus* and *armatus*) (Paraná, Santa Catarina, São Paulo); b) species with more or less gaping chelal fingers (*baliensis* and *pedroi*) (Bahia). The species *dubius* and *gracilipalpus* might belong to the first lineage (the sexual dimorphism shows individual variation!), with a more restricted distribution than *dentatus*. However, the distribution pattern of this genus remains to be defined. The surprising diversity of this genus and some aspects of the geographical distribution of its species might also be considered in relation to phoresy and bat migration, which could be responsible for their dispersal. Unfortunately, nothing seems to be known about the possible migration of the different bat colonies inhabiting the caves. It would not be surprising if collecting in yet unexplored caves yielded even more species of this genus, and the analysis of this species flock by non-morphological methods will perhaps contribute to a better comprehension of their radiation and current distribution.

All species seem to occur regularly in caves in association with bat guano, probably being guanophiles/troglophiles, following Gnaspini's (1992) definition. On

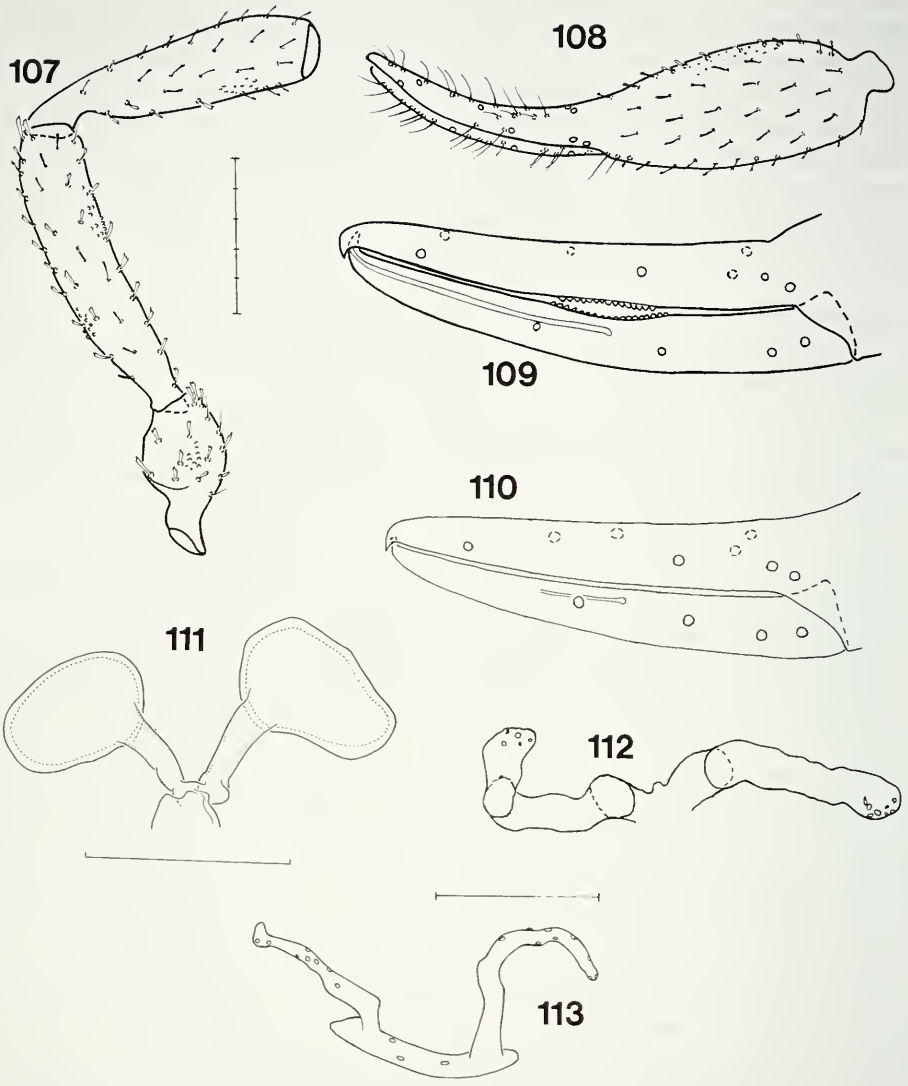
the other hand, species of this genus might show ecological features similar to those of species of *Lasiochernes* Beier or *Nudochernes* Beier which are found in subterraneous mammal nests, but also in caves (normally associated to bat guano). Brief sampling of epigean habitats near the entrance of the Gruto dos Paiva (Iporanga) yielded species of *Lustrochernes*, *Ideoroncus* and representatives of Dithidae, but no species of *Spelaeochernes*. However, our knowledge of the epigean pseudoscorpion fauna is much too fragmentary to allow any clear conclusions.

On the other hand, several insufficiently known species currently placed in the genera *Neochelanops* or *Dinocheirus* might belong to the new genus.

Zaona cavicola sp. n. Figs 107-109

Material: Mato Grosso do Sul, Caverna Santa Maria, Jardim, lg. E. Trajano & P. Gnaspini, 20. VII.1991: 1♂ (holotype) (MZUSP 13795).

Description: Carapace with two distinct transverse granulate furrows, subbasal one curved forwards and closer to posterior margin than to median furrow, no eyespots, coarsely granulate, 4-6 + 1 dentate preocular seta at anterior, 6 at posterior border, setae dentate and clearly clavate, 1.1 times as long as broad; tergites indistinctly divided, XI undivided, anterior ones granulate, posterior ones (XI included) ctenoid-scaly, 2/3/23/3-4/4-5/3/3-4/4/3-4/3 setae on posterior margin, XI 6 (2 median discal setae); setae clearly clavate; anterior lobe of palpal coxa 3 marginal and 1 discal setae, palpal coxa granulate, about 23 (1 tactile seta and 2 clavate setae), coxa I 10, II 13, III 14, IV 20; anterior genital operculum with about 36 smooth setae arranged in several rows (interior setae much longer); entrance of genital chamber with 3 smooth setae on each side; chaetotaxy of half-sternites: 4/4/6/5/3/4/4/3-4/, III 2 suprastigmatal setae, IV 1 suprastigmal seta, VII-IX with one medial anterior seta, XI 4 setae (2 short lateral tactile setae), coxal and sternal setae smooth and pointed; anal cone 2 ventral and 2 dorsal smooth setae. Pleural membrane granulate. Chelicera: palm 6 setae (*ib* dentate), fixed finger with 3 large and 3 small teeth, movable finger with a small, pointed, marginal tooth and small subapical lobe, galea 6 branches, serrula exterior 19 blades, flagellum 3 setae (first one dentate). Pedipalps (figs 107-108) elongate, *Chelifer*-like, coarsely granulate: trochanter, with broad, rounded dorsal hump; femur 4.7 times as long as broad, patella 4.2 times, club 3.2 times as long as broad, hand with pedicel 2.6 times as long as broad and 1.1 times longer than finger; chela with pedicel 4.6 times as long as broad; fingers gaping in the middle, fixed finger with 65 marginal teeth, 4 external and 3 internal accessory teeth, movable finger with 68 marginal, 6 external and 1 internal accessory teeth. Trichobothria (fig. 109): no "guard seta" near *ist*, *ist* clearly distad *est* and half-way between *isb* and *it*, *est* in proximal half and nearer *ist* than *esb*, *st* half-way between *t* and *sb*, 4 sense-spots distad *est*, two sense-spots near *sb*; nodus ramosus half-way between *st* and *t*. Leg I: femur 2.0 times, patella 4.0 times as long as deep and 1.7 times longer than femur, tibia 6.2 times, tarsus 6.8 times; leg IV: femur+patella 4.6 times, tibia 6.9 times, tarsus 7.0 times as long as deep, no tactile seta, claws smooth.



FIGS 107-113

107-109: *Zaona cavicola* sp. n. ♂, pedipalp; 110-111: *Rhopalochernes ohausi* (Tullgren) ♀ syntype (Mus. Hamburg no. 260), 110: trichobothrial pattern; 111: spermatheca (del. M. Judson); 112: *Chelanops coecus* (Gervais), spermatheca (Chile, Aysen, det. M. Beier 1963); 113: *Neochelanops patagonicus* (Tullgren), spermatheca (Argentina, Rio Negro, El Bolson; det. M. Beier 1963); scale unit 0.1mm.

Measurements: Carapace 0.93/0.85; Pedipalps: femur 1.04/0.22, patella 1.00/0.24, hand with pedicel 0.95/0.37, finger length 0.86, chelal length with pedicel 1.72; leg I : femur 0.31/0.16, patella 0.54/0.14, tibia 0.58/0.09, tarsus 0.49/0.07; leg IV: femur+patella 0.87/0.19, tibia 0.81/0.12, tarsus 0.59/0.08.

In the absence of the female (and hence in ignorance of the shape of spermatheca) there are apparently no generic characters separating the new species from *biseriatum*, the type species of the previously monotypic genus *Zaona* from Florida. The two species share a flagellum of 3 setae, a nearly identical trichobothrial pattern, elongate *Chelifer*-like pedipalps, the absence of a distinct, long tactile seta on tarsus IV and no tactile setae on tergite XI. They have similar measurements and proportions of pedipalps, but differ in following characters: *cavicola* sp. n. has no *Parachernes*-type "keel" on carapace, a more elongate pedipalpal patella (4.2 times versus 3.5-3.9 times), more numerous teeth on the chelal fingers (65/68 versus 44/51), clearly gaping fingers and leg IV much more elongate (*biseriatum*: tibia 4.8-4.9 times, tarsus 4.8-5.2). Furthermore, *cavicola* has a more slender cheliceral galea and fewer tergal setae (3-4 versus 6-7). The genus *Macrochernes* Hoff also has three blades on the flagellum and a similar trichobothrial pattern, but is characterized by the presence of a long tarsal tactile seta and a keel-like eminence on posterior margin of carapace (Muchmore, 1969).

Hopefully supplementary specimens will be collected, particularly females, which should confirm or refute the generic position of this new species.

Maxchernes iporangae Mahnert & Andrade, 1998

Material: São Paulo, Caverna Alambari de Baixo, Iporanga, in frugivorous bat guano, lg. E. Trajano & P. Gnaspini, 17.VI.1990 (MZUSP 13818): 4♂ 3♂ 1P (GE 2♂ 2♀).

These supplementary specimens have been collected in the type locality.

KEY TO ADULT CHERNETIDAE COLLECTED IN BRAZILIAN CAVES

1 Flagellum of 4 blades 2

1° Flagellum of 3 blades; large species with slender pedipalps (femur ratio 4.7, length 1.04mm, patella ratio 4.2, length 1.00 mm, chela ratio 4.6, length 1.72 mm); fingers gaping in middle over a short distance; *ist* distal to *est*, only a little nearer *est* than *it*; no tactile seta on tarsus IV.- Mato Grosso do Sul. . . . . *Zaona cavicola* sp. n.

2 Larger species, length of palpal femur at least 0.7 mm; tergite XI with two tactile setae; spermatheca with two, short, thick prolongations; a short (pseudo-)tactile seta on tarsus IV: genus *Spelaeochernes* gen. n. 3

2° Small species, length of palpal femur at most 0.64 mm; tarsus IV without tactile seta; tergite XI without tactile setae; spermatheca with two relatively long tubules . . . . . *Maxchernes iporangae* Mahnert & Andrade

3 Galea with 6 branches in both sexes 4

3° Galea with 8-10 branches in both sexes; large species (length of palpal femur at least 1.00 mm, chelal length 1.74mm); ventrobasal corner of

chelal hand with a setose patch in both sexes, chelal hand of male dorsodistally with a large anteriad-directed protuberance. - Santa Catarina. . . . . *Spelaeochernes armatus* sp. n.

4 Pedipalpal femur abruptly enlarged from pedicel laterally, thereafter parallel-sided. 5

4° Pedipalpal femur gradually enlarged from pedicel laterally, club-shaped. 6

5 Pedipalps stout, femur 2.7-3.1 times, patella 2.3-2.7 times, chela 2.7-3.2 times longer than broad; 2-4 internal accessory teeth on movable chelal finger. - Sao Paulo, Goias, Minas Gerais, Mato Grosso do Sul . . . . . *Spelaeochernes eleonorae* sp. n.

5° Pedipalps slender, femur at least 3.6 times, patella at least 2.9 times, chela at least 3.4 times longer than broad; internal accessory teeth absent on movable chelal finger.- Pará . . . . . *Spelaeochernes altamirae* sp. n.

6 Chelal fingers not gaping 8

6° Chelal fingers gaping, movable chelal finger in middle more or less distinctly curved. - Bahia 7

7 Pedipalpal femur of male 3.1-3.3 times, of female 3.4-3.5 times, patella of male 2.5-2.7 times, of female 2.8-2.9 times longer than broad; 45-51 teeth on fixed chelal finger, 48-57 on movable finger; length of tactile seta on tarsus IV 0.08-0.10mm . . . . . *Spelaeochernes bahiensis* sp. n.

7° Pedipalpal femur of male 3.3-3.7 times, of female 3.2-3.6 times, patella of both sexes 2.8-3.0 times longer than broad; 52-61 teeth on fixed finger, 57-68 teeth on movable finger; length of tactile seta on tarsus IV 0.11-0.13mm . . . . . *Spelaeochernes pedroi* sp. n.

8 At least 1-2 setae of cheliceral palm (out of 5-7) dentate; pedipalpal femur at most 3.6 times, patella 3.0 times, chela at most 3.5 times longer than broad 9

8° All setae of cheliceral palm (6-8) smooth; pedipalpal femur 3.6-3.8 times, patella 2.9-3.2 times, chela 3.4-3.9 times longer than broad; femur length 0.76-0.82mm (♂)/0.90-0.95mm (♀). - São Paulo, Minas Gerais (?). . . . . *Spelaeochernes gracilipalpus* sp. n.

9 Larger species, length of palpal femur 0.91-1.17mm, of patella 0.91-1.18mm, of chela with pedicel 1.64-2.02mm; hand of larger males with a more or less distinct hump or angle on medial side near finger base.- Parana, Sao Paulo. . . . . *Spelaeochernes dentatus* sp. n.

9° Smaller species, length of palpal femur 0.71-1.02mm, of patella 0.69-0.93mm, of chela with pedicel 1.30-1.83mm; hand of males without hump or angle on medial side of hand. - Sao Paulo, Minas Gerais, Mato Grosso do Sul. . . . . *Spelaeochernes dubius* sp. n.

(*Dinocheirus uruguayanus* Beier. 1970 (Uruguay, Gruta de Arequita, Lavalleja) might belong to this genus and could be related to *eleonorae* n.sp., judging by the shape of palpal femur, but differs from it by the presence of only dentate setae on tergite XI and the position of trichobothrium *ist* clearly proximal of *st*, *st* being quite close to *t*.)

Concluding remarks

The diversity of cave inhabiting pseudoscorpions in Brazil is quite high, with 25 species now recorded from more than a hundred caves of the different karst areas in Brazil, but this number is certainly not definitive. It is quite surprising that representatives of some genera quite common in these areas have not yet been found in these collections, e.g. the chthoniid *Tyrannochthonius* (common in the Amazon region; cavernicolous species known from different regions of the world) or the chernetids *Lustrochernes* or *Cordylochernes* (recorded from caves in Peru or Ecuador). Except for some fortuitous findings of representatives of Lechytiidae (*Lechytia chthoniiformis*) and Tridenchthoniidae (*Cryptoditha* cf. *elegans*), these are also generally lacking, despite the fact that these genera are very common in the epigean habitats of these regions (unpublished results). This absence might be explained by ecological factors (as suggested by Trajano & Gnaspini-Netto, 1991) or simply by the difficulty in collecting them in caves, due to their small size. The known diversity of the Ideoroncidae (*Ideoroncus* and *Albiorix*) (Mahnert, 1984) and Olpiidae (*Progarypus* and other genera?) suggest that more epigean and troglophilous species will be discovered.

The present results do, however, allow a preliminary biogeographical analysis, which confirms results obtained for other animal groups. We can recognize roughly three faunal districts, each characterized by at least one pseudoscorpion genus.

a) Altamira-Itaituba karst region (Pará): in the caves of this region, Amazonian elements prevail, with *Nannobisium beieri* (a widely distributed epigean syarinid species) and a well defined species of *Spelaeochernes*;

b) the species found in Bahia caves (subregion Médio Sâo Francisco of the Bambuí karst region) are well defined (*Spelaeochernes bahiensis* and *pedroi*) and present partial affinities with the Amazonian fauna (e.g. *Pseudochthonius gracilimanus* sp. n., apparently related to the widespread *P. orthodactylus* Muchmore; *Spelaeobochica allodentatus* gen.n.sp. n. with the nearest representatives of the family known from Venezuela and the Caribbean region). Some other taxa (e.g. of the genera *Progarypus* and *Cheiridium*) emphasize connections with the subtropical fauna, being well represented in the karst regions of Ribeira Valley and Bambuí.

c) the caves in the south-western parts of the country (São Paulo, Mato Grosso do Sul, etc.) have been colonized by genera that predominate in this subtropical region, e.g. *Ideoroncus* (two species), *Progarypus* (four species) and *Maxchernes* (one species), as well as by the cave-restricted genus *Spelaeochernes* (five species), and the surprising occurrence of *Zaona*. *Spelaeochernes dentatus* and *armatus* are probably a species pair typical of the Vale do Ribeira province.

LIST OF CAVES WITH PSEUDOSCORPIONS

Bahia State

BA-001: Gruta (Lapa) dos Brejões, Morro do Chapéu/Irecê; alt. 600m; 11°00'30''S/ 41°26'07''W: *Progarypus liliae* sp. n.

BA-009: Gruta do Impossível, Palmeiras; alt. 650m; 10°12'52''S/41°04'10''W: *Spelaeobochica allodentatus* n.gen.sp.; *Pseudochthonius gracilimanus* sp. n.

BA-018: Gruta dos Cristais I, Morro do Chapéu: *Spelaeochernes pedroi* sp. n.; *Cheiridium brasiliense* sp. n.

BA-069: Gruta Azul, near Fazenda Pratinha, Iraquara; alt. 660m; 12°20'52''S/41°32'33''W: *Pseudochthonius gracilimanus* sp. n.

BA-072: Gruta Lapa II (Santa Rita cave system), Iraquara, proximo Vila Santa Rita; alt. 630m; 12°20'02''S/41°36'00''W: *Spelaeochernes bahiensis* sp. n.; *Pseudochthonius gracilimanus* Mahnert (D).

BA: Gruta Lapa Doce II, Iraquara: *Spelaeochernes bahiensis* sp. n.

BA-BOD: Gruta do Bode, Itaetê, 12°56'S/41°04'W: *Spelaeochernes bahiensis* sp. n.

BA-POC: Gruto do Poço Encantando, Itaetê, 12°57'S/41°06W: *Spelaeochernes bahiensis* sp. n.

BA: Gruta da Gameleira, Campo Formoso: *Spelaeochernes bahiensis* sp. n.

BA: Gruta Califórnia, Pau Brasil: *Spelaeochernes pedroi* sp. n.

BA: Gruta Milagrosa, Pau Brasil: *Spelaeochernes pedroi* sp. n.

BA: Gruta Pedra Suspensa, Pau Brasil: *Spelaeochernes pedroi* sp. n.

BA: Gruta Toca dos Morcegos, Pau Brasil: *Spelaeochernes pedroi* sp. n.

Goiás State

GO-018: Gruta dos Ecos, Corumbá de Goiás, 15°38'00'S/48°15'20''W, alt. 1050m: *Spelaeochernes eleonorae* sp. n.

GO-066: Gruta Qualquer Coisa, Padre Bernardo, alt. 361m: *Spelaeochernes eleonorae* sp. n.

Minas Gerais State

MG-024: Gruta do Baú, Pedro Leopoldo, Distrito Fidalgo, 19°33'12''S/43°59'24''W, alt. 740m: *Progarypus gracilis* sp. n.

MG-032: Gruta Bonita, Fazenda Janelao, Januária, 15°06'23''S/44°14'20''W, alt. 630m: *Progarypus* sp. (T)

MG-123: Lapa dos Desenhos, Itacarambi, 15°06'35''S/44°13'58''W, alt. 700m: *Progarypus setifer* sp. n.

MG-125: Gruta da Dobra, Lagoa Santa, near Gruta da Lapinha, 19°33'27''S/43°57'26''W, alt. 730m: *Spelaeochernes eleonorae* sp. n.

MG-199: Gruta do Janelão, Januária/Itacarambi, 15°06'54''S/44°14'27''W, alt. 600m: *Progarypus setifer* sp. n.

MG-200: Gruta Jean Louis, Sete Lagoas, Fazenda da Lapa, 19°26'59''S/44°17'14''W, alt. 900m: *Spelaeochernes* sp. (*eleonorae* n.sp.?)

MG-215: Gruta do Lameiro, Matozinhos, 19°28'13''S/44°03'43W: *Cryptoditha* cf. *elegans* (Beier)

MG-219: Gruta da Lapinha, Lagoa Santa, 19°33'40''S/43°57'30''W, alt. 730m: *Progarypus gracilis* sp. n.

MG-288: Gruta Olhos d'Água, Itacarambi, 15°06'47''S/44°10'11''W, alt. 500m: *Pseudochthonius biseriatus* sp. n.

MG-297: Lapa das Pacas, Lagoa Santa, 19°33'32''S/43°58'00''W, alt. 670m: *Spelaeochernes eleonorae* sp. n.
MG-396: Gruta Tamboril, Unaí, 16°19'24''S/46°59'02''W, alt. 670m: *Pseudochthonius* cf. *ricardoi* n.sp.; *Spelaeochernes eleonorae* sp. n.
MG-426: Lapa Vermelha I, Pedro Leopoldo, Fazenda Lapa Vermelha, 19°36'42''S/ 43°59'44''W, alt. 760m: *Pseudochthonius strinatii* Beier, *Spelaeochernes eleonorae* sp. n.
MG-474: Gruta do Intoxicado, Pedro Leopoldo, 19°32'47''S/43°58'44''W: *Spelaeochernes dubius* sp. n.
MG-625: Gruta do Labirinto Fechado, Lagoa Santa, 19°33'09''S/43°56'59''W: *Progarypus gracilis* sp. n.
MG-657: Gruta Paredão da Fenda III, Matozinhos, 19°28'38''S/44°02'21''W: *Spelaeochernes* sp.
MG-720: Gruta Corrego do Capão, Capim Branco, Usiferro, 19°33'01''S/ 44°06' 52''W, alt. 810m: *Spelaeochernes dubius* sp. n.
MG-825: Gruta Periperi I, Matozinhos, Dolina Sacota-Minerv. Maua, 19°31'59''S/ 44°03'49''W: *Progarypus gracilis* sp. n.
MG: Gruta dos Irmãos Piría, Matozinhos: *Spelaeochernes gracilipalpus* Mahnert
MG: Buraco (=Lapa) do Medo, Sete Lagoas: *Spelaeochernes dubius* sp. n., *Pseudochthonius strinatii* Beier

Mato Grosso do Sul State

MS-002: Gruta Lago Azul, Bonito, alt. 450m: *Spelaeochernes dubius* sp. n.
MS-003: Gruta Nossa Senhora Aparecida, Bonito, alt. 440m: *Spelaeochernes* sp. (T)
MS-009: Gruta da Sao Miguel (= Carneira), Bonito: *Spelaeochernes eleonorae* sp. n.
MS-012: Gruta do Mimoso, Bonito, alt. 440m: *Spelaeochernes eleonorae* sp. n. (T)
MS-013: Gruta do Ametista, Bonito: *Spelaeochernes eleonorae* sp. n.
MS-014: Gruta João Arruda, Bonito, alt. 360m: *Spelaeochernes eleonorae* sp. n.
MS-015: Gruta do Curé, Fazenda Santa Maria, Bonito, alt. 290m: *Lechytia chthoniiformis* (Balzan); *Spelaeochernes eleonorae* sp. n.
MS-016: Abismo do Poço, Fazenda Santa Maria, Jardim, 21°26'00S/56°27'10''W: *Spelaeochernes eleonorae* sp. n.
MS-025: Caverna Santa Maria, Fazenda Santa Maria, Jardim; 21°25'50''S/ 56°27' 10''W: *Spelaeochernes eleonorae* sp. n.; *Zaona cavicola* sp. n.
MS-027: Gruta de X-Coqueiro, Fazenda Santa Maria, Jardim, 21°26'00''A/56°27' 10''W: *Spelaeochernes eleonorae* sp. n.
MS-028: Gruta Vale do Prata, Fazenda Vale Prata, Bonito, 21°25'50''S/56°28'10''W: *Spelaeochernes eleonorae* sp. n.
MS-029: Gruta Dona Matilde, Bonito: *Spelaeochernes eleonorae* sp. n.
MS-031: Gruta do Guaviral, Bonito, 21°08'20''S/56°35'40''W: *Spelaeochernes eleonorae* sp. n.
MS-034: Gruta Harmonia, Bonito: *Spelaeochernes dubius* sp. n.
MS-038: Gruta Pitangueiras, Bonito: *Spelaeochernes dubius* sp. n.

Pará State

PA-021: Caverna Pedra da Cachoeira (sandstone cave), Altamira, 03°18'43''S/52°20' 28''W, alt. 158m: *Nannobisium beieri* Mahnert

PA-024: Caverna Planaltina (sandstone cave), Medicilândia, 03°22'30''S/52°34' 18''W, alt. 170m: *Spelaeochernes altamirae* sp. n.

PA-033: Caverna do Limoeiro (sandstone cave), Medicilândia, 03°32'20''S/52°47' 07''W, alt. 250m : *Spelaeochernes altamirae* sp. n.

Parana State

PR-006: Gruta da Lancinha, Rio Branco do Sul, 25°09'58''S/49°17'12''W, alt. 880m: *Ideoroncus cavicola* n.sp.; *Spelaeochernes dentatus* sp. n.

PR-014: Gruta da Toca, Rio Branco do Sul, 25°10'38''S/49°18'16''W, alt. 900m: *Spelaeochernes dentatus* sp. n.

PR-015: Gruta de Terra Boa, Almirante Tamandaré, 25°12'58''S/49°31'23''W, alt. 667m: *Spelaeochernes dentatus* sp. n.

PR-016: Gruta de Água Boa, Almirante Tamandaré, 25°16'45''S/49°21'30''W, alt. 980m: *Spelaeochernes dentatus* sp. n.

PR-020: Gruta de Toquinhas, Rio Branco do Sul, 25°09'56''S/49°18'05''W, alt. 910m: *Spelaeochernes dentatus* sp. n.

PR-050: Gruta de Olhos d'Agua, Castro, 25°01'23''S/49°47'30''W, alt. 750m: *Spelaeochernes dentatus* sp. n.

PR-058: Gruta Morro de Pedra, Guaraqueçaba, 25°08'10''S/48°17'18''W, alt. 300m: *Spelaeochernes dentatus* sp. n.

PR-106: Gruta do Rocha, Adrianópolis, 24°44'50''S/49°06'40''W, alt. 330m: *Spelaeochernes dentatus* sp. n.; *Pseudochthonius strinatii* Beier (T)

PR-108: Gruta Ermida Paiol do Alto, Adrianópolis, 24°43'13''S/49°04'58''W, alt. 700m: *Spelaeochernes dentatus* sp. n.

PR-118: Gruta do Bom Sucesso, Cerro Azul, 24°48'06''S/49°12'40''W, alt. 305m: *Spelaeochernes dentatus* sp. n.

PR-123: Ermida do Paiol de Capim, Cerro Azul, 24°44'18''S/49°07'06''W, alt. 640m: *Spelaeochernes dentatus* sp. n.

PR-137: Ermida do Maciel, Tijuco Alto-Morro do Pote, Adrianópolis, 24°45'08''S/ 49°05'46''W, alt. 680m: *Spelaeochernes dentatus* sp. n.

São Paulo State:

SP-002: Gruta da Tapagem (= do Diabo), Eldorado Paulista, Jacupiranga region, 24°38'12''S/48°23'50''W, alt. 380m: *Spelaeochernes dentatus* sp. n.; *Pseudochthonius strinatii* Beier

SP-004: Gruta da Arataca, Espírito-Santo region, Iporanga, 24°27'23''S/48°35'22''W, alt. 482m: *Spelaeochernes gracilipalpus* sp. n. (T)

SP-009: Gruta Casa de Pedra, Iporanga, 24°28'46''S/48°35'23''W, alt. 270m: *Ideoroncus setosus* Mahnert: *Spelaeochernes dentatus* sp. n.

SP-010: Caverna da Pescaria, Espírito-Santo region, Apiaí, 24°24'13''S/48°33'01''W, alt. 280m: *Spelaeochernes dentatus* sp. n.

SP-012: Caverna Alambari de Baixo, Iporanga, 24°33'15''S/48°39'55''W, alt. 196m: *Maxchernes iporangae* Mahnert & Andres; *Ideoroncus cavicola* sp. n.

SP-013: Gruta do Chapéu, Espírito-Santo region, Iporanga, 24°25'53°''S/48°35' 20''W, alt. 610m: *Spelaeochernes gracilipalpus* sp. n.

SP-018(019): Gruta das Areias de Cima (Areias I), Iporanga, 24°35'20''S/ 48°42' 05''W, alt 205m: *Ideoroncus cavicola* sp. n.; *Pseudochthonius strinatii* Beier

SP-021(022): Gruta do Morro Preto, Iporanga, 24°31'50''S/48°41'59''W: *Pseudochthonius strinatii* Beier; *Spelaeochernes dentatus* sp. n.

SP-025: Gruta da Água Suja, Iporanga, 24°331'25''S/48°42'27''W, alt. 280m: *Pseudochthonius ricardoi* sp. n.

SP-026: Caverna Córrego Grande I, Iporanga, 24°31'03''S/48°42'47''W, alt. 300m: *Spelaeochernes dentatus* sp. n.

SP-041: Caverna Santana, Iporanga, 24°31'51''S/48°42'06''W, alt. 250m: *Progarypus nigrimanus* sp. n.

SP-042: Gruta dos Paiva, Fazenda Intervales, Iporanga, 24°16'24''S/48°26'32''W, alt. 780m: *Spelaeochernes gracilipalpus* sp. n.

SP-043: Gruta da Figueira, Fazenda Intervales, Iporanga, 24°19'13''S/48°27'45''W, alt. 625m : *Spelaeochernes dentatus* sp. n.

SP-047: Gruta Bethary de Baixo (=Gruta do Betari), Iporanga, 24°34'34''S/ 48°37'39''W, alt. 125m: *Spelaeochernes dentatus* sp. n.

SP-061: Gruta Temimina II, Espírito-Santo region, Iporanga, 24°23'05''S/48°34'08W, alt. 490m: *Spelaeochernes gracilipalpus* sp. n.

SP-072: Gruta do Espírito-Santo, Espírito-Santo region, Iporanga, 24°26'33''S/ 48°37'02''W: *Spelaeochernes dentatus* sp. n.

SP-095: Gruta da Toca (sandstone cave), Serra Geral region, Analandia: *Spelaeochernes dubius* sp. n.

SP-170: Gruta do Fazendão (sandstone cave), Serra Geral region, Ipeúna, 22°24'37''S/ 47°47'34''W, alt. 810m: *Spelaeochernes dubius* sp. n.

SP-180(181?): Gruta Sertãozinho (sandstone cave), Altinópolis, 21°03'54''S/47° 26'00''W, alt. 660m: *Spelaeochernes eleonorae* sp. n.

SP-200: Gruta do Jair, Fazenda Intervales, Iporanga, 24°27'47''S/48°36'21''W: *Spelaeochernes dentatus* sp. n.(T)

SP-210: Gruta da Aegla, Fazenda Intervales, Iporanga, 24°19'09''S/48°27'37''W, alt. 605m: *Spelaeochernes* sp. (T)

SP-211: Gruta do Zé Maneco, Fazenda Intervales, Iporanga, 24°17'54''S/ 48°26' 36''W, alt. 735m: *Spelaeochernes* sp. (T)

SP-233: Gruta do Tatu, Fazenda Intervales, Iporanga, 24°16'05''S/48°25'03''W, alt. 815m: *Spelaeochernes dentatus* sp. n.

SP-235: Toca dos Meninos, Fazenda Intervales, Ribeirão Grande, 24°15'47''S/ 48°24'58''W, alt. 870m: *Spelaeochernes dentatus* sp. n.

SP-237: Gruta Jane Mansfield, Fazenda Intervales, Iporanga, 24°15'50''S/48°26'42W, alt. 880m: *Spelaeochernes gracilipalpus* sp. n.

SP-241: Gruta do Bocão, Fazenda Intervales, Iporanga, 24°16'11''S/48°26'43''W, alt. 810m: *Spelaeochernes dubius* sp. n.

SP-246: Gruta do Fóssil Desconhecido, Fazenda Intervales, Iporanga, 24°16'04''S/ 48°25'03''W, alt. 820m: *Spelaeochernes gracilipalpus* sp. n.
SP-247: Gruta do Minotauro, Fazenda Intervales, Iporanga, 24°16'22''S/48°27'22''W, alt. 890m: *Spelaeochernes gracilipalpus* sp. n.(T)
SP-248: Caverna do Tufo, Iporanga, Fazenda Intervales, Figueira, 24°19'35''S/ 48°28'02''W, alt. 515m: *Spelaeochernes dentatus* sp. n.
SP-261: Gruta da Cabeça de Paca, Fazenda Intervales, Iporanga, 24°16'01''S/ 48°27' 15''W, alt. 885m: *Spelaeochernes gracilipalpus* sp. n.
SP-271: Gruta do Moquem, Fazenda Intervales, Iporanga, 24°18'35''S/48°27'20''W, alt. 725m: *Cryptoditha* sp. (T); *Spelaeochernes dentatus* sp. n.
SP-309(310): Gruta Sítio das Cavernas, Fazenda Intervales, Ribeirão Grande, 24°40'50''S/48°25'05''W, alt. 870m: *Spelaeochernes dentatus* sp. n.
SP-318: Gruta do Rio Preto, Fazenda Intervales, Guapiara, 24°14'19''S/48°27'04''W, alt. 860m: *Spelaeochernes dentatus* sp. n.
SP-322: Gruta dos Pianos, Fazenda Intervales, Guapiara, 24°15'45''S/48°28'55''W, alt. 860m: *Spelaeochernes dentatus* sp. n.
SP: Gruta Vista da Cachoeira (sandstone cave), Serra Geral region, Ipeúna.: *Spelaeochernes dubius* sp. n.
SP: Caverna do Grotão, Ribeira: *Spelaeochernes dentatus* sp. n.

Santa Catarina State:

SC: Gruta Botuverá, Botuverá: *Spelaeochernes armatus* sp. n.
SC: Gruta Botuverá II, Botuverá: *Spelaeochernes armatus* sp. n.

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A new species of *Laricobius* (Coleoptera: Derodontidae) from Nepal

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A new species of *Laricobius* (Coleoptera: Derodontidae) from Nepal. - A new species *Laricobius loebli* sp. n. from Nepal is described. Error concerning the sex of the holotype of *Laricobius schawalleri* Háva & Jelínek, 2000 is corrected. Key to the species of *Laricobius* from the Himalaya and China is provided.

Key-words: Coleoptera - Derodontidae - *Laricobius* - taxonomy - new species - China - Nepal.

INTRODUCTION

No representatives of the beetle family Derodontidae were previously known from southeastern part of the Palaearctic region. Recent discovery of two species of the genus *Laricobius* Rosenhauer, 1846 from the Himalaya and China (Háva & Jelínek 1999, 2000) drew attention to the family, so that additional specimens are gradually emerging from various collections. In the present paper a new species of *Laricobius* from Nepal is described along with a notice on a questionable female specimen from China, possibly conspecific with *Laricobius mirabilis* Háva & Jelínek, 1999. Key to the *Laricobius* species from the Himalaya and China is provided, too.

TAXONOMIC PART

Laricobius cf. *mirabilis* Háva & Jelínek, 1999

Material examined. China - Sichuan prov., Kangding distr., Mugezo lake, 4500m, 16-19.vii.1992, 1 female, R. Dunda lgt. Deposited in coll. J. Háva (Praha).

This examined female specimen, received from Mr. Radek Dunda (Praha), agrees in all external characters with *Laricobius mirabilis*, but differs from it by its colouration. It is black-brown with yellow elytra infuscate on the two outermost interstries and in the apical portion and with brown-yellow appendages, whilst all known specimens of *L. mirabilis* are concolorous, red-brown with brown-yellow appendages. The status of this specimen remains doubtful until a more extensive material can be studied.

Manuscript accepted 29.09.2000

Laricobius schawalleri Háva & Jelínek, 2000

The holotype of this Himalayan species is female, not a male as erroneously stated in the original description.

Laricobius loebli sp. n. Figs 1, 4

Holotype, female: Nepal, Kathmandu distr., Phulcoki, 2500m, 28-29.IV.1984, Löbl - Smetana. Deposited in Muséum d'histoire naturelle, Genève.

Description. Length 2.4 mm, width 1.2 mm. Body ovate, convex, dorsum black, meso- and metasternum black, proximal abdominal sterna piceous, posterior ones becoming gradually brown. Antennae brown-yellow, fore legs brown-yellow, tips of femora black; middle and posterior femora black, corresponding tibiae yellow-brown and brown respectively. Pubescence of normal length, thin, light, semierect, inconspicuous.

Head somewhat transverse, eyes large, convex, finely facetted. Clypeus short, transversely convex, truncate anteriorly, finely densely punctulate, not separated from frons by any transverse impression. Frons flatly convex with irregularly dispersed large and deep punctures with diameter nearly equal to the width of antennal flagellum, at sides more widely separated transversely than longitudinally. Spaces between them finely punctulate, moderately shining. Antennae slender, somewhat shorter than the maximum width of pronotum (1.16 times as long as the width of head across eyes), antennomere III as long as wide, IV to VII longer than wide; loose three-segmented club occupying one third of the antennal length (Fig. 1).

Pronotum (Fig. 4) widest at its midlength and there 1.18 times wider than long (PL/PW 0.84), transversely convex, constricted behind anterior margin, small sharp anterior angles projecting laterally. Sides in median portion behind the constriction broadly and regularly outcurved. Posterior angles distinct, small, obtuse. Basal margin broadly arcuately outcurved posteriorly. Surface punctate like frons, but some of the punctures larger, with diameter nearly equal to the width of the second antennomere, separated mostly by less than one diameter. Spaces between punctures moderately shining, finely punctulate. Scutellum small, semicircular.

Elytra ovate, widest behind their midlength, 1.33 times longer than their combined width and 3.0 times longer than pronotum, simultaneously rounded at the apex. Base of elytra wider than pronotum, humeri rounded. Surface of elytra strongly transversely convex, shallowly transversely impressed behind one fourth of their length; lateral margins just visible simultaneously from above only in posterior half. Each elytron with scutellary striole and 10 complete striae. All striae canaliculate apically, punctures nearly equal in size to those of frons, within one stria separated by nearly one diameter. The first three complete striae (counted from suture) more deeply incised, with smaller and more widely spaced punctures in posterior half. Interstries in anterior half nearly as wide as striae, moderately convex, sutural one somewhat raised behind scutellary striole. Interstries as well as impunctate humeral bulge moderately shining, finely and sparsely punctulate.

Legs slender, pro- and mesotibiae nearly 7 times, metatibiae nearly 4.5 times longer than wide, fore and middle tarsi reaching about two thirds, hind ones about three fourths of the length of corresponding tibia. Tarsal claws simple.

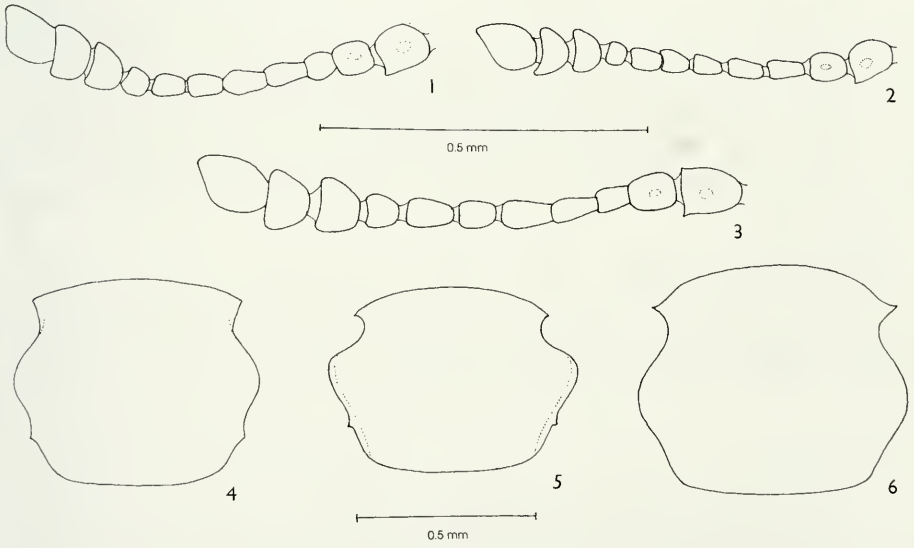
Mentum with pair of deep subtriangular impressions. Prosternum flat, in front of procoxae as short as the width of antennal flagellum, with finely bordered anterior margin and without distinct punctures. Prosternal process flat, somewhat dilated distad, truncate at the apex and there nearly as wide as the second antennomere. Hypomera flat with rather dense obsolete punctures. Mesosternum with flat, bluntly pointed impunctate yellow intercoxal process, in front of it with pair of fine raised edges diverging anteriorly on mesosternum proper and converging on prepectus, thus enclosing a shallowly concave, impunctate and strongly shining rhomboidal cell, besides it shallowly concave, smooth and shining with rather large shallow punctures. Metasternum broadly convex with deeply incised mediolongitudinal furrow all along its length, with fine punctures mostly separated by more than one diameter, between them smooth and shining. Hypopygium broadly rounded apically.

Male unknown.

Distribution: Nepal, Kathmandu district.

Etymology: We are pleased to dedicate the new species to one of collectors, Dr. Ivan Löbl.

Comments: *Laricobius loebli* sp. n. differs from the sympatric bicoloured species *L. schawalleri* Háva & Jelínek, 2000 by its unicoloured black elytra as well as by different shape and proportions of pronotum and antennae.



FIGS 1-6

Antennae (Figs 1-3) and pronota (Figs 4-6) in *Laricobius*; 1 and 4. *L. loebli* sp. n.; 2 and 5. *L. schawalleri* Háva & Jelínek; 3 and 6. *L. mirabilis* Háva & Jelínek. Scale bars = 0.5 mm in figs 1-3, = 0.5 mm in figs 4-6.

Distinguishing characters of all *Laricobius* species from southeastern part of the Palaearctic region are given in key below.

KEY TO THE *LARICOBIUS* SPECIES FROM THE HIMALAYA AND CHINA

1(4) Pronotum with minute, but distinct, subrectangular to obtuse posterior angles. Body comparatively shorter, elytra less than 1.5 times longer than their combined width. Species from the Himalaya.

2(3) Pronotum comparatively narrow, 1.18 times wider than long. Lateral margins of pronotum regularly outcurved in median portion, equally converging both anteriorly and posteriorly (Fig. 4). Antennomere III as long as wide, IV 1.8 times longer than wide, following ones becoming gradually shorter, VII nearly 1.2 times longer than wide (Fig. 1). Elytra broadly ovate, 1.33 times longer than their combined width. Black, appendages brown-yellow, femora at least partly black. Length 2.4 mm, width 1.2 mm. Nepal ..... *L. loebli* sp. n.

3(2) Pronotum distinctly transverse, 1.3 times wider than long. Lateral margins of pronotum asymmetrically outcurved in median portion, more strongly converging anteriorly than posteriorly (Fig.3). Antennomeres III - V nearly twice as long as wide (Fig. 2). Elytra 1.44 times longer than their combined width. Brown-yellow, elytra black, suture behind the transverse impression and a subtriangular apical area brown-yellow; appendages brown-yellow. Length 2.3 mm, width 1.1 mm. Nepal ..... *L. schawalleri* Háva & Jelínek

4(1) Posterior angles of pronotum indistinct, pronotum 1.22-1.24 times wider than long (Fig. 6). Body more elongate, elytra 1.53-1.55 times longer than their combined width. Antennomeres III - VII longer than wide (Fig. 3). Length 3.0-3.2 mm, width 1.3-1.5 mm. Red-brown with brown-yellow appendages, colouration possibly variable (see above). China. ..... *L. mirabilis* Háva & Jelínek

ACKNOWLEDGEMENTS

We are obliged to R. Dunda (Praha) and I. Löbl (Genève), who provided us with the material upon which this paper is based.

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Regenwürmer (Oligochaeta) aus der Umgebung von Manaus (Amazonien). Regenwürmer aus Südamerika 32

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Earthworms (Oligochaeta, Glossoscolecidae) from the surroundings of Manaus (Central Amazon region). - During an ecological survey eight species of the genera *Rhinodrilus*, *Urobenus*, *Andiorrhinus*, *Pontoscolex* and *Tuiba* have been collected from three test areas of the EMBRAPA-CPAA research station near Manaus. *Pontoscolex vandersleeni* Michaelsen is recorded for the first time from Brasil. The new species *Cirodrilus righii* sp. n. is described. A short ecological discussion analyzes the results obtained in the different test areas.

Key-words: Amazonia - Oligochaeta - Glossoscolecidae - ecology - systematics - new species.

EINLEITUNG

Im Rahmen eines internationalen SHIFT Projektes (Studies on Human Impact on Floodplains and Forest in the Tropics; ENV52), wo die Rolle der Bodenfauna beim Streuabbau in Primär- und Sekundärwäldern sowie einer Holz- Mischkulturfläche in Amazonien verfolgt wird, wurden u. a. auch Regenwürmer gesammelt. Wie aus der angeführten Literatur ersichtlich (Römbke *et al.*, 1999) ist ein Teil der Regenwürmer bestimmt worden, ein anderer Teil wurde dem Erstautor zur Bestimmung und Überprüfung übersandt. Das bestimmte Material ist bzw. wird zum Teil in der Sammlung des Instituto Nacional de Pesquisas da Amazônia (INPA) von Manaus, zum Teil in der Sammlung des Lehrstuhls für Zoosystematik und Ökologie der Eötvös Loránd Universität, Budapest (AF), aufbewahrt. Ein weiterer Teil des Materials wurde Herrn Prof. G. Righi, Sao Paulo, zur Aufbewahrung überlassen.

MATERIAL UND METHODEN

Untersuchungsgebiet

Fast alle Regenwürmer wurden auf dem Gelände der agroforstwirtschaftlichen Forschungsstation EMBRAPA-CPAA (Empresa Brasileira de Pesquisa Agropecuária,

Manuskript angenommen 19.09.2000

Centro de Pesquisa Agroflorestal na Amazônia Occidental) im Bundesstaat Amazonas (Brasilien) gefangen. Dieses Untersuchungsgebiet liegt 29 km nördlich von Manaus an der Strasse nach Itacoatiara (3°8'S, 59°52'W). Insgesamt wurden drei Versuchsparzellen (Abb.1) vierteljährlich (Juni 1996 – März 1999) beprobt (Römbke *et al.*, 1999):

- Holz-Mischkultursystem (2 Teilflächen: POA, POC): eine 1992 erfolgte Aufforstung mit vier verschiedenen Baumarten (*Hevea* spp. (Euphorbiaceae), *Schizolobium amazonicum* (Caesalpiniaceae), *Swietenia macrophylla* (Meliaceae) und *Carapa guianensis* (Meliaceae), zwischen denen Sekundärvegetation zugelassen wird;
- Sekundärwald (SEC): seit 1984 in unmittelbarer Nähe zur Holz-Mischkulturfläche gelegen, dominiert durch drei Arten der Gattung *Vismia* sp.;
- Primärwald (terra firme; FLO): auch nahe bei der Holz-Mischkulturfläche gelegen.

Die wichtigsten Bodeneigenschaften unterschieden sich zwischen diesen Versuchsparzellen nicht (Tab. 1). In den Jahren 1996, 1997 und 1998 lag der Niederschlag bei 2585, 2238 bzw. 2545 mm bei einer mittleren Jahrestemperatur von ca. 27°C (gemessen jeweils an der EMBRAPA-Station; Martius, pers. Mittl.). Ungewöhnlich war ein sehr trockener Zeitraum im zweiten Halbjahr 1997, der als El Niño Effekt interpretiert wird.

Tabelle 1

Kurze Charakterisierung der vier Untersuchungsflächen

Parameter	**FLO**	**SEC**	**POA**	**POC**
Vegetation	Primärwald	Sekundärwald	Polykulturflächen	
Bodentyp	Xanthic Ferrasol = Sandiger Ton: 60 % Ton, 25 % Sand, 15 % Schluff			
pH Wert ($CaCl_2$)	4.0 ± 0.2	4.0 ± 0.1	4.2 ± 0.1	4.0 ± 0.2
Wk_{Max} (%)	86.4	79.7	76.8	?
C Gehalt (%)	3.5 – 4.5	2.5 - 3.3	2.5 – 3.5	3.1 – 4.5
N Gehalt (%)	0.26 – 0.31	0.21 – 0.25	0.20 – 0.26	0.23 – 0.30

Fangmethodik

Der Grossteil der hier beschriebenen Tiere wurde mittels Formolextraktion (an 8 Zeitpunkten jeweils 2 Flächen von 4 m^2 pro Untersuchungsfläche) gefangen. Einige wenige, vor allem kleinere Individuen wurden bei der Trockenextraktion (Berlese) von Streu- und Oberbodenproben gefunden.

Abb. 1

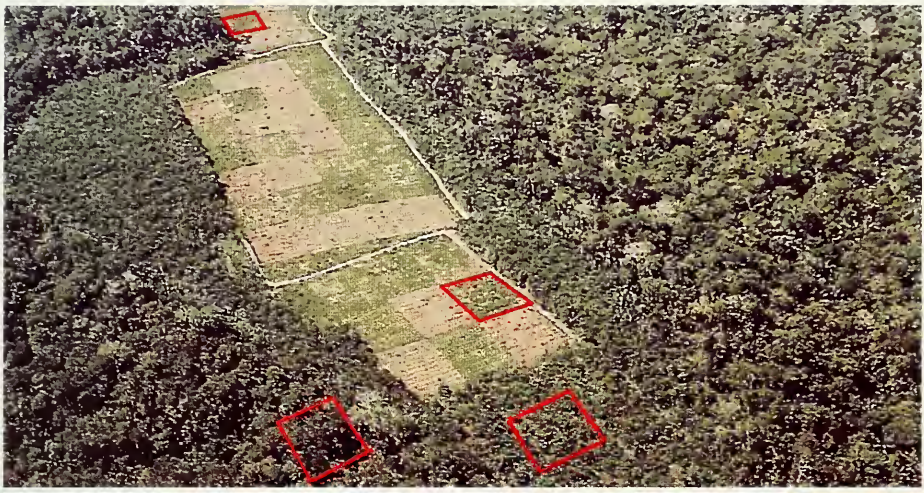
Versuchsparzellen der Forschungsstation EMBRAPA-CPAA im Bundestaat Amazonien (Brasilien).

Abb. 2

Rhinodrilus priollii Righi, 1969. 2. Ventralansicht der Gürtelregion mit dem Pubertätsfeld.

Abb. 3

Rhinodrilus contortus Cernosvitov, 1938. Ventralansicht der Gürtelregion mit hervorstehenden Pubertätstuberkeln auf dem Pubertätsfeld.



1

2

3

ERGEBNISSE

Artenbesprechung

Rhinodrilus Perrier, 1872

Rhinodrilus Perrier, 1872:65
Rhinodrilus part.: Benham 1890:253; Beddard 1895:636; Michaelsen 1900:430, 1918:165; Righi 1971:10; Righi, 1985:232 emend
Rhinodrilus (Rhinodrilus) part: Cognetti, 1906:174
Geogenia part.:Vaillant, 1889:188
Tykonus part.: Beddard, 1895:650
Anteus part.: Beddard, 1895:651; Rosa, 1896:90

Rhinodrilus priollii Righi, 1967

Fundorte: AF/4070 1 Ex., Manaus, Embrapa (FLO AF39), 2.9.1998, leg. Römbke. AF/4081 1 juv. Ex., Manaus, Embrapa (FLO 1), 8.7.1997, leg. Meller. AF/5002 1 Ex., Manaus Embrapa, Estrada para area SHIFT, 26. 6. 1997, leg. Meller.

Es liegen von dieser seit der Erstbeschreibung bisher nicht wieder gesammelten Art 2 adulte Tiere vor. Die Originalbeschreibung erfolgte vor mehr als drei Jahrzehnten aufgrund eines Exemplares und wurde seither nicht revidiert. Da die vorliegenden Tiere in mehreren Kennzeichen eindeutig von der Originalbeschreibung abweichen und seinerzeit mehrere Merkmale nicht angeführt wurden, soll nachstehend eine Wiederbeschreibung erfolgen.

Länge 620-860 mm, Breite 15-19 mm, Segmentzahl 424-439. Es besteht die Möglichkeit, dass der Grössenunterschied der beiden Tiere auf einer Ausdehnung des einen Tieres bei der Konservierung beruht, da in der Segmentzahl kaum Unterschiede bestehen. Eindeutig ist der Unterschied in Righis Angaben, wo eine Länge von 480 mm und eine Segmentzahl von 268 angegeben wird.

Farbe abgetötet grau, gestreift, besonders in den Intersegmentalfurchen dunkler gefärbt. Kopf rüsselförmig, eingezogen. Erstes und zweites Segment längsgefurcht. Einige Segmente vor dem Gürtel zweiringlig. Borsten gepaart, hinter dem Gürtel deutlich zu erkennen. Vor dem Gürtel sind sie, da meistens von Verdickungen überdeckt, nur auf wenigen Segmenten zu sehen. Borstenverhältnis hinter dem Gürtel *aa:ab:bc:cd:dd* wie 5,3:1,3:4,6:1:9,3. Ventrale Borsten des 7.-9. Segmentes zu Geschlechtsborsten verwandelt, Länge 3,5 mm, Breite 0,06 mm, Zahl der Narben 25. Die Borsten sind eingezogen und liegen in Borstensäcken, so dass sie von aussen nur durch schlitzförmige kleine Öffnungen zu erkennen sind, die von einem helleren Hof umgeben werden. Von Righi (1967, p. 477 Abb. 1) werden diese als "espermatecas acessôrias" bezeichnet. Aufgrund der vorliegenden Tiere kann ich mich dieser Ansicht nicht anschliessen. Nephridialporen vom 4. Segment in der mutmasslichen Berstenlinie *d*. Samentaschenporen auf Intersegmentalfurche 6/7-8/9 vor den Nephridialporen, kleine hervorstehende Öffnungen.

Gürtel sattelförmig am 17.-25. Segment, Pubertätsstreifen vom 1/2 19., 19. -23. Segment. Borsten des 19., 22., 23. Segment zu Geschlechtsborsten verwandelt, die in schlitzförmigen Vertiefungen liegen (Abb. 2), die innen von Geschlechtsdrüsen

umgeben sind. Weibliche Poren auf dem 14. Segment in der Borstenlinie *a*, innerhalb der Intersegmentalfurche 14/15. Männliche Poren (winzige Öffnungen) auf dem 20. Segment auf den Pubertätsstreifen. Innen liegt hier eine kompakte Tasche, die von Righi im 19. Segment erkannt wurde und Kopulationstasche genannt wird. In diese sollen die Samenleiter münden und im männlichen Porus des 19. Segments enden. Die männlichen Poren sind nach Righi breite mediane Schlitze im 19. Segment. Bei den vorliegenden Tieren liegen in den breiten Schlitzen die Geschlechtsborsten. Sie sind hier 5,1 mm lang, 0,08 mm breit und verfügen über 30 Narben.

Innere Organisation. Dissepimente 6/7-18 verdickt, die vorderen trichterförmig ineinander gelegt. Muskelmagen im 6. Segment. Chylustaschen im 7.-9. Segment, Rispenschlauchtaschen. Herzen im 7.-12. Segment, besonders gross sind die des 10.-12. Segments. Perlschnurartiges Dorsalgefäss reicht bis ins 26. Segment. Hoden und Samentrichter im 10. und 11. Segment von perioesophagealen Testikelblasen eingeschlossen, die dorsal miteinader verbunden sind (so wie dies von Righi, 1967 p. 477 Abb. 6 veranschaulicht wird). Zwei kleine Samensäcke im 11. und 12. Segment. Ovarien am hinteren Rand des Dissepiment 12/13, breite, längliche Gebilde. Ovarientrichter nicht erkannt. Mitteldarm im 27. Segment beginnend, hier auch mit einer kleinen Typhlosolis versehen. Nephridien mit Nephridialblasen versehen, ohne büschelförmigen Nephrostom. Samentaschen im 8. und 9. Segment, lange (20-22 mm), fadenförmige Schläuche, die am Ende etwas zurückgebogen sind. Im Ausführungsgang Samenkämmerchen vorhanden. Die Samentaschenschläuche sind fast gleichlang (Abb. 4).

Bemerkung. Obwohl einige Unterschiede bestehen (Lage der männlichen Poren, Form der Samentaschen und Vorhandensein von Samenkämmerchen) ist mit Sicherheit anzunehmen, dass uns Righis Art vorliegt. Dafür spricht zudem, dass die Tiere nahezu vom gleichen Fundort stammen und auch von Righi für seine Art gehalten wurden. Durch die Ergänzungsmerkmale ist die Art jetzt mit Sicherheit zu erkennen.

ABB. 4

Samentaschen von *Rhinodrilus priollii* Righi, 1962. SK = Samenkämmerchen.

R. priollii scheint (zumindest) im nördlichen Umfeld von Manaus regelmässig vorzukommen, da diese grosse Art von den Einheimischen mit einem eigenen Namen ("Minhococu") bezeichnet wird und auch in anderen ökologischen Studien (z.B. in der "Reserva Ducke", etwa auf halbem Wege zwischen der Embrapa und dem Stadtgebiet von Manaus gelegen; Martius, pers. Mittl.) gefunden wird. Die Tiere scheinen sich meist im Übergangsbereich zwischen Mineralboden und Streu- bzw. Wurzelschicht aufzuhalten. Bei Störung autotomieren sie schnell, bewegen sich ansonsten aber deutlich langsamer als z.B. Individuen von *T. dianae*.

Rhinodrilus contortus Cernosvitov, 1938

Fundorte. AF/4071 2 Ex., Manaus, Embrapa (FLO U30), 1.9.1998, leg. Römbke. AF/4072 3+3 juv. Ex., Manaus, Embrapa (FLO G18), 2.12.1997, leg. Feijoo.

Seltener als *R. priollii* werden diese Tiere dennoch regelmässig beim Überqueren von Waldwegen gesehen (bzw. überfahren), da sie als Bewohner der unteren Streuschicht recht mobil sind.

Diese Art wurde ebenfalls anhand eines Exemplares beschrieben und seither nicht wieder gesammelt. Jetzt liegen auch mehrere Exemplare in verschiedenen Entwicklungsstadien vor. Die Tiere stimmen vollkommen mit der Originalbeschreibung überein. Einige Abweichungen bzw. nicht angeführte Merkmale werden nachstehend angegeben. Bei den vollkommen entwickelten Tieren mit ringförmigem Gürtel erstreckt sich dieses Organ auch auf 1/2 16. und 1/2 25. Segment. Pubertätsfeld vom 19.-21. Segment mit hervorstehenden Pubertätstuberkeln (Abb. 3). Der Mitteldarm beginnt im 26., die Typhlosolis im 27. Segment. Nephridien ohne büschelförmigem Nephrostom.

Urobenus Benham, 1887

Urobenus Benham, 1887:82; Benham, 1890:255; Beddard, 1895:661; Righi, 1985: 247.
Anteus part: Rosa: 1896:90.
Rhinodrilus part: Michaelsen, 1900:430; 1918:165; Righi, 1971:10.

Urobenus brasiliensis brasiliensis Benham. 1887

Fundort. AF/4075 2 Ex., Manaus, Embrapa (FLO H05), 4.3.1999 leg. Römbke
Diese Tiere kommen auf allen Untersuchungsflächen häufig und regelässig vor.

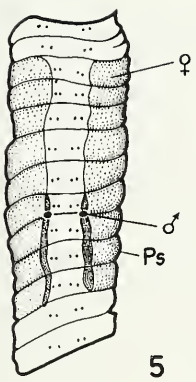
Andiorrhinus Cognetti, 1908

Andiorrhinus Cognetti, 1908:511; Michaelsen, 1918:198; Righi, 1986:124; Righi, 199:136 emend.; Zicsi, 1995:588.

Andiorrhinus (Amazonidrilus) amazonius Michaelsen, 1918

Fundort. AF/4074 4 Ex., Manaus, Embrapa (FLO H05), 2.3. 1999, leg. Römbke

Die Art wird regelmässig, aber nie sehr häufig, im Umfeld von Manaus gefunden, nicht zuletzt auf Polykulturflächen.



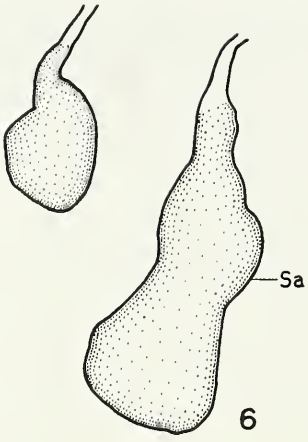


Abb. 5-6

Cirodrilus righii sp. n. 5. Ventralansicht der Gürtelregion. Ps=Pubertätsstreifen. 6. Samentaschen. Sa=Samentaschenampulle.

Andiorrhinus (Amazonidrilus) tarumanis Righi, Ayres & Bittencourt, 1976

Fundort. AF/4073 1. Ex., Manaus, Embrapa (SEC Y22), 2.12.1998, leg. Garcia

Von dieser Art wurden bisher nur sehr wenige Individuen im Rahmen des ENV52-Projekts gefangen.

Cirodrilus Righi, 1975

Cirodrilus righii sp. n.

Fundort: Manaus, Embrapa, aus Berlese-Proben, 2. 12. 1998, leg. Garcia: Holotypus (Sammlung INPA).

Länge des Holotypus 60 mm, Breite 2 mm, Segmentzahl 309. Farbe grau, unpigmentiert. Kopf eingezogen, daumenförmig verdickt. Segmente ungeringelt. Borsten gepaart, Borstenverhältnis hinter dem Gürtel *aa*:*ab*:*bc*:*cd*:*dd* wie 3:1,5:4:1:8. Geschlechtsborsten sind nicht erkannt worden. Nephridialporen in der Borstenlinie *cd*. Samentaschenporen auf Intersegmentalfurche 7/8 und 8/9 in der Borstenlinie *ab*. Gürtel sattelförmig auf dem 14.-22. Segment. Pubertätsstreifen auf dem 19.-22. Segment. Weibliche Poren auf dem hinteren Rand des 14. Segments, in der Borstenlinie a. Männlche Poren auf Intersegmentalfurche 19/20, in Höhe der Pubertätsstreifen (Abb. 5).

Innere Organisation. Dissepimente 6/7-9/10 etwas verdickt. Schlunddrüsen reichen bis ins 5. Segment. Grosser Muskelmagen im 6. Segment. Kleine Chylustaschen im 8. und 9. Segment, beide öffnen sich in der ventralen Mittellinie des Oesophagus. Es sind typische Leistentaschen. Dahinter tritt der Oesophagus plötzlich hervor und bildet im 10. und 11. Segment kleine seitliche Kämmerchen, die ebenfalls eine leistenförmige Struktur aufweisen. Nach einer Verschnürung des Oesophagus

hinter den beiden Kämmerchen bildet der Oesophagus eine grössere zusammenhängende Erweiterung, die im 12.-14. Segment ebenfalls eine leistenförmige Struktur aufweist und mit den saumförmigen Querfalten des Oesophagus in Verbindung steht. Herzen im 10. und 11. Segment. Perlschnurartiges Dorsalgefäss reicht bis ins 15. Segment. Ein Paar Hoden und Samentrichter im 11. Segment, glänzende Samenmassen sind auch im 12. Segment zu erkennen. Die Samenleiter treten im 11. Segment hervor und verlaufen der Muskelwand angeschmiegt bis ins 19. Segment, wo sie ins längliche Drüsenfeld eintreten und auf der Intersegmentalfurche 19/20 in den männlichen Porus ausmünden. Das innere Drüsenfeld, erstreckt sich, den Pubertätsstreifen entsprechend, auf dem 19.-22. Segment. Ein Paar Samensäcke verlaufen dem Mitteldarm angeschmiegt bis ins 52. Segment. Mitteldarm und Typhlosolis im 18. Segment beginnend. Nephridien mit Nephridialblasen versehen. Zwei Paar Samentaschen im 8. und 9. Segment: es sind schlauchförmige grosse Gebilde mit kurzem Ausführungsgang. Keine Samenkämmerchen vorhanden (Abb. 6).

Die neue Art unterscheidet sich von den drei bisher beschriebenen Arten *C. angeloi*, *C. aidae* und *C. venezuelanus* in der Lage der Pubertätsstreifen und in der Zahl der Samentaschen.

Die neue Art wird zu Ehren in Erinnerung an Prof. Dr. Gilberto Righi, den bekannten Oligochaeten-Fachmann benannt, der sich in der Erkundung der brasilianischen Regenwurmfauna grösste Verdienste erworben hat.

Pontoscolex Schmarda, 1861

Pontoscolex Schmarda, 1861:11; Beddard, 1895:653; Michaelsen, 1900:424; 1928: 233; Stephenson, 1923:489; Righi, 1971:40; Gates, 1972:53; Righi, 1984:160 emend.
Meroscolex Cernosvitov, 1934:56
Eurydame Kinberg, 1867:97
Urochaeta Perrier, 1872:142

Pontoscolex* (*P.*) *corethrurus (Müller), 1857

Fundort. Manaus, Embrapa.

Es ist die weitverbreiteste Glossoscoleciden-Art und kommt in allen tropischen und subtropischen Gebieten der Erde vor. Auf dem Embrapa-Gelände fehlt sie im Primärwald (FLO) ganz, während ihr Dominanzanteil mit steigendem anthropogenen Einfluss zunimmt (vgl. Tabelle 2).

Pontoscolex* (*P.*) *vandersleeni Michaelsen, 1933

Fundort. AF/4086 1 Ex., Manaus, Embrapa (SEC AL06), 4.3.1999, leg. Garcia.

Die Art scheint sehr selten zu sein; bisher ist jedenfalls nur ein Exemplar gefunden worden.

Diese Art wurde bisher nur in Surinam gesammelt. Von hier liegen 2 geschlechtsreife Tiere vor. Das in der Umgebung von Manaus, aus Berlese-Proben stammende Tier besitzt nur den Vorderteil des Körpers, wo die Gürtelorgane und das Pubertätsfeld mit den kennzeichnenden akzessorischen Pubertätsorganen deutlich

erkannt werden konnten. Alleinstehend ist diese Art auch durch das Vorhandensein von 4 Paar Samentaschen. Der neue Fundort beweist, dass es sich nicht um eine einfache Variation von *P. corethrurus* handeln kann, wie dies von Righi (1984, p.175) angedeutet wurde.

Tuiba Righi, Ayres et Bittencourt, 1976

Tuiba dianae Righi, Ayres et Bittencourt, 1976

Fundorte. Igapo (Überschwemmungswald), nahe des Rio Jaracui (Nebenfluss des Rio Negro), 100 km NW von der Embrapa Station, 10.8.1997, leg. Römbke. AF/4076 19 juv Ex., Manaus, Embrapa (FLO H05), 2.3.1999, leg Römbke; AF/4084 3 praed. Ei., Manaus, Embrapa (FLO G18), 2.12.1997, leg. Feijoo.

Die Art ist an allen Waldstandorten auf dem Embrapa-Gelände sehr häufig.

Aus Amazonien sind gleichzeitig zwei Arten beschrieben worden, wobei Tiere mit Gürtel und geschlechtsreife Tiere unterschieden werden. Ob es sich bei den sogenannten geschlechtsreifen Exemplaren um Tiere handelt, bei denen die Gürtelorgane nur durch Verfärbung angedeutet sind, geht aus den Beschreibungen nicht hervor. *T. tipema* soll sich von der Typusart *dianae* nur in der Form des Muskelmagens, im Fehlen der Drüsenpölster entlang der Pubertätsstreifen und der Drüsenzellen, die die Geschlechtsborsten in Höhe der Samentaschen umgeben, unterscheiden. In einer späteren Arbeit (Righi, 1989) wurde aufgrund von 23 mit Gürtel versehenen, 10 geschlechtsreifen und 13 juvenilen Tieren, trotz Fehlen dieser inneren Drüsenfelder, die Art *T. tipema* zu *dianae* eingezogen. Die 4 mit Gürtel versehenen Tiere, die 100 km NW von der Embrapa Station gesammelt wurden, stimmen vollkommen mit der Beschreibung von *dianae* überein. Die von den übrigen Fundorten vorliegenden Exemplare, die alle aus der Umgebung von Manaus stammen, besitzen keinen Gürtel. Die Lage des Gürtels lässt sich nur durch Verfärbung erkennen. Sie stehen *T. tipema* näher, da bei allen Tieren die inneren Drüsenverdickungen fehlen. Ob diese Exemplare nicht geschlechtsreif waren, ist nicht mit Sicherheit auszuschliessen, da die Divertikel der Samentaschen mit Samenmassen gefüllt sind. Es kann sich um eine Rückbildung der Gürtelorgane handeln, was auch bei anderen Regenwürmern verschiedener Familien bekannt ist. Da keine Tiere mit Gürtel aus dieser Gegend vorliegen, diese Drüsen sich auch später ausbilden könnten, wird vorerst die Verschmelzung der beiden Arten beibehalten. Sollten noch Tiere mit Gürtel gesammelt werden, würde die Aufrechterhaltung beider Taxa (tipema mindestens als Unterart) befürwortet.

Im Äusseren ähneln diese Tiere den Vertretern der Gattung *Onoreodrilus* Zicsi, 1988 aus dem Andengebiet Ekuadors, wo diese Tiere sich schlingelnd oder aufgestöbert durch kleine Sprünge in der Laubstreu sehr feuchter Wälder fortbewegen. Die dunkle Farbe und die zeitweilige Zurückbildung der Gürtelorgane erinnern an die vorausgehend bekannt gegebenen Tiere. Auch die aus einem Regenwald im Osten Perus beschriebene Art *Martiodrilus ecuadoriensis papillatus* verhält sich sehr ähnlich (Römbke & Verhaagh, 1992). Eventuell sind Färbung und die für Regenwürmer ungewöhnliche Art der Fortbewegung bei Störung als Anpassung an die Raubzüge von Wanderameisen aufzufassen: Nach persönlicher Beobachtung

können mehrere, schnell hintereinander durchgeführte Sprünge die Tiere ausserhalb der "Front eines Ameisenzugs auf Beutesuche bringen.

DISKUSSION

Die Artenzusammensetzung der Regenwürmer ist auf den vier Untersuchungsflächen relativ einheitlich (Tabelle 2). Zum Beispiel unterscheidet sich der Dominanzanteil von *A. amazonius* oder *Rh. priollii* nur zwischen 25 bis 33 % bzw. 5 bis 12 %. Nur in wenigen Fällen fehlt eine Art auf einer Fläche vollständig (z.B. *Rh. contortus* auf POA) oder ist eindeutig mehr oder weniger häufig auf einer im Vergleich zu den anderen Flächen (z.B. *U. brasiliensis* auf POC). Zwei Besonderheiten sollten herausgehoben werden:

- Nach ihrer Artenzusammensetzung ähneln sich FLO und SEC untereinander mehr als die beiden Polykulturflächen;
- Der Dominanzanteil der einzigen bisher gefundenen peregrinen Art (*P. corethrurus*) steigt von FLO (0 %) ber SEC (2 %), POC (5 %) und POA (12 %) an.

Bei diesen Aussagen ist allerdings die generell geringe Dichte (< 20 ind/m^2) und die hohe Variabilität des Auftretens zu bedenken: nur *T. dianae* und *R. priollii* wurden regelmässig gefangen. Eine jahreszeitliche Dynamik ist nicht erkennbar, auch wenn Abundanzminima in der Trockenzeit (speziell im September) auftreten. Die äusserst wichtige Rolle der Regenwürmer im Boden der Embrapa-Fläche steht aber zweifelsfrei fest, da ihre Biomasse ähnliche Grössenordnungen (bis 35 g/m^2 FG in FLO) wie die der gesamten übrigen Fauna erreicht und positive Korrelationen zwischen Regenwurmbiomasse und der Streuabbaurate festgestellt wurden.

Die relativ geringen Unterschiede zwischen den einzelnen Untersuchungsflächen dürften darauf zurückzuführen sein, dass der ursprüngliche Primärwald und die Sekundär- bzw. Polykulturflächen räumlich nah zusammenliegen und sich zudem in ihren abiotischen (z.B. klimatischen) Bedingungen nicht total unterscheiden. Bei weiter nördlich von Manaus gelegenen Flächen, auf denen der Primärwald in Weiden umgewandelt wurde, dominiert dagegen *P. corethrurus* nahezu vollständig (Lavelle *et al.*, 1998).

TABELLE 2

Anteil der wichtigsten Regenwurmarten auf den vier Untersuchungsflächen des auf dem EMBRAPA Gelände (Grundlage: Abundanzwerte)

Art	FLO	SEC	POA	POC
A. amazonicus	11 %	10 %	12 %	22 %
P. corethrurus	0 %	2 %	12 %	5 %
Rh. contortus	31 %	17 %	0 %	14 %
Rh. priollii	6 %	5 %	12 %	5 %
U. brasiliensis	20 %	34 %	33 %	10 %
T. dianae	25 %	28 %	30 %	33 %
Rest	7 %	6 %	1 %	11 %

An sehr feuchten Stellen im Primärwald wurden, vor allem an vor Regen geschützten Stellen, sehr grosse Exkrementansammlungen gefunden, die aufgrund ihrer Grösse nur von den *Rhinodrilus*-Arten stammen können. Teilweise erreichten diese "Türmchen Höhen von 10 – 15 cm. Das weitgehende Fehlen dieser auffälligen Strukturen im Sekundärwald bzw. den Polykulturflächen dürfte auf die klimatischen Bedingungen zurückzuführen sein (sowohl *R. priollii* als auch, seltener, *R. contortus*, kommen hier vor): Aufgrund der häufigen Sonneneinstrahlung auf den Boden (Fehlen eines geschlossenen Kronendaches) zerfallen Exkremente durch den schnellen Temperatur- und Feuchtewechsel leicht.

Soweit die bisherigen, sehr fragmentarischen Funde Aussagen zulassen scheint sich die Regenwurmfauna der Embrapa-Fläche biogeographisch aus vier unterschiedlichen Gruppen zusammenzusetzen:

- Peregrine Arten: nur *P. corethrurus* (in der weiteren Umgebung der Embrapa-Fläche auch verschiedene Dichogaster-Arten);
- In Amazonien weit(er) verbreitete Arten wie *A. amazonius*, *A. v. tarumanis*, *U. brasiliensis* und *P. vandersleeni*;
- Auf die Umgebung von Manaus beschänkte Arten wie *R. priollii* und *R. contortus* (evtl. auch *T. dianae*);
- Neue Arten wie *C. righii*, über deren Verbreitung noch nichts gesagt werden kann.

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Cave-dwelling oribatid mites from Greece (Acari: Oribatida)[1]. (Neue und interessante Milben aus dem Genfer Museum XLIX)

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Cave-dwelling oribatid mites from Greece (Acari: Oribatida). (Neue und interessante Milben aus dem Genfer Museum XLIX). – A list of 15 Oribatida species from natural caves and artificial galleries of Samos, Nikaria and Corinth in Greece is given. Among them 3 species and 1 subspecies are described as new to science: *Phthiracarus* (*A.*) *eupalineus* sp. n. (Phthiracaridae), *Issaniella mograbin hauseri* ssp. n. (Hermanniellidae), *Lasiobelba icaria* sp. n. and *Medioppia samaina* sp. n. (Oppiidae). *Lasiobelba quadriseta* Subias, 1989 is noted as an unavailable name.

Key-words: Acari - Oribatida - taxonomy - new species, new subspecies - caves - Greece.

INTRODUCTION

Dr. B. Hauser has continuously investigated the soil and cave fauna of Greece over years and has collected a great number of samples for extraction by the Berlese apparatus and some for extraction by the Moczarski-Winkler apparatus. The mite material has been entrusted to me. As well as 5 publications on Acarida, Anoetida and Tarsonemina, I have published 5 papers on Oribatids (Mahunka, 1974, 1977a, 1977b, 1979 and 1982). In 1981 a paper was prepared with Dr. B. Hauser as senior author which, however, has never been published. This has raised some nomenclatorial problems, but the other data are worth publishing. To this end I have again studied the material and have prepared this new manuscript.

The paper discusses 15 species. Besides describing three new species and one new subspecies I give the history of origin of the name *Daedaloppia* sp. which has, unfortunately, been erroneously introduced into literature.

The Oribatid Fauna of Greece still remains almost unknown: the checklist of Flogaitis (1992) contains only 220 species.

From a zoogeographical point of view the new subspecies of *Issaniella mograbin* Grandjean, 1962 is of great interest. Standing quite close to the nominate form from Morocco, it makes a bridge between the soil fauna of North Africa and Southern Europe.

[1] Sixth Contribution to the Oribatid Fauna of Greece (Acari: Oribatida).

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When describing species I have used terminology already applied in some of my earlier papers (e.g. Mahunka, 1996).

LIST OF LOCALITIES[2]

Sam-80/4: Grèce: **Icarie:** Aghios Kirikos: ancienne mine au lieu-dit Metallion, 30m; 24.IV. 1980; leg. B. Hauser.
Sam-80/9: Grèce: **Samos:** environs de Kosmathei: grotte "Kako Perato", près du monastère Kimisos Theotoki, 580m; 25.IV.1980; leg. B. Hauser.
Sam-80/10: Grèce: **Samos:** environs de Kosmathei: grotte "Tsitse Tripa", 510m; 25.IV.1980; leg. B. Hauser.
Sam-80/11: Grèce: **Samos:** environs de Kosmathei: prélèvement de vieilles souches de Pins près de l'entrée de la grotte "Tsitse Tripa", 510m; 25.IV.1980; leg. B. Hauser – (extraction par appareil Berlese).
Sam-80/12: Grèce: **Samos:** environs de Pythagorion: grotte "Panaghia Spiliani", 110m; 26.IV. 1980; leg. B. Hauser.
Sam-80/13: Grèce: **Samos:** environs de Drakei: grotte "Spilia tis Aghias Triadas", Monts Kerkis, 840m; 27.IV.1980; leg. B. Hauser.
Sam-80/16: Grèce: **Samos:** environs de Karlovasi: galerie artificielle inachevée pour une source thermale radioactive, au bord de la mer dans la région de "Potamos", 5m; 28.IV.1980; leg. B. Hauser.
Sam-80/17: Grèce: **Samos:** environs de Karlovasi: grotte, région de "Potamos", 5m; 28.IV. 1980; leg. B. Hauser.
Sam-80/20: Grèce: **Corinthe:** grotte „Tripa tou Kalivaki" près de la route Klenia - Aghionorion, 640m; 2.V.1980; leg. B. Hauser.

LIST OF IDENTIFIED SPECIES

Aphelacaridae Grandjean, 1954

Aphelacarus acarinus (Berlese, 1910)
Locality: Sam-80/11: 9 specimens.
Distribution: Palearctic region.

Brachychthoniidae Thor, 1934

Sellnickochthonius hungaricus (Balogh, 1943)
Locality: Sam-80/11: 5 specimens.
Distribution: Southern part of the Palearctic region.

Phthiracaridae Perty, 1841

Calyptophthiracarus vicinus (Niedbała, 1984)
Locality: Sam-80/11: 26 specimens.
Distribution: Caucasus (hitherto known from the type locality only), Greece: first record.

Phthiracarus (Archiphthiracarus) eupalineus sp. n.
Localities: Sam-80/4, Sam-80/9, Sam-80/10.

Oribotritiidae

Iudotritia consimilis Märkel, 1964
Locality: Sam-80/12: 72 specimens.
Distribution: Central and Southern Europe.

[2] Original indications given by the collector.

Hermanniellidae Grandjean, 1934
Hermanniella dolosa Grandjean, 1931
Locality: Sam-80/11: 3 specimens.
Distribution: Southern part of the Palearctic region.
Issaniella mograbin hauseri ssp. n.
Locality: Sam-80/16.

Liodidae Grandjean, 1936
Platyliodes doderleini (Berlese, 1883)
Locality: Sam-80/11: 5 specimens.
Distribution: Southern Europe.

Licnobelbidae Grandjean, 1965
Licnobelba caesarea (Berlese, 1910)
Locality: Sam-80/11: 6 specimens.
Distribution: Southern Europe.

Amerobelbidae Grandjean, 1954
Berndamerus eremuloides (Berlese, 1910)
Locality: Sam-80/11: 9 specimens.
Distribution: Italy.

Xenillidae Woolley et Higgins, 1966
Dorycranosus splendens (Coggi, 1898)
Localities: Sam-80/4: 1 specimen; Sam-80/17: 24 specimen.
Distribution: Central and Southern Europe, Caucasus.

Oppiidae Grandjean, 1951
Lasiobelba icaria sp. n.
Locality: Sam-80/4.
Medioppia samaina sp. n.
Locality: Sam-80/11.

Haplozetidae Grandjean, 1936
Haplozetes vindobonensis Willmann, 1935
Locality: Sam-80/20: 1 specimen.
Distribution: Palearctic region.

Ceratozetidae Jacot, 1925
Ceratozetes peritus Grandjean, 1951
Localities: Sam-80/9: 3 specimens; Sam-80/13: 2 specimens; Sam-80/20: 4 specimens.
Distribution: Europe.

DESCRIPTIONS AND TAXONOMICAL NOTES

Phthiracarus (Archiphthiracarus) eupalineus sp. n. Figs 7-10

Material examined: Greece: Nikaria: Holotype: Sam-80/4; Samos: 11 paratypes: Sam-80/9; 4 paratypes: Sam-80/10. Holotype and 10 paratypes: MHNG[3]; 5 paratypes (1592-PO-97): HNHM[4].

Measurements: Length of aspis: 407-485 µm; length of notogaster: 849-1045 µm; height of notogaster: 620-708 µm.

Aspis: Lateral carina distinct. Sinus line not observable. Sensillus (Figs 8, 9) slightly dilated basally, setiform distally, blunt at tip. All prodorsal setae very fine, simple, exobothridial one conspicuously long (Fig. 8).

Notogaster: All fifteen pairs of notogastral setae very fine, simple, mostly with flagelliform distal ends (Fig. 7). Setae c_1 originating far from the collar line, setae c_3 near to it. Vestigial setae f_1 located above setae h_1. Only two pairs of lyrifissures (*ia*, *im*) present.

Anogenital region (Fig. 10): Typical for the genus. Five pairs of ano-adanal setae present, the two pairs of anal setae conspicuously longer than the adanal ones. Setae ad_3 longer than ad_1 and ad_2.

Legs: All claws with ventral teeth. The legs chaetotaxy is of the "complete type" with the setal formula:

I: 1 - 4 - 2+1 - 5+1 - 16+3 - 1
IV: 2 - 1 - 1 - 2+1 - 10 - 1

Remarks: On the basis of the form of the sensillus the new species stands nearest to *Phthiracarus (P.) ferrugineus* (C. L. Koch, 1841). However, setae c_1 of the latter species arises very near to the collar line,the notogastral setae are directed mostly backwards, the vestigial setae f_1 are located behind setae h_1 (above in the new species). Furthermore, the new species belongs to the subgenus *Archiphthiracarus*, while *ferrugineus* belongs to the nominate subgenus.

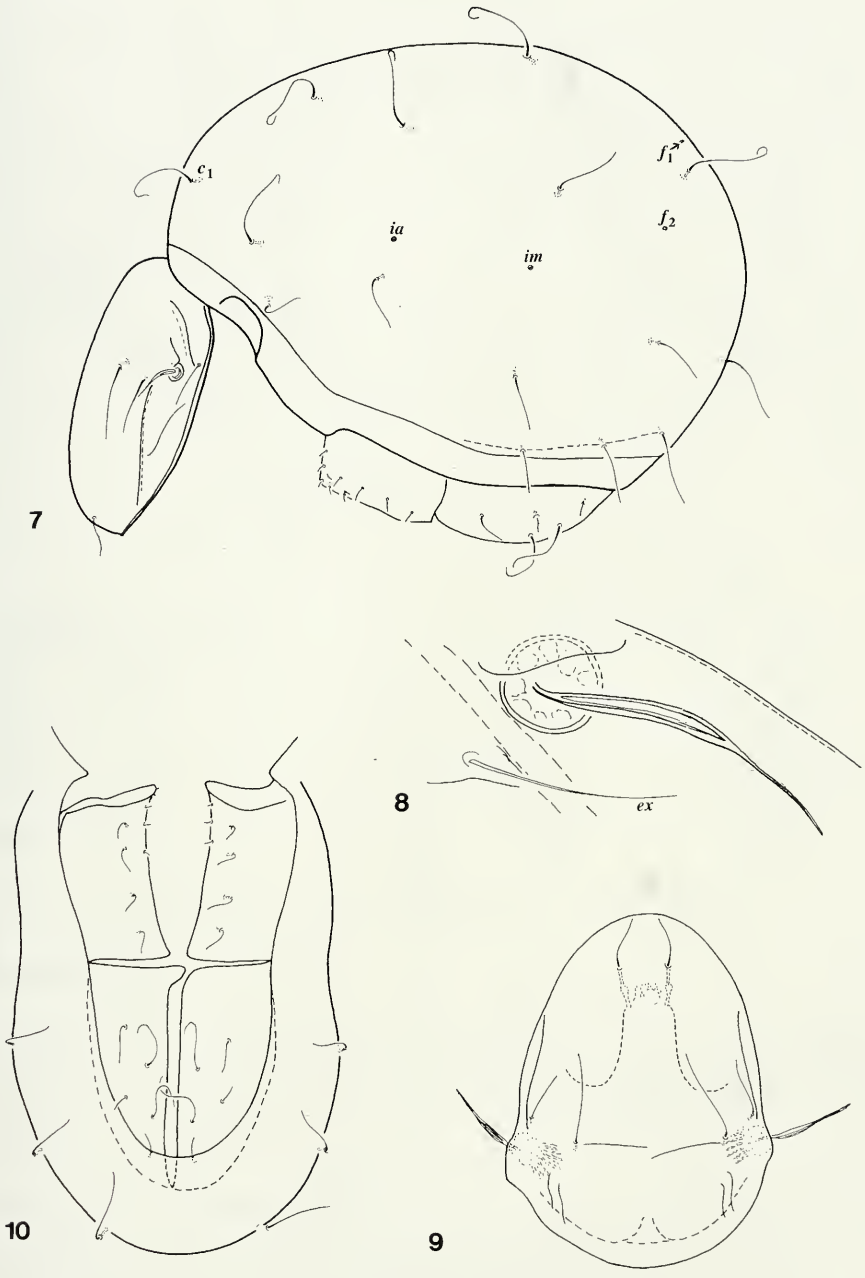
Derivatio nominis: Named after Eupalinos of Mégara, engineer in Samos, who constructed a famous gallery for the water-supply of the capital in about 530 BC. This tunnel of 1km in length, called Eupalineion, is still intact.

Calyptophthiracarus vicinus (Niedbała, 1984) Figs 1-6

The species was described from Caucasus. The specimens from Greece are readily identified with the figures given by Niedbała (1984) and his description. Minor differences occur in the shape of the sensillus. The sensillus in Niedbała's paper is somewhat more elongated and bears shorter spines.

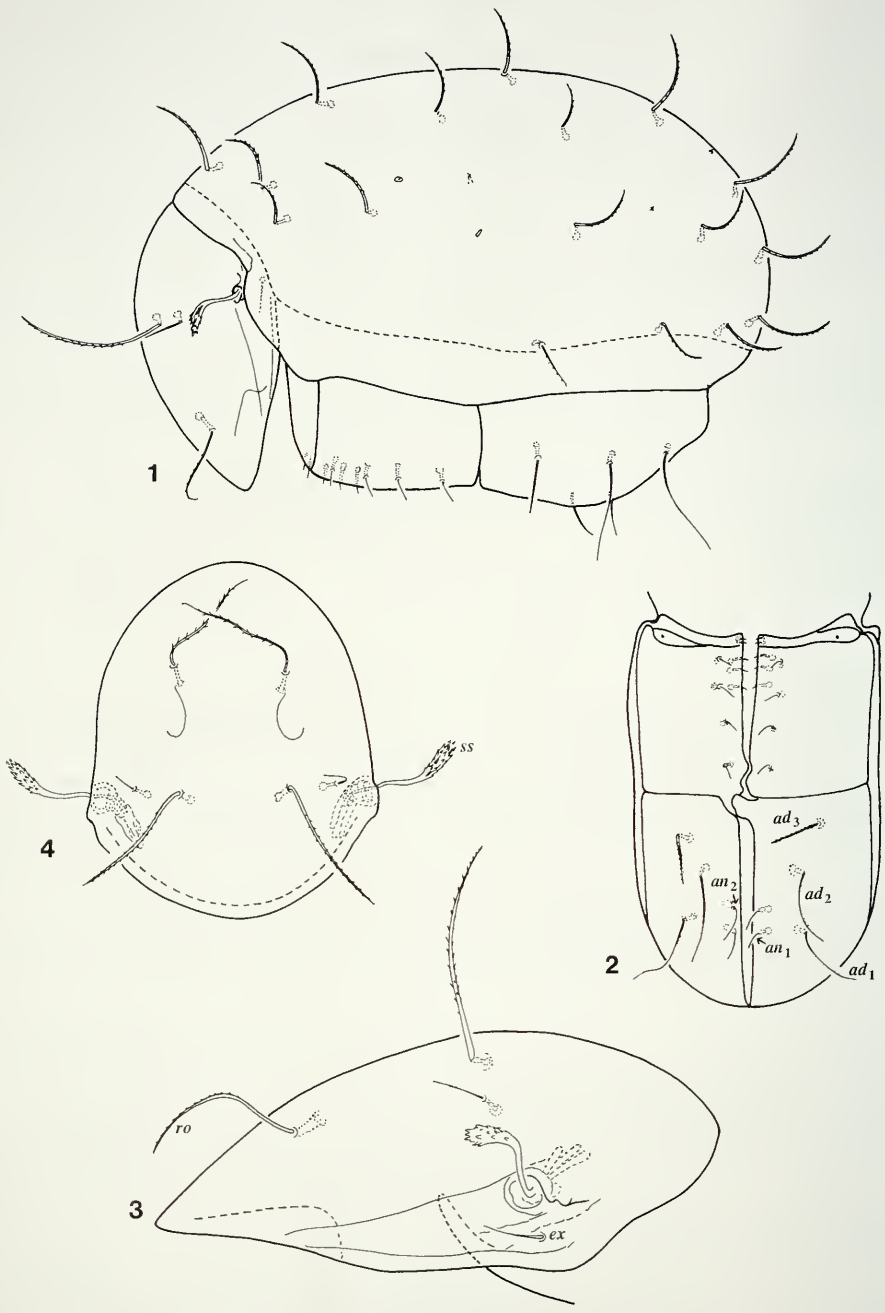
[3] MHNG: deposited in the Muséum d'histoire naturelle, Geneva.

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



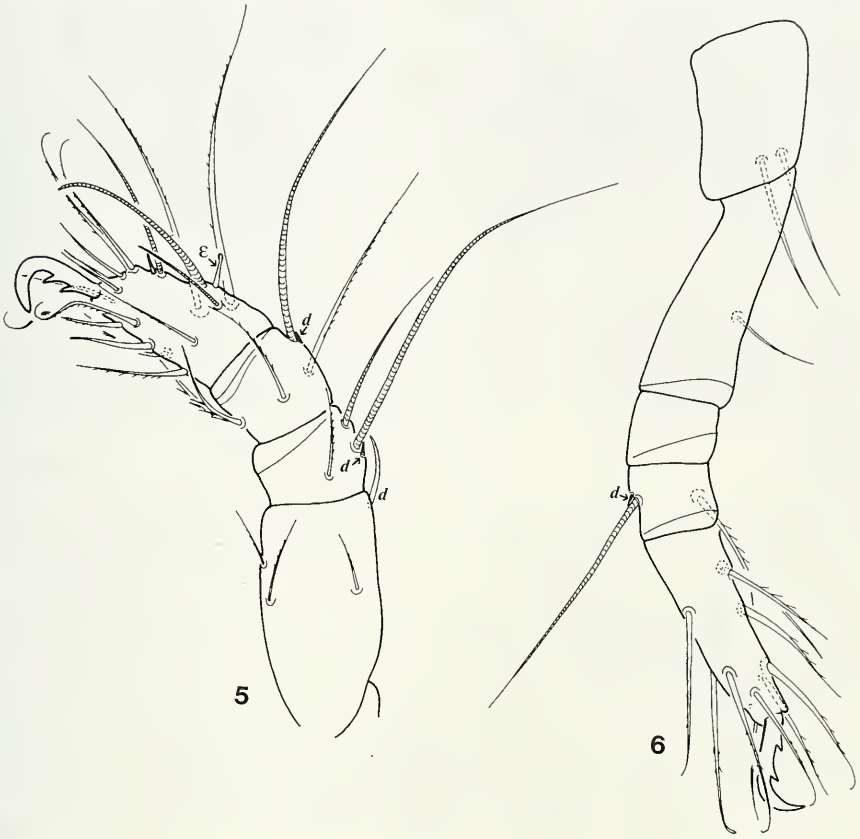
FIGS 7-10

Phthiracarus (Archiphthiracarus) eupalineus sp. n. - 7: body in lateral view, 8: bothrydial region, 9: aspis in dorsal view, 10: anogenital region.



FIGS 1-4

Calyptophthiracarus vicinus (Niedbała, 1984) - 1: body in lateral view, 2: anogenital region, 3: aspis in lateral view, 4. aspis in dorsal view.



FIGS 5-6
Calyptophthiracarus vicinus (Niedbała, 1984) - 5: leg I, 6: leg IV.

Issaniella mograbin Grandjean, 1962

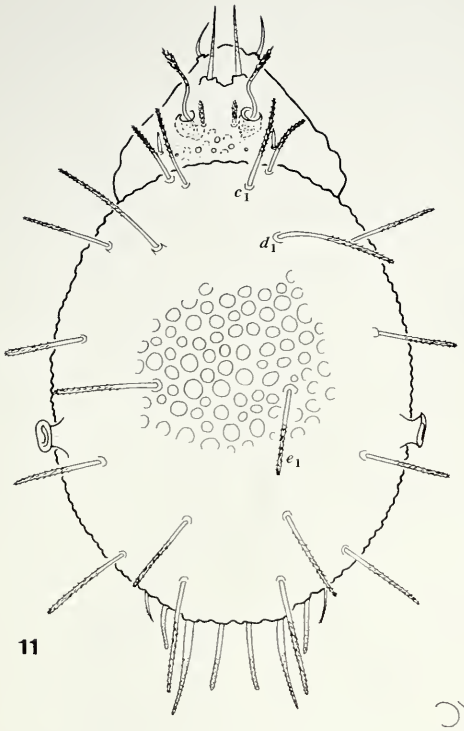
The nominate form was described by Grandjean (1962) from Morocco. The species has not been collected elsewhere. The Greek specimens are highly similar to the nominate form. However, basic differences exist in the length of setae and in the sculpture. These are so significant that I feel justified to introduce for the Greek specimens a new subspecies.

Issaniella mograbin hauseri ssp. n. Figs 11-15, Pl. a-b

Material examined: Greece: Samos: Holotype: Sam-80/16; 61 paratypes from the same sample. Holotype and 36 paratypes: MHNG and 24 paratypes (1585-PO-96): HNHM.

Measurements: Length: 713-752 µm; width: 388-461 µm.

Diagnosis: Setae c_1 and d_1 are very long (136 µm), longer than the distance between their alveoli. Foveolae comprising the sculpture of notogaster are large, only 5-6 foveolae occur between setae e_1 (Fig. 13).



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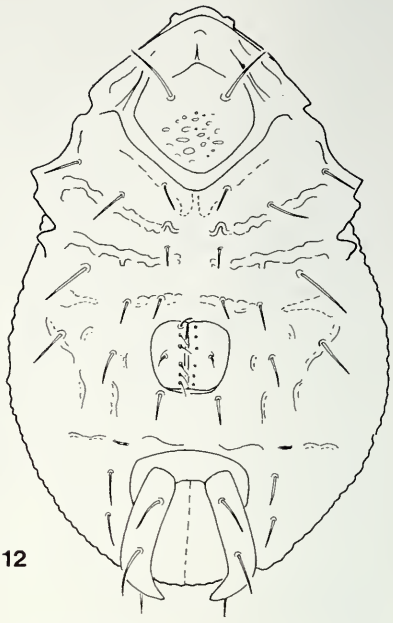

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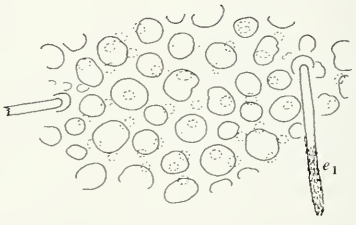

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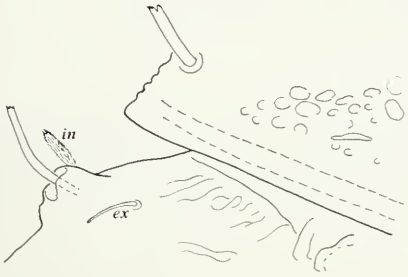

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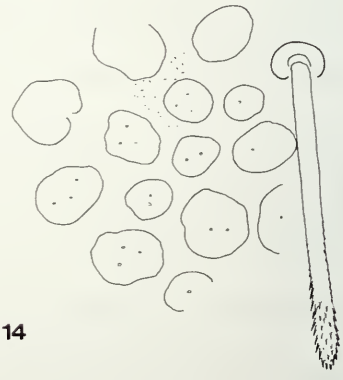

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FIGS 11-15

Issaniella mograbin hauseri ssp. n. - 11: body in dorsal view, 12: body in ventral view, 13: sculpture of notogaster between setae e_1, 14: sculpture of notogaster, 15: bothridial region in lateral view.

Derivatio nominis: I dedicate the new subspecies to my friend Dr. B. Hauser, collector of this interesting material.

Remarks: This is a second case of a very close relation between oribatids from Morocco and Greece. The first time we made this observation was with the two cave oribatids *Brachychochthonius maroccanus* Mahunka, 1980 and *Brachychochthonius guanophilus* Mahunka, 1979 (Mahunka, 1980). Perhaps this phenomenon can be ascribed to the fact that the Mediterranean Sea dried out some 6 million years ago (Hsü, 1972) and the Black Sea also less than 6 million years ago (Hsü, 1978).

Issaniella mograbin mograbin Grandjean, 1962

Diagnosis: Setae *1c* and d_1 are half as long as the distance between them (see Grandjean, 1962: fig. 5A). Foveolae comprising the sculpture of notogaster are small, 9-10 foveolae may find space between setae e_1 (see Grandjean, 1962: fig. 6A)

Berndamerus eremuloides (Berlese, 1910) Figs 16-22

A series of figures, based on the specimens from Greece, are given because only few illustrations exist of this species and none of its legs. It is here recorded for the first time from Greece.

This species was earlier misidentified under the name *Rastellobata rastelligera* (Berlese, 1908) and reported from Greece (Mahunka, 1974).

After the revision of the oribatid types of Berlese (see Mahunka & Mahunka-Papp, 1995) we must correct these data. At present we have convincing data on the distribution of *Rastellobata rastelligera* only for Italy. Therefore this species is to omit from the list of oribatids from Greece (Flogaitis, 1992), at least for the moment. The other data published on *Rastellobata rastelligera* should be handled with utmost care, as, e.g., the Hungarian reference (Balogh, 1943) is certainly erroneous.

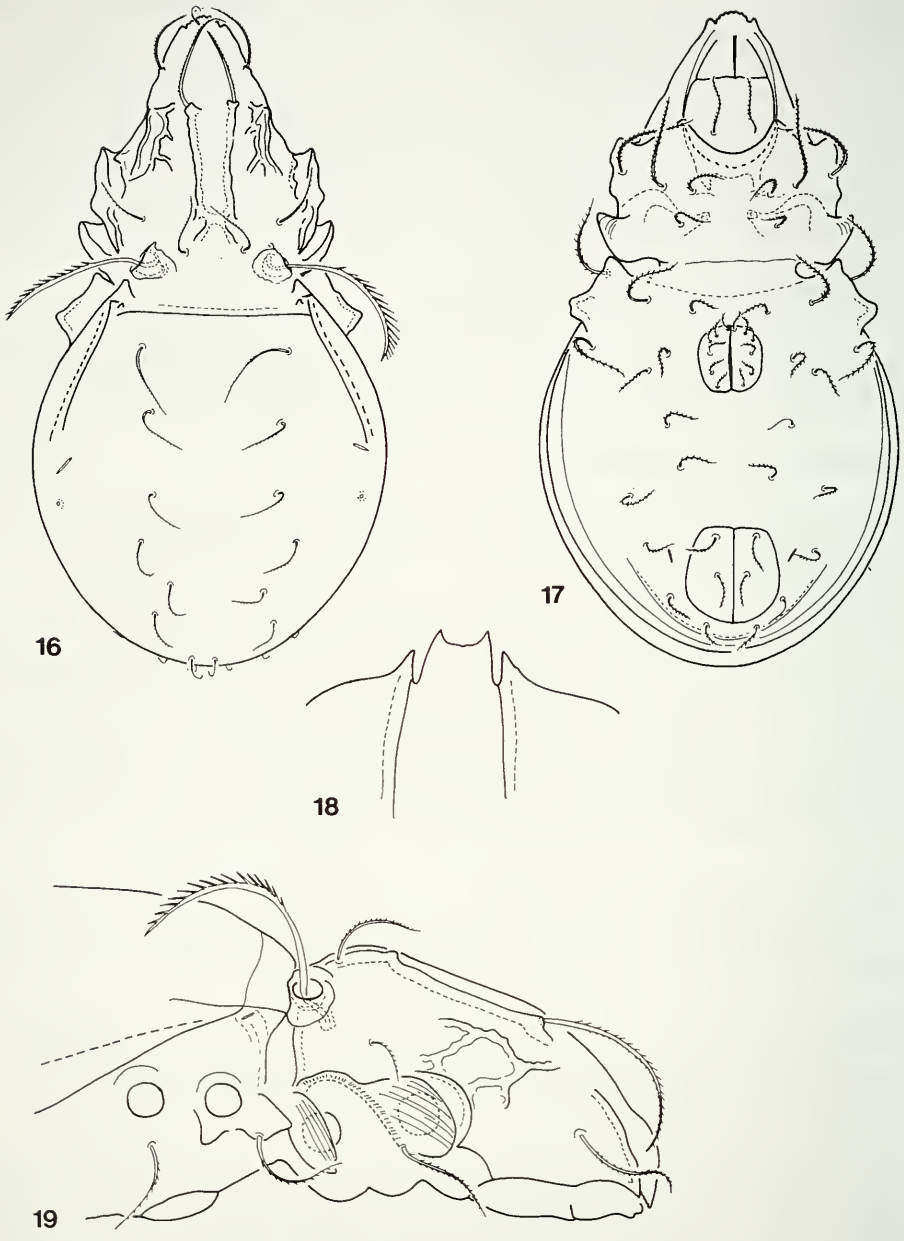
Dorycranosus splendens (Coggi, 1898) Figs 23-31

This is the first record for Greece of this rare Mediterranean species and for this reason a series of figures of Greek specimens is given.

Lasiobelba icaria sp. n. Figs 32-41

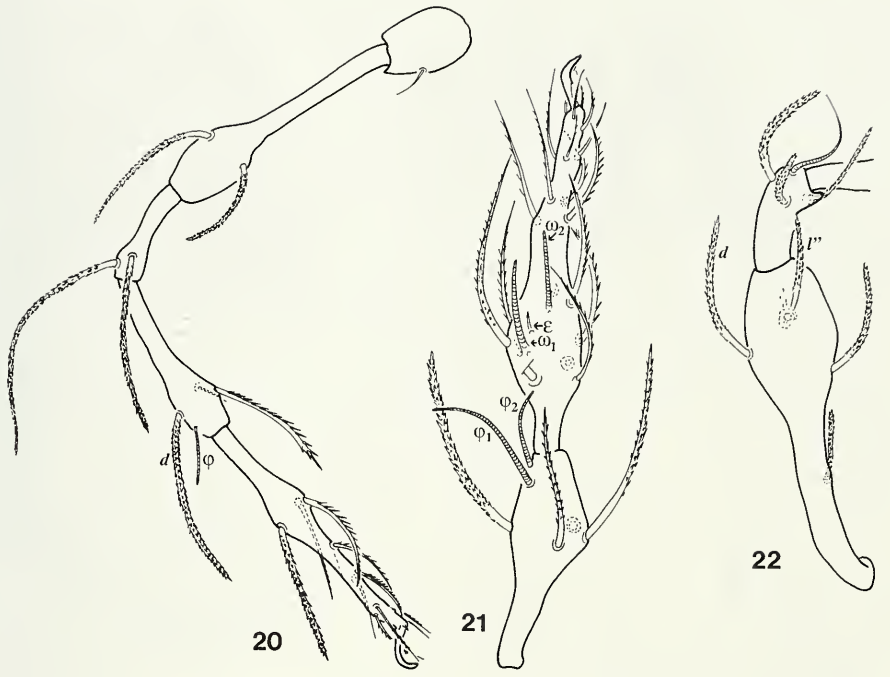
= *Daedaloppia* sp. Hauser et Mahunka in Balogh, 1983 – unavailable name
= *Lasiobelba quadriseta* Subias nom. n., 1989, in Subias & Balogh, 1989 – syn. nov.

A description of this species should have been published, together with the other novelties, in a paper with B. Hauser as senior author, under the name *Daedaloppia icaria* gen. n., sp. n. This publication, however, has not appeared. Balogh asked us to include the name of the genus in his paper (1983) in order to make the Oppiidae genus key as complete as possible. In this way the name *Daedaloppia* sp. Hauser et Mahunka, 1983 was unfortunately introduced into the literature with all the nomenclatural consequences. Indeed "no generic name was made available in Balogh (1983),



FIGS 16-19

Berndamerus eremuloides (Berlese, 1910) - 16: body in dorsal view, 17: body in ventral view, 18: rostral apex, 19: podosoma in lateral view.



FIGS 20-22

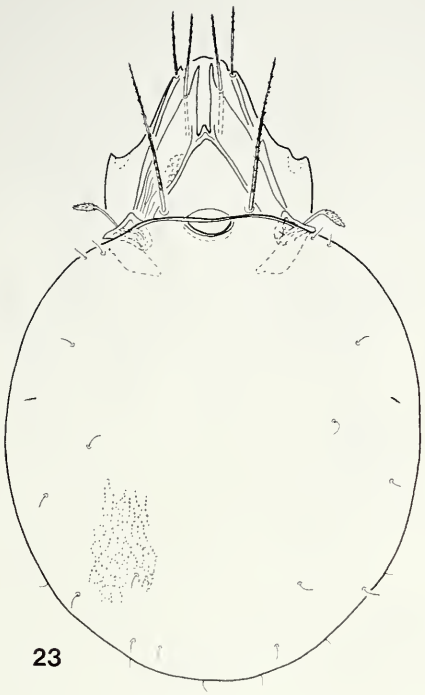
Berndamerus eremuloides (Berlese, 1910) - 20: leg IV, 21: tibia and tarsus of leg I, 22: femur and genu of leg I.

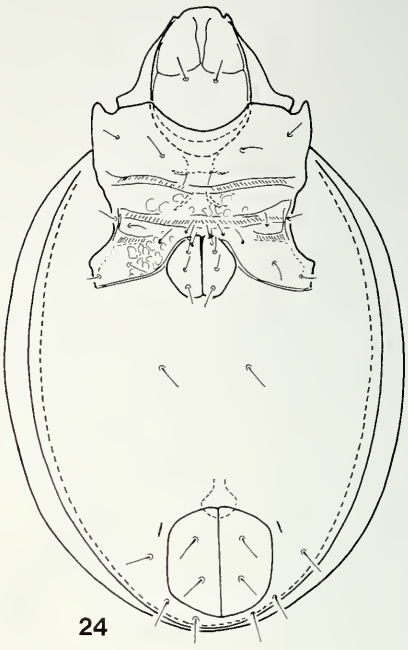
since there was no nominal species included in the genus and, by extension of this, no type species was fixed" (P. K. Tubs, in litteris electronicis of 20.VII.2000)[5]. However, when it became clear that *Daedaloppia* and *Lasiobelba* were identical, we withdrew our manuscript to re-write it but which, for various reasons, was rather delayed.

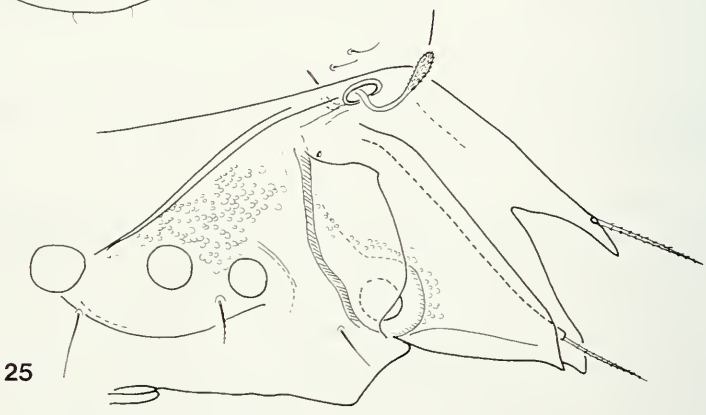
When, for the second time (1988) the manuscript was handed in for publication we were informed about the paper of Subias & Balogh (1989), wherein the species received a name: *Lasiobelba quadriseta* Subias nom. n. (for *Daedaloppia* sp. Hauser et Mahunka, 1983) without our knowledge and approval. The name given by Subias is not available,"since *L. quadriseta* cannot be a nom. nov. for *Daedaloplia* [sic!] sp. Hauser et Mahunka, 1983 (an unavailable, indeed non-existent, name attributed to a non-existent publication)" (P. K. Tubbs, in litt. electr. of 20. VII. 2000).

This is why I name this species *L. icaria*, as originally intended. A detailed description of the species follows hereunder.

[5] Dr. B. Hauser has submitted this case to the Executive Secretary of the International Commission on Zoological Nomenclature (London), Dr. P. K. Tubbs, who has kindly furnished the valuabel above-mentioned statements.

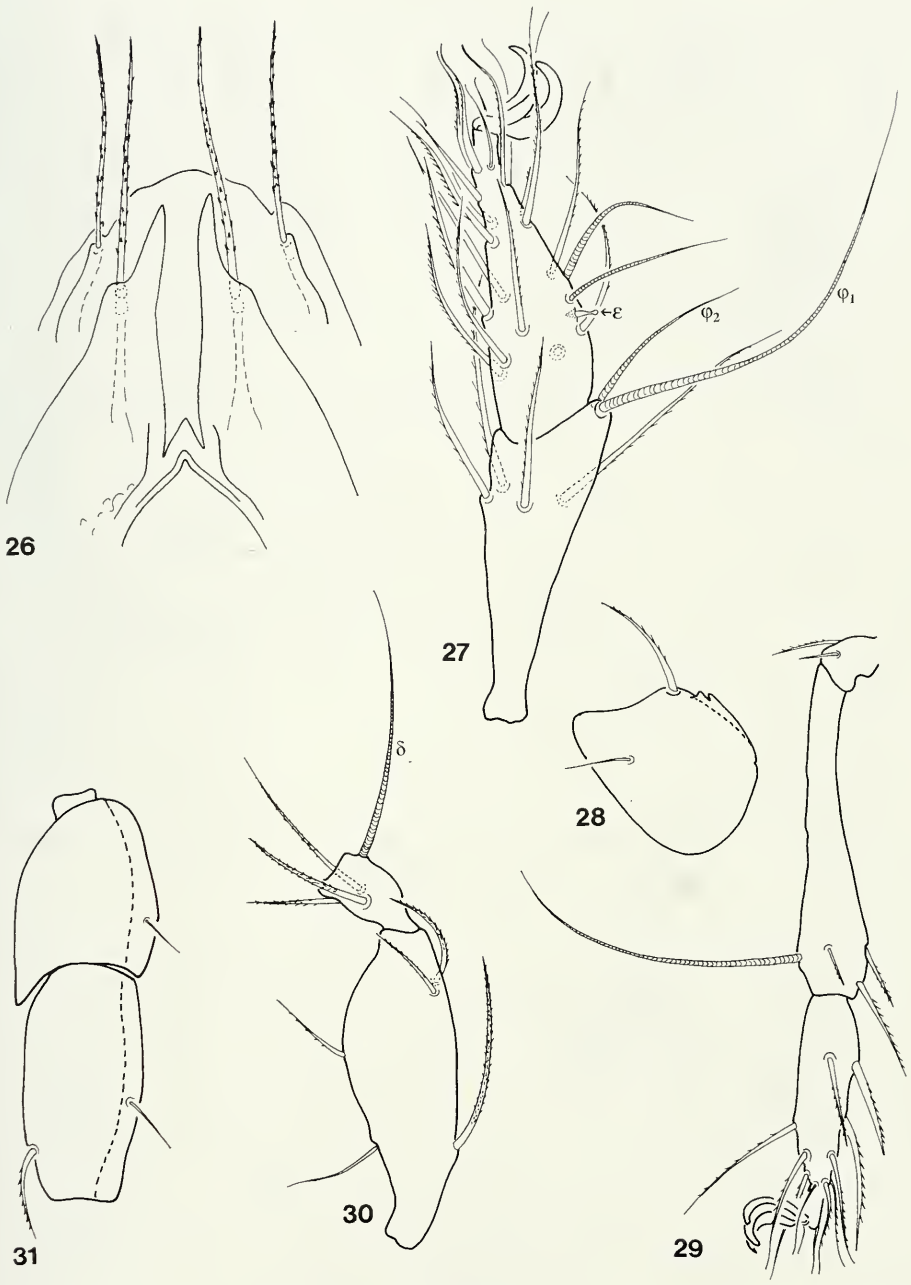






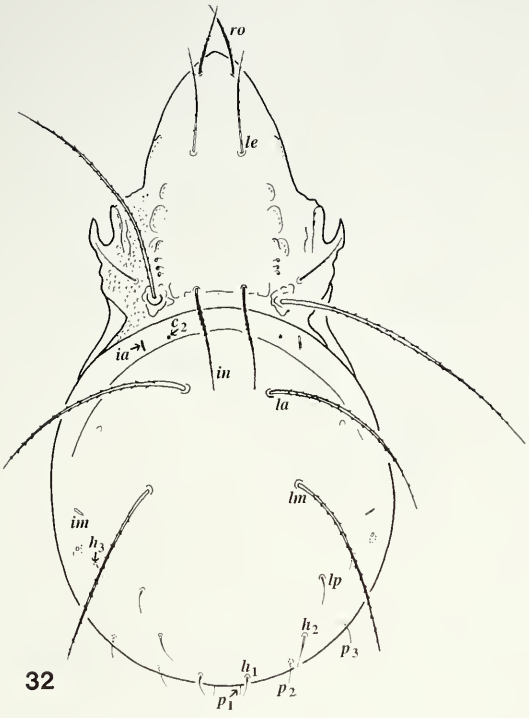
FIGS 23-25

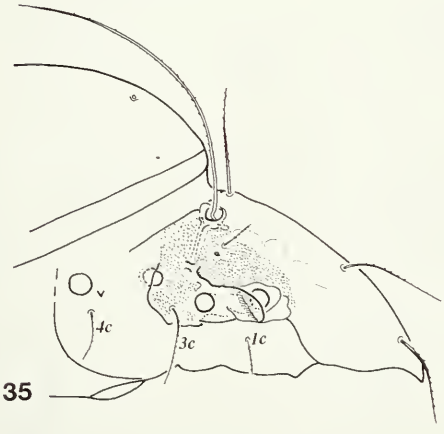
Dorycranosus splendens (Coggi, 1898) - 23: body in dorsal view, 24: body in ventral view, 25: podosoma in lateral view.

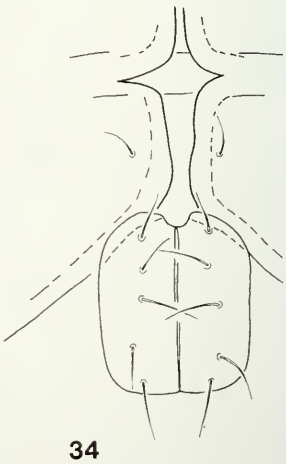


FIGS 26-31

Dorycranosus splendens (Coggi, 1898) - 26: rostral part of the prodorsum, 27: tibia and tarsus of leg I, 28: trochanter of leg II, 29: tibia and tarsus of leg IV, 30: femur and genu of leg I, 31: trochanter and femur of leg IV.

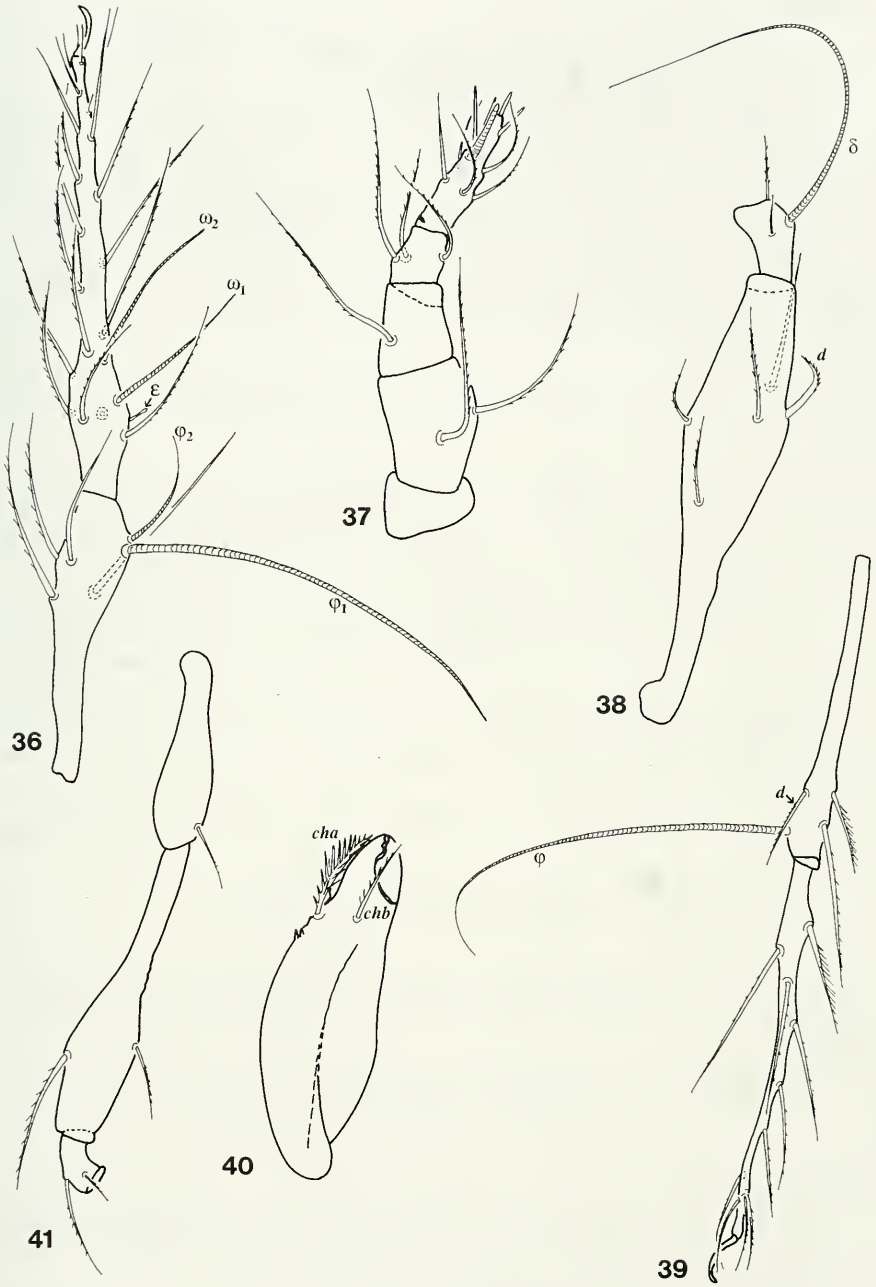






FIGS 32-35

Lasiobelba icaria sp. n. - 32: body in dorsal view, 33: body in ventral view, 34: genital plates and the posteromedian part of the coxisternal region, 35: podosoma in lateral view.



FIGS 36-41

Lasiobelba icaria sp. n. - 36: tibia and tarsus of leg I, 37: palp, 38: femur and genu of leg I. 39: tibia and tarsus of leg IV, 40: chelicera, 41: trochanter, femur and genu of leg IV.

DESCRIPTION

Material examined: Greece: Nikaria: Holotype: Sam-80/4. Holotype: MHNG.

Measurements: Length: 456 µm; width 216 µm.

Prodorsum: Rostrum elongate, rostral apex conical. Prodorsal surface with some irregular fields laterally and basally its lateral part distinctly and uniformly granulated. Among the prodorsal setae, the rostral setae slightly thicker than the lamellar and interlamellar ones, their ratio as shown in fig. 35. Sensillus very long (218 µm), setiform, without thickening medially, sparsely ciliated.

Notogaster: Nine pairs of notogastral setae present (setae c_2 represented only by their alveoli). Two pairs of them very long and pilose, all the others short, fine and smooth (Fig. 32).

Lateral part of podosoma: Pedotecta I normal, pedotecta II-III absent, discidium with sharply pointed cusps. Sejugal region also granulated (Fig. 35). Setae *1c* arising far from pedotecta I.

Coxisternal region: Anterior part of the sternal apodema (and borders) reduced, only short tuberculae present. Epimeres 1 fused or touching medially. The longitudinal borders between epimeres 2 and 3-4 conspicuous, these fields not touching medially (Fig. 34). Sejugal apodema and borders also well developed. Epimeral setae simple, mostly well ciliate. Setae *1b* conspicuously long, much longer than *1a* or *1c* (Fig. 33).

Anogenital region: Anterior margin of the genital plates concave medially (Fig. 33). Anal aperture much larger than the genital one. Anogenital setal formula: 5-1-2-3: setae ad_1 in post-, setae ad_3 para- and the lyrifissures *iad* also in paraanal position.

Gnathosoma: Chelicera (Fig. 40) with two strong teeth on its dorsal surface, setae *cha* very long having spiniform branches. Palpal setal formula: 0-2-1-3-9+1 (Fig. 37).

Legs: All segments of legs very long, narrow, with the typical oppioid setal formula:

I: 1-5-2+1-4+2-20+2-1 (Figs 36, 38)
IV: 1-2-2-3+1-10-1 (Figs 39, 41)

Remarks: This species is readily relegated to the genus *Lasiobelba* Aoki, 1959. It is distinguished from all other *Lasiobelba* species by the strong heterotrichy of the notogaster.

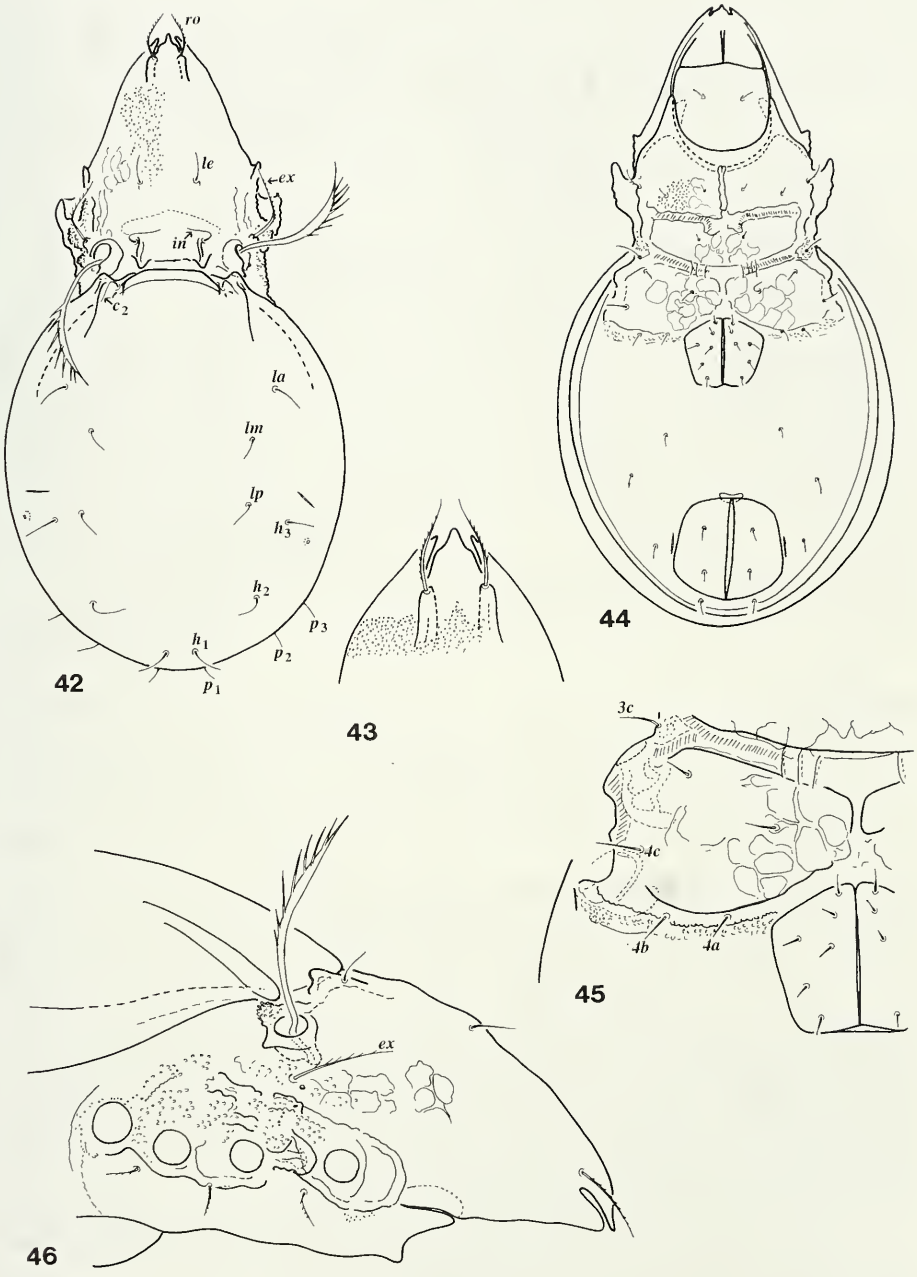
Derivatio nominis: Dedicated to the island of Nikaria where Hercules buried Icarus, son of Daedalus who plunged near this island into the sea.

Medioppia samaina sp. n. Figs 42-49

Material examined: Greece: Samos: Holotype: Sam-80/11: 7 paratypes from the same sample. Holotype and 4 paratypes: MHNG and 3 paratypes (1591-PO-97): HNHM.

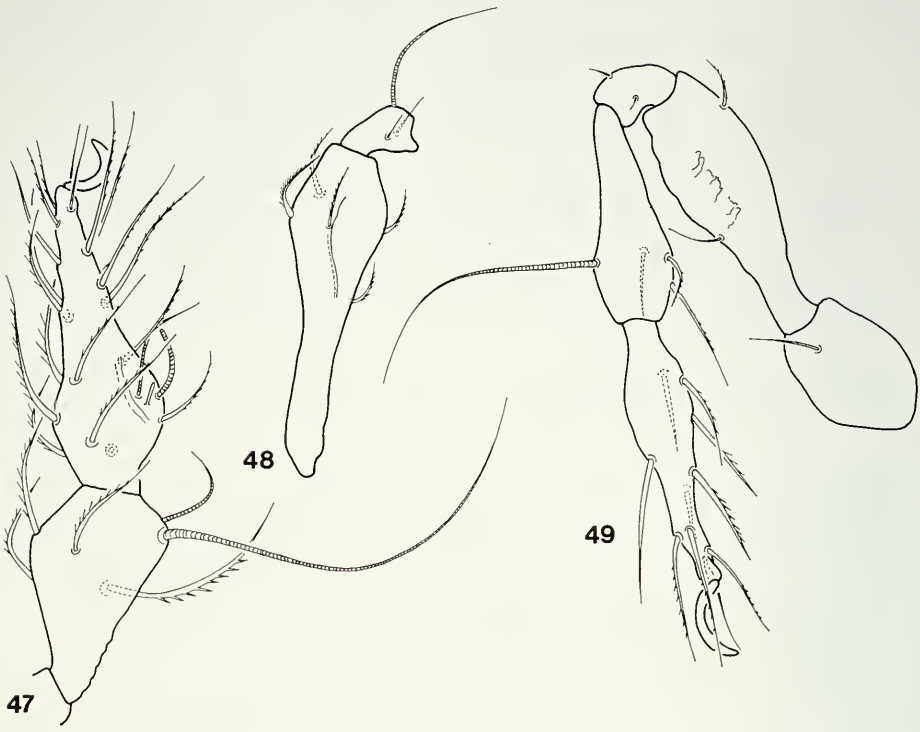
Measurements: Length: 265-295 µm; width: 137-158 µm.

Prodorsum: Rostrum divided by incisions. Median rostral apex characteristically narrowing anteriorly (Fig. 43), longer than lateral teeth. Rostral setae originating



FIGS 42-46

Medioppia samaina sp. n. - 42: body in dorsal view, 43: rostrum, 44: body in ventral view, 45: epimeres 3-4 and genital plate, 46: podosoma in lateral view.



FIGS 47-49
Medioppia samaina sp. n. - 47: tibia and tarsus of leg I, 48: femur and genu of leg I, 49: leg IV.

at the end of the rostral incisions, inserted on short but clearly observable crests. Prodorsal surface distinctly granulated. Basal part of prodorsum with two large tubercles, continued in short longitudinal crests anteriorly, interlamellar setae arising at their distal end. Rostral setae thicker and more pilose than the lamellar and interlamellar ones, but the exobothridial setae the longest, strongest and most pilose of all. Sensillus pectinate, with 6-7 equally long branches. Bothridium with large basal tubercles and a smaller lateral protuberance. The tubercles conspicuously granulate.

Notogaster: Dorsosejugal region with one pair of large apophyses. Median part straight anteriorly, lateral crests strong, conspicous (Fig. 42); setae c_2 arising between them. Ten pairs of short and simple notogastral setae present.

Lateral part of prodorsum: Whole part conspicuously sclerotised (Fig. 46), with granulate longitudinal crests. The surface above the acetabula I-IV granulate. Pedotecta I rather squamous. Pedotecta II-III and discidium are very small.

Coxisternal region: A complete sternal apodema absent, sejugal apodeme and epimeral borders conspicous, having 3-4 transversal crests on them. Along the posterior border of this region the surface is also granulate with a small fossa obser-

vable laterally, its inner surface also granulate (Fig. 45). Epimeral setae short, setae *1c* pilose, originating far from pedotecta I.

Anogenital region: Anogenital setal formula: 6-1-2-4. All setae short and simple (Fig. 44), setae ad_3 in preanal, with lyrifissures *iad* in paraanal position.

Legs: Leg setal formula is typical for the family :

I: 1-5-2+1-4+2-20+2-1 (Figs 47-48)
IV: 1-2-2-3+1-10-1 (Fig. 49)

Remarks: The new species is readily classified into the genus *Medioppia* Subías & Minguez, 1985; it belongs to the *tridentata*-species group characterised by the well divided rostrum. The new species seems to be closely related to the type species of the genus and to *Medioppia centrodentata* Gordeeva & Niemi, 1990. However, it is well distinguished from both by the short and subequal branches of the sensillus (different in length in the other species), the position of c_2 setae arising behind the notogastral crests in *M. tridentata* and in *M. centrodentata*, the presence of the granulated area along the posterior epimeral border (absent in the other two species). The longitudinal crests on the sejugal epimeral borders were not mentioned either by Subías & Minguez (1985) or Gordeeva & Niemi (1990).

Derivatio nominis: The species is named after the famous Greek warship, which was built in ancient times on the island of Samos. The ship's prow was in form of a wild boar's head.

Haplozetes vindobonensis Willmann, 1935 Figs 50-56

This is the first record for Greece and it seems of interest to give some figures based on Greek specimens.

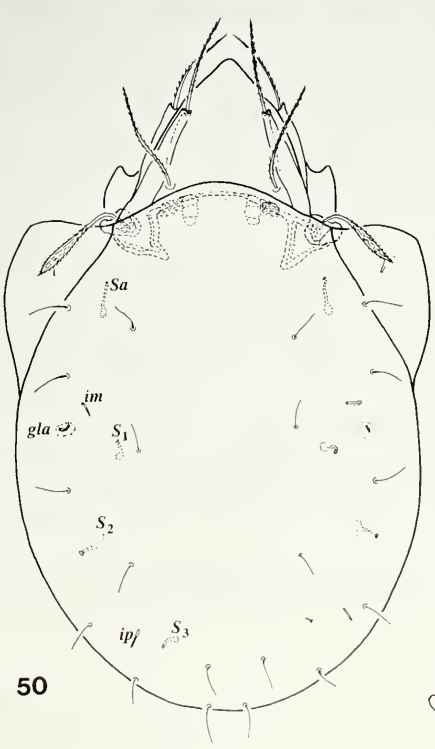
Ceratozetes peritus Grandjean, 1951 Figs 60-63, Pl. c-f

This species is recorded for the first time for Greece, for this reason some illustrations of the Greek material are given.

ACKNOWLEDGEMENTS

I thank very heartily Dr. B. Hauser, former Head of the Arthropod Department of the Muséum d'histoire naturelle, Geneva, the collector of this valuable material, for all his efforts to bring to a happy end this long affair, Dr. C. Lienhard, Research Officer in the same Department, for his precious help in many questions including the nomenclature, Dr. Jean Wüest (also Geneva Museum) for the scanning photographs taken in August 1980(!), Dr. M. Luxton (National Museum of Wales, Cardiff) for his tireless support in reading and correcting the manuscript.

This work was partly sponsored by the Hungarian Scientific Research Fund (OTKA: 16729).



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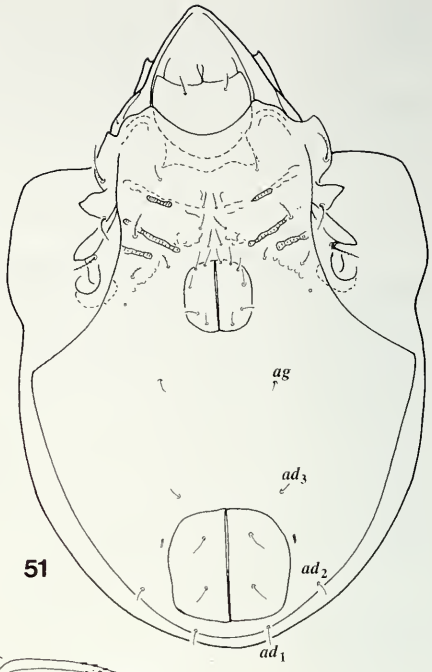

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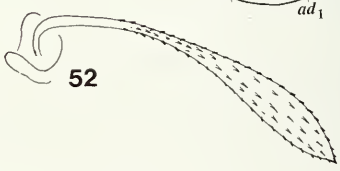

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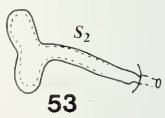

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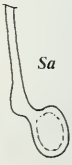

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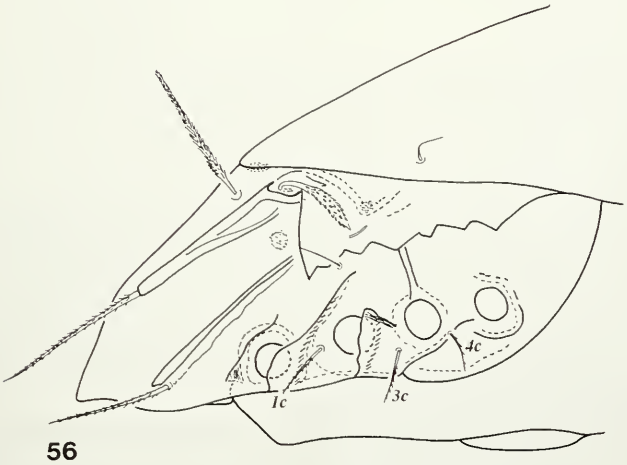

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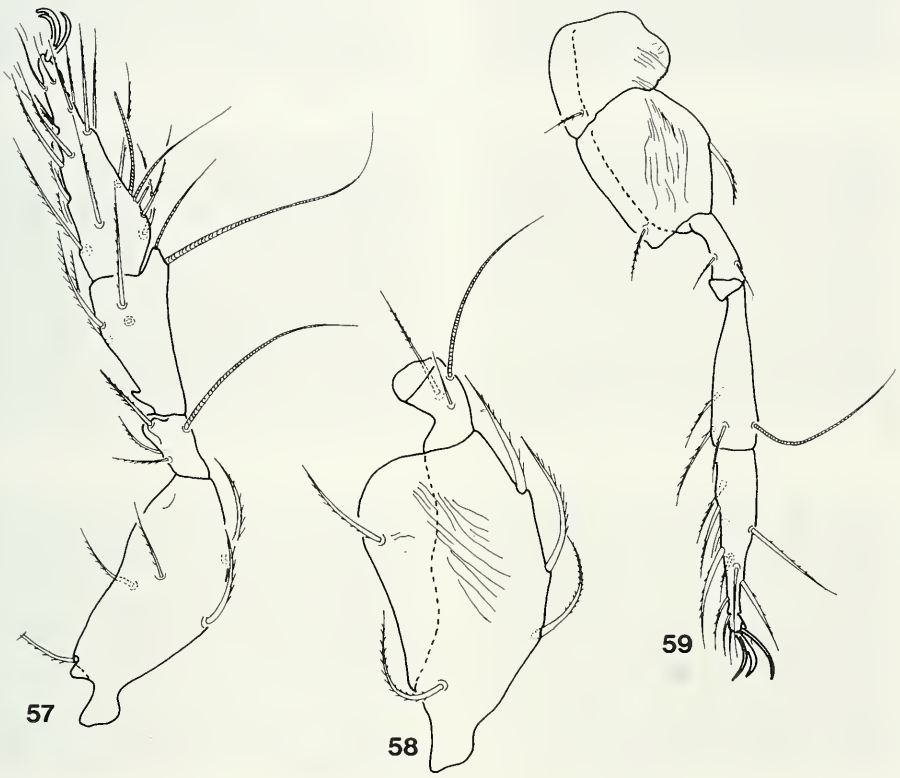
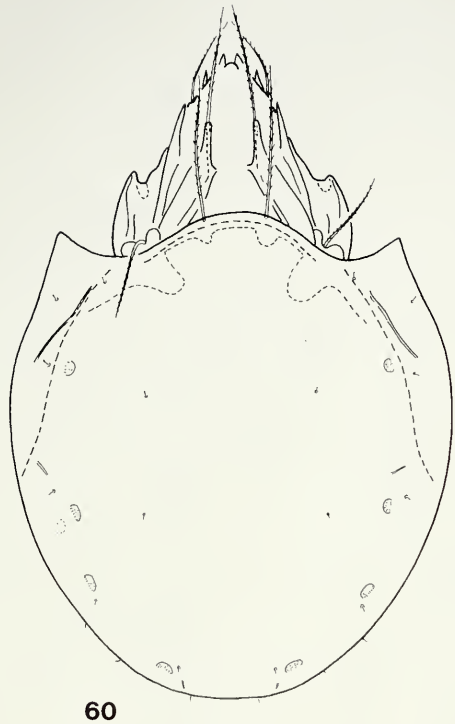
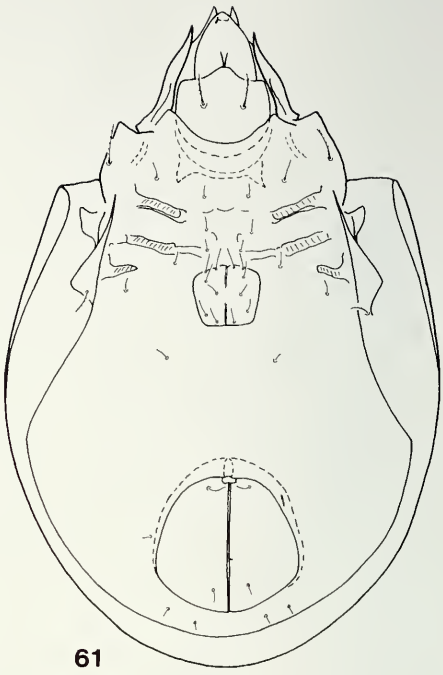
FIGS 50-56

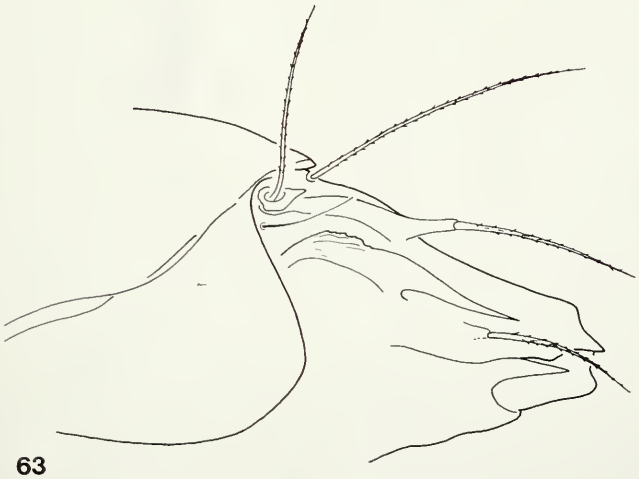
Haplozetes vindobonensis (Willmann, 1935) - 50: body in dorsal view, 51: body in ventral view, 52: sensillus, 53: sacculus S2, 54: sacculus S3, 55: sacculus Sa, 56: podosoma in lateral view.



FIGS 57-59
Haplozetes vindobonensis (Willmann, 1935) - 57: leg I, 58: femur and genu of leg II, 59: leg IV.

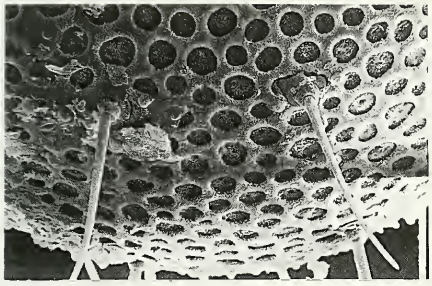




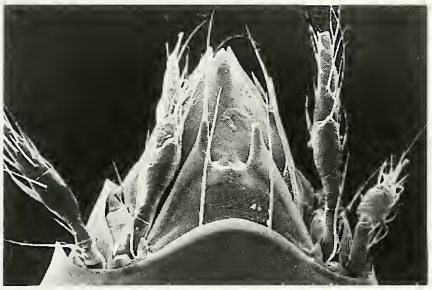


FIGS 60-63

Ceratozetes peritus Grandjean, 1951 - 60: body in dorsal view, 61: body in ventral view, 62: rostrum, 63: podosoma in lateral view.


a


b


c


d


e


f

PHOTO PLATE a-f

Issaniella mograbin hauseri ssp. n. - a: sculpture of the notogaster, b: setae of the posterior margin.

Ceratozetes peritus Grandjean, 1951 - c: prodorsum in dorsal view, d: prodorsum in lateral view, e: bothridial region, f: end of sensillus.

(Photographs taken by Dr. Jean Wüest on the Super Mini SEM by ISI of the Muséum d'histoire naturelle, Geneva)

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A generic revision of the insect order Phasmatodea: The New World genera of the stick insect subfamily Diapheromeridae: Diapheromerinae = Heteronemiidae: Heteronemiinae sensu Bradley & Galil, 1977*

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A generic revision of the insect order Phasmatodea: The New World genera of the stick insect subfamily Diapheromerinae (Diapheromeridae) = Heteronemiinae (Heteronemiidae) sensu Bradley & Galil, 1977* - The North and South American genera of the phasmatodean subfamily Diapheromerinae = Heteronemiinae sensu Bradley & Galil are revised. All genera are redescribed, type species are mentioned or designated, and synonyms listed. Two new tribes, Ocnophilini and Oreophoetini, are established, and the Libethrini are synonymized with Diapheromerini. Genitalia, eggs and important other characters of most genera are figured. Ten new genera are introduced and five new species are described. Previously unknown males, females and eggs of several species are described. The genera are arranged in groups, with separate keys to all tribes and generic-level groups, including males, females, and eggs to the extent currently known.

Key-words: Orthoptera - Phasmatodea - Diapheromerinae - Heteronemiinae - suprageneric revision - Diapheromerini - Ocnophilini - Oreophoetini - new genera - new species - new synonyms - lectotypes - North America - South America.

INTRODUCTION

Although a good number of the world's largest and most spectacular insects belong to the Phasmatodea, this order remains comparatively poorly known. It is still a problem to attribute males or females to a species described on just one sex as both sexes normally look quite different.

During the last few decades, phasmids have become more interesting to amateur entomologists and rearers. As a result, definite pairs of approximately 300 species are known from cultures; several of these are still undescribed.

* Dedicated to my parents Gisela and Rolf Zompro.

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The most striking problem is lack of identification keys even at the generic level. The only monograph concerning this insect order, by Karl Brunner v. Wattenwyl (1907) and Josef Redtenbacher (1906, 1908), published in three parts, contains numerous errors, yet it still remains about the major reference point for specialists. A later basic paper on stick insect systematics was published by Günther (1953), which included keys to subfamilies. More recently, most specialists have been using the work by Bradley & Galil (1977) which, although mainly based on literature studies, included keys to tribes.

The present work is based on the author's unpublished thesis (1998d) and represents an updated version.

MATERIAL AND METHODS

Whenever possible, this work has been based on type material. In many cases, the matching of the sexes has been confirmed by rearing species. However, in a few cases non-type material has been used. This study has received support from almost all curators of stick insect collections in European museums. Material from several private collections has also been examined.

Stick insects were reared in cages and preserved as described by Zompro (1996). Examinations were carried out using a Zeiss Jena Citoval-2 stereoscope and drawings made using a drawing tube. Pictures of genitalia were made at 10x magnification, eggs at 20x. The terminology of egg structures follows that of Clark Sellick (1997).

Antennae are measured against the body, and not against the forelegs as usual. This has the advantage that the length can be compared in specimens with reproduced or broken legs, too.

Abbreviations used

AMNH	American Museum of Natural History, New York, USA.
ANSP	Academy of Natural Sciences, Philadelphia, USA.
BMNH	The Natural History Museum, London, England.
DEIC	Deutsches Entomologisches Institut, Eberswalde, Germany.
ETHZ	Eidgenössische Technische Hochschule, Zurich, Switzerland.
HLDH	Hessisches Landesmuseum, Darmstadt, Germany.
HMUG	Hunterian Museum, University of Glasgow, England.
MCSN	Museo Civico di Storia Naturale „Giacomo Doria", Genova, Italy.
MHNG	Muséum d'histoire naturelle, Geneva, Switzerland.
MIZT	Museo Regionale Scienze Naturali, Torino, Italy.
MNHN	Muséum National d'Histoire Naturelle, Paris, France.
NHMW	Naturhistorisches Museum, Vienna, Austria.
NHME	Natural History Museum, Maastricht, Netherlands.
NHRS	Naturhistoriska Riksmuseet, Stockholm, Sweden.
OXUM	Hope Entomological Collections, University Museum, Oxford, England.
OZ	Coll. O. Zompro, Kiel, Germany, affiliated with Zoologisches Museum, Kiel.
RMNH	Nationaal Natuurhistorische Museum, Leiden, Netherlands.

SMFD	Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt, Germany.
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany.
SMTD	Staatliches Museum für Tierkunde, Dresden, Germany.
USNM	United States National Museum, Washington, USA.
ZMUH	Zoologisches Museum der Universität Hamburg, Germany.
ZMHB	Zoologisches Museum der Humboldt-Universität, Berlin, Germany.
ZMUC	Zoologisk Museum, University of Copenhagen, Denmark.

HT, AT, PT, ST, LT, PLT: Holo-, allo-, para-, syn-, lecto-, paralectotype.
* = Material examined, in some cases by colour prints only.

Basic taxonomic background

As noted above, Bradley & Galil (1977) mainly based their work on literature sources, hence several of the inaccurate statements by previous authors are inadvertently repeated and some others added. The Heteronemiinae are discussed on pages 178-180. In discussing the family Heteronemiidae (p. 179), Bradley & Galil adopt Rehn's (1904: 53) opinion that *Bacunculus* Burmeister is a synonym of *Heteronemia* Gray. Zompro (in press) showed, that *Heteronemia* Rehn (nec Gray) is a synonym of *Pseudosermyle* Caudell. Further errors (all on p. 180) are as follows: the type-species of *Bacunculus* Burmeister is *Bacunculus spatulatus* Burmeister, 1838, a synonym of *Heteronemia mexicana* Gray, 1835, synonymized by Zompro (in press), but not Bradley & Galil, as their point of view on the identity of *H. mexicana* was based on Rehn's misidentification. The type of *Heteronemia* Gray is correctly mentioned later on p. 201. The authors of *Manomera* are Rehn & Hebard, 1907, not Rehn alone; *Ocuophylla* should be corrected as *Ocuophila* Brunner v. W., 1907; *Trichopeplus* should read *Trychopeplus* Shelford, 1909.

The key to the tribes of Bradley & Galil's Heteronemiinae, including their Heteronemiini and the Libethrini, as given by Bradley & Galil (1977) is solely based on structural differences in ♂ genitalia, this meaning that no single ♀ could be properly assigned even to a tribe. Their Heteronemiini is characterized by "Margins of 9th tergum of ♂ turned downward and overlapping ventrally so that the segment, at least apically, appears as closed tube", the Libethrini by "Margins of 9th tergum of ♂ built normally, not ending in closed tube". Indeed, the genus Libethra Stål keys out into their Heteronemiinae, while the genera *Diapheromera*, *Manomera* and *Pseudosermyle* key into the Libethrini. Therefore it is proposed Libethrini sensu Bradley & Galil is a synonym of their Heteronemiini. The genera *Clonistria* Stål and *Bostra* Stål, both members of the Phasmatidae: Cladomorphinae: Hesperophasmatini in the sense of Bradley & Galil (1977), key out to their Heteronemiini, and are here transferred.

The correct name for the Heteronemiidae sensu Bradley & Galil is Diapheromeridae, introduced by Kirby, 1904, as shown by Zompro (in press), as, after examination of the type-specimen of the type-species of *Heteronemia* Gray, *Heteronemia mexicana* Gray, 1835, this genus belongs into the suborder Areolatae, while all other genera and species included (more than 50% of all described phasmids) belong to the Anareolatae.

The family Diapheromeridae (=Heteronemiidae sensu Bradley & Galil) contains mainly stick-like phasmids divided into five subfamilies. Palophinae and are distributed in the Afro-Tropical region, Pachymorphinae in the Afro-Tropical, Oriental and Australian regions, and Necrosciinae and Lonchodinae in the Oriental und Australian regions. The Diapheromerinae are restricted to the New World; one genus in the Afro-Tropical and one in the Asian region are doubtful and are possibly members of Palophinae.

RESULTS AND COMMENTS

Diapheromerinae

In this section, the tribes, generic groups and genera of the Diapheromerinae are described and discussed. Every part starts with a list of the genera included, followed by characteristics of the group and a key to the constituent subgroups. Then each genus involved is assessed and discussed. The lists of "species included" are not intended to be complete, as they only include the species which have been examined by the author and / or are considered to be definite members of the respective genus. This should serve as support to further revisors. All species are listed with the genus and specific name of the original description.

In the keys, the median segment (first abdominal segment, fused with metathorax, but to recognize by a more or less developed dividing line) is often used as a character. This has the advantage that in many cases specimens can be determined to generic level even when the appendices are broken.

The Diapheromerinae are to be split into three tribes. These contain the following genera, synonyms included (in alphabetical order):

Diapheromerini: *Alienobostra* gen. n.; *Bacteria* Latreille, Le Pelletier, Audinet-Serville & Guérin, 1828 (=*Pseudobacteria* Saussure, 1870); *Bostra* Stål, 1875; *Calynda* Stål, 1875; *Caribbiopheromera* gen. n.; *Clonistria* Stål, 1875; *Diapheromera* Gray, 1835; *Dyme* Stål, 1875; *Globocalynda* gen. n.; *Libethra* Stål, 1875; *Libethroidea* Hebard, 1919; *Litosermyle* Hebard, 1919; *Manomera* Rehn & Hebard,1907; *Megaphasma* Caudell, 1903; *Rugosolibethra* n. n. (= *Caulonia* Stål, 1875 (nec Loriol)); *Oncotophasma* Rehn, 1904 (= *Paradiapheromera* Brunner v. W., 1907); *Paracalynda* gen. n.; *Paraclonistria* Lelong & Langlois, 1998; *Paraphanocles* gen. n.; *Phanocles* Stål, 1875; *Phanocloidea* gen. n.; *Phantasca* Redtenbacher, 1908; *Pseudoceroys* Hebard, 1923; *Pseudosermyle* Caudell, 1903; *Pterolibethra* Günther, 1940; *Rhabdoceratites* Rehn & Hebard, 1912 (= *Ceratites* Rehn & Hebard, 1909; = *Ceratita* Strand, 1926); *Sermyle* Stål, 1875 (= *Hoplolibethra* Caudell, 1904); *Spinopeplus* gen. n.; *Trychopeplus* Shelford, 1909.

Ocnophilini: *Dubiophasma* gen. n.; *Exocnophila* gen. n.; *Ocnophila* Brunner v. W., 1907; *Ocnophiloidea* gen. n.; *Parocnophila* Zompro, 1998.

Oreophoetini: *Oreophoetes* Rehn, 1904 (= *Allophyllus* Brunner v. W., 1907).

Incertae sedis: *Bactricia* Kirby, 1896 (= *Scaphegyna* Karsch, 1898); *Pseudobactricia* Brock, 1999.

Key to the adults and nymphs of tribes of Diapheromerinae:

1 Profemora straight. . . . . Oreophoetini
- Profemora curved basally. 2
2 Meso- and metafemora trapezoid in cross section, often armed (projecting keels or carinae not to be considered). . . . . Diapheromerini
- Meso- and metafemora rectangular in cross section, obviously higher than wide, not armed (projecting keels or carinae are to be disregarded). . . . . Ocnophilini

Key to the eggs of tribes of Diapheromerinae

1 Capsule laterally almost round, in cross section rhombic. . . . . Oreophoetini
- Capsule different. 2
2 Capitulum absent. 3
- Capitulum present. . . . . Diapheromerini
3 Micropylar plate with broad, whitish margin, capitulum absent. . . . . Ocnophilini
- Micropylar plate different. . . . . Diapheromerini

Tribe Diapheromerini

Characteristics. Stick-insect habitus; tibiae without area apicalis; abdomen at least as long as, usually distinctly longer than thorax; profemora not serrated; meso- and metafemora not evenly serrated ventrally, sometimes with few distal teeth, mostly unarmed; antennae distinctly longer than profemora; rarely winged; anal segment of ♂ neither split nor bilobed; eggs with or without capitulum.

Comments on Diapheromerini. The Diapheromerini contains the bulk of Diapheromerinae. Seven groups of genera may be distinguished by adults and egg morphology. The *Phanocles* group contains the largest members, the ♂ sometimes being winged. The egg and ♂ genitalic structures of its genus *Alienobostra* n. g. show similarities with the *Bacteria* group, but in the main characters it is a typical member. In the *Bacteria* group, the genus *Paracalynda* displays the same metamorphoses of the first antennal segments as *Manomera* of the *Diapheromera* group. The *Caribbiopheromera* group agrees with the latter in structure of the ♂ genitalia. The following three groups differ from the previous ones by the absence of a capitulum in the eggs, but it is impossible to separate the *Sermyle* group, in which the eggs lack a capitulum, from the *Diapheromera* group. The *Sermyle* group includes specialized genera which glue their eggs to a substrate. The genera of the *Clonistria* group show tendencies of developing highly specialized metamorphosis of the body and extremities; the most striking members belonging to *Trychopeplus* with several lichen-like species. Their eggs are bullet-shaped. The *Dyme* group includes highly elongated species, their flattened eggs resembling those of the Ocnophilini.

Key to the generic groups of Diapheromerini:

♂♂:

1 Tergite X closed ventrally by sternite X, appearing as a closed tube, vomer not produced 2
- Tergite X not closed by sternite X ventrally, vomer produced. 4
2 Meso- and / or metafemora with one or more spines ventrally. . . . . *Diapheromera* group
- Meso- and metafemora without spines ventrally. 3
3 Median segment considerably shorter than metathorax. . . . . *Sermyle* group
- Median segment almost as long as metathorax. . . . . *Caribbiopheromera* group
4 Median segment more than half as long as metathorax. . . . . *Phanocles* group
- Median segment less than half as long as metathorax. 5
5 Thorax and median segment distinctly longer than abdomen. . . . *Bacteria* group
- Thorax and median segment not distinctly longer than abdomen, often shorter. 6
6 Mesonotum in the middle less than 19 times as long as wide. . . *Clonistria* group
- Mesonotum in the middle more than 20 times as long as wide. . . . . *Dyme* group

♀♀:

1 Thorax and abdomen with longitudinal carinae. . . . . *Sermyle* group
- Thorax and abdomen without longitudinal carinae. 2
2 Thorax with median segment at least one quarter longer than abdomen. 4
- Thorax with median segment less than one quarter longer than abdomen, often shorter. 3
3 Mesonotum in the middle less than 8 times as long as wide. . . . *Clonistria* group
- Mesonotum in the middle more than 9 times as long as wide. . . . . *Dyme* group
4 Metathorax less than 1.5 times as long as median segment. 5
- Metathorax more than 2.5 times as long as median segment. . . . . *Diapheromera-*, *Bacteria* group
5 Abdomen smooth. . . . . *Phanocles*-goup
- Abdomen granulated, smaller than 10 cm. . . . . *Caribbiopheromera* group

Eggs:

1 Capitulum present. 2
- Capitulum absent. 4
2 Area between micropylar plate and operculum distinctly concave. . . . . *Phanocles* group
- Area between micropylar plate and operculum round, not concave. 3
3 Capsule length equal with height. . . . . *Caribbiopheromera* group
- Capsule length considerably longer than heigth. *Diapheromera-*, *Bacteria* group
4 Capsule elongated, glued to a surface ventrally. . . . . *Sermyle* group
- Capsule not glued to a surface. 5
5 Capsule laterally subquadrate, with irregular, broad elevations. . . *Dyme* group
- Capsule bullet-like . . . . . *Clonistria* group

Phanocles group

Genera. *Alienobostra* gen. n.; *Phanocloidea* gen. n.; *Bostra* Stål, 1875; *Paraphanocles* gen. n.; *Phanocles* Stål, 1875.

Characteristics. Large Diapheromerini. Scapus strikingly flat, roundly rectangular. ♂ with vomer; body always shorter than in ♀. Subgenital plate of ♀ often projecting beyond abdomen and spear-like. Basitarsus always carinated, carina flat or produced like a high, triangular crest.

Eggs with capitulum, micropylar plate inserted in an angle less than 90° to the operculum; concave between micropylar plate and operculum.

Comments on the *Phanocles* group. *Phanocloidea*, *Phanocles* and *Paraphanocles* are more closely related to each other than the other genera, as they all have a median segment that is longer than the metathorax. *Bostra* has a shorter median segment, but the ♂ genitalia show relations to *Paraphanocles*. The shortest median segment is found in *Alienobostra*; but it is still much longer than in the following *Bacteria* group. *Alienobostra* seems to be isolated within this group: It is the only genus whose ♂ subgenital plate is not bulbous but strikingly small and flat; the vomer has two appendices instead of one; the cerci are very long and specialized, as is known in the *Diapheromera* group only; the micropylar plate of the egg is only half as long as the capsule.

Key to the genera of the *Phanocles* group

♂♂:

1 Cerci distinctly longer than abdominal segment X. . . . . *Alienobostra*
- Cerci not longer than abdominal segment X. 2
2 Median segment at best as long as metathorax or shorter. . . . . *Bostra*
- Median segment distinctly longer than metathorax. 3
3 Subgenital plate elongated in a hump or tooth posteroventrally. 4
- Subgenital plate rounded posteroventrally, not elongated. . . . . *Phanocloidea*
4 Abdominal segment X as wide as posterior half of IX. . . . . *Phanocles*
- Abdominal segment X widened posteriorly, wider than IX. . . . . *Paraphanocles*

♀♀:

1 Metathorax as long as or longer than median segment. 2
- Median segment longer than metathorax. 3
2 Median segment as long as metathorax. . . . . *Bostra*
- Median segment shorter than metathorax. . . . . *Alienobostra*
3 Head depressed, distinctly longer than wide. . . . . *Phanocloidea*
- Head globose, only slightly longer than wide, armed. 4
4 Abdominal tergite VI with lateral lobes. . . . . *Phanocles*
- Abdominal tergite VI without lateral lobes. . . . . *Paraphanocles*

Eggs:

1 Micropylar plate half as long as capsule. . . . . *Alienobostra*
- Micropylar plate distinctly longer. 2

2	Capsule flattened laterally, parallel-sided, surrounded by compact hairy structures	*Bostra*
-	Lateral margins of capsule not flattened, more globose	3
3	Capsule punctured	4
-	Capsule different	*Phanocloidea*
4	Capitulum with uniform, round impressions	*Paraphanocles*
-	Capitulum with irregular impressions	*Phanocles*

Phanocloidea gen. n. Figs 1-2, 70-71

Type-species. *Bacteria nodulosa* Redtenbacher, 1908: 416, by present designation.

Bacteria: Burmeister, 1838: 563 (part.); Westwood, 1859: 20 (part.); Saussure, 1870: 151; Stål, 1875: 6, 14; 1875: 29; 1875: 11; Rehn, 1904: 61; Redtenbacher, 1908: 412; Shelford, 1909: 362; Zompro, 2000: 171.

Material examined and species included. *Bacteria aequatorialis* Redtenbacher, 1908: 419: HT ♀ nymph-5, Cachabi, Ecuador, circa 500ft, XI.96, Rosenburg [NHMW*]; *Bacteria divergens* Redtenbacher, 1908: 418: ST ♀, Cayenne, Prudhomme, 620/85 [MHNG*]; *Bacteria freygessneri* Redtenbacher, 1908: 421: HT ♀, Guatemala, Mr. H. d. Saussure, 2/14 [MHNG*]; *Mantis filiformes* Fabricius, 1787: 227: HT ♀, no data [HMUG*]; *Bacteria muricata* Burmeister, 1838: 564: ST ♂, Parà, Sieber, ♀, no data [ZMHB*]; *Bacteria nodulosa* Redtenbacher, 1908: 416: ST ♂, Museum Paris, Guyane Franc., F. Geay 1900 [NHMW*]; ST ♂, Cayenne, leg. Thorey, 805 [NHMW*]; ST ♂, no data [SMNS*]; 4 ♂♂, 4 ♀♀, several eggs: Culture O. Zompro [OZ*]; *Bacteria redtenbacheri* Brock, 1998c: 34, n. n. for *Bacteria innocens* Redtenbacher, 1908: 420: HT ♂, Callanga (Peru), Staudinger [NHMW*]; *Bacteria rufopecta* Redtenbacher, 1908: 416: HT ♂, Cayenne, Prudhomme, 620/85 [MHNG*]; *Bacteria satyr* Redtenbacher, 1908: ST ♀, Brasil [SMTD*]; *Bacteria schulthessi* Redtenbacher, 1908: 419: HT ♀, Ecuador [ETHZ*]; *Bacteria segmentaria* Redtenbacher, 1908: 420: HT ♂, Colombia ?, Mus. Dresden [NHMW*];

Diagnosis. ♂♀. A typical member of the *Phanocles* group. *Phanocloidea* differs from *Alienobostra* and *Bostra* in the longer median segment, from *Phanocles* and *Paraphanocles* in structure of the ♂ genitalia and in the ♀ in the flat, non-globose head. The egg is similar to that of *Phanocles* and *Paraphanocles*, but its capsule is not punctured.

Description. Large Diapheromerini. Head distinctly longer than wide, vertex slightly elevated or swollen, armed or unarmed, eyes projecting hemispherically. Scapus flat, roundly rectangular, pedicellus subcylindrical, two-thirds (♂) or half (♀) as long and two-thirds as wide. Antennae exceeding end of abdominal segment IV (♂) or III (♀). Prothorax as long as head but considerably narrower. Mesonotum strongly elongated, slightly narrower (♂) or of same width (♀) as prothorax, smooth in ♂, smooth, granulated, tuberculated or spinose in ♀. Metathorax about one-third as long as mesothorax, equal or different in structure. Profemora curved basally, triangular in cross section, laminate. Meso- and metafemora trapezoid in cross section, sometimes with small ventroapical spines, smooth, serrated or bilobed. Tibiae distinctly longer than femora. Probasitarsus distinctly (♂) or slightly (♀) longer than following segments combined. Mesobasitarsus as long as, metabasitarsus longer than (♂) or as long as (♀) following segments combined. Basitarsi carinate to cristate dorsally. Median

segment much (♂) or slightly (♀) longer than metathorax. Abdominal segment II shorter than median segment. Segment II longer (♂) or slightly shorter than (♀) III; III to V increasingly longer, VI shorter than V, VII shorter than VI, latter widest in ♀. Segment VIII of ♂ dilated posteriorly, IX wider than VIII or X, narrowed posteriorly. Segment X subquadrate, emarginated posteriorly. Segment IX longer than VIII, latter as long as X. Cerci short, directed downwards, not longer than X. Subgenital plate bulgy. Vomer produced. Segments VIII to X of ♀ narrower than previous segments, all of equal width. Segment VIII longer than IX, latter and X of similar length. Segment X quadrate dorsally, posterior margin with an emargination (♂). Cerci shorter than X, sligthly surpassing X by less than its half-length. In ♀, praeopercular organ produced, subgenital plate in posterior half with a ventromedian carina slightly to considerably surpassing the tip of abdomen.

Obviously some ♂♂ of this genus possess more or less well-developed tegmina and alae.

Derivatio nominis. *Phanocloidea* mirrors the close relationship to *Phanocles* Stål.

Distribution. Northern South America.

Comments on the genus. This genus includes many of the species published under the name "*Bacteria*". *Phanocloidea* includes both apterous ♂♂ and those with fully developed wings.

The erstwhile genus *Bacteria* auct. is heterogenous without any doubt, with the predictible result that, along with further revisions at the species level, it will be splitted. *Phanocloidea* is but a first step, for its type is known from both sexes and the egg is documented as well. For further comments see *Bacteria*.

Different characteristics vary between the species of *Bacteria* auct., yet the known material does not allow for significant morphological tendencies to be revealed. The head can be oblong depressed or the vertex elevated, with long spines or horns or totally unarmed, the thorax smooth to prominently spinose, the metatarsi dorsally with a small carina or a prominent, triangular crest.

Zompro (2000) presents a SEM study of the egg of *Phanocloidea nodulosa* (Redtenbacher, 1908) and the first description of the female. This work includes figures of the adults.

Phanocles Stål, 1875 Figs 3- 5, 72-75

Phanocles: Stål, 1875: 28; *Bacteria*: Redtenbacher, 1908: 412 (part.); Shelford, 1909: 363, pl. 7: 3b.

Type-species. *Bacteria burkartii* Saussure, 1868: 65, by subsequent designation of Kirby, 1904: 353.

Material examined and species included. *Phanocles burkartii* (Saussure, 1868: 65): 2 ♀, Mexico, Soconusco (Chiapas) 1200m üb. Meer, Herm.-Hans Kolow, 6.7.1900, 1 egg ex ovipositor [ZMUH*; OZ *]; ♀, Mexico, Deyrolle [NHMW*]; *Bacteria sartoriana* Kaup & Heyden, 1871: 18, 29, pl. 1: 5: HT ♀, Mexico, (Sartorius) v. Heyden. n. syn. of *Phanocles burkartii* (Saussure) [SMFD*]; *Phanocles* n. sp. Hennemann i. pr. HT ♂, Bred England, Essex, Hockley, 1992. PSG 47, AJE. Harman, PT ♀, Bred England, Essex, Hockley, 1991. AJE. Harman. Originally Costa Rica 1989 [Coll. F. Hennemann*].

Complementary description. ♂♀. Head subglobose, only slightly longer than wide. Eyes projecting hemispherically, two humps or tubercles behind eyes. Scapus flat, rectangular with rounded edges, pedicellus one-third as long and two-thirds as wide, antennae projecting beyond abdominal segment IV (♂) or reaching the anterior half of II (♀). Prothorax as long as head. Mesothorax strongly elongated, narrower than prothorax and smooth (♂) or as wide as prothorax and granulated to spinose (♀). Metathorax structured as mesothorax, a little longer than prothorax. Profemora curved basally, triangular in cross section, edges laminate. Meso- and metafemora trapezoid in cross section, mesofemora in anterior quarter with small lobes ventrolaterally, with a row of (sometimes indistinct) spines ventro-apically (at least in ♀). Tibiae considerably longer than femora. Basitarsi of ♂ with a low carina, of ♀ with a high, triangular carina. Probasitarsus longer than (♂) or as long as, mesobasitarsus as long as (♂) or shorter than, metabasitarsus as long as (♂) or shorter than (♀) following segments combined. Abdominal segment II shorter than median segment, segment III longer than II, in ♂ length very slightly increasing from III to V, segment VI as long as II, VII half as long as V; VIII to X combined as long as V; VIII as long as IX; X two-thirds of IX. Segment VIII equally dilated, IX before middle abruptly narrowed, posterior half as wide as X; latter slightly emarginated posteriorly. Cerci shorter than X, slightly curved, directed downwards. Subgenital plate prominent, posteriorly elongated into an appendix, flattened posteromedially. In ♀, segments III to V increasingly longer, VI as long as IV, with lobes posterolaterally, segment VII as long as II. Praeopercular organ produced. Segments VIII to X combined as long as VI; segments IX and X of equal length, VIII considerably longer. Cerci straight, slightly projecting beyond segment X. Subgenital plate broad, distinctly projecting beyond tip of abdomen.

Egg. Capsule irregularly oval, with punctured structure. Micropylar plate elongated, longer than two-thirds of capsule. Operculum oval. Capitulum smooth, high, with several irregular impressions.

Distribution. Central America.

Comments on the genus. The drawings by Saussure (1870: 151, pl. 3: 6) and Shelford (1909: 363, pl. 7: 3b) show the ♀ without lateral lobes, despite these being mentioned in the original diagnosis; consequently all following authors erroneously synonymized *Phanocles* with *Bacteria*, including some species which now belong to *Phanocloidea* n. g. The lobes are convergent to those in the Oriental genus *Pharnacia* Stål, 1877 and are in fact of generic value. The genus is easiest to separate from *Phanocloidea* by the posteroventrally elongated subgenital plate of the ♂ and the globose head of the ♀; the egg by its punctured structure. Possibly some ♂♂ of this genus are winged (as in *Phanocloidea* or some species of the erstwhile *Bacteria*). The complementary description above has been complemented by the ♂ of a new species from Costa Rica (Hennemann, in press).

Paraphanocles gen. n. Figs 6-7, 76-77, 124-125

Bacteria: Redtenbacher, 1908: 412 (part.).

Type-species. *Mantis keratosqueleton* Olivier, 1792: 639, by present designation.

Material examined and species included. *Mantis keratosqueleton* Olivier, 1792: 639: ♀, Trinidad, Port-of-Spain 1914. H. Woortman leg. vend. 22.8.1921 [ZMUH*]; ♂, Trinidad, Brit. West. Ind. W. Griem leg. 24.9.38. Eing. 48/38 [ZMUH*]; 2 ♂♂, 2 ♀♀, several eggs: Ex culture O. Zompro. Origin of culture stock: Martinique [OZ*]; = *Phasma cornutum* Lichtenstein, 1796: 78, synonymized by Gray, 1835: 16; = *Phasma bicornis* Stoll, 1785: 15: 57: ST ♀, no data [RMNH*], synonymized by Redtenbacher, 1908: 422; = *Bacteria cyphus* Westwood, 1859: 24, pl. 7: 7, synonymized by Redtenbacher, 1908: 422; = *Phanocles curvipes* Redtenbacher, 1882: 27, pl. 15: 9; synonymized by Redtenbacher, 1908: 422; = *Bacteria bellangeri* Redtenbacher, 1908: HT ♂, Martinique, Mus. Paris, leg. V. Bellanger [NHMW*], synonymized by Zompro, 1998: 6; = *Bacteria bradypus* Redtenbacher, 1908: ST ♀, Antilles, Mus. Paris [NHMW*], synonymized by Zompro, 1998: 6; = *Bacteria integra* Redtenbacher, 1908: HT ♀, Trinidad, leg. Boucard [NHMW*], synonymized by Zompro, 1998: 6; = *Bacteria maxwelli* Redtenbacher, 1908: 421: ST 3 ♂♂, 2 ♀♀, Barbados, Maxwell Lefroy [NHMW*], synonymized by Zompro, 1998: 6.

Diagnosis. ♂♀. Closely related to Phanocles, differing in ♂ morphology of tergite X, which is dilating and wider than IX. ♀ without lateral lobes of VI.

Description. Head subglobose, slightly longer than wide, armed with two spines (♂) or lobes (♀). Eyes projecting hemispherically. Scapus roundly rectangular, pedicellus half (♂) or two-thirds (♀) as long and two-thirds as wide. Antennae reaching the abdominal segment IV (♂) or II (♀). Prothorax as long as head, slightly narrower. Mesothorax strongly elongated, slightly narrower (♂) or of equal width (♀) as prothorax, in ♂ smooth, in ♀ with few granules. Metathorax of same structure, about one-quarter as long as previous segment. Median segment considerably (♂) or slightly (♀) longer than metathorax. Profemora curved basally, triangular in cross section, laminate. Meso- and metafemora trapezoid in cross section, in ♀ slightly broadened proximally. All tibiae longer than profemora. Basitarsi of ♂ longer than following segments combined, with a low carina, probasitarsus as long as and meso- and metabasitarsus shorter than following segments combined, with a high, triangular crest. Abdominal segment II shorter than median segment. In ♂, segments II to V of similar length, VI shorter, VII shorter than VI, segments VIII to X combined slightly longer than V; segment VIII dilating, IX slightly narrower than posterior end of VIII, anterior half of X as wide as posterior half of VIII, dilated posteriorly, with a slight emargination posteriorly. Subgenital plate prominent, with a spine posteroventrally, with an acute margin posteriorly. Cerci short, straight, directed downwards. In ♀, segments II to V increasingly longer, V longest, VI as IV, VII as II, narrower than previous segments. Segments VIII to X as wide as VII, combined as long as IV; segment VIII longer than X, segment IX shorter. Posterior margin of X with a broad notch. Cerci short, straight, slightly projecting beyond X. Praeopercular organ indistinct, sternite VII with two posterolateral spines. Subgenital plate of ♀ elongated, reaching the tip of abdomen or considerably projecting, with a medioventral carina.

Egg. Capsule regularly oval, with fine punctured structure. Micropylar plate elongated, longer than two-thirds of capsule. Operculum oval. Capitulum smooth, low, with many uniform, round impressions.

Distribution. Caribbean islands, coastal areas of the Caribbean Sea.

Derivatio nominis. *Paraphanocles* shows very close relationships with *Phanocles*.

Bostra Stål, 1875 Figs 8-9, 78-79

Bostra Stål, 1875: 13; 1875: 24; Redtenbacher, 1908: 46 (part.).

Type-species. *Bacteria turgida* Westwood, 1859: 28, pl. 8: 4 ♂, 9 ♀, by subsequent designation of Kirby, 1904: 350.

Material examined and species included. *Bostra dorsuaria* Stål, 1875: 79: ST ♂♀, Chiriqui (Panama), Staudinger [NHMW*]; *Bacteria turgida* Westwood, 1859: 28, pl. 8: 4, 9: LT (by present designation) ♂, Venezuela [BMNH*]; PLT ♀, Venezuela [BMNH*], LT and PLT mounted on same pin; 6 ♂♂, 4 ♀♀, several eggs: Reared by O. Zompro, origin: Venezuela [OZ*].

Complementary description. ♂♀. The ♂ genitalia resemble *Paraphanocles*, but *Bostra* is separated by the shorter metathorax and the different egg structure.

Head subglobose, vertex with two tubercles, spines or horns, eyes projecting hemispherically. Scapus flat, rectangular with rounded corners, pedicellus half of its length and two-thirds of its width. Antennae projecting beyond the middle of abdominal segment IV (♂) or III (♀). Prothorax as long as head, slightly narrower. Mesothorax strongly elongated, almost parallel-sided, in ♂ narrower than and in the ♀ as wide as prothorax. Mesothorax of ♀ spinose laterally. Metathorax a little longer (♂) or of similar length (♀) as median segment. Profemora curved basally, triangular in cross section, edges laminated. Meso- and metafemora trapezoid in cross section, with several small spines ventromedially. All tibiae longer than femora. Probasitarsus slightly shorter than following segments combined, mesobasitarsus as long as three following segments and metabasitarsus slightly shorter than four following segments (♂) or as long as three following segments combined. Tarsal segments slightly carinated dorsally. Abdominal segment II as long as median segment, segments II to V increasingly longer, VI = IV, VII = II. Segments VIII to X combined as long as III. In ♂, segment VIII half as long as VII, dilated posteriorly, segment IX longer, lateral margins broadened, therefore much wider than VIII. Segment X shorter than VIII, slightly emarginated posteriorly, considerably narrower than IX, with a prominent median carina dorsally. Subgenital plate flat, broad, not projecting beyond IX, posterior margin slightly emarginated. In ♀, segment IV widest, V longest, segment VIII longer than X, latter longer than IX, emarginated posteriorly. Praeopercular organ produced. Subgenital plate flat, broad, reaching the end of X, posterior half with a ventromedian carina. Cerci short, straight, not projecting beyond X.

Egg. Capsule strikingly angular, flattened laterally, bordered laterally and dorsally by structures appearing like a wall of hairs. Operculum oval, capitulum structured similar.

Distribution. Northern half of South America.

Alienobostra gen. n. Figs 10-11, 80-81, 126-127

Type-species. *Calynda brocki* Hausleithner, 1987: 177, figs. 1-2, 5-6, by present designation.

Material examined and species included. *Bostra amplectens* Redtenbacher, 1908: HT ♂, Cache, Costa Rica. [BMNH*]; *Calynda brocki* Hausleithner, 1987: 177, figs. 1-2, 5-6: HT ♂, PT 2 ♂♂, 3 ♀♀, Costa Rica. [NHMW*]; ♂♀, several eggs: Zucht O. Zompro [OZ*]; *Bostra jugalis* Rehn, 1905: 72: ST ♂♀, Chinandega, Nicaragua, Coll. Baker. [ANSP*].

Diagnosis. ♂♀. The morphology of the strongly elongated and curved ♂ cerci is unique in the *Phanocles* group, the vomer with its two appendices is striking and unknown in any other member of Diapheromerinae; the short median segment likewise different from all other members of this group. The structure of the egg capsule shows relationship with the following *Bacteria* group.

Description. Smaller members of the *Phanocles* group. Head flat, longer than wide, narrowed posteriorly. Vertex of ♀ bispinose. Scapus flat, roundly rectangular, pedicellus half (♂) or one-third (♀) of its length and half as wide. Antennae comparatively short, reaching the end of abdominal segment III (♂) or the end of metathorax (♀). Pronotum as long as head, slightly narrower. Mesothorax strongly elongated, narrower than prothorax, smooth and unarmed (♂) or of equal width and tuberculate to spinose laterally (♀). Metathorax structured as previous segment, distinctly shorter than its half. Profemora curved basally, triangular in cross section and laminate. Meso- and metafemora trapezoid in cross section, in ♀ with several small spines ventro-apically. All tibiae longer than femora, basitarsi as long as following segments combined. Median segment slightly shorter than metathorax, of same length as abdominal segment II. Segments II to V of ♂ of similar length, in ♀ increasingly longer, V being widest. Segment VI shorter than V, segment VII shorter than VI. Segments VIII and IX of ♂ combined as long as V, of same length, VIII posteriorly dilating, IX inserted at an angle, narrowed posteriorly, touching ventroposterolaterally. Segment X shorter than IX, in anterior half dilated, posterior half parallel-sided, with two teeth posterolaterally. Cerci longer than VII, curved in proximal one-third and flattened in apical half. Vomer in the type with two appendices. Subgenital plate small, almost hidden inside tergite IX. Segments VIII to X of ♀ of equal width, VIII longer than IX, latter as long as X. Cerci straight, shorter than X. Subgenital plate elongated, projecting beyond tip of abdomen by length of VIII to X.

Egg. Capsule suboval, smooth, with grey, white or black spots. Micropylar plate oval, half as long as capsule, inserted at an angle of 70°; median line present. Operculum round, capitulum slightly shorter than half of capsule, with longitudinal impressions.

Distribution. Middle America.

Derivatio nominis. The name *Alienobostra* wants to show the relations to *Bostra* and to point out the striking differences in structure of the genitalia.

Comments on the type. Hausleithner (1987: 185) presents notes on the culture of *Calynda brocki*. This species only differs from *Bostra jugalis* Rehn, 1905 in parts of the colouration, and the length of the ♀ subgenital plate; therefore it might be a synonym. As *B. jugalis* could only be examined from a colour print, a final decision must wait for a revision at the species level. Another possible identic species is *Bostra amplectens* Redtenbacher, 1908. If these species will be found to be synonymous, *Alienobostra jugalis* (Rehn, 1904), is the correct name of the type-species. *Calynda brocki* is chosen now, because both sexes and egg of this species could be examined.

Bacteria group

Genera. *Bacteria* Latreille, Le Peletier, Audinet-Serville & Guérin, 1827 (= *Pseudobacteria* Saussure, 1870); *Calynda* Stål, 1875; *Globocalynda* gen. n.; *Paracalynda* gen. n.

Characteristics. Median segment very short. Cerci distinctly but at best slightly projecting beyond tip of abdomen, never specialized. Tarsal segments lacking high carinae or crests. Vomer produced.

In the egg space between micropylar plate and operculum convex in outline, not concave.

Key to the genera of the *Bacteria* group

♂♂:

1	Abdominal segments VIII to X globose	*Globocalynda*
-	Abdominal segments VIII to X forming no globose structure	2
2	Posterior part of abdominal tergite X curved upwards	3
-	Posterior part of abdominal tergite X straight, not curved upwards	*Paracalynda*
3	Abdominal tergites VIII to X of similar width	*Calynda*
-	Abdominal tergites from VIII to X dilating	*Bacteria*

♀♀:

1	Head not armed, smooth	2
-	Head armed	*Calynda*
2	Subgenital plate not projecting beyond tip of abdomen	3
-	Subgenital plate projecting considerably beyond tip of abdomen	*Globocalynda*
5	Abdominal segment VIII of similar length as IX and X	*Paracalynda*
-	Abdominal segment VIII as long as IX and X combined	*Bacteria*

Eggs:

1	Capsule not punctured, with leather-like structure or smooth (20 x)	2
-	Capsule punctured (20 x)	3
2	Capsule with irregular spots of darker colouration laterally	*Paracalynda*
-	Capsule monochromous laterally	*Bacteria*
3	Capsule bullet-like, considerably longer than high	*Calynda*
-	Capsule almost quadrate, slightly longer than high	*Globocalynda*

Globocalynda gen. n. Figs 12-13, 82-83, 126-127

Calynda: Brunner v. W., 1907: 328 (part.)

Type-species. *Calynda simplex* Brunner v. W., 1907: 329, by present designation.

Material examined and species included. *Calynda simplex* Brunner v. W., 1907: 329: LT ♂ (here selected), Callanga, Peru, Staudinger. Collection Brunner v. W. det. Brunner v. W. *Calynda simplex* Br.; 22.572 [NHMW*]; PLT ♀, 2 eggs ex abdomen, Coll. Brunner v. W., Songo (Bolivia), Staudinger. det. Brunner v. W. *Calynda simplex* Br.; 22.250 [NHMW*]; *Calynda unilobata* Brunner v. W., 1907: 330: ST ♂ ♀ [NHMW*].

Diagnosis. ♂♀. Very characteristic by the globose terminal segments of the abdomen of the ♂, in this feature differing strikingly from the related genera. The long median segment shows relations to the previous group, but the simple tarsal segments and the morphology of the egg clearly make *Globocalynda* placed within the *Bacteria* group.

Description. Head a little longer than wide, flat, smooth, scapus roundly rectangular, pedicellus subglobose, of half-length and two-thirds of width of previous segments. Antennae reaching the abdominal segment VII (♂) or III (♀). Prothorax as long as head, in / slightly narrower. Mesothorax strongly elongated, narrower than prothorax (♂) or equally dilated posteriorly, 2.5 (♂) or 2 times (♀) as long as metathorax. Profemora slightly curved basally, depressed laterally, triangular in cross section, edges prominently laminated. Probasitarsus longer than (♂) or of equal length (♀) as following segments combined. Meso- and metafemora trapezoid in cross section, mesobasitarsus longer than (♂) or as long as four following segments without unguis (♀) combined, metabasitarsus considerably longer than (♂) or as long as (♀) following segments combined. All tibiae longer. Abdominal segment II less than twice as long as median segment, III slightly longer, IV longer than III, segment V longer than IV, segment VI as long as II (♂) or V (♀). Segment VII shorter than (♂) or as long as II (♀). Segments VIII to X of ♂ combined as long as VII, segment VIII as long as X, segment IX longer than VIII or X. Segments VIII to X combined globose. Segment VIII dilated posteriorly, IX as wide as posterior part of IX, segment X considerably narrower, posterior margin notched, with a triangular keel medially. Cerci straight, directed downward. Subgenital plate of ♂ reaching the middle of X, posterior part straightly upturned. Vomer simple. Segment VIII of ♀ almost as long as IX, segment X considerably shorter. Subgenital plate strongly elongated, broad, with a ventromedian carina.

Egg. Capsule from lateral view roundly rectangular, flattened dorsoventrally, shiny, black, with leather-like structure (20x). Micropylar plate elongated, two-thirds of length of capsule, parallel-sided, marginated, surrounded by a white area more than twice as wide as margin. Median line present, reaching the polar area. Capitulum flat.

Distribution. NW South America.

Derivatio nominis. The name derives from the morphology of the abdominal segments VIII to X in the ♂ and shows the close relationship with *Calynda* Stål.

Bacteria Latreille, Le Peletier, Audinet-Serville & Guérin, 1827 Figs 15-16, 84-85

Bactérie: Latreille, 1825: 412; *Bacteria*: Latreille, Le Peletier, Audinet-Serville & Guérin, 1827: 445; Burmeister, 1838: 563 (part.); Westwood, 1859: 20 (part.); Kirby, 1904: 355 (part.); Brock, 1998c: 33; *Pseudobacteria*: Saussure, 1870: 157; Kirby, 1904: 346 (part.); *Dyme*: Brunner v. W., 1907 (part.); *Bostra*: Redtenbacher, 1908: 406 (part.); nec *Bacteria*: Stål, 1875: 6, 14; 1875: 29; 1875: 11; Rehn, 1904: 61; Redtenbacher, 1908: 412; Shelford, 1909: 362.

Type-species. *Mantis ferula* Fabricius, 1793: 12, by subsequent designation of Kirby 1904c: 346.

Material examined and species included. *Mantis ferula* Fabricius, 1793: 12: ♀, Guadeloupe Mus. Seh. & T. L *Ferula* F. = *Antillarum* Sauss iion *Arumatia* Stoll [ZMUC*]. This specimen might be Fabricius's HT, but it is difficult to find evidence for this statement, as it was labelled subsequently; ST of *Bacteria antillarum* Saussure, 1868: 65: ♂♀, one egg ex ovipositor, Guadeloupe, Schramm; ST 2 ♂♀, Guadeloupe, H. d. Saussure; ST ♀, Guadeloupe, coll. Guerin [MHNG*]; *Pseudobacteria donskoffi* Lelong & Langlois, 1998: 248, figs. 10-15 [MNHN].

Complementary description. ♂♀. *Bacteria* is closely related to *Calynda* Stål, but differs in the very short subgenital plate, the short cerci, the flattened head and the terminal tergite of the ♂, in which the posterior part is elevated as a bulge. The vomer lacks an apex.

Large members of this group. Head longer than wide, smooth, unarmed. Scapus flat, pedicellus half as long, round. Antennae reaching the posterior end of abdominal segment IV (♂) or I (♀). Prothorax as long and wide as head. Mesothorax strongly elongated, smooth, as wide as prothorax (♂) or gently widened proximally (♀); metathorax structured like previous segment, but only half as long. Profemora curved basally, with one high keel dorsally and ventrally, with one less prominent keel interiorly; protibiae shorter, probasitarsus longer (♂) or as long (♀) as following segments combined. Meso- and metafemora four-edged, with a more or less prominent spine ventro-apically. Meso- and metabasitarsus in both sexes of same length as following segments combined. Median segment less than one-fifth as long as metathorax. Segments II to IV of similar length; segment IV widest in ♀. Segment VII slightly shorter than VI. Terminal segments of ♂ from VIII to X dilated, of similar length, posterior margin of X with a prominent edge (no margin as in the other groups), this edge separated from lateral margin of this segment. Supra-anal plate hidden under the edge. Vomer transverse, prominent apex absent. Cerci elongated, strongly curved, as long as X. Subgenital plate bulgy, marginated posteriorly. Segment VIII of ♀ almost as long as IX and X combined, segments IX and X of equal length. Last three segments narrower than those before, of same width. Supra-anal plate very short, indistinctly projecting beyond X. Cerci strong but short, half as long as X. Subgenital plate blunt, not projecting beyond X.

Egg. Capsule oval, smooth, lacking any structure (50 x), capitulum regularly punctured. Micropylar plate elongated, three-quarters as long as capsule, with a short median line, surrounded by a white area.

Distribution. Caribbean islands.

Comments on the genus. Rehn (1904: 61) corrected the name of the author "Latreille, 1825". This author used the name only in the French form "*Bactérie*". Latreille, Le Peletier, Audinet-Serville & Guérin were the first to use the latinized form "*Bacteria*" and are consequently the authors. They adopted Latreille's diagnosis without completing it. The confusion in the use of the name *Bacteria* is discussed by Brock (1998c: 33). Brock was correct to synonymize *Bacteria* with *Pseudobacteria*, examining the exact identity of the type-species; as a result the formerly large *Bacteria* includes only two species now, while most of the species formerly assigned in this genus have to be transferred to other genera. Many of them will obviously warrant erection of new genera, for the bulk are definitely heterogenous, making it impossible

to incorporate them in already existing genera. Some are currently members of the new genus *Phanocloidea*. A revision at the species level is thus badly needed.

Comments on the type-species. Kirby selected *Bacteria antillarum* Saussure, 1868, as type-species of *Pseudobacteria* Saussure, which is an objective synonym of *Bacteria ferula* (Fabricius, 1793).

As formerly *Bacteria* was one of the largest genera in Phasmatodea, a full list of citations and synonymy of the type-species seems helpful:

Mantis ferula Fabricius, 1793: 12; *Phasma ferula*: Fabricius, 1798: 187; Lichtenstein, 1802: 10 (part.); *Bacteria ferula*: Latreille, Le Peletier, Audinet-Serville & Guérin, 1828: 445; Burmeister, 1838: 564; Kirby, 1904c: 355; Brock, 1998c: 33.

Bacteria arumatia: Westwood, 1859: 22 (not pl. 23: 4 „var.").

Bacteria crudelis Westwood, 1859: 24 (synonymized by Brock, 1998c: 33); *Pseudobacteria crudelis*: Kirby, 1904: 346; *Bostra crudelis*: Redtenbacher, 1908: 409.

Bacteria antillarum Saussure, 1868: 65; *Pseudobacteria antillarum*: Saussure, 1872: 157 (synonymized by Kirby, 1904: 346); *Dyme antillarum*: Brunner v. W., 1907: 328.

Calynda Stål, 1875 Figs 17-18, 86-87

Calynda Stål, 1875: 24; Rehn, 1904: 57; Kirby, 1904: 353; Brunner v. W., 1907: 328 (part.); Shelford, 1909: 349; Hausleithner, 1987: 177.

Type-species. *Calynda bicuspis* Stål, 1875, by monotypy.

Material examined and species included. *Calynda bicuspis* Stål, 1875: 78: HT ♀ [NHRS*] (The ♂ mentioned by Sjöstedt (1933: 5) is a ♀); ♀, Chiriqui, Staudinger [NHMW*]; ♀, Cache, Costa Rica, H. Rogers [NHMW*]; *Calynda coronata* Carl, 1913: 34: ST ♀, Costa Rica, San Jose, 1161 m [MHNG*]; ST ♀, San Carlos, 250 m, Biolley [MHNG*]; *Dyme discors* Brunner v. W., 1907: 324: LT ♂ (here selected), Coll. Br. v. W., Chiriqui. (Panama) Staudinger [NHMW*]; 4 PLT ♂♂: Panama, Vale de Chiriqui, leg. Champion [BMNH*].

Complementary description. ♂♀. This genus is well defined within this group by the morphology of the ♂ genitalia and the head of the ♀ being armed.

Medium to large members of the *Bacteria* group. Head a little longer than wide, narrowed proximally, vertex of ♀ armed in its anteromedian part. Scapus flat, pedicellus round, half as long as scapus, following segments elongated. Antennae reaching the middle of abdominal segment VII (♂) or IV (♀). Prothorax parallel-sided, longer than head. Mesothorax strongly elongated, as wide as prothorax. Metathorax considerably shorter than previous segment, of similar width and same structure. Profemora curved basally, with one dorsal, one ventral and one interior keel. Tibiae longer than femora. Basitarsus longer (♂) or as long as (♀) following segments combined. Basitarsus of ♀ with a dorsomedian carina. Meso- and metafemora unarmed (♂) or in basal quarter with exteriorly directed lobes dorsolaterally (♀), with one or more very small spines ventro-apically. Meso- and metabasitarsus about as long as length of following segments combined, that of ♀ with a dorsal carina. Median segment less than 1/10 (♂) or 1/3 (♀) as long as metanotum. Abdominal segment II 5 (♂) or 2 times (♀) as long as median segment. Segments II to VI of ♂ of similar length. III

of ♀ longer than II, of same length as IV to VI. Segment VII in both sexes shorter than previous segment. Sternite VII of ♀ with a small praeopercular organ. Segments VIII to X of ♂ wider than previous segments, VIII widened distally, trapezoid, longer than X but shorter than IX, latter as wide as X but twice as long, X emarginated posteriorly, lobes upcurved, with several black teeth ventrally, margin absent. Supra-anal plate projecting, triangular. Vomer broad, triangular, with one apex. Cerci long, curved, projecting beyond tip of abdomen by length of IX. Segments VIII to X of ♀ of similar length and width, supra-anal plate broad, triangular. Cerci straight, as long as X. Subgenital plate elongated, projecting beyond tip of abdomen, with a notch posteriorly, carinate ventrally.

Egg. Capsule flattened bullet-like, smooth, dark brown with leather-like structure (50 x). Micropylar plate half as long as capsule, surrounded by a wide, white area covering its posterodorsal part, parallel-sided, with a broad, flat margin and a median line.

Distribution: Central America.

Comments on the genus. Brunner v. W.'s note (1907: 328) "Dieses Genus unterscheidet sich von *Dyme* nur durch das lange Operculum. Das einzige bekannte Männchen ist mit Ausnahme der geschwollenen letzten Hinterleibssegmente von Dyme nicht zu unterscheiden." is inaccurate and based on his handling of *Dyme*, a genus in which he included several highly heterogeneous species. Hausleithner (1987: 178) calls the diversity in the length of the median segment "ein nicht unwesentliches Unterscheidungsmerkmal der *Calynda*-Arten". In fact it is of generic value; in his work, just like in Brunner's, there is no hint concerning the type-species *C. bicuspis* Stål. Windsor et al. (1996) report dispersal of the eggs by ants in this species, but their phasmid is definitely an undetermined species of *Phanocloidea*.

The diagnosis of *Calynda* is completed by the yet undescribed ♂♂ of *C. coronata* Carl, 1915 and *C. discors* (Brunner v. W., 1907) comb. n.

Calynda coronata Carl, 1913, ♂ Fig. 18

Material examined: ♂, Costa Rica, Monteverde, Nebelwald, 10°17'53" N 84°48'14" W, 1500m, 17.II.1998, leg. I. Richling [OZ 386-3*].

Description. General colour light brown, body shiny. Head smooth, not armed, distinctly longer than wide, narrowed posteriorly, widest across eyes, these projecting slightly more than hemispherically. Genae black, with a white stripe dorsally, vertex brown, posterior half darker. Ventral part of head white. Scapus club-like, distally broadened, brown, with an elongated, black triangle anteroventrally. Pedicellus half as long, globose, slightly narrower, brown, darker ventrally. Following segments elongated, black ventrally, posterior ends annulated up to middle of antennae, lighter from middle to apex. Antennae reaching the middle of abdominal segment VII. Prothorax slightly shorter than head, lateral margins convex, median longitudinal impression and median transverse furrow present. Mesothorax slightly narrower than prothorax, 7 times as long, smooth. Metathorax like previous segment, two-thirds as long. Profemora strongly curved basally, curved part light green, following part light brown, triangular

in cross section, laminate. Protibiae distinctly longer, quadrate in cross section, probasitarsus distinctly longer than following segments combined, segment II as long as III and IV combined, III twice as long as IV. Terminal segment as long as II. Meso- and metafemora trapezoid in cross section, with a row of some small granules ventro-apically, tibiae black in proximal part, then light brown. Mesobasitarsus slightly shorter, metabasitarsus as long as following segments combined. Median segment very short, abdominal segment II 6 times as long. Abdominal segments light brown, smooth. Length of II to V slightly increasing, VI shorter than II, segment VII shorter than VI. Segments VIII to X combined slightly longer than V. Segment IX longer than VIII, segment X about two-thirds of IX. Both IX and X as wide as II, segment VIII dilated posteriorly, therefore slightly wider. Segment X posteriorly with a broad notch. Supra-anal plate small, not projecting beyond X, but visible in the notch, white. Cerci as long as X, projecting, curved before apex. Subgenital plate flat, broadly marginated posteriorly. Vomer sulcate ventrally, with a short, black apex.

Measurements (mm). Body: 76.2; head: 3.2; pronotum: 3.0; mesonotum: 21.0; metanotum: 14.0; median segment: 0.9; profemora: 27.5; protibiae: 36.2; mesofemora: 23.0; mesotibiae: 28.5; metafemora: 28.3; metatibiae: 38.1.

Paracalynda gen. n. Figs 19-20, 88-89, 130-131

Type-species. *Bacunculus pictus* Brunner v. W., 1907: 333, by present designation.

Material examined and species included. *Bacunculus pictus* Brunner v. W. 1907: 333: HT ♂, Coll. Brunner v. W., Guatemala, Godman [NHMW*]; *Pseudobacteria picta utilaensis* Zompro, 1998: 215, fig. 6-8: HT ♂, PT 2 ♂♂, 2 ♀♀, ♂ nymph IV, ♀ nymph V, several eggs, Honduras, Utila Id., III.1997, leg. T. Kujawski [OZ 323-1 - 7*].

Diagnosis. ♂♀. This genus is a typical member of this group, even so relations to the next group are evident: the genitalia resemble those of *Diapheromera*, the specialized antennae that in *Manomera*. The eggs are typical for the Bacteria group.

Description. Medium to large-sized members of the *Diapheromera* group (see below), ♂ comparatively colourful. Body surface smooth. Head distinctly longer than wide. Scapus very flat, pedicellus cylindrical, half as long and two-thirds as wide as scapus. First antennal segments comparatively strong, antennae projecting beyond tip of abdomen (♂) or reaching the end of abdominal segment V (♀). Prothorax as long as head and of same width. Mesothorax highly elongated, narrower than prothorax (♂) or of same width (♀). Metathorax about two-thirds of length of mesothorax. Profemora curved basally, triangular in cross section, probasitarsus distinctly longer (♂) or of same length (♀) as following segments combined. Meso- and metafemora trapezoidal in cross section, ventro-apical spines absent, mesobasitarsus as long as (♂) or shorter (♀) than following segments, metabasitarsus longer than (♂) or of equal length (♀) as following segments combined. Metanotum 8 (♂) or 4 times (♀) as long as median segment. Abdominal segment II a little more than twice as long as median segment, III to VI of equal length, longer than II (♂) or III longer than II, segments IV to VI of equal length, longer than III (♀). Segment IV of ♀ widest, II to VII of ♂ of equal width. VII of ♀ as long as III, VII of ♂ shorter than II. Segment VIII of ♂ dilated

caudally, wider and longer than IX and X. Both latter of equal length. Segment X wider than IX, dilated and emarginated posteriorly. Segments IX and X closed ventrally, vomer reduced, not visible. Subgenital plate small, not projecting beyond segment IX. Segments VIII to X of ♀ of same width, narrower than previous segments, VIII and X of equal length, IX shorter, X emarginated, posterior half with a keel, supra-anal plate triangular. Subgenital plate slender, slightly projecting beyond tip of abdomen. Cerci of ♂ very long, with one big tooth basally, curved; of ♀ straight, longer than X.

Egg. Capsule very shiny, smooth, oval, flattened laterally. Micropylar plate almost reaching the operculum, broadly marginated. Capitulum flat, punctured deeply and regularly. Median line almost as long as micropylar plate.

Distribution. Central America.

Derivatio nominis. Related to *Calynda*.

Diapheromera group

Genera. *Diapheromera* Gray, 1835; *Manomera* Rehn & Hebard, 1907; *Megaphasma* Caudell, 1903; *Diapheromera* (*Rhabdoceratites*) Rehn & Hebard, 1912 = *Diapheromera* (*Ceratites*) Rehn & Hebard, 1909; = *Diapheromera* (*Ceratita*) Strand, 1926).

Characteristics. The spination of the femora separates the *Diapheromera* group from the related generic groups. The structure of the ♂ genitalia shows relation to the following groups, while the sponge-like capitulum of the eggs resembles the *Bacteria* group.

Small to medium-sized Diapheromerini, body strikingly shiny. Femora spinose ventro-apically, abdominal tergite X of ♂ closed by sternite X ventrally, vomer not produced. Eggs with a sponge-like capitulum.

Key to the genera of the *Diapheromera* group

♂♂:

1	Abdominal segment VIII as wide as X	2
-	Abdominal segment X wider than VIII	*Megaphasma*
2	Meso- and / or metafemora broadened	3
-	Meso- and / or metafemora built normally, not broadened	*Manomera*
3	Head depress, longer than wide	*Diapheromera s. str.*
-	Head globose	*Diapheromera (Rhabdoceratites)*

♀♀:

1	Cerci elongated, projecting beyond abdomen at least by the length of tergite X	*Manomera*
-	Cerci not projecting beyond abdomen so strongly	2
2	Head prognathous	3
-	Head almost orthognathous	*Megaphasma*
3	Head unarmed	*Diapheromera s. str.*
-	Head armed with short horns	*Diapheromera (Rhabdoceratites)*

Eggs:

1 Anterior margin of capsule surrounded by hairs, capitulum strongly elevated ..... *Megaphasma*
- Anterior margin of capsule not surrounded by hairs. 2
2 Capsule not shiny. ..... *Manomera*
- Capsule shiny. ..... *Diapheromera*

Manomera Rehn & Hebard, 1907 Figs 21-22, 90-91

Manomera Rehn & Hebard, 1907: 283; *Bacunculus*: Scudder, 1900: 95; Caudell, 1903: 872.

Type-species. *Bacunculus tenuescens* Scudder, 1899, by monotypy.

Material examined and species included. *Manomera tenuescens* (Scudder 1899: 95, pl. 1: 1, 2): HT ♂ [ANSP]; ♀, Alachua Co., Fla, XI.10.1922, F. W. Walker [DEIC*]; ♀, Coll. Brunner v. W., Georgia, Morrison leg. [NHMW*]; 2 ♂♂, 4 ♀♀, several eggs, USA, Fla, Gainesville, 07.VI.1997, leg. E. Tilgner & E. Lewis [OZ 385-1 - 6*]; *Bacunculus blatchleyi* Caudell, 1905: 212; *Manomera blatchleyi atlantica* Davis, 1923: 53, pl. 10: 1-4: HT ♀, Clove Valley, Staten Island, N. Y., September 9, 1893 [AMNH*]; *Manomera brachypyga* Rehn & Hebard, 1914: 384: 2, 4: HT ♂, Homestead, Dade Co., Florida, July 10-12, 1912; AT ♀, Miami, Dade Co., Florida, March 28, 1910 [ANSP*].

Complementary description. ♂♀. Slender and elongated members of the *Diapheromera* group. Characterized by the slender and elongated head which is at least 2 times as long as wide, the femora which are not broadened and the thick first segments of the antennae, the latter feature showing relationship with *Paracalynda* of the previous group. The ventro-apical spines of the femora are sometimes indistinct, but not lacking as mentioned by Rehn & Hebard (1907).

Very slender, medium-sized members of the *Diapheromera* group. Head elongate, twice as long as wide, greatest width at eyes, equally narrowed proximad. Scapus slightly flattened, of same width and double length as pedicellus, first segments of antenna broad, almost as wide as pedicellus. Antennae reaching the anterior half of abdominal segment VII (♂) or IV (♀). Body smooth. Pronotum a little more than half-length of head and width of its posterior margin. Mesonotum strongly elongated, narrower than pronotum and parallel-sided (♂) or of same width and equally dilated (♀), mesonotum more than two-thirds of its length. Profemora curved basally, triangular in cross section, tibiae longer, probasitarsus longer than (♂) or of equal length as (♀) following segments combined. Mesofemora with one prominent (♂) or one indistinct spine (♀) ventro-apically, mesofemora with one indistinct spine in both sexes. Mesobasitarsus of same length (♂) as or shorter (♀) than following segments combined, metabasitarsus slightly longer (♂) or shorter (♀) than following tarsal segments combined. Metanotum more than 8 (♂) or 5 times (♀) longer than median segment. Abdominal segment II more than 3 (♂) or 2 (♀) times longer than median segment, II longer than III to VI, these of similar length (♂) or II as long as VI and VII, segments III to V of similar length but longer than II, VI or VII (♀). Segments II to VII in ♂ of same width, in ♀ IV widest. Segments VIII to X of ♂ of same width, VIII as long as IX, segment X 1.5 times longer than IX, slightly emarginated posteriorly; X almost closed ventrally, vomer reduced, not visible, cerci as long as X, curved, directed

downward. Subgenital plate very flat. Segments VIII and IX of ♀ of same length, X almost 1.5 times as long as IX. Cerci as long as X, straight, inserted horizontally. Subgenital plate not projecting beyond IX.

Egg. Capsule flattened bullet-like, in lateral view roundly rectangular, with leather-like structure (50 x) and grey-white colour, not shiny. Micropylar plate parallel-sided, elongated, almost reaching the operculum, median line present. Capitulum flat, sponge-like, with several invaginations.

Distribution. Southern USA.

Diapheromera Gray, 1835 (s. str.) Figs 23-26, 92-93

Diapheromera: Gray, 1835: 18; Westwood, 1859: 20; Saussure, 1870: 165; Stål, 1875: 7, 13; 1875: 21; Caudell, 1903: 873; Rehn, 1904: 50; Kirby, 1904: 346; Brunner v. W., 1907: 337; Shelford, 1909: 353; Hebard, 1934: 281; 1943; 299; Günther, 1953: 561.

Type-species. *Spectrum femoratum* Say, 1824: 297, by monotypy.

Material examined and species included. *Diapheromera arizonensis* Caudell, 1903: 877 [USNM]; *Bacunculus calcarata* Burmeister, 1838: 566: HT ♂, Mexico, Deppe [ZMHB*]; *Diapheromera dolichocephala* Brunner v. W., 1907: 338: ST ♀, Texas, Boll leg. [NHMW*]; *Diapheromera erythropleura* Hebard, 1923: 192: HT ♂, Venvidio, Sinaloa, Mexico, IX.2.1912 (J. A. Kusche); AT ♀, ♂, Venvidio, Sinaloa, Mexico, VIII.1918 (J. A. Kusche) [ANSP*]; *Spectrum femoratum* Say, 1824: 297): HT ♂, E. Doubleday, Illinois [OXUM*] = *Diapheromera sayi* Gray, 1835: 18: HT ♀, N. America [BMNH*]; 5 ♂♂, 6 ♀♀, several eggs, Reared by O. Zompro [OZ 147-1 - 10*]; 1 ♂, Missouri, Springfield, leg. Muche, ex coll. SMTD [OZ 147-11*]; *Diapheromera nitens* Brunner v. W., 1907: 338: ST ♀, Mexico, Procopp [NHMW*]; *Bacunculus texanus* Brunner v. W., 1907: 333: ST ♂, Texas, Boll leg. [NHMW*]. ST ♀, Dallas, Texas [NHMW*]; ST ♀, New York [MNHN*]; *Diapheromera torquata* Hebard, 1934: 281, pl. 20: 1-3: HT ♂, Lost Mine, Chisos Mts., Texas [ANSP*].

Complementary description. ♂♀. Small to medium-sized members of this group. Body smooth and, especially in ♂, shiny. Head subglobose, flat dorsally, slightly longer than wide. Scapus flattened, pedicellus a little more than half of its length, cylindrical. Antennae almost reaching the end of abdomen (♂) or projecting beyond abdominal segment III (♀). Prothorax as long as head and as wide as head's posterior part. Mesothorax as wide as prothorax, dilated toward mesocoxae. Metathorax barely shorter than mesothorax. Median segment one-fifth as long as metathorax. Profemora curved basally, triangular in cross section, comparatively thick; protibiae slightly longer, probasitarsus of similar length as following segments combined. Mesofemora of ♂ considerably, of ♀ slightly broadened, not projecting beyond abdominal segment II. Metafemora slightly broadened (♂) or built like mesofemora (♀), meso- and metafemora with one prominent (♂) or small (♀) spine ventro-apically. Mesobasitarsus as long as following three combined, metabasitarsus as long as following four segments without unguis combined. Median segment a little longer than one-third of abdominal segment II. In ♂, segments II to V longer than previous one, VI as long as II, segment VII shorter. Segments II to VII almost parallel-sided or equally indistinctly narrowed. Segment VII narrowed in the middle. VIII wider, as wide as X, both wider than IX. Segments VIII and X of similar length, IX considerably shorter.

Segment X without posterior margin. Cerci elongated, curved. Subgenital plate small, shorter than IX. Margins of tergites VIII to X turned downward, narrowed ventrally. Sternite X present, not produced as a vomer, but integrated in X so that the segment appears as a closed tube. Segment II of ♀ slightly shorter than III, segments III to V of similar length, IV as long as II, segment VII shorter. Segments II to IV widened, latter widest, IV to VII equally narrowed. Posterior part of margin of VII turned downward, edges almost in touch ventrally. Segment VIII shorter than X, both longer than IX, all of similar width. Segment X with a notch posteriorly, supra-anal plate projecting, roundly triangular. Cerci thick, short, straight, subgenital plate slightly projecting beyond IX.

Egg. Capsule flattened bullet-like, shiny, surface with indistinct leather-like structure (50 x). Micropylar plate elongated, slender, half as long as capsule; a strong median line present. Capitulum sponge-like, with big holes, colourful, flat hemispherical.

Distribution. Southern Canada, USA, Mexico.

Comments on the type-species. The type-species is one of the best known of all phasmid species. It reaches Canada in the North and is one of the globe's most boreal stick insects. Both sexes vary a lot in their body size.

Diapheromera *(Rhabdoceratites)* Rehn & Hebard, 1912 Figs 25-26

Rhabdoceratites Rehn & Hebard, 1912: 232; Ceratites Rehn & Hebard, 1909: 126; Ceratita Strand, 1926: 46.

Type-species. *Diapheromera (Ceratites)* covilleae Rehn & Hebard, 1909, by original designation.

Material examined and species included. *Diapheromera (Rhabdoceratites) covilleae* (Rehn & Hebard, 1909: 126, fig. 5): HT ♂, PT ♀, Franklin Mountains, altitude 4500ft. El Paso, El Paso County, Texas, VII. 9,1907, [ANSP*]; *Diapheromera beckeri* Kaup, 1871: 27: HT ♂, Mexiko [HLDH*].

Comments on the subgenus. Only a few species of *Diapheromera s. l.* could be examined, but the comparatively more globose head and its armature seem to be of taxonomic importance and justify the subgeneric rank. The type-species, examined from a colour-print of P. Brock, looks like a typical *Diapheromera* and the lack of horns in the *tamaulipensis* ♂ mentioned by Rehn & Hebard (1909) does not entirely look like "purely accidental". In phasmids one sex often possesses horns and in the other these are absent, mostly in the ♂. Rehn & Hebard (1909) mention *D. bidens* Kaup as a member of this subgenus; in fact it is a member of *Sermyle* Stål, as is *D. saussurei* Kirby.

Distribution. Southwestern USA and Mexico.

Megaphasma Caudell, 1903 Figs 27-28, 94-95

Megaphasma Caudell, 1903: 878; Kirby, 1904: 347.

Type-species. *Diapheromera dentricus* Stål, 1875, by monotypy.

Material examined and species included. *Diapheromera dentricus* Stål 1875: 76: HT ♀, Lousiana [NHRS*]: ♂♀. Texas [MHNG*]; ♂♀: SW-Texas, leg. Lehmann, 7.1994 [F. H. Hennemann 43-1, 2*]; ♂, USA, California, Los Angeles, Baton Rouge, 15.VIII.1968, leg. K. Odom; ♀, USA, California, Los Angeles, Baton Rouge, East B. R. Parish, 13.VI.1981, leg. M. L. Israel; 1 egg, USA, Arkansas, in leaf litter [OZ 72-1, 2 *]; *Diapheromera furcata* Brunner v. W. 1907: 338: LT (here designated) ♂. Venta de Zopilote, Guerrero, 2800ft, June. H. H. Smith; Collectio Br. v. W.; det. Br. v. W. *Diapheromera furcata*; 23.855 [NHMW*].

Complementary description. ♂♀. Large members of this group. Head globose, slightly longer than wide. Head orthognathous. Eyes projecting hemispherically. Ocelli indistinct. Scapus flat, rectangular, longer than wide, pedicellus cylindrical, almost as wide as scapus; antennae reaching the posterior margin of abdominal segment V (♂) or II (♀). Body, especially of ♂, very shiny and colourful. Prothorax of same length as head, narrower. Mesonotum elongated, posterior quarter widened toward coxae, this segment of same length and structure as metanotum. Meso- and metatergum with an indistinct (♂) to very clear (♀) median line. Profemora curved basally. Probasitarsus slightly shorter than following segments combined, in ♀ carinate. Meso- and metafemora broadened, trapezoid in cross section, with a distinct to very prominent spine ventro-apically and several smaller ones medio-ventrally. Meso- and metabasitarsus shorter than following segments combined, carinate dorsally. Median segment less than one-fifth of length of metanotum. Abdominal segment II more than twice as long as median segment, slightly shorter than III. Segments III to VI of similar length, VII shorter, shorter than (♂) or as long as II (♀). Segment VIII of ♂ dilated posteriorly, posterior margin as wide as IX, latter parallel-sided, X again dilated, emarginated posteriorly. Segment VIII as long as IX, segment X longer. Segment IX closed ventrally by sternite X, latter not produced as a vomer. Cerci elongated, longer than X, spatulate or furcate. Subgenital plate very small, almost globose, with a flat posterior margin. Segment VIII of ♀ longer than IX, segment X longer than VIII. Supra-anal plate projecting, round. Cerci slightly curved, half as long as X. Praeopercular organ reduced. Subgenital plate boat-like, reaching the middle of X, ending in a projecting apex.

Egg. Capsule oval, moderatly shiny, structured leather-like (50 x), micropylar plate elongated, measuring two-thirds of capsule length, widened in posterior half. Operculum surrounded by hairs and, with capitulum, both structured sponge-like, with large holes and slender supports.

Distribution. Southern USA, Northern Central America.

Comments on the genus. The validity of Caudell's genus is proved by the eggs described by Stark & Lentz (1986), which show a strongly swollen capitulum surrounded by hairs, both lacking in *Diapheromera*. As in other genera of Diapheromerini, the morphology of the ♂ cerci is only important at the species level. *Diapheromera furcata* Brunner v. W. is a typical *Megaphasma*, differing only in the cerci being furcate, not spatulate as in dentricum.

Caribbiopheromera group

Genus. *Caribbiopheromera* gen. n.

Characteristics. Small Diapheromerini. Median segment almost as long as metathorax. Body not shiny. Abdominal segments VIII and IX of ♂ completely melted, no dividing lines visible. Body of ♀ with several tubercles. Femora without ventral spines. Egg almost round, shiny, with elongated micropylar plate and sponge like capitulum.

Caribbiopheromera gen. n. Figs 48-49, 96-97, 132-133

Type-species. *Caribbiopheromera jamaicana* sp. n., by present designation.

Material examined and species included. See *C. jamaicana* sp. n.

Diagnosis. ♂♀. The new genus shows characters of both the *Diapheromera* and *Heteronemia* groups. With the first group, it agrees in egg structure, with the second in lack of ventral spines on the femora and in the body of the ♀, which is not glossy. The abdominal tergites VIII and IX of the ? are completely fused, a tendency also visible in Pseudosermyle of the Sermyle group. Yet it differs in the length of the median segment, which is almost as long as the metanotum. The monotypic genus is endemic to Jamaica.

Small to medium-sized Heteronemiini. Body surface smooth (♂) or rough (♀), not shiny, with several tubercles (♀). Head scarcely longer than wide, flattened dorsally (♂) or slightly longer than wide, vertex and occiput slightly elevated, with irregular tubercles (♀). Scapus of ♂ flattened, twice as long as pedicellus, latter globose in the middle, apical and distal parts cylindrical. In ♀, scapus more strongly flattened than in ♂, only one-quarter longer than wide. Antennae of ♂ as long as body, last segments whitish, apex black, of ♀ projecting beyond the middle of abdominal segment VI. Pronotum indistinctly longer than head, in ♂ rectangular, anterior margin narrower than posterior one, in ♀ longer than broad, anterior margin wider than posterior one, granulated. Mesonotum of ♂ elongated, 5.5 times as long as pronotum, with a flat median carina, in ♀ 4 times longer than pronotum, irregularly granulated, with some larger granules, 3 times longer than metanotum, latter structured similar. Median segment two-thirds as long as metanotum. Legs slender, unarmed, metatarsi of fore- and hindlegs almost twice, of midlegs as long as remaining segments combined, in ♀ interior and exterior of mesofemora before knees with a triangular lobe. Abdominal segment II of ♂ one-third longer than I, segments II to VI of similar length, VII shorter. Segments VIII and IX fused, X short, as wide as long, posteriorly with a v-shaped notch, but not marginated. Sternite VIII globose, IX very short. Vomer very slender, black. In ♀, abdominal segments marginated. Segments II to VI of similar length, VI strongly elevated and tuberculated, VII shorter, carinate dorsally. Segment VIII half as long as VI, depressed laterally, with a median carina. Segments VIII to X more narrow, of equal width, IX half as long as VII, carinae less sharp as in VIII. Segment X as long as VIII, its apex w-shaped.

Egg. Depressed, round, smooth, shiny, with an oval, parallel-sided, whitish marginated micropylar plate and an orange operculum.

Distribution. Jamaica.

Derivatio nominis. The generic name derives from the Caribbean distribution and mirrors the close relation to the *Diapheromera group*.

Caribbiopheromera jamaicana sp. n. Figs 48-49, 96-97, 132-133

Material examined. *Caribbiopheromera jamaicana* n. sp.: HT ♂, Jamaica, PSG-culture, origin: Jamaica. Culture O. Zompro VII.1995 [MHNG, ex coll. O. Zompro 118-2*];

PT: 1 ♀, 2 eggs [MHNG, ex coll. O. Zompro 118-5*]; 2 ♂♂, 3 ♀♀, several eggs: as HT [OZ 118-1, 3-4, 6-7*]; 1 ♀, Zucht U. Ziegler [OZ 118-8*]; 1 ♂, 3 ♀♀ [Coll. F. Hennemann 61-1 - 4*].

Description.

♂. General colour brown with pale intersegmental membranes. Head subglobose, flat dorsally, a little bit longer than wide, narrowed proximadly, ground colour lighter brown, genae with a furrow dorsally, and a wide brown stripe ventrally. Vertex with a wide brown stripe dorsomedially. Frons projecting before antennae with a longitudinal, dark stripe, with several small tubercles lateroposteriorly. Eyes projecting more than hemispherically. Scapus flat and wide, longer than eye, pedicellus less than half as long, subcylindrical, following segments elongated, bristled, in the distal third becoming shorter, last segments whitish before apex. Antennae reaching the end of abdomen.

Pronotum longer than head, rectangular, parallel-sided, anterior part with longitudinal impressions laterally and a median furrow, area around this furrow being darker. Middle of pronotum with a deep, v-shaped, transverse furrow, posterior part with an indistinct median carina, anterior margin of this segment half as broad as posterior one. Mesonotum elongated, as wide as pronotum, smooth, finely marginated laterally. Metanotum of same width and structure, but only one-third as long. Profemora curved basally, subquadrate in cross section, carinae with very fine bristles, tibiae of same structure, one-sixth longer. Basitarsus nearly 2 times as long as following segments combined. Meso- and metafemora quadrate in cross section, basitarsus of mesofemora as long, of metafemora twice as long as remaining segments combined.

Median segment almost by one-third shorter than metanotum. Abdominal segments II to VI structured like thorax, with a yellow spot at anterior angles, a light transverse stripe posteriorly and with indistinct differences in length. Segment VII two-thirds of VI, flattened dorsoventrally. Anterior part of VIII round in cross section, posterior part widened, fused with IX, posterior part of IX subcylindrical, building a closed tube, with its ventral part curved downward. Segment X short, not marginated, with a v-shaped incision. Sternite IX globose, subgenital plate short, angular, with short projection ventrally, a long phallus visible.

Measurements (mm). Body: 46.2-50.8; head: 2.0-2.3; pronotum: 2.1-2.4; mesonotum: 9.6-11.2; metanotum: 3.8-4.7; median segment: 3.0-3.6; profemora: 17.1-18.9; mesofemora: 12.8-13.3; metafemora: 15.9-17.6.

♀. General colour yellow-brown, surface rough, with some tubercles.

Head subglobose, indistinctly longer than wide, vertex and occiput slightly elevated, with several irregular tubercles. Eyes projecting more than hemispherically. Scapus flattened, rectangular, pedicellus globose, one-third as long as previous segment. Antennae reaching the middle of abdominal segment VI, colouration as in ♂.

Anterior half of pronotum with an impression laterally, median transverse impression less distinct. Tubercles prominent, separated. Mesonotum elongated, gently

widened proximadly, in anterior third with two or more, prominent, black tubercles. Smaller ones over entire segment; with irregular rows of small, colourless spines laterally. Metanotum with neither spines nor tubercles in dorsal part. Profemora with a strong notch basally, keeled dorsally and ventrally, with two lower keels interiorly, tibiae of same structure, by about one-sixth longer, basitarsus 1.5 times as long as following segments combined, with a median carina, segment II 2 times as long as III and 4 times as long as IV. Mesofemora trapezoid in cross section, narrower dorsally than ventrally, ventral edges in proximal third with a small lobule both interiorly and exteriorly, in distal third with a larger, tooth-like lobule both interiorly and exteriorly as well. Basitarsus as long as following segments, without carina dorsally, but gently furrowed. Hindlegs structured like midlegs, but without lobes, basitarsus by one-third longer than the following segment.

Abdominal segments II to VI of similar length, marginated, II to V tuberculated irregularly, VI elevated dorsally, this elevated area supporting stronger tubercles. Segment VII shorter, narrowed distadly, with a median carina, segments VIII to X narrower, of equal width; IX shorter than VIII and X, these of equal length, segment IX half as long as VII, carina less sharp as in VIII. Apex of X with a small incision, therefore w-shaped. Subgenital plate broad, projecting beyond the middle of tergite X, marginated laterally.

Measurements (mm). Body: 71.2-79.4; head: 3.8-4.3; pronotum: 3.3-4.1; mesonotum: 16.3-18.4; metanotum: 5.9-6.2; median segment: 4.3-4.9; profemora: 22.0-24.8; mesofemora: 14.8-16.2; metafemora: 18.9-21.0.

Egg. Capsule medium to dark brown, smooth, shiny, oval, depressed laterally, anterior and dorsal parts lighter, micropylar plate with a white margin, elongated, anterior margin round, posterior one with micropylar cup acute. An indistinct median line present. Capitulum orange, with lateral margins closed, anterior part torn.

Measurements (mm). Total: 2.95; length: 2.54; width: 1.65; height: 2.00.

Derivatio nominis: From the origin Jamaica.

Comments. This species is in culture in the Phasmid Study Group (PSG No. 17) as "Warty stick" and feeds on bramble. Further information is provided by James (1982: 7).

Sermyle group

Genera. *Litosermyle* Hebard, 1919; *Pseudosermyle* Caudell, 1903; *Sermyle* Stål, 1875 = *Hoplolibethra* Caudell, 1904.

Characteristics. This group seems to be monophyletic because of such common characters as the femora, which are unarmed ventrally, the last abdominal segment (X) of the ♂, which is closed by sternite X ventrally: the latter is not produced as a vomer. The ♂ cerci show a large variety. The body of the ♀ always bears longitudinal carinae. The egg's anterior region around the micropylar plate projecting. Eggs are glued to a surface and not dropped, as in all other groups of Diapheromerini. *Litosermyle* and *Sermyle* differ from *Pseudosermyle* by their broadened mesofemora.

Key to the genera of the *Sermyle* group:

♂♂:

1 Head smooth, not armed. . . . . *Pseudosermyle*
- Head armed, at least with two small spines between eyes. . . . . *Sermyle*

♀♀:

1 Head without spines 2
- Head armed, mesofemora broadened. . . . . *Sermyle*
2 Abdominal segments VIII to X considerably narrower than previous segments. . . . . *Pseudosermyle*
- Abdominal segments VIII to X not considerably narrower than previous segments. . . . . *Litosermyle*

Eggs:

1 Micropylar plate round, less than one-quarter as high as capsule *Pseudosermyle*
- Micropylar plate oval, about half as high as capsule. . . . . *Sermyle*

Pseudosermyle Caudell, 1903 Figs 50-53, 98-99

Pseudosermyle Caudell, 1903: 867; Kirby, 1904: 345;
Bacunculus Brunner v. W., 1907: 331 (nec Burmeister, 1838);
Heteronemia Rehn, 1904a: 53 (nec Gray, 1835).

Type-species. *Pseudosermyle banksii* Caudell, 1903, by original designation.

Material examined and species included. *Sermyle arbuscula* Rehn, 1902: 141: HT ♀, San Diego, California [ANSP*]; *Bacteria azteca* Saussure, 1859: 62: HT ♀ [MHNG, not traced]; *Pseudosermyle banksii* Caudell, 1903: 871: HT ♂, Brazos County, Texas, September, Mr. Nathan Banks [USNM*]; *Bacunculus elongatus* Brunner v. W., 1907: 335: ST ♂♀, Tepic, Mexico, X.1891, Eisen [NHMW*]; *Bacunculus godmani* Brunner v. W., 1907: 334: ST ♂, Mexico, Amula, Guerrero, 6.000 ft, VIII., leg. H. H. Smith (676) [NHMW*]; *Sermyle guatemalae* Rehn, 1902: 7: HT ♀, Gualan, Guatemala, Mrs. S. P. McElroy [USNM*]; *Bacunculus incongruens* Brunner v. W., 1907: 336: ST 2 ♂, Guatemala, Teapa, Tabasco, leg. H. H. Smith [NHMW*]; *Bacunculus inconspicuus* Brunner v. W., 1907: 334: ST ♂, Costa Rica, leg. Boucard [NHMW*], ST 2 ♂, Costa Rica, Amer. Centr., P. Biolley. [MHNG*]; *Bacteria olmeca* Saussure, 1870: 156: HT ♂, Mexique [MHNG*]; *Sermyle phalangiphora* Rehn, 1907: 229: HT ♂, Belize, British Honduras [ANSP*]; *Sermyle physcouia* Rehn, 1914: 51: HT ♂, PT ♀, Piedras Negras, Costa Rica (Schild nd Burgdorf) [USNM*]; *Bacunculus praetermissus* Brunner v. W., 1907: 333: LT (here designated) ♂, Coll. Br. v. W., Guatemala, Dr. Candeze; det. Br. v. W., *Bacunculus praetermissus*; 7307; 22., 7307. [NHMW*]; *Bacunculus straminеus* Scudder, 1904: 20: ST ♂♀, Between Mesilla Park and Little Mountain, July 1 (A. P. Morse) [ANSP*]; *Bacunculus striatus* Burmeister, 1838: 567: ST ♂♀, Mexico, Deppe [ZMHB*]; *Sermyle strigata* Scudder, 1899: 34, pl. 1: 3: HT ♀, Texas, Boll., Lincecum [ANSP*]; *Diapheromera strigiceps* Kaup, 1871b: 27: HT ♂, Puebla, Becker [HLDH*]; *Bacunculus tridens* Burmeister, 1938: 567: HT ♂, Mexico, Oaxaca [ZMHB]; ♂♀, 1 egg ex abdomen: Mexico, Cueruavaca [ZMUH*]; *Pseudosermyle truncata* Caudell, 1903: 869, pl. 58: 3a-b: HT ♀, Dos Cabezos, Arizona, June, 1891, No. 6613. [USNM]; *Pseudosermyle sp.* ("*Heteronemia mexicana*") Brunner v. W., 1907: 333, nec Gray, 1835: 19: ♂: Coll. Brunner v. W., Mexico, Deyrolle [NHMW*].

Complementary description. ♂♀. ♂ very slender, ♀ comparatively compact; medium to large sized members of this group. Head elongated, almost twice as long (♂) or 1.5 times as long as wide, flattened dorsally. Scapus flattened, almost rectangular, pedicellus half of its length and two-thirds of its width. Antennae reaching

abdominal segment VIII (♂) or III (♀). Prothorax shorter (♂) or of equal length (♀) as head. Mesonotum of same width (♂) or wider (♀) than pronotum, strongly elongated. Body smooth, a little bit shiny (♂) or with several longitudinal carinae and not shiny (♀). Metathorax longer than two-thirds of mesothorax, with equal structure. Legs slender, long. Profemora curved basally, triangular in cross section, in / with lobe-like keels on each edge. Protibia considerably longer, probasitarsus longer than combined length of following segments. Meso- and metafemora unarmed, trapezoid in cross section. Mesobasitarsus shorter, metabasitarsus as long as following segments combined. Median segment shorter than one-fifth of metanotum and one-third as long as abdominal segment II. III to VI (♂) or III to V (♀) of similar length, longer than II. Segments in ♂ parallel sided, in ♀ IV widest. VII as long as II. VIII of ♂ bell-like widened caudadly, IX much narrower, X broadened again. VIII as long as IX and X combined, the latter of equal length. VIII to X separated indistinctly, without magnification appearing fused. IX and X closed by sternite IX and X ventrally, forming a closed tube. Subgenital plate small, almost closed dorsally, at least in the anterior part. Cerci of ♂ show large variety: simple, bi- or trifid or spatuliform. Segments VIII to X of ♀ considerably narrower than the previous ones, parallel-sided. VIII and IX of equal length, X 1.5 times as long as IX. Subgenital plate small, triangular, with median keel. Cerci straight, wide projecting, apices with variable morphology. Subgenital plate very specific, acute, projecting IX slightly.

Egg. Capsule elongated, almost round in transverse section. Micropylar plate round, small, less than one quarter of length of capsule. Operculum round, inserted in an angle of about 45°; capitulum absent. The egg is glued to a substrate ventrally.

Distribution. Southern USA, Middle America.

Comments on the genus. The type of *P. banksii* could not be examined, but Kaup's *D. strigiceps* agrees with Caudell's diagnosis, so it might be a synonym of the latter, but this needs confirmation. They definitely belong to the same genus.

The designation of *Sermyle arbuscula* Rehn, 1902, as type-species by Kirby (1904: 345) was based on a misprint and corrected by himself (1910: 359).

Caudell's diagnosis versus the related genera shows sheer carelessness. "The most stable character" which divides this genus from *Bacunculus* Burmeister, the latter being synomyized with *Heteronemia* Gray, 1835, by Zompro (in press) is the presence of an area apicalis in the latter, which places it in the suborder Areolatae and makes it impossible to be closely related to *Pseudosermyle*. This was the reason why later authors synonymized these genera (Rehn, 1904: 53) (see notes on *Heteronemia* in Zompro, in press). Without doubt, however, *Pseudosermyle* is a valid genus, but Caudell did not recognize its important characteristics. The morphology of the cerci with one to three apices or being totally flattened is only of importance at the specific level. Often this is the only character to separate the ♂♂ of various species.

Brunner's *Bacunculus* (1907) and Rehn's *Heteronemia* (1904) are synonyms of *Pseudosermyle* Caudell, as their genera are based on an misidentification of the type-species. For further comments see Zompro (in press).

The diagnosis below has been complemented by a ♂, a ♀, and an egg taken out of the ♀ abdomen of *Pseudosermyle tridens* (Burmeister, 1838).

Litosermyle Hebard, 1919 Fig. 54

Litosermyle Hebard 1919: 171.

Type-species. *Litosermyle ocanae* Hebard, 1919, by original designation.

Material examined and species included. *Litosermyle ocanae* Hebard 1919: 172, pl. 23: 9, 10: HT ♀, Puebla Nueva de Ocaña, Santander, Colombia [ANSP*].

Complementary description. ♀. Head considerably longer than wide, with several small tubercles, longer than prothorax. Scapus dilating anteriorly, pedicellus half as long and two-thirds as wide, antennae reaching abdominal segment III. Body with longitudinal carinae. Mesothorax more than 4 times as long as prothorax and about twice as long as metathorax, tuberculated. Profemora curved basally, strongly laminate. Mesofemora slightly broadened, metafemora slender. Tibiae longer than femora. Basitarsi slightly longer than combined length of following three segments. Abdominal segment II twice as long as median segment, III to VI of similar length, each longer than II, VII shorter than VI. Segments VIII to X of equal width, not narrower than VII, IX shorter than VIII, VIII shorter than X. Subgenital plate not projecting middle of X.

Male and egg unknown.

Distribution. Colombia.

Comments on the genus. In his diagnosis, Hebard did not count the median segment as part of the abdomen. The species has never been recorded again, while the type, which has only been re-examined from a picture, is damaged. For further comments see *Sermyle*.

Sermyle Stål, 1875 Figs 55-58, 100-101

Sermyle Stål, 1875: 23; Rehn, 1904: 51; Kirby, 1904: 345; *Hoplolibethra* Caudell, 1904: 108; *Libethra*: Brunner v. W., 1907: 303 (part.); *Ocnophila*: Brunner v. W., 1907: 309 (part.); *Bacunculus*: Brunner v. W., 1907: 331 (part.).

Type-species. *Acanthoderus mexicanus* Saussure, 1859, by subsequent designation of Rehn, 1904: 51.

Material examined and species included. *Diapheromera bidens* Kaup, 1871b: 28: HT ♂, Puebla, Becker [HLDH*]: *Libethra confusa* Brunner v. W., 1907: 308: ST ♀, Guatemala, Dr. Candeza [NHMW]; *Sermyle kujawskii* Zompro 1998: 212: HT ♂, PT ♀, several eggs, Honduras, Isl. Utila, III.1997, leg. T. Kujawski [OZ*]: *Acanthoderus mexicanus* Saussure, 1859: 62: HT ♀, Mexico, Potsero [MHNG*]; ♀, coll. Brunner v. W., Mexico [NHMW*]; *Bacunculus neptunus* Brunner v. W., 1907: 335: HT ♂, Mexico, California, 95, Diguet [NHMW*]; *Sermyle kirbyi* n. n. for *Diapheromera saussurei* Kirby, 1889: 501: HT ♂, Dominica, St. Michael [BMNH*]; *Sermyle saussurii* Stål, 1875: 77: HT ♀, Mexico [NHMW*]; *Hoplolibethra tuberculata* Caudell, 1904: 108, pl. 6: 1, 2: HT ♀, Esperanza Ranch, June 25 [USNM*].

Complementary description. ♂♀. Body of ♂ smooth, of ♀ rough, granulated. Head globose, vertex elevated, armed with spines or lobes, eyes projecting hemispherical, slightly longer than wide. Scapus flattened rectangular, pedicellus two-thirds as wide as scapus and half as long. Prothorax as long and wide as head. Mesothorax elongated, as wide as prothorax (♂) or equally dilating (♀); metathorax two-thirds of its length, with equal structure. Profemora slender, triangular in cross section, with one dorsal, two interior and one ventral carina. Probasitarsus as long as following four segments without unguis. Meso-and metafemora trapezoid in cross section. Meso-

femora slightly (♂) or strongly broadened and with dorsoventral lobes (♀). Mesobasitarsus as long as following three segments together. Metafemora slender, metabasitarsus as long as following segments together, unguis excluded. Median segment less than one-quarter (♂) or one-third (♀) as long as metathorax. Abdominal segment II twice as long as median segment, III almost as long as IV toV (♂) or IV to VI (♀). VI of ♂ as long as II, VII shorter. VIII parallel sided, slightly shorter than VII, as long as IX. X little longer, emarginated posteriorly, closed by sternite X ventrally. Subgenital plate small. Cerci specialized, variable. VI of ♀ in the type-species with dorsolateral lobes, VII slightly shorter than II, VIII shorter than VII, as long as X, IX shorter. VIII to X of equal width, considerably narrower than VII. Cerci short, simple, straight. Subgenital plate short, acute, simple, not projecting beyond IX.

Egg. Capsule rounded subrectangular, with punctured structure, covered with bristles. The egg is glued to a substrate laterally. Micropylar plate projecting anteriorly. Operculum round, flat, surrounded by bristles, inserted in the capsule in an angle of about 20°.

Distribution. Southern USA, Middle America.

Comments on the genus. According to Hebard (1932: 216), *Hoplolibethra tuberculata* Caudell, the type-species of *Hoplolibethra* Caudell by original designation, is identical with *Acanthoderus mexicanus* Saussure, the type-species of *Sermyle* Stål. This is not correct, *H. tuberculata* is a valid species, but obviously a member of *Sermyle*. Consequently *Hoplolibethra* Caudell falls in synonymy. Caudell, who only saw a single specimen, mentions the different lengths of the abdominal segments. A comparison between his type and *S. mexicana* shows no significant differences, so *S. tuberculata* is a typical member of *Sermyle*.

The type of *Diapheromera bidens* Kaup has also been re-examined. It agrees in the main characters with the ♀ of the type-species and might be the ♂; it was used for completing the diagnosis of the genus. *Sermyle kujawskii* agrees in the main characters, but has a flat and unarmed head. The ♂ has styli, this being the first such case known in Phasmatodea. The terminal three segments of the ♀ are not narrowed. It might be a different genus, but no formal consequences can be drawn until definite ♂♂ of *S. mexicana* are known.

The description of the egg is based on *S. kujawskii*, which might not be a typical member of this genus. It is possible that the genus has to be split; but this should be done in a revision at the species level. Possibly the species with a flat head belong to *Litosermyle*, but an examination of its type and all species with this character is required. The broadened mesofemora of the ♀ show relationship to *Litosermyle*.

Clonistria group

Genera. *Clonistria* Stål, 1875; *Libethra* Stål, 1875; *Libethroidea* Hebard, 1932; *Rugosolibethra* n. n. (= *Caulonia* Stål, 1875, nec Loriol, 1873); *Oncotophasma* Rehn, 1904; *Paraclonistria* Langlois & Lelong, 1998; *Phantasca* Redtenbacher, 1906; *Pseudoceroys* Hebard, 1923; *Pterolibethra* Günther, 1940; *Spinopeplus* gen. n.; *Trychopeplus* Shelford, 1909.

Characteristics. The *Clonistria* group consists of monophyletic genera with common characters, but it seems to be in the process of diverging. The genera *Clonistria* and *Phantasca* show similarity with Libethroidea, as all are slender phasmids without striking metamorphosis of the body. The ♂♂ of *Libethroidea* have small, lateral nodes on their terminal tergite, as they are present in *Libethra*, *Pterolibethra*, Rugosolibethra and *Spinopeplus*, too. The ♀♀ of the latter show relation to *Oncotophasma* by their genitalic structures and the operculum of the egg which, in both genera compared, is covered by hairy structures. Throughout the group, apterous genera have a winged counterpart. The most striking member is *Trychopeplus*, a very specialized genus with a number of appendages on the body; its genitalia show close relation to *Oncotophasma*.

The presence of a capitulum in *Paraclonistria* is unique in the *Clonistria* group. No material of the type-species could be examined, and it is possible that its capitulum is just a pseudocapitulum.

Antennae longer than body (♂) or at least reaching abdominal segment V, profemora unarmed, non-serrated, three-edged, meso- and metafemora trapezoid, pro- and metabasitarsi longer than, and mesobasitarsi as long as, following segments combined, tarsal segments sulcate dorsally, at best slightly carinated, then carina sulcate dorsally, ♂ with vomer, ♀ with praeopercular organ, body surface of ♂ smooth, of ♀ often rough or granulated. Eggs bullet-like, capitulum absent (Exception: *Paraclonistria*).

Key to the genera of the *Clonistria* group

♂♂:

1 Tergite X with lateral nodes. 2
- Tergite X without lateral nodes. 6
2 Tergites VIII and IX of equal width, parallel sided. . . . . *Libethroidea*
- Tergite IX at least somewhat little narrower than VIII. 4
3 Tegmina and alae present. . . . . *Pterolibethra*
- Tegmina and alae absent. 5
5 Elongated species, mesonotum more than 20 times as long as wide. . . . *Libethra*
- More compact, mesonotum less than 12 times as long as wide. . *Rugosolibethra*
6 Anterior half of metanotum with same structure as posterior part. 7
- Anterior half of metanotum with different structure as posterior part. . . . . *Oncotophasma*
7 Body and extremities without spines or leaf-like appendices. 9
- Body and extremities with spines or leaf-like appendices. 8
8 Extremities and body with simple spines. . . . . *Spinopeplus*
- Extremities and body with leaf-like appendices and lobes, winged. *Trychopeplus*
9 Tegmina and alae present. . . . . *Phantasca*
- Tegmina and alae absent. 10
10 Head as long as pronotum, not longer. . . . . *Clonistria*
- Head longer than pronotum. . . . . *Paraclonistria*

♀♀:

1 Supra-anal- and subgenital plate elongated. . . . . *Pseudoceroys*
- Supra-anal plate not elongated. 2
2 Subgenital plate not projecting tip of abdomen. 5
- Subgenital plate projecting tip of abdomen. 3
3 Extremities and body without spines or leaf-like appendices and lobes . . . . . *Oncotophasma*
- Extremities and body with spines or leaf-like appendices and lobes. 4
4 Extremities and body with simple spines. . . . . *Spinopeplus*
- Extremities and body with leaf-like appendices and lobes. . . . . *Trychopeplus*
5 Supra-anal plate elongated, projecting beyond tip of abdomen. . . . . *Libethroidea*
- Supra-anal plate neither elongated nor projecting beyond tip of abdomen. 6
6 Abdominal segments II to VII of similar length. 7
- Abdominal segments IV to VI of similar length, longer than the remaining. . . . 8
7 Extremities armed, at least undulate dorsally. . . . . *Rugosolibethra*
- Extremities unarmed. . . . . *Libethra*
8 Head as long as pronotum, not longer. . . . . *Clonistria*
- Head longer than pronotum. . . . . *Paraclonistria*

Eggs:

1 Capitulum present. . . . . *Paraclonistria*
- Capitulum absent. 2
2 Operculum inserted in capsule with angle of 90°. . . . . *Clonistria*
- Operculum inserted in capsule with angle of less than 80°. 2
3 Operculum inserted in capsule with angle of ca. 70°. 4
- Operculum inserted in capsule with angle of 45°, capsule punctured *Spinopeplus*
4 Capsule with net-like structure. . . . . *Oncotophasma*
- Capsule covered with short, not combined keels. . . . . *Libethra*

Paraclonistria Lelong & Langlois, 1998

Paraclonistria Lelong & Langlois, 1998: 250

Type-species. *Paraclonistria nigramala* Lelong & Langlois, 1998, by original designation.

Species included. *Paraclonistria nigramala* Lelong & Langlois, 1998: 250, figs. 16-21, 28-30.

Diagnosis. See Lelong & Langlois, 1998.

Distribution. Caribbean Islands.

Comments on the genus. The occurence of a capitulum in this genus is unusual for it is the only member with this character in the *Clonistria* group. Nonetheless, this genus shows close relationship with *Clonistria* Stål. Another, yet undescribed member of this genus is reared in the Phasmid Study Group as "Tony James St. Kitts", which displays the same characters in the morphology of the adults and the egg, except for the capitulum being absent. The operculum of this species is roughly structured. The presence of a capitulum could prove relations to the previous group.

Clonistria Stål, 1875 Figs 30-31, 102-103

Clonistria Stål, 1875: 6; 1875: 25; Rehn, 1904: 60; Redtenbacher, 1908: 403; Shelford, 1909: 358.

Type-species. *Clonistria bartholomaea* Stål, 1875: 16, by monotypy.

Material examined and species included. *Clonistria bartholomaea* Stål, 1875: 16: ST 2 ♂♂, Insula Santi Bartholomaei Indiae occidentalis [NHRS*]; ♂♀, Balthazar, (Windward side), Grenada, W. L., H. H. Smith, coll. Brunner v. W. [NHMW*]; 8 ♂♂, 5 ♀♀, several eggs, Ex culture O. Zompro, origin: Grenada [OZ*]; *Clonistria exornata* Redtenbacher, 1908: 405: ST 2 ♂♂, 2 ♀♀, Cuba, Mr. H. d. Saussure [MHNG*]; *Clonistria guadeloupensis* Redtenbacher, 1908: 404: ST ♂, Guadeloupe, Steinheil [NHMW*]; ST 2 ♂♂, 3 nymphs [SMNS*]; ST 2 ♀♀ [MHNG*]; *Bacteria haita* Westwood, 1859: 25, pl. 25: 5, 6 [BMNH]; *Clonistria santaluciae* Redtenbacher, 1908: 405: HT ♀, St. Lucia, Mus. Paris [NHMW*]; *Clonistria xenia* Redtenbacher, 1908: 405: ST ♂♀, locality not known [NHMW*].

Complementary description. ♂♀. *Clonistria*-species are characterized by their unarmed body, the equally length of meso- and metanotum, the rough surface of the body of the ♀, the elongated, flattened head and the unarmed femora. The different species are difficult to determine, the lateral appendices of the ♂ vomer and the morphology of the eggs are helpful.

Medium-sized, slender members of this group of Diapheromerinae. ♀ longer than ♂, body of both sexes without spines or larger tubercles, abdomen longer than thorax. Thorax and abdomen of ♀ with fine median keel, sternite VII with praeopercular organ. Head rectangular, longer than wide, narrowed proximadly, flattened, scapus flat, longer than wide, pedicellus half as long and much narrower, cylindrical, antennae surpassing apex of abdomen (♂) or reaching proximal part of abdominal segment IV (♀). Prothorax as long as head, of equal width, mesonotum elongated, more than 2 times as long as metanotum. Profemora curved basally, three-edged, tibiae longer, basitarsus 2 (♂) or 1.5 (♀) times as long as following tarsal segments combined. Meso- and metafemora four-edged, unarmed, only with one or more indistinct teeths ventroapically, tibiae longer than femora, mesobasitarsus 1.5 times longer (♂) or of equal length (♀), metabasitarsus 2 times (♂) or almost 1.5 times (♀) as long as following tarsal segments combined. Median segment almost as long as metanotum, of equal length as abdominal segment II. Abdomen of ♂ parallel, of ♀ widened in the median segments. Relations of length of segments equal in both sexes. Segment III longer than II, IV to VI of same length, longer than III. VII as long as III, VIII to X (♂) or VIII and X of equal length, longer than IX (♀). VIII to X of ♂ almost parallel-sided, X only indistinctly wider than IX, posterior margin with v-shaped outcut. ♀ with prominent supra-anal plate, with median carina. Subgenital plate small, comparably flat, with concave posterior margin (♂) or reaching or surpassing apex of abdomen, acute (♀). ♂ with long triangular vomer with lateral appendices. Cerci short.

Egg. Bullet-like, grey, with keel-like structures, micropylar plate oval, half as long as capsule, with short median line. Operculum flat, inserted in an angle of 90° to the capsule, with keel-like structures as on the capsule.

Distribution. Caribbean Islands.

Comments. Bradley & Galil (1977) place *Clonistria* in the Cladomorphinae: Hesperophasmatini. (Cladomorphinae is used by Bradley & Galil, 1977: 189). Yet in

their key *Clonistria* does not lead to this tribe, and is a typical member of Diapheromerinae.

Phantasca Redtenbacher, 1906 Fig. 32

Phantasca Redtenbacher, 1906: 111.

Type-species. *Phasma phantasma* Westwood, 1859: 126, pl. 12: 5a, b, by present designation.

Species included. *Phasma phantasma* Westwood, 1859: 126, pl. 12: 5a, b: HT ♂, Tapajos, Brazil, Bates; *Phasma puppeius* Westwood, 1859: 125, pl. 10: 1: HT ♂, Brazil, Tapajos, Bates; *Phasma valgius* Westwood, 1859: 126, pl. 10: 3: HT ♂, no data.

Origin. Brazil.

Complementary description. ♂. Very similar to *Clonistria* Stål. Head slightly globose, not armed. Eyes projecting hemipherically. Prothorax as long as head, slightly narrowed posteriorly. Mesothorax elongated, almost 7.5 times as long as prothorax. Metathorax half as long as metathorax and 3 times as long as median segment. Tegmina squamiform, alae produced, reaching end of abdominal segment V. All femora and tibiae not armed. Profemora curved basally. Pro- meso- and metabasitarsi longer than following segments combined. Abdominal segments of same width, II less than 2 times as long as median segment, III longer than II, IV longest segment, V slightly longer than II, VI as long as II, VII half as long as V. VIII two thirds as long as VII, X slightly shorter than VIII, IX longer than VIII and shorter than VII. X marginated posteriorly. Subgenital plate triangular in lateral view, not projecting IX.

Both ♀ and egg unknown.

Distribution. Brazil.

Comments. Redtenbacher placed this genus erroneously in the Areolatae. Günther (1940: 500) is in error about *Phantasca* Redtenbacher being synonymous with *Pterolibethra* Günther, 1940, as the genitalia of the first resemble *Clonistria* Stål and those of the latter *Libethra* Stål, 1875.

Libethroidea Hebard, 1919 Figs 33-35

Libethroidea Hebard, 1919: 170.

Type-species. *Libethroidea inusitata* Hebard, 1919: 170, pl. 23: 7, 8, by original designation.

Material examined and species included. *Libethroidea inusitata* Hebard, 1919: 170, pl. 23: 7, 8: HT ♀, Atlas de las Cruces, near San Antonio, Cauca, Colombia. Elevation, 7200 feet. October, 1908. [USNM*]; *Bacunculus (?) nodosus* (Giglio-Tos, 1898: 27: HT ♂, Gualaquiza. [MIZT*], *Bacunculus palea* Giglio-Tos, 1898: 26: HT ♀, Valle del Santiago. [MIZT*]; *Bacunculus sarmentum* Giglio-Tos, 1898: 25: HT ♀, Valle de Santiago. [MIZT*].

Complementary description. ♂ ♀. Medium sized members of this group. Head flat, unarmed, smooth, as long or little longer than prothorax, of same width. Eyes projecting hemispherically. Scapus flattened, twice as long as the cylindrical pedicellus, antennae projecting beyond apex of abdomen (♂) or reaching anterior half of abdominal segment VII. Mesonotum very slender, little less than twice as long as meta-

notum and much narrower than prothorax (♂) or little longer than 1.5 times the length of metanotum, of equal width as prothorax (♀). Profemora three-edged, tibiae longer, probasitarsus longer (♂) or as long as (♀) following segments combined. Meso- and metafemora four-edged, unarmed, tibiae longer, mesobasitarsus as long as, metabasitarsus longer than (♂) or as long as length of following segments combined. All tarsal segments slightly furrowed. Median segment short, less than one-fifth of metanotum, abdominal segment II more than twice as long as median segment, segments III to VI of same length, in ♂ of same width, in ♀ wider than the other segments, VII little shorter. Tergites II to VII of ♀ with several parallel longitudinal carinae. VIII of ♂ fewly shorter than IX, of same width, X fewly longer than VIII, with lateral node-like structures. Lateral margins of IX turned downward, posterolateral corners not touching each other ventrally. Subgenital plate small, not covering internal organs totally. Vomer small, flat, simple. VIII of ♀ twice as long as IX, IX very elongated, acute, with dorsomedian carina, projecting apex of abdomen by the length of VIII. X as long as length of VIII and IX combined. Subgenital plate projecting IX by the half of its length, posterior margin with v-shaped incision.

Egg. Unknown.

Distribution. Northern half of South America.

Comments on the genus. Hebard (1919) does not count the median segment as first abdominal segment, this has to be considered when using his diagnosis. The morphology of the ♀ genitalia is very characteristic and similar to that of *Parocnophila* Zompro, a member of Ocnophilini.

Libethra Stål, 1875 Figs 36-37, 104-105

Libethra Stål, 1875: 20; Kirby, 1904b: 345; Hebard, 1919: 163; Brunner v. W., 1907: 303; Shelford, 1909: 344; *Ocnophila*: Brunner v. W., 1907: 313 (part.).

Type-species. *Libethra nisseri* Stål, 1875: 74, by subsequent designation of Kirby, 1904: 345.

Material examined and species included. *Bacteria molita* Westwood, 1859: 29, pl. 24: 3: HT ♂, Columbia, Goudot. [OXUM*]: *Libethra nisseri* Stål, 1875: 74: LT (by present selection) ♂, Columbia, Antioquia, leg. Nieder (Body length: 65 mm), PLT ♀: same data [NHRS*]; 7 ♂♂, 6 ♀♀, 5 eggs, Colombia, Aruenia, on *Pinus patula* Schldl. & Cham., 18°C, 1800m, IV.1994, leg. C. Rodas [SMTD*, OZ*]; *Ocnophila zamorana* Giglio-Tos, 1910: 29: HT ♀, Valle dello Zamorana nell'Ecuador. [MIZT*].

Complementary description. ♂ ♀. Medium to large sized members of this group. Body smooth, unarmed, slender, elongated. General colour of ♂ brown, ♀ yellow or brown. Head flat, unarmed, little longer than wide, subparallel-sided. Eyes projecting hemispherically. Scapus flat, considerably longer than wide, pedicellus little longer than half of its length, antennae reaching beyond abdominal segment VI (♂) or at least III (♀). Prothorax as long and wide as head, mesothorax elongated, more than 15 times (♂) or more than 7 times (♀) as long as wide, parallel-sided (♂) or slightly widened proximadly (♀). Mesothorax almost 2 times as long as metathorax. Profemora basally curved, three-edged, unarmed, tibiae longer, probasitarsus as long as following segments combined. Meso- and metafemora four-edged, unarmed, except for some very

small spines ventroapically, tibiae little longer, mesobasitarsus as long as following three, metabasitarsus as long as the following segments combined. All tarsal segments furrowed dorsally, the furrow sometimes indistinct. Thorax and abdomen of ♀ with indistinct median carina. Metathorax more than 6 (♂) or more than 4 times (♀) as long as median segment. Abdominal segment II twice as long as median segment, as long as VII, shorter than III, III to IV of equal length and width (♂), or IV to VI of equal length and width, the widest segments (♀). VIII of ♂ as long as X, swollen, with prominent median carina, IX longer, X with two lateral node-like structures, subgenital plate not reaching posterior end of tergite IX, variable. Lateral margins of IX turned ventrad, posterolateral edges almost touching ventrally. VIII of ♀ as long as IX and X combined, IX considerably longer than X, posterior margin of X concave, subgenital plate not projecting apex abdominis, with v-shaped outcut. Cerci of ♂ strong, curved, with specific forms in different species, simple in the ♀. Short and flat vomer present, ♀ with praeopercular organ.

Egg. Bullet-like, capsule covered with rough, bulgy structures, micropylar plate oval, with prominent margin, one-third as long as capsule, prominent median line present, reaching the polar area. Operculum inserted with an angle of 70°, structured as capsule.

Distribution. Northern half of South America.

Comments on the genus. Brunner (1907: 304) selected *Libethra sutoria* Stål 1875: 75 as type of *Libethra*. This selection was antedated by Kirby (1904b: 345) and is therefore invalid. Hebard (1919: 163) stated that *Libethra* Stål, 1875 is a synonym of *Caulonia* Stål, 1875, because the types (*Ceroys rabdota* Westwood, 1859 and *Libethra nisseri* Stål, 1875) should be congeneric. This is obviously not the case.

Günther (1932: 226 ff.) published a review of *Libethra*, mainly based on a collection from Colombia. He divides the genus into the *Libethra rabdota* group and the *Libethra strigiventris* group. His first group agrees with *Caulonia* Stål; it is characterized by lobes on the ♀'s abdominal segment III. These lobes are absent in his second group, which includes provisionally *Libethra nisseri* Stål, and Günther considers that „sie gar nicht in dieses Genus gehört" (1932: 248), ignoring the fact that it is the type-species. These lobes are variable and therefore not useful as generic character. The armation of the femora does not vary. *Libethra* always has unarmed femora. For further comments see *Rugosolibethra*.

Pterolibethra Günther, 1940 Fig. 38

Pterolibethra Günther, 1940: 498.

Type-species. *Pterolibethra heteronemia* Günther, 1940: 499, by original designation.

Material examined and species included. *Pterolibethra heteronemia* Günther, 1940: 499: HT ♂, Rio Negro, San Gabriel, 3.I., Roman leg. (Schwedische Amazonasexped.) [NHRS*]; *Pterolibethra* sp.: ♂, Bolivia, Guanay, Ujapi, X.1994, leg. L. Peña & A. Ugarte. [OZ 0-123*].

Complementary description. ♂. Medium to large members of this group. The genus agrees in all aspects with *Libethra*, but differs in the following characters: Head globose, wider and longer than prothorax. Antennae reaching end of abdominal

segment VII. Pro- and metabasitarsi twice as long as following segments combined. Elytra and alae present. Tegmina short, not reaching middle of metanotum, with tubercle mesolaterally. Alae covering abdominal segment III. Median segment two-thirds of length of metanotum.

♀ and egg unknown.

Distribution. Brazil, Bolivia.

Comments on the genus. Günther is in error about the length of the median segment. It is obvious from the colourprint by P. Brock of the type, that the median segment measures only two-thirds of the metanotum. The genitalia show in fact a close relationship to *Libethra*, from which it is separated by the length of the median segment, the form of the head and the wings only. In an appendix (1940: 500) he calls *Pterolibethra* a synonym of *Phantasca* Redtenbacher. This is wrong, because the genitalia of *Phantasca* resemble *Clonistria*, those of *Pterolibethra* are similar to *Libethra*.

Rugosolibethra n. n. Figs 39-40

Caulonia: Stål, 1875: 20, 74; Stål, 1875: 10; Kirby, 1904b: 344; Hebard, 1919: 163 (nec Loriol, 1873); *Ceroys*: Westwood, 1859: 59 (part.).

Type-species of *Caulonia* Stål, 1875. *Ceroys rabdota* Westwood, 1859: 61, pl. 22: 6a-e, by subsequent designation of Hebard, 1919: 163.

Material examined and species included. *Libethra crassespinosa* Brunner v. W., 1907: 307: ST ♀, Columbia. [NHMW*]; *Ocnophila imbellis* Brunner v. W., 1907: 312: HT ♀, ♂. [MCSN*]; *Ceroys rabdota* Westwood, 1859: 61, pl. 22: 6: HT ♀, Columbia, Gaudichaud. [OXUM*]; ♂, Coll. Brunner v. W., Sta. Fé de Bogota, Staudinger [NHMW*]; *Libethra rabdotula* Brunner v. W., 1907: 307: ST ♂♀, Bogota. [NHMW*]; *Libethra ramale* Giglio-Tos, 1898: 27: HT ♀ [MIZT*].

Diagnosis. ♂♀. A typical member of the *Clonistria* group. Terminal segment of ♂ with lateral nodes as *Libethroidea* or *Libethra*, but more compact. The ♀ differs from the closely related genera as shown in the key by their armed meso- and metafemora.

Medium sized members of this group. Body of ♂ smooth, of ♀ granulated, rugose or belobed. Head distinctly longer than wide, depressed and smooth in ♂, slightly elevated and armed in ♀. Scapus flat, broadened anteriorly, pedicellus almost as wide and half as long. Antennae reaching abdominal segment II (♀). Prothorax as long as head, of same width. Mesothorax as wide as (♂) or wider (♀) than prothorax. Metathorax slightly shorter (♂) or longer (♀) than half as long. Profemora curved basally, triangular, meso- and metafemora trapezoid in cross section. Femora and tibiae armed in ♀, in ♂ smooth. Pro- and metabasitarsus about as long as following segments combined, mesobasitarsus slightly shorter. Median segment one fifth (♂) or third (♀) as long as metathorax. Abdominal segments of ♂ elongated, II twice as long as median segment, II to IV increasingly longer, V as long as IV, VI as III, VII as II, dilating posteriorly. VIII slightly shorter than VII, increasingly dilating, turned downwards laterally, with slight median carina. IX as long as IV, turned ventrad laterally, almost touching in its full length ventrally, with dorsomedian carina. X as long as VIII, emarginated posteriorly and produced in two large nodes laterally. Subgenital plate

very prominent, bulbous, anterior part lateral depress. Vomer small, flat. Cerci strong, but short, curved. Abdominal segments of ♀ transverse, II 1.5 times as long as median segment, II to V of similar length and width, III (at least in the type) with dorsal lobes, VI of same length, slightly narrower, VII dilating posteriorly, as long as VI. VIII narrowed posteriorly, longer than VII. IX and X narrower than previous segments, IX slightly shorter than VII, X almost half as long as IX, with a notch posteriorly. Cerci short, small. Subgenital plate reaching tip of abdomen.

Egg. Unknown.

Distribution. Northern half of South America.

Comments on the genus. Kirby (1904: 344) selected *Ceroys biggibus* Rehn 1904: 48 as type-species of *Caulonia* Stål. This species was not included by Stål and is therefore not available. Subsequently Hebard (1919: 163) designated *Ceroys rabdota* Westwood, 1859 as type-species. *Caulonia* Stål is preoccupied by *Caulonia* Loriol 1873, a genus of Echinodermata. Most authors considered *Caulonia* Stål as a synonym of *Libethra*, but there are striking differences between these genera. ♀♀ of *Libethra* do not show appendices on the body like those present in *Rugosolibethra*, femora are not armed, both sexes are much slenderer. Supposedly the egg will show further differences. For further comments see *Libethra*.

Spinopeplus gen. n. Fig 41-42, 106-107, 134-135

Caulonia: Kirby, 1904: 344 (part).

Type-species. *Ocnophila festae* Giglio-Tos, 1910: 28, by present designation.

Origin. Ecuador.

Material examined and species included. *Caulonia conradi* Giglio-Tos, 1898: 30: HT ♀, Pun. [MIZT*]; *Ocnophila festae* Giglio-Tos, 1910: 28: LT ♀, Valle del Santiago nell'Ecuador [MIZT*], selected by Brock, 1998a: 301; 1 ♂♀, 1 egg ex abdomen: Santa Inez (Ecuad.) R. Haensch S. [OZ 308-1, 2*]; *Libethra senticosa* Giglio-Tos, 1898: 26: HT ♀, Valle de Santiago nell'Ecuador. [MIZT*]; *Caulonia spinosissima* Kirby, 1896: 464, pl. 40: 4, 4a (not 5, 5a): Archidona.

Diagnosis. ♂♀. One of the more specialized genera of this group. Closely related to *Rugosolibethra*, as it is obvious from the structure of the ♂ genitalia. That of the ♀ shows relations to *Oncotophasma* and *Trychopeplus*, the transverse abdominal segments are similar to those seen in *Rugosolibethra*. The egg is a further hint for a close relationship.

Average sized members of this group of Diapheromerinae. Both sexes of equal length, thorax and abdomen spinose, abdomen shorter than thorax. Head globose, vertex spinose, eyes projecting hemispherically, scapus flattened, longer than wide, pedicellus quadrate, antennae longer than body (♂) or reaching abdominal segment VIII (♀). Pronotum shorter and narrower than head. Mesothorax of ♂ strongly elongated, parallel-sided, narrower than pronotum, spinose, of ♀ proximadly equally widened. Metathorax structured as mesothorax, about two-thirds of its length. Profemora curved basally, three-edged, armed in the ♀, protibiae considerably longer than femora, basitarsus longer than (♂) or as long as (♀) following segments combined. Meso- and metafemora four-edged, unarmed with at least one small ventroapical spine (♂) or armed with several large teeth ventrolaterally (♀), tibiae unarmed, longer than femora,

mesobasitarsus as long as, metabasitarsus longer than following segments combined. All tarsal segments furrowed dorsally.

Metanotum 5 times (♂) or 3 times (♀) longer than median segment. Abdominal segment II 2 times as long as median segment, III to V of equal length and width (♂) or of equal length and widened, IV the widest, following narrowed (♀). VIII to X unarmed.

Segments VI and VII of ♂ shorter than previous segments, as wide as IX and X, VIII wider. VIII as long as X, IX as long as VII, depressed laterally, posterior margin of ♂ w-shaped. Subgenital plate prominent, swollen. Cerci strong, curved, Vomer elongated, furrowed ventroapically. Segments VI and VII of ♀ shorter than previous segments, VIII to X unarmed, VIII longer than VII, widened proximally. IX and X of equal length and width, shorter than VIII, posterior margin concave. Cerci thick and short, softly curved. Subgenital plate projecting beyond apex of abdomen, keeled ventrally. Sternite II of ♀ with praeopercularorgan.

Egg. Bullet-like, brown, with punctured texture, micropylar plate oval, half as long as capsule, short median line present. Operculum oval, flat, inserted in an angle of 45° to the capsule, covered with hairy structures.

Distribution. NW South America.

Pseudoceroys Hebard, 1923

Pseudoceroys Hebard, 1923: 355.

Type-species. *Pseudoceroys harroweri* Hebard, 1923: 355, pl. 15: 1, 2, by original designation.

Material examined and species included. *Pseudoceroys harroweri* Hebard, 1923: 355, pl. 15: 1, 2: HT ♀, Porto Bello, Panama. August 18 to 22, 1916. (D. E. Harrower). [ANSP*].

Diagnosis. See Hebard (1923).

Distribution. Panama.

Comments on the genus. Highly characteristic in structure of the abdominal segments VII to X: VII dilated laterally, with a strong median carina. The anterior part of VII bears a black spot on each side. The ovipositor consists of an elongated supra-anal and subgenital plate. The ♂ is unknown.

Oncotophasma Rehn, 1904 Figs 43-44, 108-109

Oncotophasma Rehn, 1904: 59; Kirby, 1904: 351; Hebard, 1923: 358; *Paradiapheromera* Brunner v. W., 1907: 317; Shelford, 1909: 347; *Bostra*: Shelford, 1909: 359 (part.).

Type-species. *Bostra martini* Griffini, 1896: 10, by original designation.

Material examined and species included. *Paradiapheromera armata* Brunner v. W., 1907: 317: HT ♂, V. de Chiriqui, 4000-5000 ft, Champion; 25; Godman-Salvin Coll. 1908.-168. [BMNH*]; *Dyme coxata* Brunner v. W., 1907: 323: HT ♂, Colombia, Staudinger. [NHMW*]; *Bostra martini* Griffini, 1896: 10, fig. a-c: HT ♂, Foreste presso la laguna della Pita (Darien). [MIZT*]; = *Paradiapheromera strumosa* Brunner v. W., 1907: 317: LT (here designated) ♂, Coll. Br. v. W., Chririqui, (Panama) Staudinger; det. Br. v. W., *Paradiapheromera strumosa*; 20.587; PLT ♂, Coll. Br. v. W., Chiriqui, (Panama) Staudinger; det. Br. v. W., *Paradiaphero-*

mera strumosa [NHMW*]; ♂, Gatun, Panama, VII, 28.-VIII,5.1916. (D. E. Harrower) [MHNG*]; *Dyme modesta* Brunner v. W., 1907: 324: HT ♂, V. de Chiriqui, 4000-5000 ft, Champion; 34; Godman-Salvin Coll. 1908.-168. [BMNH*]; *Bostra podagrica* Stål, 1875: 79: HT ♂, Panama. [NHRS*], and material mentioned in the description of ♀ and egg.

Complementary description. ♂♀. Medium to large sized members of this group. Head longer than wide, unarmed, parallel sided; scapus flattened, longer than wide, pedicellus half as long and wide, cylindrical; antennae projecting beyond apex of abdomen by far (♂) or reaching at least abdominal segment V (♀). Head indistincly longer and wider than prothorax, eyes projecting hemispherically. Mesonotum of ♂ elongated, at least twice as long as metanotum, considerably narrower than prothorax.

Anterior half of metanotum smooth, built normally, posterior part, at least dorsally, structured different, often rough and swollen. Mesonotum of ♀ of same width as pronotum, more than twice as long as metanotum, smooth or granulated. Profemora curved basally, three-edged, tibiae longer, probasitarsus longer (♂) or of equal length as following segments (♀), meso- and metafemora four-edged, unarmed, except for at least one ventroapical spine in the meso- and at least two in the metafemora, mesobasitarsus as long as, metabasitarsus longer than combined length of following tarsal segments. Metafemora of ♂ broadened, often with several prominent spines ventrally. All tarsal segments softly furrowed dorsally. Median segment one-third (♂) or half (♀) of length of abdominal segment II. III to VI longer than II, of equal width (♂) or wider than others (♀), VII as long as II. VIII of ♂ widened proximadly, widest segment, as long as IX, longer than X. Anterior half of IX with impression laterally. Subgenital plate rounded, with broad posterior margin. Vomer broad triangular. VIII and IX of ♀ of similar length, longer than X, subgenital plate projecting apex of abdomen by length of VIII, furrowed ventroapically, lateral margins turned upwards, touching each other dorsally and building a closed tube in the posterior half. Sternite VII with praeopercular organ.

Egg. Capsule elongated, flattened bullet-like, ventral side straight, dorsal side curved, surface covered with irregular keels. Colour brown. Micropylar plate elongated oval, one-third of length of capsule, median line present, reaching polar-area. Operculum inserted in an angle of 70°, oval, with sharp, elevated margin, set with hair-like structures.

Distribution. Costa Rica to Colombia.

Comments on the genus. Hebard (1922: 358) recognized the synonymy of *Oncotophasma martini* Griffini and *Paradiapheromera strumosa* Brunner v. W. and designated the latter as type-species of *Paradiapheromera* Brunner v. W.. Shelford was obviously not aware of this and listed both names as distinct species.

The defensive-behaviour of *O. martini* (Griffini) was described by Robinson (1968). ♂♂ of this genus are easy to recognize for they are the only Diapheromerinae with a structurally divided mesonotum.

Rehn (1904: 59) gave a good diagnosis of this genus, but it only holds for the type-species, not for *O. podagricum* (Stål). It is better to characterize the metathorax as given in the complementary description above. Hebard (1933: 125) described briefly ♀♀ of this genus. The complementary description is completed by the ♀ and egg of *Oncotophasma podagricum* (Stål, 1875), described below:

Oncotophasma podagricum (Stål, 1875)

Material examined: 1♀, 1 egg: Costa Rica, Hondura 6.6.36, F. Nevermann ded., Eing. Nr. 41, 1937 [ZMUH].

Description of ♀. Yellow-brown, legs ligther.

Head roundly rectangular, depressed dorsolaterally. With a y-shaped impression between the eyes, its apices directed towards antennae. Eyes prominent, antennae projecting beyond abdominal segment IV.

Prothorax edged laterally, with fine impression medianly. Mesothorax considerably elongated, 4.5 times as long as prothorax, strongly granulated, with two parallel keels dorsomedianly. Metathorax structured equally, but less than half as long. Profemora triangular in diameter, curved basally. Meso- and metafemora in diameter quadrate, dorsally narrower than ventrally. Mesofemora at the apex ventrally with two dark spines standing one after the other, metafemora with three spines, of which the basal one is the smallest. Basitarsus half as long as the whole tarsus. Metathorax and median segment divided by a fine line. Abdominal tergites equally fine granulated and double keeled laterally. Up to IV broadened, than narrowed. VIII to X depressed laterally. X of half length as IX. Operculum projecting beyond apex of abdomen by length of IX and X combined, weakly curved upwards.

Measurements (mm). Body: 77.8; head: 4.2; pronotum: 3.9; mesonotum: 17.8; metanotum: 6.9; profemora: 18.0; mesofemora: 13.2; metafemora: 17.5.

Egg. Brown; long-oval; depressed laterally; nearly straight ventrally, weakly broadened dorsally; surface covered with narrow, irregular keels; micropylar plate long-oval, exterior margin wide, structured regularly, interior part elevated, structured irregularly, chamfered. Median line as a sharp edge reaching to the posterior part. Operculum rounded by a high keel, set with long hairs.

Measurements (mm). Total length: 3.60; length: 3.50; width: 1.45; height: 1.65.

Trychopeplus Shelford, 1909 Fig. 45

Trychopeplus Shelford, 1909: 356; Hebard, 1923: 358; *Ceroys*: Westwood, 1874: 174; *Pericentrus*: Redtenbacher, 1906: 351 (part.).

Type-species. *Pericentrus multilobatus* Redtenbacher, 1908: 352, by monotypy.

Material examined and species included. *Ceroys laciniatus* Westwood, 1874: 174, pl. 32: 4 = *Pericentrus multilobatus* (♂, nec ♀) Redtenbacher, 1908: 352: HT ♀. Nicaragua [OXUM*]; LT of *Pericentrus multilobatus* Redtenbacher, 1908: 352 (here designated): ♀, 4th-instar nymph, det. Br. v. W., *Pericentrus multilobatus*, Collectio Br. v. W., Peru, Staudinger, 10.333 [NHMW*] (recorded as adult ♀ by Brock, 1998: 44); *Pericentrus spinosolobatus* Redtenbacher, 1908: 353: HT ♀, Patria ?; 4; Coll. Br. v. W. ? Mus. Dresden; det. Br. v. W. *Pericentrus spinosolobatus*; 12389 [NHMW*]; *Trychopeplus thaumasius* Hebard, 1924: 148, pl. 6: 8, 9: HT ♀, Rio Topo, near Rio Pastaza, Tunguragua, Ecuador, Elevation 4200 feet. [ANSP*].

Complementary description. ♂♀. Striking species because of their bilobed and spined bodies and extremities. Head longer than wide, eyes projecting hemispherically. Vertex and occiput elevated, spinose. Scapus flat, rounded rectangular, pedicellus subcylindrical, half as long, much narrower. Following segments elongated. Antennae reaching abdominal segment V (♂) or III (♀). Prothorax shorter and narrower than

head. Mesothorax of same width as prothorax, elongated and parallel sided (♂) or abruptly widened and swollen, with strong spination. Metathorax less than half as long, spines less prominent. ♂ with squamiform tegmina and fully developed alae. Profemora curved basally, triangular in cross section, bilobed, protibiae with smaller lobes. Probasitarsus longer than following three segments, carinated dorsally. Meso- and metafemora trapezoid in cross section, especially ventral edges with prominent lobes. Meso- and metabasitarsus much longer than following segments combined. All tibiae longer than their femora. Median segment as long as metathorax. Abdominal segment II to VI of similar length, each about as long as median segment. VII shorter and - in ♀ - narrower. VIII of ♂ dilated posteriorly, IX wider, X narrower than IX; VIII as long as X, IX longer. VIII of ♀ longer than IX or X, of same width. Supra-anal plate narrow, triangular, with strong median carina. Subgenital plate elongated, curved upwards, projecting beyond tip of abdomen almost by the length of VIII to X. Cerci simple, little shorter than X, almost straight.

Egg. Hebard (1923: 360, pl. 15: 6) figures an egg of *T. laciniatus*. Capsule oval, covered with „long silky hairs". Operculum flat, capitulum absent. This brief description is based on his figure.

Distribution. Middle America, NW South America.

Comments on the genus. As Hebard (1923: 329) mentions, Redtenbacher's nymph appears to belong to another species, but the characteristics are too underdeveloped to draw taxonomic consequences.The name "*Trychopeplus*" was taken from Brunner's unpublished notes, who was obviously planning to separate the Oriental species from the New World ones. This was not accepted by Redtenbacher, but by Shelford. In the remaining species of the Asian *Pericentrus* no ♂♂ are known. ♀♀ of *Trychopeplus* are easy to recognize by their ovipositor, which is curved upwards and projecting beyond the last tergite by more than its length. This character is absent from ♀♀ of *Pericentrus*, which might be related to *Menexenus* Stål. The ♂ genitals and the metamorphosises of the thorax show relations to *Oncotophasma* Rehn. ♂♂ of *Trychopeplus* are winged. The different species show a very impressionable camouflage with their lobe- or spiniform appendixes on body and legs.

Dyme group

Genus. *Dyme* Stål, 1875.

Characteristics. Body elongated, very slender, vertex elevated, granulated, tuberculated or spinose, ♀ with crown, body of ♂ smooth, almost shiny, of ♀ granulose. Probasitarsus as long as (♂) or fewly shorter (♀) than following segments, mesobasitarsus as long as following three segments combined, metabasitarsus as long as following four segments without unguis combined. Median segment short. Abdominal tergite VIII widened distally, IX widened proximadly, their widest parts wider than any other abdominal segment.

Egg. See below.

Dyme Stål, 1875 Figs 46-47, 110-111

Dyme Stål, 1875: 24; Kirby, 1904: 350; Brunner v. W., 1907: 318.

Type-species. *Dyme bifrons* Stål, 1875: 77, by monotypy.

Material examined and species included. *Dyme bifrons* Stål 1875: 77: LT (here designated) ♂, Collectio Br. v. W.; Peru Staudinger; 10.332; det. Br. v. W. *Dyme bifrons*; PLT ♀: Collectio Br. v. W.; Peru Staudinger; 10.331; det. Br. v. W. *Dyme bifrons* [NHMW*]; *Libethra (?) palmes* Giglio-Tos, 1898: 28: HT ♂. Valle del Santiago [MIZT*]; *Dyme rarospinosa* Brunner v. W. 1907: 327: ST 1 ♀, Peru, Santo Domingo, 6.000 ft. Rosenberg. [NHMW*]; 1 ♀, Peru, Marcapata, Staudinger. [NHMW*]; 1 ♀, Chile, Staudinger. [NHMW*].

Complementary description. ♂ ♀. Body strongly elongated. Head softly elevated dorsally, with small granula (♂) or a crown of spines or tubercles (♀), longer than wide. Scapus flat, broad, fewly wider than long, pedicellus subcylindrical, antennae projecting abdominal segment IV (♂) or reaching III (♀). Pronotum as long and wide as head. Thorax strongly elongated, more than 20 times as long as wide, smooth (♂), or 9 times as long as wide, granulated, with median line (♀). Metanotum as mesonotum, more than half of its length long. Profemora curved basally, three-edged, protibiae longer, probasitarsus as long as (♂) or fewly shorter than combined length of following segments. Meso- and metafemora four-edged, sometimes with indistinct tubercle ventroapically, tibiae longer, mesobasitarsus as long as following four segments without unguis (♂) or following three segments combined, metabasitarsus as long as following segments combined. Median segment less than one sixth as long as metanotum. Abdominal segment II twice as long as median segment, III 2.5 times as long as II, IV longer, IV to IV (♂) or IV to VII (♀) of equal with. Sides of abdomen subparallel, of same width as thorax in both sexes. VII of ♂ as long as II. VIII of ♂ broadened distally, as long as IX, IX anteriorly as wide as posterior part of VIII, narrowed distally, margins turned downwards, approximated, but not touching, ventrally, X of equal length, posterior margin acute concave. Subgenital plate prominent, depressed laterally, with prominent ventromedian carina, marginated posteriorly. VIII of ♀ little shorter than combined length of IX and X, these of equal length. Subgenital plate broad, bluntly rounded, shorter than apex of abdomen.

Egg. Capsule rounded rectangular, flattened laterally, covered with irregular broad bulges. Micropylar plate elongated, oval, measuring one half of length of capsule. Anterior margin of capsule broadly marginated. Operculum suboval, median part structured as capsule.

Distribution. NW South America.

Comments on the genus. The relation between length and width of the mesothorax and the characteristic structure of the egg separates this group from the previous one. It is not obvious which are the nearest relatives; though most of the characters prove relation to the *Clonistria* group, the flattened and broad eggs are similar to those of the Ocnophilini. The types of *D. bifrons* are figured by Brunner v. W., 1907: 322, pl. 14: 3a ♂, b ♀.

Brunners comment (1907: 318) „Die Weibchen sind von denjenigen des Genus *Bacillus* schwer zu unterscheiden" is hard to understand, because *Bacillus* is a member of the Areolatae. His *Dyme* contains heterogenous species.

Bradley & Galil (1977) consider *Dyme* as a synonym of *Pseudobacteria*. The latter genus, a synonym of *Bacteria*, is a member of the *Bacteria* group.

Ocnophilini

Genera. *Dubiophasma* gen. n.; *Exocnophila* gen. n.; *Ocnophila* Brunner v. W., 1907 (= *Parapygirhynchus* Brunner v. W., 1907, syn. n.); *Ocnophiloidea* gen. n.; *Parocnophila* Zompro, 1998.

Characteristics. This tribe includes several common characters. It includes small to medium-sized phasmids.

Ocelli absent. Thorax and abdomen of ♀♀ bear several longitudinal carinae. Profemora curved basally, triangular, meso- and metafemora rectangular, not trapezoid, in cross section, unarmed. Basitarsus strikingly short, as long as 3 following segments combined, carinated. Abdomen often not longer or indistinctly shorter than thorax, both sexes of similar body length. ♂ with vomer, poculum prominent, swollen. Lateral margins of IX and X of ♂ turned downward.

Eggs often very large in relation to body size. Micropylar plate surrounded by a broad, whitish margin, placed at an angle of 90° to the operculum, capitulum absent.

Key to the genera of Ocnophilini

♂♂

1 Vertex armed. 2
- Vertex unarmed. . . . . *Parocnophila*
2 Posterolateral corners of abdominal segment VIII wider than IX. . . . . *Ocnophila*
- VIII in its widest part at best as wide as IX. . . . . *Ocnophiloidea*

♀♀

1 Supra-anal- and subgenital plate small, hardly visible. 2
- Supra-anal- or subgenital plate elongated. 4
2 Abdominal segment X longer than VIII. . . . . *Dubiophasma*
- Abdominal segment X as long as or shorter than VIII. 3
3 Abdominal segments IX as long as X, VIII longer. . . . . *Ocnophiloidea*
- Abdominal segments VIII to X of similar length. . . . . *Exocnophila*
4 Vertex armed. . . . . *Ocnophila*
- Vertex unarmed. . . . . *Parocnophila*

Eggs

1 Micropylar plate cordiform. 2
- Micropylar plate oblong-oval. 3
2 Micropylar plate half as long or longer than capsule. . . . . *Parocnophila*
- Micropylar plate less than half as long as capsule. . . . . *Ocnophiloidea*
3 Capsule irregular in shape. . . . . *Dubiophasma*
- Capsule oval or roundly rectangular in shape. 4
4 Operculum round. . . . . *Exocnophila*
- Operculum oval, with longitudinal median impression. . . . . *Ocnophila*

Ocnophila Brunner v. W., 1907 Figs 59-60, 112-113

Ocnophila Brunner v. W., 1907: 309; *Parapygirhynchus* Brunner v. W., 1907: 316, syn. n.

Type-species. *Ocnophila integra* Brunner v. W., 1907, by subsequent designation of Hebard 1919: 163.

Material examined and species included. *Ocnophila integra* Brunner v. W., 1907: 313, pl. 14: 1 (♂, nec ♀, described as *Exocnophila exintegra* g. n. sp. n. below): LT (by present designation) ♂, Coll. Br. v. W., Porto Cabello, Thorey; det. Br. v. W. *Ocnophila integra*; 1399 [NHMW*]; 2 ♂♂, 2 ♀♀, several eggs: Venezuela, Maracay, Estacion Rancho Grande, autumn 1995, leg. D. Münch, ex culture O. Zompro [OZ*]; = *Parapygirhynchus catenatus* Brunner v. W., 1907: 316, syn. n.: HT ♀, Porto Cabello, Venezuela [ZMUH*]; *Pygirhynchus iphiclus* Westwood, 1859: 58, pl. 2: 2: ST ♂, no data [BMNH*], ST ♀, Colombia & Venezuela [BMNH*]; *Acanthoderus scabrosus* Burmeister, 1838: 569: ST ♂♀, Brasilien. [ZMHB*].

Complementary description. Head roundly rectangular, slightly narrowed posteriorly, vertex with small spines (♂) or spiny lobes (♀). Eyes small, projecting hemispherically. Scapus flat, considerably (♂) or slightly (♀) shorter than wide. Pedicellus subglobose, of half length and narrower. Antennae reaching abdominal segment VI (♂) or II (♀). Prothorax as long and wide as head, tuberculated or spiny. Mesothorax of ♂ slender, narrower than prothorax, very elongated, of ♀ wider than prothorax, mesosternum with median carina. Metanotum two-thirds of mesonotum, with equal structure. Profemora curved basally, triangular in cross section, tibiae longer than femora, probasitarsus much shorter than following segments together. Meso- and metafemora rectangular in cross section, tibiae longer, basitarsus with dorsal carina, as long as following three segments together. Median segment one-quarter or less as long as metathorax. Abdominal segment II twice as long as median segment. III longer than II, III to VI (♂) or III to VII (♀) of equal length. Abdomen of ♀ with several longitudinal carinae. VII of ♂ shorter than VI; VIII widened posteriorly, posterior margin wider than IX. IX longer than VIII, VIII longer than X. X emarginated posteriorly. Poculum bulgy, marginated posteriorly. Vomer present. Cerci short, curved, broadened apically. VIII of ♀ longer than IX, IX longer than X. Supra-anal plate elongated, spoon-like, with dorsal carina. Subgenital plate flat, not projecting X. Cerci short, flat.

Egg. Shape of capsule from lateral rounded rectangular, flattened laterally, structured by irregular keels (30x). Operculum acute oval, with risen, roughly structured area medianly. Micropylar plate of half length as capsule, with broad, whitish margin.

Distribution. Northern South America.

Comments on the genus. The ♂♂ of Brunner v. W.'s *Ocnophila integra* are conspecific with *Parapygirhynchus catenatus* of the same author, described after a single ♀, both derive from Venezuela, Porto Cabello. Type-species of *Parapygirhynchus* Brunner v. W., 1907 is *Parapygirhynchus catenatus* Brunner v. W., 1907, by present designation. The ♀ of *O. integra* belongs to a different species and genus, described below. *Ocnophila integra* is present in the author's cultures, so the synonymy is doubtless. Species and genus of *O. integra* were described before *P. catenatus* and are therefore valid. The ♂ of *O. integra* is presently chosen as LT, consequently *Parapygirhynchus* Brunner v. W. falls as a synonym of *Ocnophila* Brunner v. W.

Up to now, 33 species have been described in this genus, 9 of them by Brunner v. W. himself in his monograph. None of the described ♀♀ shows the morphology of the genitalia described in the complementary description below. In a revision on species-level all of them will have to be placed in other genera.

Exocnophila gen. n. Figs 64, 120-121

Type-species. *Exocnophila exintegra* sp. n.

Species included. *Exocnophila exintegra* sp. n. (see below).

Diagnosis. ♀. This large species of Ocnophilini resembles at first view *Ocnophiloidea*, but differs in the length ratios of the abdominal segments VIII to X and, especially, in egg structure. It is to hope that the ♂ will be found to increase the knowledge in this difficult group of Phasmatodea.

Large member of Ocnophilini. Head longer than wide, vertex elevated, posterior half with two elevated tubercles medianly and irregular rows of small granula. Scapus flat, dilated laterally in round lobes which are turned ventrad. Pedicellus less than half as long and wide. Antennae broken, supposedly reaching abdominal segment III. Prothorax as long as head, with strong, transverse median furrow. Mesothorax strongly elongated, more than 4 times as long as prothorax, of equal width, with indistinct median carina and few tubercles. Metathorax half as long, with same structure. Profemora curved basally, triangular in cross section, edges with high carinae. Meso- and metafemora rectangular in cross section, unarmed. All tibiae longer than femora, all basitarsi as long as following three segments combined. Metathorax more than 6 times as long as median segment, this one-third as long as abdominal segment II. III longer than II, IV longer than III, as long as V, these the widest segments, VI as III and VII as II. Tergites posteromedian, sternites with a tubercle submedianly. II to IX with six longitudinal carinae submedianly, median carina absent. VIII shorter than VII, as long as IX, X longer than IX, with median carina. Lateral margins of VIII to X turned ventrad. Praeopercular organ on sternite VII present, subgenital plate flat, boat-like, with submedian carina. Cerci short, simple.

Egg. See below.

Derivatio nominis. The name shall refer to „made out of *Ocnophila integra*".

Exocnophila exintegra sp. n. Figs 64, 120-121, 136

Material examined. HT ♀, 2 eggs ex abdomen, Espirito Santo, Brasil, ex coll. Fruhstorfer; Collectio Br. v. W.; det. Br. v. W. *Ocnophila integra*; 20.264 [NHMW*]; PT ♀, Coll. Brunner v. W., Brasilien, Mus. Bern; det. Br. v. W. *Ocnophila integra*; 14978 [NHMW*]; both formerly ST of *Ocnophila integra* Brunner v. W., 1907.

Description. ♀. General colour brown. Head considerably longer than wide, flat, vertex tuberculous, with two prominent spines submedianly. Eyes projecting hemispherically, genae 4 times longer. Scapus prominent, flat, rectangular, with two longitudinal impressions dorsosubmedially. Pedicellus one-third as long and two-thirds as wide, subcylindrical. Following antennal segments elongated, half as wide as pedicellus. Prothorax as long as head, anterior half narrower than posterior one. Anterior margin prominent and wide. Anterior half with deep impressions laterally. With deep

transversal furrow medially. Surface tuberculate, in the posterior half with two submedian diverging rows of larger tubercles. Mesothorax 4.5 times as long as prothorax, tuberculate, with strong median and weaker submedian carinae. Metathorax as previous segment, but half as long, submedian carinae in the last third curved upwards. Profemora curved basally, triangular in cross section. Meso- and metafemora rectangular in cross section, edges carinated. Basitarsi as long as following three segments combined, terminal segment longer. All tarsal segments with rounded dorsal carina.

Median segment less than half as long as abdominal segment II, II to V increasingly longer and wider, IV widest, VI as long as V, VII as III. VII to X of similar width, margins almost parallel. VIII as long as X, IX slightly shorter. Three terminal segments combined as long as combined length of VI and VII. Median segment up to segment IX with two parallel carinae dorsally and a submedian one dorsolaterally. Lateral margin with a carina and an indistinct one slightly above. III with a prominent spine posterodorsomedianly, IV and V with a smaller or indistinct one. X with curved lateral margin and median carina. Sternites structured as tergites, but III to V without posterior spine, VII with praeopercular organ. Subgenital plate with two sharp carinae ventrolaterally, its tip rectangular, reaching middle of X. Cerci short and flat.

Antennae broken in both types, in HT left meso- and metatarsus missing, in PT only right foreleg and half left metafemur present. The measurements of the larger specimen are taken from the holotype.

Measurements (mm). Body: 68.1- 69.5, head: 4.4-4.6; prothorax: 3.3-4.0; mesothorax: 17.2-18.2; metathorax: 8.8-9.7; median segment: 1.8-2.0; profemora: 20.0; protibia: 24.1; mesofemora: 15.3; mesotibia: 16.8; metafemora: 19.0; metatibia: 24.0.

Egg. Capsule brown, oval, rounded, slightly depressed laterally, with leather-like structure (30x). Micropylar plate projecting, elongated, two-thirds as long as capsule, with broad, doubled, whitish margin. Operculum flat, round, smooth, marginated.

Measurements (mm). Length: 2.25; width: 1.50; height: 1.75.

Ocnophiloidea gen. n. Figs 61-62, 114-115, 137-138

Libethra: Brunner v. W., 1907: 303 (in part.).

Type-species. *Libethra regularis* Brunner v. W., 1907: 308, by present designation.

Material examined and species included. *Libethra regularis* Brunner v. W. 1907: 308: LT (by present designation) ♀, Port of Spain (Trinidad), Prof. O. Burger leg., vend. 1.1.1898 [ZMUH*]: PLT ♀, Port of Spain, Mus. Hamburg [NHMW*]; ♂: Caparo, Trinidad, VIII. 1913, S. M. Klages (*Parapygirhynchus regularis* Redt.), det. Hebard 1926 [NHMW*]; 7 ♂♂, 6 ♀♀, several eggs, ex culture O. Zompro, origin: Trinidad [OZ*].

Diagnosis. Typical, small Ocnophilini. The ♀♀ differ from those of the closest related genus *Ocnophila* by the absence of an elongated supra-anal plate, the ♂♂ in the equal width of tergites VIII to X: in *Ocnophila* VIII is considerably broader than the following segments. The eggs differ by the shape of the capsule and the cordiforme micropylar plate.

Head longer than wide, vertex bispinose and tuberculated; eyes projecting. Scapus strikingly flat, almost as long as wide, pedicellus half as wide and long, cylindrical. Prothorax as wide and long as head. Body of ♀ with several longitudinal carinae. Mesothorax of ♂ slightly narrower than prothorax, elongated, of ♀ wider than prothorax. Metathorax structured as mesothorax, little more than half as long. Profemora curved basally, triangular in cross section, carinae flat and high. Tibiae one-third longer, probasitarsus hardly as long as following three segments together. Meso- and metafemora rectangular in cross section, unarmed. Meso- and metabasitarsus as long as combined length of following two segments. Median segment less than one-quarter of length of metanotum. Abdominal segment II twice as long as median segment, III slightly longer, IV to VI longest, of equal length to each other, VIII as long as III. IV and V of ♀ widest segments. VIII of ♂ dilating posteriorly, keeled dorsomedially, IX as wide as dilated part of VIII, longest of the terminal segments, narrowed posteriorly, X shorter than VIII, posterior margin with a notch. Cerci very short, hidden in X, vomer present. Subgenital plate bulgy, posteroventral with a transverse edge, marginated posteriorly. VIII of / almost as long as IX and X together, these of similar length. Supra-anal plate visible as small, transverse stripe. Cerci short, but strong, subgenital plate flat, not projecting X, in the type with a notch posteriorly.

Egg. Capsule oval, flattened laterally, with two longitudinal impressions on each side. Micropylar plate cordiform, with wide whitish margin, median line present. Operculum flat, without differentiated structures.

Distribution. Trinidad.

Dubiophasma gen. n. Figs 63, 116-117, 139

Type-species. *Dubiophasma longicarinatum* sp. n. by present designation.

Species included. *Dubiophasma longicarinatum* sp. n.: HT ♀ (see below).

Diagnosis. ♀. The habitus of this genus appears very similar to the genus *Pseudosermyle*, which is a member of Diapheromerini, but easy to be distinguished by the trapezoid cross section of the meso- and metafemora. The eggs show further differences. The nearest relative in the Ocnophilini seems to be *Parocnophila*, which agrees in the head and egg structure, but differs in that of the genitalia. Interestingly, the specialized cerci which might prove useful for egg-laying.

Large members of Ocnophilini. Head strikingly slender, unarmed. Scapus flat, broad, dilated laterally. Pedicellus half as long and wide. Antennae projecting beyond median segment; they are broken in the only specimen, the exact length is unknown. Thorax and abdomen with several longitudinal carinae. Pronotum slightly wider than head, of equal length, mesonotum more than 4 times as long, wider, 1.5 times as long as the following metanotum. Profemora curved basally, triangular in cross section, edges lobiform. All tibiae longer than femora. Meso- and metafemora rectangular in cross section, unarmed. Mesobasitarsus as long as following three segments combined. Metanotum 5 times longer than median segment, abdominal segment II more than twice as long. III longer, of equal length as each of the following IV to VI, VII as II, VIII and IX narrower, of equal length and width, considerably shorter than VII. X of same width,

but almost as long as VIII and XI together. Subgenital plate flat, hardly projecting X. Cerci long, projecting tip of abdomen by the length of IX, specialized.

Egg. Capsule with irregular impressions laterally, plain dorsally, impressed ventrally by the micropylar plate. This is two-thirds as long as capsule, oval, with whitish margin.

Operculum flat, round, with rough structure and round impression medially.

Derivatio nominis. The name „*Dubiophasma*" relates to the difficulties this insect caused whilst working on this paper.

Dubiophasma longicarinatum sp. n. Figs 63, 116-117, 139

Material examined. HT ♀, several eggs ex abdomen, Salina Cruz, Mexico, R. Paessler leg. 3.-5.VIII.1909. ded. 1.II.1910. PHA 16. ZMUH [ZMUH*].

♀. Body colour light brown. Thorax and abdomen with longitudinal carinae. Head strikingly slender, narrower than posterior half of pronotum. Eggs small, projecting less than hemispherical. Genae 4 times as long as diameter of the eyes. Head smooth, unarmed. Scapus flat, 1.5 times as long as wide, dilated laterally. Pedicellus half as wide and long, cylindrical. Following segments irregularly elongated. Tip of antennae broken. Prothorax as long as head, but in the posterior half wider, with transversal furrow medianly, marginated laterally. Mesonotum more than 4.5 times as long as prothorax, with one median and two submedian carinae on each side. Mesosternum with a median and one submedian longitudinal carina medially, too. Metanotum structured equally, but wider, mesonotum 1.5 times as long. Profemora curved basally, triangular in cross section, edges produced as high lobes. All tibiae four-edged, longer than profemora. Right fore leg missing. Meso- and metafemora rectangular in cross section, unarmed. All tarsi except for left mesotarsus missing. Mesobasitarsus as long as following three segments together, carinated. Metathorax more than 5 times as long as median segment, abdominal segment II slightly longer than 2 times as the previous one. Tergites and sternites of abdomen with five longitudinal carinae, one of them medially, the others submedially. III longer than II. III to VI of similar length. III and IV widest segments. VII as long as II, narrowed posteriorly. VIII and IX narrower, of equal length and width. X little shorter than VIII and IX together, slightly narrower. Posterior margin with slight emargination. Subgenital plate slightly projecting beyond IX, flat, acute. Cerci projecting by the length of IX, tapering.

Measurements (mm). Body: 79.8; head: 3.8; pronotum: 3.8; mesonotum: 18.1; metanotum: 11.1; median segment: 2.0; profemora: 22.0; protibia: 25.1; mesofemora: 19.7; mesotibia: 21.9; metafemora: 22.7; metatibia: 28.6.

Egg. Capsule brown, plain ventrally. Micropylar plate impressed in middle, subcordiform, with broad, whitish margin.

Measurements (mm). Length: 2.5; width: 1.2; height: 1.65.

Derivatio nominis. The name of the species refers to the long carinae on the thorax and abdomen.

Parocnophila Zompro, 1998, stat. n. Figs 65-67, 118-119, 140-141

Ocnophila (Parocnophila) Zompro, 1998: 457.

Type-species. *Ocnophila (Parocnophila) carinata* Zompro, 1998: 458, by original designation.

Material examined and species included. *Ocnophila (Parocnophila) carinata* Zompro, 1998: 458, fig. 2: HT ♀, Venzuela, Bejuma, Casa Maria [OZ 364-1*]; *Parocnophila latirostrata* sp. n. (see below).

Origin. Venezuela.

Complementary description. Head longer than wide, unarmed, except for some small furrows in the posterior quarter. Scapus flat, half times as (♂) or almost as wide as (♀) long, pedicellus half as long and slightly narrower (♂) or half as wide (♀), antennae reaching abdominal segment VIII (♂) or posterior half of II (♀). Prothorax slightly shorter than head, of same width. Mesothorax elongated, narrower than (♂) or wider than (♀) prothorax. Metathorax structured as mesothorax, two-thirds as long (♂) or half as long (♀) as mesothorax. Profemora curved basally, triangular in cross section, with high carinae, meso- and metafemora rectangular in cross section, unarmed. Tibiae longer. All basitarsi as long as following three segments combined. Median segment shorter than one-quarter of metathorax, about one-third as long as abdominal segment II. III longer than II, III to V (♂) or III to VI (♀) of similar length, III and IV of ♀ widest. VI of ♂ as long as II, VII shorter. VIII widened, as wide and long as IX, X emarginated posteriorly, shorter than the previous segments. Subgenital plate bulgy, with short ventral carina, posterior margin emarginated. Vomer prominent, apex obtuse, cerci slender, slightly curved. VII of ♀ slightly shorter than VI, VIII as long as IX and X combined, these of equal length, supra-anal plate elongated, not separated from X visibly, with carina dorsomedianly. Subgenital plate flat, in the type with a notch posteriorly, in P. latirostrata n. sp. rounded. Cerci curved.

Egg. Capsule rectangular from lateral with undulate ventral and dorsal sides, with four deep and wide impressions laterally, micropylar plate round, with broad, whitish margin. Operculum oval, flat.

Distribution. NW South America.

Comments on the genus. *Parocnophila* was erected as a subgenus of *Ocnophila* Brunner v. W.; ♂ and egg were unknown. The description of the new species below, including ♂ and egg, shows significant differences to *Ocnophila*, so the full generic rank seems justified.

Key to the ♀♀ of *Parocnophila*

1 Supra-anal plate as long as VIII. . . . . *P. carinata* Zompro
- Supra-anal plate shorter, as long as IX. . . . . *P. latirostrata* sp. n.

Parocnophila latirostrata sp. n. Figs 66-67, 118-119

Libethra sp. Potvin, 1993: 59 fig. 1-3.

Material examined. 2 ♂♂, 2 ♀♀, 10 eggs. 1 ♂, HT, 1 ♀, PT, 10 eggs: Ex culture I. Fritzsche [OZ 432-1, 2*]; 1 ♂, ♀, PT, Ex culture W. Potvin, 1993 [F. H. Hennemann]. Origin of culture-stock: Ecuador.

♂. General colour brown. Head considerably longer than wide, unarmed, posterior margin tuberculose, disturbed by four short furrows. Whith a black, transverse stripe before, and a lighter spot between eyes. Genae darker. Scapus long, flattened subcylindrically, with a strong carina exteriorly. Pedicellus half of its length, two-thirds of its width, cylindrical. Antennal segment III 3 times as long as scapus and pedicellus combined, following ones elongated, but growing shorter. Antennae of lighter colour, with irregular black annulation, reaching abdominal segment VIII. Prothorax slightly shorter than head, with cross-like impression. Mesothorax almost 6 times as long, narrower, smooth, with few indistinct, darker tubercles. Metanotum with same structure, two-thirds as long. Profemora curved basally, triangular in cross section, edges elevated, bristled. Protibiae one-quarter longer, subrectangualar, with bristled carinae. Probasitarsus as long as three following segments together, with a strong median carina. Meso- and metafemora rectangular in cross section, furrowed dorsally, unarmed. Tibiae like protibiae. Meso- and metabasitarsus like probasitarsus. Metathorax and abdomen with an indistinct, darker, dorsomedian line. Metathorax 8 times longer than median segment, latter one-third as long as abdominal segment II. II to V of equal length, VI shorter, VII shorter than VI. Segments VIII and IX almost rectangular, both as long as VII, with four longitudinal carinae dorsally. The interior two are placed submedially and evenly bristled. The exterior ones on VIII diverging posteriad, on IX with a curve directed mediad in the anterior half, its posterior corners produced and directed downward. Segment X shorter, with one median and two diverging longitudinal carinae, posterior margin emarginated. Subgenital plate bulgy, as high as tergite VIII, with flat but broad posterior margin. Vomer round with an obtuse, simple apex. Cerci simple, slightly curved.

Measurements (mm). Body: 49.8; head: 2.2; pronotum: 2.1; mesonotum: 12.9; metanotum: 8.6; median segment: 1.0; profemora: 16.1; mesofemora: 13.1; metafemora: 16.8.

♀. General colour light brown. Head considerably longer than wide, with two tubercles posterosubmedially, eyes projecting. Scapus very flat and wide, dilated into flat lobes laterally. Pedicellus subcylindrical, half as long and half as wide. Following segments light brown, elongated, but of irregular length, apex darker, reaching posterior half of abdominal segment II. Prothorax with an interrupted median carina, shorter than head. Mesothorax more than 3 times as long, with one median and two submedian carinae. Metathorax half as long, of equal structure. Profemora curved basally, triangular in cross section, edges elevated, bristled. All tibiae four edged, edges bristled, longer than femora. All basitarsi as long as following three segments combined, carinated. Meso- and metafemora rectangular in cross section, unarmed. Metanotum 6 times as long as median segment, abdominal segment II 2.5 times as long as latter. III

to VI of equal length, longer than II. VII as long as II. Sternite VII with v-like opercular organ. VIII as long as IX and X combined. Segments II to IX dorsal with six longitudinal carinae, all placed submedially, median carina absent. Supra-anal plate elongated, with a prominent median carina, a little longer than IX. Subgenital plate flat, in posterior half with a short median carina, not projecting beyond X.

Measurements (mm). Body: 55.1; head: 3.4; pronotum: 3,0; mesonotum: 14.0; metanotum: 7.0; median segment: 1.2; profemora: 15.6; mesofemora: 12.7; metafemora: 20.5.

Egg. Capsule rectangular in lateral view, compressed, grey, rough, each side with four, irregular, brown, deeper impressions. Micropylar plate with a broad, white and very rough margin, inner part black, more smooth. Dorsal edge undulate. Ventral side with an irregular, net-like structure of brown and grey. Operculum oval, flat.

Measurements (mm). Length: 3.14; width: 2.12; height: 1.30.

Comments. Potvin (1993) gives a description and figures of this species and its egg and adds some notes on rearing and behaviour.

OREOPHOETINI trib. n.

Genus included. *Oreophoetes* Rehn, 1904 (= *Allophyllus* Brunner v. W., 1907).

Comments on the Oreophoetini. In contrast to Rehn (1904: 56), Brunner v. W. (1907: 317) recognized that the character which separates this genus from all others of Diapheromerinae is, the basically straight, non-curved profemora. However, in cross section they are not round, but roundly quadrate. These straight, not curved profemora are unique in this tribe.

The egg differs strikingly from that of the other tribes: In longitudinal cross section it is rhombic because of its lateral bulges. The micropylar plate reaches from the anterior to the posterior end and is almost parallel-sided. The operculum is rhombic, too, almost flat, and touches the micropylar plate in its anterior end. A capitulum is not present.

Some hints show a closer relationship to the Ocnophilini, e.g., the similar body length of both sexes, the meso- and metafemora which are unarmed and rectangular in cross section, and the lack of a capitulum in the eggs.

The species of *Oreophoetes* are highly specialized phasmids feeding on ferns in montane regions of western South America.

Oreophoetes Rehn, 1904 Figs 68-69, 122-123

Oreophoetes Rehn, 1904: 56; Giglio-Tos, 1910: 31; *Allophyllus* Brunner v. W., 1907: 317.

Type-species. *Bacteria peruana* Saussure, 1868: 65, by original designation.

Material examined and species included. *Bacunculus mimus* Giglio-Tos, 1898: 25: ST 1 ♀, Gualaquiza. [MIZT*]; *Bacteria nigripes* Scudder, 1875: 278 [ANSP*]; *Bacteria peruana* Saussure, 1868: 65: ST 1 ♂, Iquitos, Perou, 600/81, Anc. coll.; [MHNG*]; ST 1 ♂, Perou. [MHNG*]; 1 ♂♀, Baños, Ecuador. [MHNG*]; LT ♀ *Bacunculus festuca* Giglio-Tos, 1898: Valle del Santiago [MIZT*], designated by Brock, 1998a: 302; *Bacunculus gramen* Giglio-Tos,

1898: 26: HT ♂, Valle de Santiago. [MIZT*]; ♀, no data [MHNG*]; 2 ♂♂, ♀, Santa Inez (Ecuad.), R. Haensch S. [ZMUH*]; ♂, Ecuador, Barancas, 16.XII.1905 [ZMUH*]; ♀, Ost-Ecuador, Riobamba-Macas und flussabwärts. E. Feyer leg. [ZMUH*]; 4 ♂♂, 3 ♀♀, several eggs, Culture O. Zompro, origin: Peru. [OZ*].

Origin. Peru, Ecuador.

Complementary description. Small to medium sized, very colourful phasmids. Head subglobose, slightly flattened and longer than wide. Eyes very small, projecting hemispherically. Antennae much longer than body. Scapus flattened, rounded rectangular, pedicellus half as long and wide, rounded cylindrical. Prothorax as long and wide as head. Mesonotum twice as long as metanotum, of similar width as pronotum. Profemora straight, not curved basally. Protibiae longer than femora, probasitarsus longer than combined length of following segments. Meso- and metafemora rectangular in cross section. Mesobasitarsus slightly shorter, metabasitarsus as long as following segments combined. Median segment shorter than one-quarter of metanotum. Abdomen shorter than thorax. Abdominal segment II twice as long as median segment. II to VII of similar width, VII slightly shorter or of equal length. VIII of ♂ as long as X, IX longer. Segment VIII slightly widened posteriorly, IX with dorsomedian carina, X with a notch posteriorly. Subgenital plate bulgy, with prominent margin posteriorly. Vomer prominent. Cerci straight to slightly curved. VIII of ♀ indistinctly wider than VII, longer than IX or X. X as long as IX. Cerci strong, straight. Subgenital plate boat-like, acute, with carina ventromedially.

Egg. Capsule almost round from lateral, with leather like structure (20x). Capsule rhombic in cross section from dorsal view. Operculum oval, long, flat, without capitulum. Micropylar plate elongated, reaching from operculum to polar area.

Distribution. NW South America.

Genera incertae sedis.

Bactricia Kirby, 1896

Bactricia Kirby, 1896: 463; *Scaphegyna* Karsch, 1898: 366.

Type-species of *Bactricia* Kirby, 1896: *Bacteria trophinus* Westwood, 1859: 30, pl. 5: 5, by original designation.

Type-species of *Scaphegyna* Karsch, 1898: *Bacteria bituberculata* Schaum, 1857: 423, by monotypy.

Distribution. Africa, Mozambique.

Discussion. Karsch suggested (1898: 367) that *B. bituberculata* is the ♀ of *Bacteria trophinus* Westwood. Consequently, *Scaphegyna* Karsch falls as a synonym of *Bactricia* Kirby, 1896.

The dorsally furrowed tibiae of this genus and species also occur in the African genus *Palophus* Westwood, 1859. Possibly *Bactricia* is a member of the African Palophinae. Especially the morphology of the legs resembles other species of this subfamily. Exact statements on the taxonomic position of this genus should not be made before revising the Palophinae.

Pseudobactricia Brock, 1999

Pseudobactricia Brock, 1999: 26.

Type-species: *Bactricia ridleyi* Kirby, 1904c: 429, by original designation.

Distribution. Singapore.

Discussion. The whole genus is only known from the holotype, figured by Brock 1999: 27, fig. 10a-c. This very slender species is striking because of its prominent lobes behind the eyes. It is related to *Bactricia* Kirby. The correct taxonomic position is unclear, it might be a member of Palophinae as well as Diapheromerinae. Final conclusions should not be drawn before a revision of the Palophinae.

SUMMARY

The genera in the North and South American phasmatodean Diapheromeridae: Diapheromerinae (= Heteronemiinae senus Bradley & Galil) are rediagnosed and revised. The subfamily is split into three tribes, Diapheromerini, Ocnophilini, and Oreophoetini, while the names Libethrini and Heteronemiini sensu Bradley & Galil are considered as a synonym of Diapheromerini, as their type species and genera are typical members of the latter tribe. The tribes are subdivided into groups of genera, keys to males, females and eggs of all groups, genera and tribes are inlcuded. The type-species of all genera are listed or designated for *Phantasca* Redtenbacher, 1908, and *Parapygirhynchus* Brunner v. W., 1907.

Within the Diapheromerini, seven new genera are erected: *Paraphanocles* gen. n., *Alienobostra* gen. n., *Globocalynda* gen. n., *Paracalynda* gen. n.; *Caribbiopheromera* gen. n., *Rugosolibethra* n. n., and *Spinopeplus* gen. n.. *Caribbiopheromera jamaicana* sp. n., the ♂ of *Calynda coronata* Carl, 1915, and the ♀ and egg of *Oncotophasma podagricum* (Stål) are described.

The Ocnophilini differs from the other tribes in the meso- and metafemora being rectangular, and not trapezoid, in cross section and the strikinkly short tarsal segments. It includes three new genera, *Dubiophasma* gen. n., *Ocnophiloidea* gen. n., and *Exocnophila* gen. n.. *Parapygirhynchus* Brunner v. W., 1907, is a synonym of *Ocnophila* Brunner v. W., 1907, syn. n.; their type-species are just different sexes of one species. *Dubiophasma longicarinatum* sp. n., *Exocnophila exintegra* sp. n. and *Parocnophila latirostrata* sp. n. are described.

The Oreophoetini with the single genus *Oreophoetes* Rehn differ from the other tribes in respect of the straight profemora and egg structure.

Lectotypes are designated for *Dyme bifrons* Stål, 1875, *Dyme discors* Brunner v. W., 1907, *Ocnophila integra* Brunner v. W., 1907, *Pericentrus multilobatus* Redtenbacher, 1908, *Libethra nisseri* Stål, 1875, *Bacunculus praeternissus* Brunner v. W., 1907, *Libethra regularis* Brunner v. W., 1907, *Calynda simplex* Brunner v. W., 1907 and *Bacteria turgida* Westwood, 1859.

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Plate I

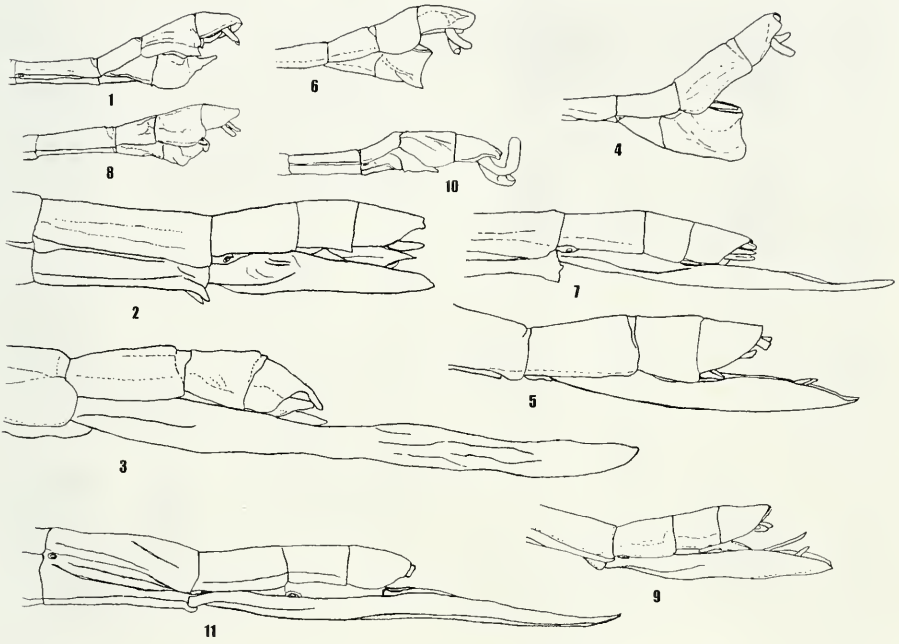
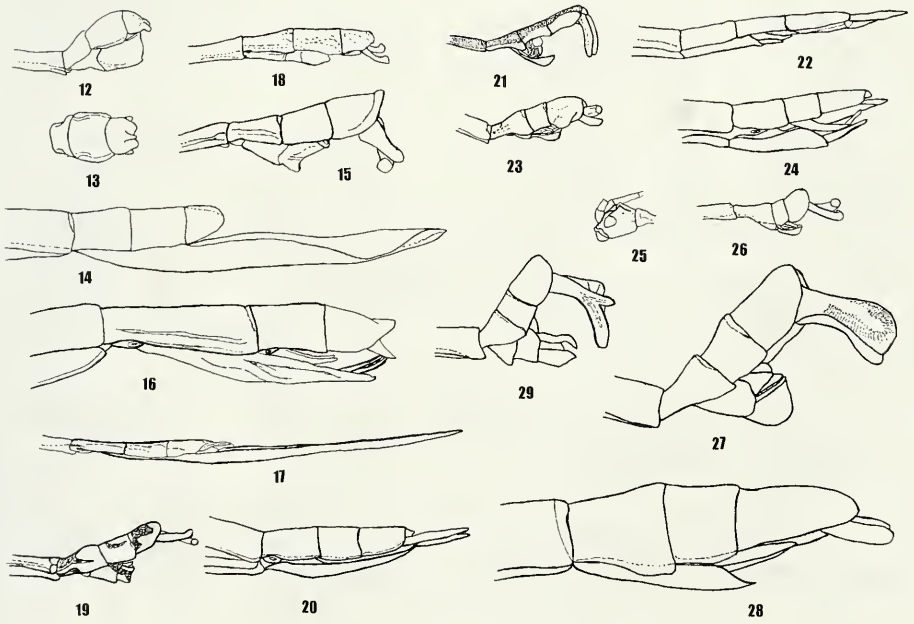


Plate II



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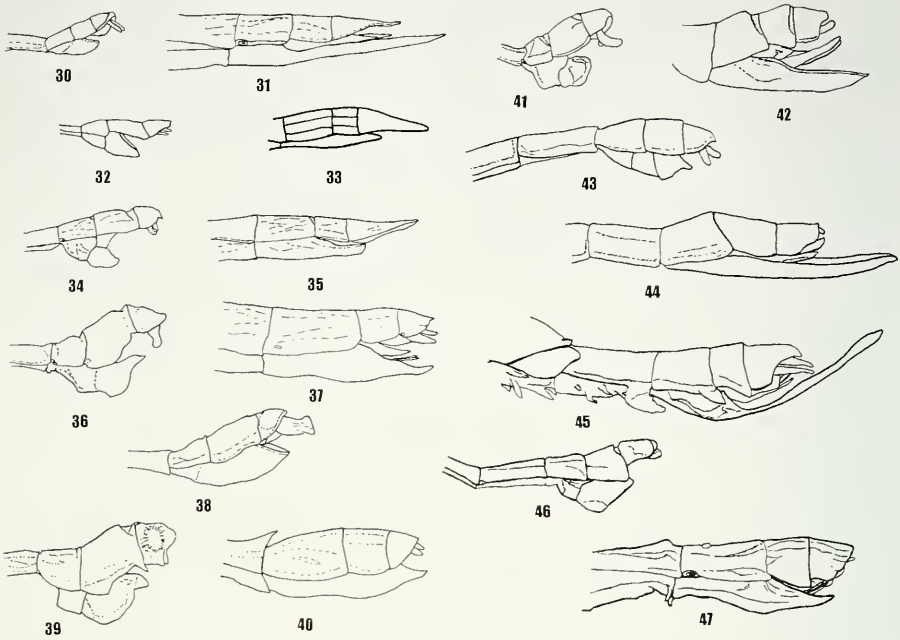


Plate IV

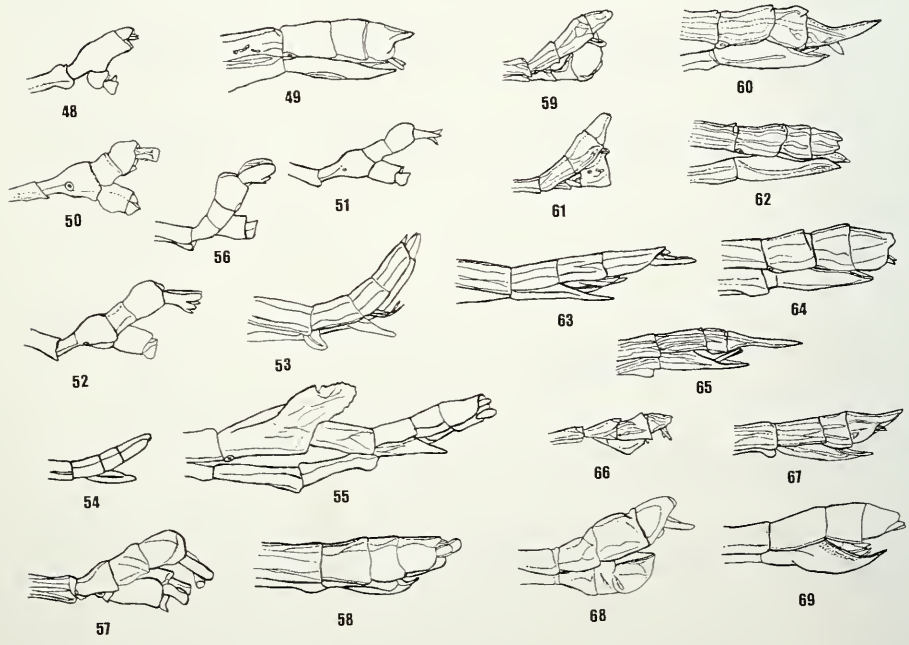


PLATE V

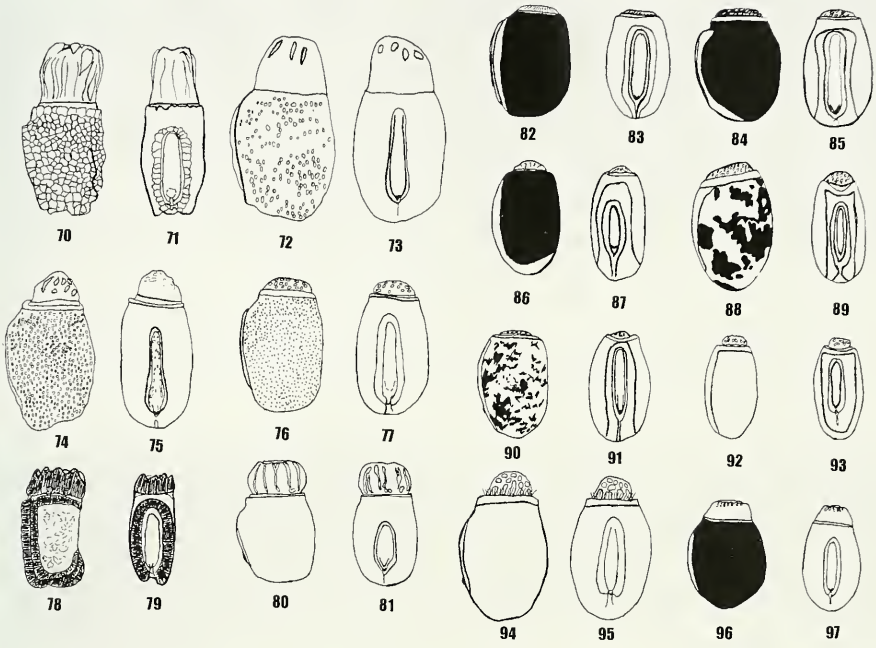


PLATE VI

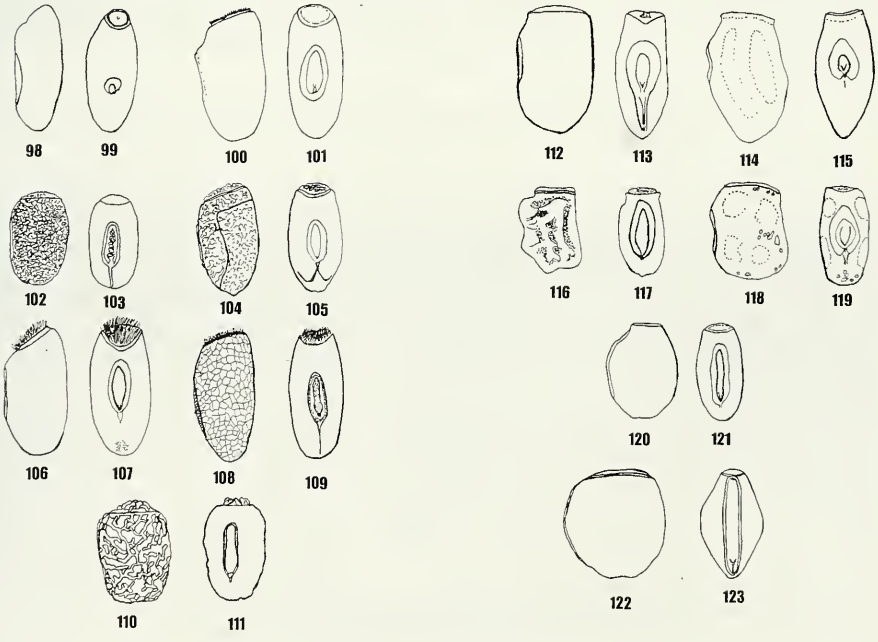


PLATE I. Terminal abdominal segments. Diapheromerini. *Phanocles* group. *Phanocloidea nodulosa* (Redtenbacher, 1908). 1. ♂, 2. ♀; *Phanocles burkartii* (Saussure, 1868). 3. ♀; *Phanocles* sp. n. Hennemann, i. pr. 4. ♂, 5. ♀; *Paraphanocles keratosqueleton* (Olivier, 1792). 6. ♂, 7. ♀; *Bostra turgida* (Westwood, 1859). 8. ♂, 9. ♀; *Alienobostra brocki* (Hausleithner, 1987). 10. ♂, 11. ♀.

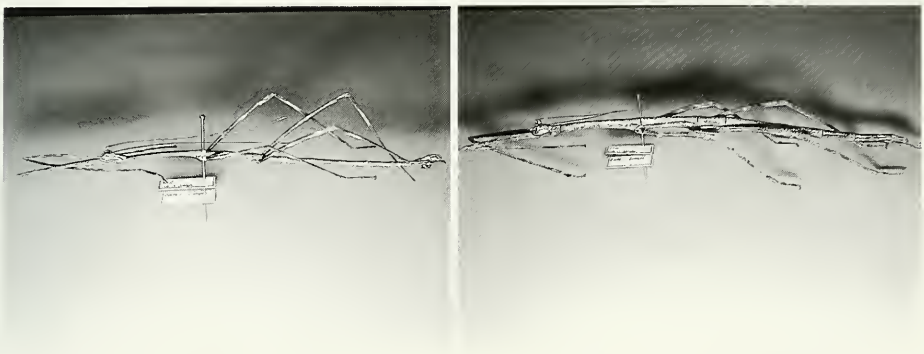
PLATE II. Terminal abdominal segments. Diapheromerini. *Bacteria* group. *Globocalynda simplex* (Brunner v. W., 1907). 12. ♂ lateral, 13. ♂ dorsal, 14. ♀; *Bacteria fernla* (Fabricius, 1793). 15. ♂, 16. ♀; *Calynda bicuspis* Stål, 1875. 17. ♀; *Calynda coronata* Carl, 1913. 18. ♂; *Paracalynda picta ntilaensis* (Zompro, 1998). 19. ♂, 20. ♀. *Diapheromera* group. *Manomera tenuescens* (Scudder, 1900). 21. ♂, 22. ♀; *Diapheromera femorata* (Say, 1824). 23. ♂, 24. ♀; *Diapheromera (Rhabdoceratites) beckeri* (Kaup, 1871). 25. ♂, 26. ♂, head lateral; *Megaphasma dentricum* (Stål, 1875). 27. ♂, 28. ♀; *Megaphasma furcatum* (Brunner v. W., 1907). 29. ♂.

PLATE III. Terminal abdominal segments. Diapheromerini. *Clonistria* group. *Clonistria bartholomaea* Stål, 1875. 30. ♂, 31. ♀; *Phantasca phantasma* (Westwood, 1859). 32. ♂, (after Westwood, 1859: pl. 12: 5a); *Libethroidea innsitata* Hebard, 1919. 33. ♂ (after Hebard, 1919, pl. 23: 7); *Libethroidea nodosa* (Giglio-Tos, 1898). 34. ♂, 35. ♀; *Libethra nisseri* Stål, 1875. 36. ♂, 37. ♀; *Pterolibethra* spec. 38. ♂; *Rugosolibethra rabdota* (Westwood, 1859). 39. ♂, 40. ♀ (after Westwood, 1859, pl. 22: 6b); *Spinopeplus festae* (Giglio-Tos, 1910). 41. ♂, 42. ♀, *Oncotophasma martini* (Griffini, 1896). 43. ♂; *Oncotophasma podagrica* (Stål, 1875). 44. ♀; *Trychopeplus spinosolobatus* (Redtenbacher, 1908). 45. ♀. *Dyme* group. *Dyme bifrons* Stål, 1875. 46. ♂, 47. ♀.

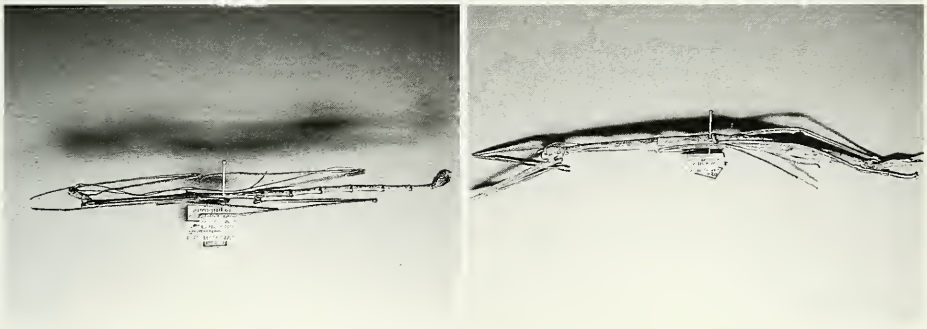
PLATE IV. Terminal abdominal segments. Diapheromerini. *Caribbiopheromera* group. *Caribbiopheromera jamaicana* gen. n. sp. n. 48. ♂, 49. ♀. Diapheromera group. *Pseudosermyle sp. "Heteronemia mexicana"* Brunner v. W., 1907. 50. ♂; *Pseudosermyle strigiceps* (Kaup, 1871). 51. ♂; *Pseudosermyle tridens* (Burmeister, 1838). 52. ♂, 53. ♀; *Litosermyle ocanae* Hebard, 1919. 54. ♀ (after Hebard, 1919, pl. 23: 9); *Sermyle mexicana* (Saussure, 1859). 55. ♀; *Sermyle bidens* (Kaup 1871) 56. ♂; *Sermyle knjawskii* Zompro, 1998. 57. ♂, 58. ♀. Ocnophilini. Terminal abdominal segments. *Ocnophila integra* Brunner v. W., 1907. 59. ♂, 60. ♀; *Ocnophiloidea regularis* (Brunner v. W., 1907). 61. ♂, 62. ♀; *Dubiophasma longicarinata* gen. n. sp. n. 63. ♀; *Exocnophila exintegra* (Brunner v. W., 1907). 64. ♀; *Parocnophila carinata* Zompro, 1998. 65. ♀; *Parocnophila latirostrata* sp. n. 66. ♂, 67. ♀; Oreophoetini. *Oreophoetes peruana* (Saussure, 1868). 68. ♂, 69. ♀.

PLATE V. Eggs. Diapheromerini. *Phanocles* group. *Phanocloidea nodulosa* (Redtenbacher, 1908). 70. lateral, 71. dorsal; *Phanocles burkartii* (Saussure, 1868). 72. lateral, 73. dorsal; *Phanocles* sp. n. Hennemann, i. pr. 74. lateral, 75. dorsal; *Paraphanocles keratosqueleton* (Olivier, 1792). 76. lateral, 77. dorsal; *Bostra turgida* (Westwood, 1859). 78. lateral, 79. dorsal; *Alienobostra brocki* (Hausleithner, 1987). 80. lateral, 81. dorsal. *Bacteria* group. *Globocalynda simplex* (Brunner v. W., 1907). 82. lateral, 83. dorsal; *Bacteria ferula* (Fabricius, 1793). 84. lateral, 85. dorsal; *Calynda bicuspis* Stål, 1875. 86. lateral, 87. dorsal; *Paracalynda picta ntilaensis* (Zompro, 1998). 88. lateral, 89. dorsal. *Diapheromera* group. *Manomera tenuescens* (Scudder, 1900). 90. lateral, 91. dorsal; *Diapheromera femorata* (Say, 1824). 92. lateral, 93. dorsal; *Megaphasma dentricum* (Stål, 1875). 94. lateral, 95. dorsal. *Caribbiopheromera* group. *Caribbiopheromera jamaicana* gen. n. sp. n. 96. lateral, 97. dorsal.

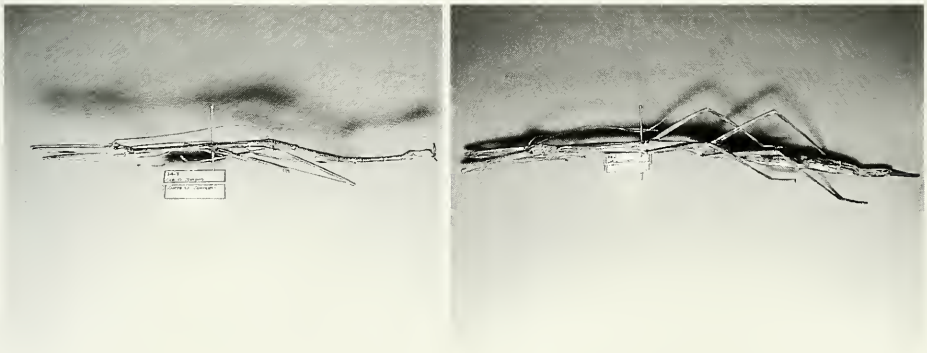
PLATE VI. Eggs. Diapheromerini. *Diapheromera* group. *Pseudosermyle tridens* (Burmeister, 1838). 98. lateral, 99. dorsal; *Sermyle kujawskii* Zompro, 1998. 100. lateral, 101. dorsal. *Clonistria* group. *Clonistria bartholomaea* Stål, 1875. 102. lateral, 103. dorsal; *Libethra nisseri* Stål, 1875. 104. lateral, 105. dorsal; *Spinopeplus festae* (Giglio-Tos, 1910). 106. lateral, 107. dorsal; *Oncotophasma podagricum* (Stål, 1875). 108. lateral, 109. dorsal. *Dyme* group. *Dyme* spec. 110. lateral, 111. dorsal. Ocnophilini. *Ocnophila integra* Brunner v. W., 1907. 112. lateral, 113. dorsal; *Ocnophiloidea regularis* (Brunner v. W., 1907). 114. lateral, 115. dorsal; *Dubiophasma longicarinata* gen. n. sp. n. 116. lateral, 117. dorsal; *Parocnophila latirostrata* n. sp. 118. lateral, 119. dorsal; *Exocnophila exintegra* gen. n. sp. n. 120. lateral, 121. dorsal. Oreophoetini. *Oreophoetes pernana* (Saussure, 1868). 122. lateral, 123. dorsal.



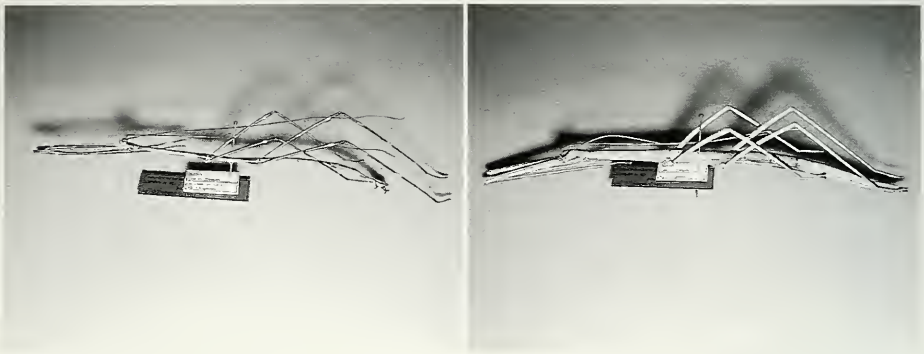
Paraphanocles keratosqueleton (Olivier, 1792). 124: ♂, 125: ♀



Globocalynda simplex (Brunner v. W., 1907). 126: ♂, 127: ♀



Alienobostra brocki (Hausleithner, 1987). 128: ♂, 129: ♀

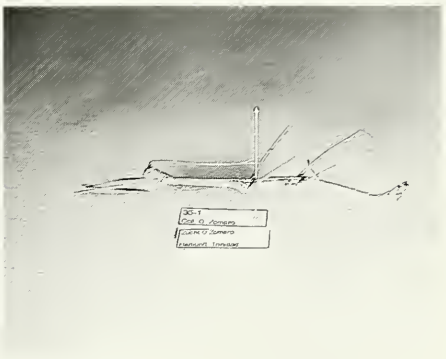


Paracalynda picta utilaensis (Zompro, 1998). 130: ♂, 131: ♀

Caribbiopheromera jamaicana gen. n. sp. n. 132: PT ♂. 133: PT ♀

Spinopephus festae (Giglio-Tos, 1910). 134: ♂, 135: ♀

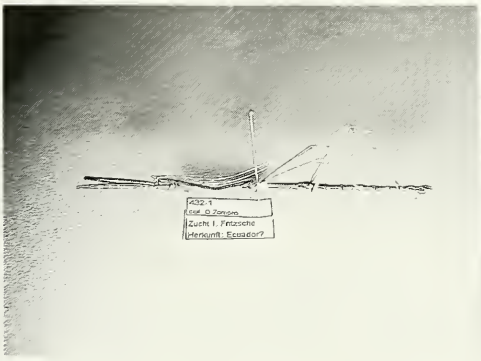
Exocnophila exintegra gen. n. sp. n. 136: HT ♀



Ocnophiloidea regularis (Brunner v. W., 1907). 137: ♂

Ocnophiloidea regularis (Brunner v. W., 1907). 138: ♀

Dubiophasma longicarinatum gen. n. sp. n. 139: HT ♀



Parocnophila latirostrata sp. n. 140: HT ♂, 141: PT ♀

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Zwei neue Arten der Tribus Quediini aus Pakistan (Coleoptera: Staphylinidae)

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Two New Species of the Tribe Quediini from Pakistan (Coleoptera: Staphylinidae). - Two new species of the tribe Quediini *(Quedius (Raphirus) pakistanicus* and *Heterothops pakistanicus)* from northern Pakistan are described, illustrated and compared to related species. Additional species of this tribe collected are mentioned as well.

Key-words: Taxonomy - Faunistics - New species - Coleoptera - Staphylinidae - Pakistan.

EINLEITUNG

In der Käferausbeute aus der Studienreise von Herrn Dr. C. Besuchet und Dr. I. Löbl nach Nordpakistan im Jahre 1983 kamen unter anderem zahlreichere Exemplare einiger *Quedius*- und *Heterothops*-Arten vor: *Quedius (Microsaurus) ochripennis* (Ménétries, 1832); *Quedius (Distichalius) chatterjeei* Cameron, 1926; *Quedius (Raphirus) aureiventris* Bernhauer, 1915; *Quedius (Raphirus) fluviatilis* Cameron, 1926; *Quedius (Raphirus) rougemonti* Smetana, 1990; *Heterothops indicus* Cameron, 1926; *Heterothops meurguesae* Tronquet, 1981; *Heterothops ?saano* Smetana, 1988; *Heterothops tanygnathoides* Reitter, 1891. Das Material enthielt auch zwei neue Arten, die im folgenden beschrieben sind.

Das Typenmaterial der neuen Arten ist überwiegend in den Sammlungen des Muséum d'histoire naturelle Genève, Schweiz (MHNG), einige *Heterothops*-Exemplare in den Sammlungen L. Hromádka, Prag, Tschechische Republik (LH) und des Verfassers (PS) aufbewahrt.

Ich danke Herrn Dr. I. Löbl für die Möglichkeit, die gesammelte Kollektion durchzuschauen und Herrn L. Hromádka für die Bestimmung einiger *Quedius*-Arten.

TAXONOMISCHER TEIL

Quedius (Raphirus) pakistanicus sp. n. Abb. 1-8

Typenmaterial. Holotypus ♂ und Allotypus ♀: "PAKISTAN: Swat, s/Miandam, 2300 m, 10.V.1983, Besuchet-Löbl" (MHNG).

Beschreibung. Männchen. Länge 9-10 mm. Schwarz, Flügeldecken dunkel metallisch blau, Hinterleib schwach irisierend. Fühler, Palpen und Beine pechschwarz, Tarsen dunkler pechbraun, Basis des 2. bis 6. Fühlergliedes schmal rötlich.

Manuskript angenommen 08.01.2001

Kopf quer (Länge/Breite=21/27,5) mit grossen, gewölbten Augen, Schläfen von oben gesehen viel kürzer als der Längsdurchmesser der Augen (3,75/12). Zwischen den vorderen Stirnpunkten befinden sich keine weiteren Punkte. Der hintere Stirnpunkt liegt nahe dem Augenhinterrand (Zwischenraum etwas schmäler als der Punktdurchmesser). Zwischen ihm und der Halsabschnürung steht ein weiterer Punkt. Der Schläfenpunkt liegt knapp am Hinterrand des Auges. Die Kopfoberfläche mit sehr feiner und besonders hinten stellenweise verloschener querwelliger Mikroskulptur.

Fühler relativ kurz und zur Spitze kaum erweitert, ihr 3. Glied deutlich länger als 2. (5,5/3,5), die folgenden Glieder allmählich kürzer werdend, aber stets länger als breit, das 11. Glied kürzer als die beiden vorhergehenden Glieder zusammengenommen.

Halsschild quer (Länge/Breite=30,75/33,5), hinten breit abgerundet, etwa in der Mitte am breitesten, von dort zu den Vorderecken deutlich verengt. Dorsalpunktreihen mit 3, Sublateralreihen mit 2 Punkten, der hintere liegt kurz hinter dem Niveau des grossen Lateralpunktes. Mikroskulptur wie auf dem Kopf, aber extrem fein und grösstenteils verloschen.

Schildchen punktiert und behaart.

Flügeldecken so lang wie breit, an der Basis etwa so breit wie die grösste Halsschildbreite. An den Seiten länger (38/30,75), an der Naht (einschliesslich des Schildchens) etwa so lang wie der Halschild entlang der Mittellinie. Oberfläche mittelstark und ziemlich dicht punktiert, Punktabstände durchschnittlich so gross wie der Durchmesser der Punkte, Untergrund ohne Mikroskulptur.

Hinterleib vom 5. Tergit an nach hinten allmählich verengt, der Hinterrand des 7. Tergites mit weissem Hautsaum. Punktierung der Tergite etwas feiner, in ihrer Vorderhälfte dichter und in der Hinterhälfte weitläufiger als auf den Flügeldecken, zum Ende des Hinterleibes ist die Punktierung kaum lockerer. Der 8. Sternit in der Mitte des Hinterrandes nicht zu tief dreieckig ausgeschnitten (Abb. 5). Die Form des 10. Tergites und 9. Sternites siehe Abb. 6-7.

Die anliegende schwarze Behaarung der Flügeldecken und des Hinterleibes einfach nach rückwärts angeordnet.

Vordertarsen erweitert, das 2. Glied merklich breiter als die Spitze der Schiene.

Der Aedoeagus (Abb. 1-4) ziemlich robust, sein Medianlobus bei Ventralansicht im mittleren Teil nur schwach verengt und erst dann in die ziemlich scharfe Spitze verengt, nahe der Spitze befindet sich das Kielchen des Apikalzähnchens. Bei Lateralansicht ist der Medianlobus etwa im Apikaldrittel zur Innenseite der Paramere gebogen und mit gut sichtbarem Zähnchen nahe der Spitze. Paramere bei Ventralansicht von der Basis allmählich und fast gerade zur kurz abgerundeten Spitze verengt. Bei Lateralansicht ist sie hinter der Mitte etwas nach aussen gekrümmt. Die Papillenstreifen bilden an der Spitze einen scharfen Pfeil.

Weibchen. In Grösse, Färbung und äusseren Merkmalen sind keine wesentliche Unterschiede gegenüber dem Männchen, nur auf dem Halsschild ist die linke Dorsalpunktreihe mit 4 Punkten, beiderseits fehlen hintere Punkte in Sublateral-

punktreihen und die Mikroskulptur ist geringfügig deutlicher. Vordertarsen schwächer erweitert, das 2. Glied etwa so breit wie die Spitze der Schiene. Die Form des 10. Tergites siehe Abb.8.

Differentialdiagnose. Die neue Art gehört in der *Q. himalayicus*-Gruppe zu den Arten mit metallisch blau gefärbten Flügeldecken und in dieser Gruppe durch das Vorhandensein des Zähnchens nahe der Medianlobusspitze in die Nähe zu den von Smetana (1988) beschriebenen Arten *Q. kuiro* und *Q. nilo*. Der Holotypus der neuen Art wurde mit einem Männchen von *Q. kuiro* ("Ost-Nepal, Umg. Shivalaya, Ufer Kimti Khola, 02.05.1993, leg. A. Kleeberg", J. Janák coll., P. Štourač det. 1998) verglichen, *Q. nilo* kenne ich nur aus der Beschreibung (Smetana, 1988). Mit Rücksicht darauf, dass äussere Merkmale sehr ähnlich sind und variiren können, kann man die neue Art von diesen Arten (sowie von *Q. himalayicus* Bernhauer, 1915) nur durch die Form des Medianlobus und der Paramere mit Sicherheit unterscheiden. Die Paramere von *Q. pakistanicus* verschmälert sich fast gleichmässig von der Basis zur Spitze, bei *Q. kuiro* ist der Mittelteil parallelseitig, bei *Q. nilo* und *Q. himalayicus* sogar verbreitert. Der Apikalteil des Medianlobus ist in Ventralansicht ähnlich wie bei *Q. kuiro* geformt. Bei Lateralansicht ist aber die Spitze geringfügig mehr abgerundet und das Zähnchen deutlicher. Die Behaarung des 8. Sternites ähnelt jener von *Q. kuiro*, der Ausschnitt in der Mitte des Apikalrandes ist aber flacher - die Tiefe nur 0,21 mm (bei studiertem Exemplar von *Q. kuiro* 0,27 mm).

Etymologie. Die Art ist nach ihrem Ursprung aus dem Pakistan benannt.

Heterothops pakistanicus sp. n. Abb. 9-11

Typenmaterial. Holotypus ♂ und Allotypus ♀: " PAKISTAN: Swat, Vallée d'Ushu, 2300 m, 15.V.1983, Besuchet-Löbl" (MHNG). Paratypen: 6♂♂ 3♀♀ - gleiche Angaben wie bei Holotypus und Allotypus (MHNG, 2 ex. PS); 7♂♂ 7♀♀ - "PAKISTAN: Chitral, s/Madaglasht, 27.V.1983, 2900-3050 m, Besuchet-Löbl" (MHNG, 2 ex. LH, 2 ex. PS); 2♂♂ - "PAKISTAN: Chitral, s/Bumburet, 25.V.1983, 2500-2700 m, Besuchet-Löbl" (MHNG); 1♂ - PAKISTAN: Dir, Lawarai Pass, 2700 m, 21.V.1983, Besuchet-Löbl" (MHNG); 1♂ - "PAKISTAN: Hazara, s/Naran, 2600 m, 1.VI.1983, Besuchet-Löbl" (MHNG); 2♀♀ - "PAKISTAN: Hazara, Naran-Kaghan, 2300 m, 2.VI.1983, Besuchet-Löbl" (MHNG).

Beschreibung. Männchen. Länge 3,7-4,2 mm. Kopf und Hinterleib dunkelbraun, Halsschild heller braunrot bis braunrot, Flügeldecken einfarbig rötlich braungelb. Beine gelbbraun mit schwach getrübter Innenseite der Mittel- und Hinterschienen, Fühler und Taster mehr oder weniger heller braun, an beiden das 1. und Basis des 2. Gliedes, sowie Apikalränder der Hinterleibstergite gelbbraun.

Kopf relativ robust und geringfügig länger als breit (Länge/Breite= 14/13,75), Seiten erst parallel und dann im flachen Bogen zum Hals verschmälert, Hinterecken mehr oder weniger angedeutet. Augen ziemlich klein, aus der Seitenwölbung des Kopfes nur schwach hervorragend, Schläfen von oben gesehen länger als der Längsdurchmesser der Augen (6,5/5). Zwischen dem vorderen und hinteren Stirnpunkt befinden sich gewöhnlich zwei Punkte (seltener auf einer Seite drei Punkte), der hintere von diesen liegt deutlich hinter dem Niveau des Augenhinterrandes. Der Schläfenpunkt liegt etwa in der Mitte zwischen dem Augenhinterrand und der Halsabschnürung. Die Kopfoberfläche mit feiner, stellenweise (besonders hinten) bis verloschener querwelliger Mikroskulptur.

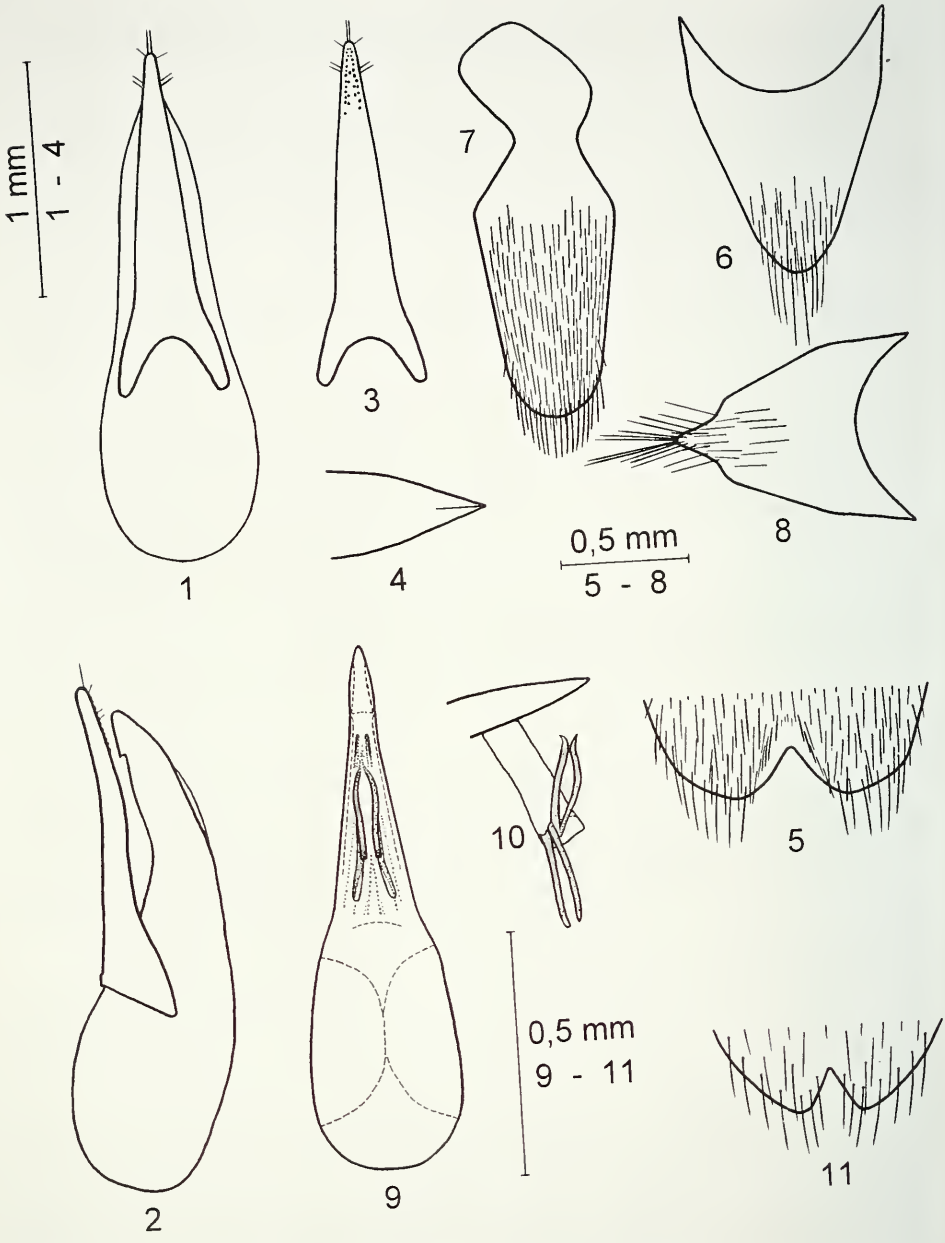

Abb. 1-11. 1-8: *Quedius (Raphirus) pakistanicus* sp. n. 1-7. Holotypus ♂. 1 - Medianlobus ventral; 2 - Medianlobus lateral; 3 - Innenseite der Paramere; 4 - Medianlobusapex ventral; 5 - Ausschnitt am Apikalrand des 8. Sternites; 6 - 10. Tergit; 7 - 9. Sternit. 8. Allotypus ♀ - 10. Tergit. 9-11: *Heterothops pakistanicus* sp. n.: 9 - Aedoeagus ventral (Holotypus ♂); 10 - Aedoeagus mit vorgetretenem Innensack schräg von der Seite (Paratypus ♂ - s/Madaglasht); 11 - Ausschnitt am Apikalrand des 8. Sternites beim Holotypus ♂.

Fühler zur Spitze kaum erweitert, das 2. und 3. Glied gleichlang, die vorletzten Glieder etwa so lang wie breit oder geringfügig länger, das 11. Glied kürzer als die beiden vorhergehenden Glieder zusammengenommen.

Halsschild quer (Länge/Breite=17,25/18,75), hinten breit abgerundet, fast im hinteren Viertel am breitesten, von dort zu Vorderecken deutlich und besonders im zweiten Drittel gerade verengt. In der Chaetotaxie sind keine Unterschiede gegen andere *Heterothops*-Arten vorhanden. Scheibe völlig glatt, an den Seiten nur Spuren sehr feiner querwelliger Mikroskulptur.

Schildchen punktiert und behaart.

Flügeldecken quer (Länge/Breite=20/23), an der Basis etwa so breit wie die grösste Halsschildbreite und nach hinten merklich erweitert. An den Seiten etwas länger (19,75/17,25), an der Naht (einschliesslich des Schildchens) kürzer (15,75/17,25) als der Halschild entlang der Mittellinie. Punktierung fein und etwas unregelmässig, Punktabstände in der Querrichtung durchschnittlich einmal, in der Längsrichtung zweimal so gross als der Durchmesser der Punkte.

Hinterleib mit weissem Hautsaum am Apikalrand des 7. Tergites, Punktierung durchschnittlich etwas feiner als auf den Flügeldecken; die Hinterhälfte einzelner Tergite weitläufiger als die Vorderhälfte punktiert, zum Ende des Hinterleibes ist die Punktierung kaum lockerer. Der 8. Sternit in der Mitte des Hinterrandes ziemlich tief, schärfer dreieckig ausgeschnitten (Abb. 11).

Die anliegende Behaarung der Flügeldecken und des Hinterleibes bräunlich.

Vordertarsen schwach erweitert, das 2. Glied kaum breiter als die Spitze der Schiene.

Der Aedoeagus mit Medianlobus etwa in ersten zwei Dritteln Richtung Spitze gerade verengt, restlicher Teil erst parallelseitig und dann im flachen Bogen zu schmal abgerundeter Spitze wieder verengt (seine Form und Sklerite des Innensackes siehe Abb. 9-10).

Weibchen. Grösse, Färbung und äussere Merkmale wie beim Männchen, nur Fühler durchschnittlich etwas kürzer und mit schwach queren vorletzten Gliedern. Vordertarsen schlanker, das 2. Glied etwas schmäler als die Spitze der Schiene.

Differentialdiagnose. *Heterothops pakistanicus* ist mit den anderen paläarktischen Arten dieser Gattung (einschliesslich des Himalaya-Gebietes) kaum vergleichbar. Durch die kleinen Augen, den glatten Halsschild, die ziemlich kurzen, trapezoiden Flügeldecken und die hellere Färbung ähnelt die neue Art etwas *H. angusticeps* Reitter, 1891 und *H. baicalensis* Fauvel, 1900. Von *H. angusticeps* unterscheidet sich *H. pakistanicus* durch den breiteren, hinten angedeutet eckigen Kopf und durch den ganz anders geformten Aedoeagus, von *H. baicalensis* noch dazu durch nicht deutlich quere vorletzte Fühlerglieder.

Etymologie. Die Art ist nach dem Fundland benannt.

LITERATUR

SMETANA, A. 1988. Revision of the tribes Quediini and Atanygnathini. Part II. The Himalayan region (Coleoptera: Staphylinidae). *Quaestiones Entomologicae*, 24: 163-464.

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Caractéristiques des gîtes utilisés par la Fouine (*Martes foina*, Erxleben, 1777) dans le Haut-Doubs

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Characteristics of dens used by Stone marten (*Martes foina*, Erxleben, 1777) in the Haut-Doubs. - This study is based on the survey of 49 buildings located within a 4-kilometre radius around Le Russey in the Doubs department, France. Those were isolated, uninhabited derelict farm buildings or shelters used for cattle in summer. For each building, information pertaining to the presence or absence of stone marten, its features and surrounding natural habitat was collected. 67.3% of the buildings were used by the species. Compared with areas whose climate is equally harsh and where the species is strictly confined to built-up areas, these structures made it possible for stone marten to have a wider range in a rural setting. A principal component analysis based on items of building description shows that stone martens favoured buildings whose roofs had wooden panelling under the tiles and which contained hay - or any other material affording suitable shelter - and were located in the close vicinity of hedges or woodland. Such criteria correspond to the species' requirements for warmth, the availability of safe hiding places and easy access to hunting grounds.

Key-words: Resting site - Habitat - Stone Marten - *Martes foina* - Mustelids.

INTRODUCTION

Au sein de son aire de répartition, la Fouine (*Martes foina*) fréquente d'une part les habitats rocheux, notamment dans le Sud (Delibes, 1983; Santos-Reis, 1983) et d'autre part les milieux de substitutions que sont les constructions humaines (Hainard, 1987; Corbet *et al.*, 1984). Les études sur l'habitat révèlent également sa présence dans les forêts de feuillus (Dunant *in* Hainard, 1987; Corbet *et al.*, 1984; Labrid, 1983; Skirnisson 1986). Dans le Nord, elle est nettement inféodée aux habitats humains. Ainsi, au Danemark, 2/3 des captures de Fouines sont effectuées à proximité des villages (Jensen & Jensen, 1970). Le taux de capture monte à 80 % en Allemagne (Stubbe, 1989) et 95 % en Alsace (Waechter, 1975). Partout, l'espèce se rencontre

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également dans les grandes villes telles que Genève, Zürich (Hainard, 1987), Strasbourg, Mulhouse (Waechter, 1975), Liège (Libois, 1982), Nantes (Clément & Saint-Girons, 1982), Montpellier (comm. pers.). En Franche-Comté, le fichier des observations mammalogiques du Groupe Naturaliste de Franche-Comté (G.N.F.C.) révèle la présence de ce Mustélidé dans la plupart des grandes villes de la région : Besançon, Pontarlier, Vesoul, Lons-le-Saunier et agglomération de Belfort-Montbéliard. Dans le massif du Jura, on la rencontre dans les zones de falaises, les pierriers et les éboulis (obs. pers. et fichier des observations mammalogiques du G.N.F.C.). Dans cette région, la Fouine fréquente aussi les abris pour le bétail (appelés loges), qui sont disséminés dans les pâturages. Ces types de construction sont fréquents dans le Haut-Doubs et rares dans les régions de plaine.

Grâce au suivi radio-télémétrique, Lachat Feller (1993b) a montré, dans une zone suisse d'altitude, de climat et de structure paysagère similaire, que 92,1 % (n = 518) des gîtes utilisés par la Fouine étaient des constructions humaines (granges pour 67,2 % et remises pour 24,5 %), et que 64 % des constructions disponibles étaient fréquentées.

La question se pose donc de connaître les facteurs qui déterminent l'utilisation d'une construction humaine.

L'objectif du présent travail est de rechercher les critères de sélection présidant à l'installation de la Fouine dans les constructions hors agglomérations, dans une zone agricole de moyenne montagne.

MATÉRIEL ET MÉTHODE

Entre 1981 à 1986, toutes les constructions humaines, situées en dehors des agglomérations et non habitée par l'homme ont été systématiquement visitées. Il peut donc s'agir de simples remises, d'anciennes fermes désormais à l'abandon ou de loges (construction servant à l'abri pour le bétail en période estivale).

Pour chacune d'elles les informations suivantes, correspondant à 12 variables, ont été notées:

1 - la présence de Fouine, déterminée par :
+ l'observation directe de l'animal,
+ la présence de crottes dans la loge,
+ l'identification des traces.

Les loges n'ayant révélé aucun indice sont considérées comme inoccupées.

2 - la surface au sol de la loge (en m^2).

3 - l'état général: 4 classes ont été définies selon les caractéristiques suivantes :

+ excellent (E): construction entretenue. Par rapport aux loges de la catégorie suivante, les murs sont généralement crépis. On note également la présence de portes ou de fenêtres avec carreaux à toutes les ouvertures.

+ bon (B): toit et façades hermétiques à l'eau et au vent. Charpente, lambris (quand ils existent) et constructions internes en état. Les loges de ce type ne font pas l'objet d'un entretien systématique, aussi les portes et les fenêtres ne ferment pas toujours très bien; une planche manque ici ou là.

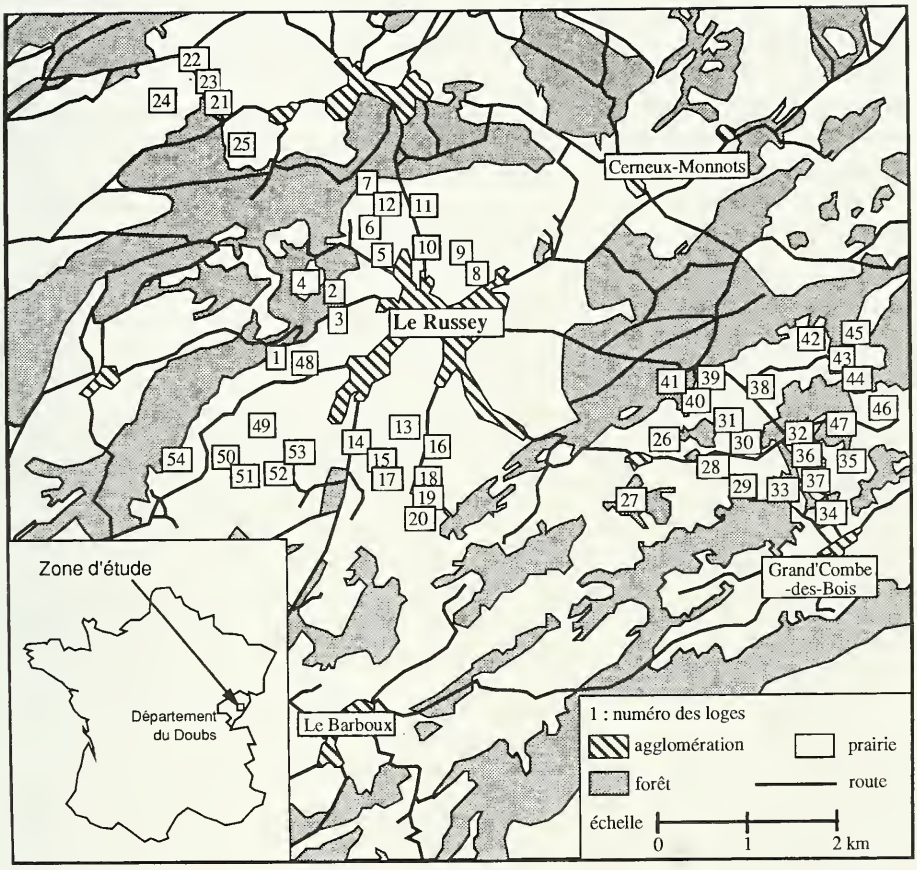

FIG. 1
Localisation des loges dans la zone d'étude.

+ moyen (M): possède ses 4 façades et un toit en suffisamment bon état pour protéger la majeure partie de la construction des précipitations et du vent; l'intérieur de la loge est généralement en mauvais état et menace de s'écrouler.

+ mauvais (L): la façade ou une partie du toit tombée; le vent et les précipitations peuvent donc pénétrer à l'intérieur de la bâtisse.

4 - la surface de lambris sous les tuiles: dans certaines constructions, les Fouines fréquentent l'espace situé entre les tuiles et les lambris. L'indice donné est le pourcentage de la superficie lambrissée par rapport à la surface du toit.

5 - la surface occupée par le grenier: parmi les constructions, certaines présentent un étage dénommé ici grenier. Sa superficie est exprimée en pourcentage par rapport à la surface de la loge.

6 - le nombre d'ouvertures permettant à la Fouine de sortir de la loge: 2 classes ont été définies: faible (F) et important (I). En général, un nombre inférieur à 3 ouvertures (de diamètre supérieur à 7 cm) permet le classement de la loge dans la

catégorie F mais des critères de répartition spatiale des ouvertures à l'intérieur de la loge sont également pris en compte. Par exemple, une loge présentant 4 ou 5 ouvertures, toutes situées sur la même façade, est classée dans la catégorie F alors qu'une loge ne présentant que 3 ouvertures mais situées sur 3 façades différentes est classée en I; les possibilités de fuite étant jugées plus importantes dans la seconde construction que dans la première.

7 - la présence ou l'absence de foin ou de paille, de sciure, de tas de bois, de tuiles, de planches ou de tout autre type de matériaux susceptibles de fournir un abri à la Fouine dans la loge. Aucun critère de volume de matériaux n'est pris en compte ici.

8 - la présence ou l'absence de matériel agricole.

9 - la présence ou l'absence de bétail en période estivale.

10 - la distance à l'espace boisé le plus proche. Il s'agit généralement d'une haie, plus rarement de la forêt.

11 - la distance au massif forestier le plus proche (bosquet, plantation, forêt).

12 - la typologie paysagère. Elle a été établie selon la méthode développée par Delattre *et al.* (1996). Pour chaque loge, un carré de 500 mètres de côté, centré sur le bâtiment a été tracé sur l'une ou l'autre des deux cartes I.G.N. au 1/25 000 concernées. Un type paysager est ensuite affecté à chaque carré selon une classification en 16 unités paysagères basée sur l'abondance relative de la forêt, de bosquets, de haies, de milieux ouverts (prairie ou pâture), de milieu humide et la proximité immédiate d'un village. Cette typologie caractérise la structure paysagère selon un gradient allant du milieu le plus fermé au plus ouvert.

Toutes les fiches ont été remplies par la même personne (DM). De ce fait l'évaluation de certains critères comme l'état général et le nombre d'entrées a toujours été notée de la même manière.

La corrélation entre la présence de Fouine et chacun des descripteurs des loges a été calculée (corrélation linéaire de Pearson).

Ensuite, une analyse en composante principale a été effectuée sur le tableau "variables x relevés (loges)", afin de mettre en évidence les caractéristiques principales des loges étudiées. La variable concernant la présence de la Fouine a été utilisée comme variable supplémentaire: elle ne contribue donc pas à la structuration de l'espace factoriel. Les analyses ont été effectuées grâce à la programmathèque ADE (Thioulouse *et al.*, 1997).

Présentation de la zone prospectée

Le secteur prospecté (figure 1) est situé dans le Haut-Doubs, dans un rayon d'environ 4 kilomètres autour du Russey (Doubs, coordonnées 47° 9' 50" de latitude nord et 6° 43' 52" de longitude est). La zone d'étude couvre une surface d'environ 100 km^2. L'altitude varie de 850 à 1040 mètres. Le paysage est constitué par une alternance de prairies et de forêts de résineux à Epicéa commun (*Picea abies*) et Sapin blanc (*Abies alba*). La surface agricole est utilisée uniquement sous forme de pâtures et de prairies de fauche. Des haies de feuillus limitent les parcelles dans certains secteurs mais elles sont totalement absentes ailleurs.

RÉSULTATS

Taux d'occupation des loges

Cinquante-quatre constructions ont été visitées mais cinq ont été éliminées de l'analyse en raison de fiche de description imcomplète. L'analyse porte donc sur 49 loges. Sur cet effectif, 33 (67,3%) avaient été occupées ou étaient occupées par une Fouine au moment de la visite.

Typologie des loges "à Fouine"

La présence de la Fouine n'est corrélée fortement à aucun des descripteurs des loges. La présence de foin, d'un grenier et de lambris sous les tuiles sont les descripteurs qui enregistrent les plus fortes corrélations (respectivement 0,6 ; 0,5 et 0,4). La présence de tas de bois, de matériel agricole ($r = 0,3$) est moins importante mais entre tout de même en compte dans le choix du gîte par l'animal. De même, une loge dans un très mauvais état n'attire pas le Mustélidé. Il faut dire qu'en raison de leur délabrement (elles sont ouvertes à tous les vents), ces loges ne laissent guère de possibilité de gîtes. Enfin, la superficie de la loge doit être suffisante ($r = 0,3$). Ainsi aucune loge de moins de 25 m^2 n'est occupée ($N = 5$) mais il convient de préciser qu'aucune de ces 5 bâtisses ne présente l'ensemble des critères fortement corrélés à la présence du Mustélidé. Enfin, l'environnement paysager semble également intervenir dans le choix du gîte puisque l'occupation d'une loge est corrélée à la distance au premier élément boisé (haie ou forêt) par un coefficient égal à 0,3.

La matrice des corrélations entre les autres variables (tableau 1) montre que d'une manière générale les différents descripteurs caractérisant les loges sont peu corrélés entre eux. En conséquence, tous les descripteurs seront gardés dans les analyses suivantes. La distance de la loge à l'espace boisé le plus proche est corrélée à la distance entre la loge et la forêt par un coefficient de corrélation égal à 0,5. Ces deux descripteurs sont corrélés à la typologie paysagère (respectivement $r = 0,4$ et 0,7), ce qui est attendu puisque la typologie paysagère rend compte d'un gradient de fermeture du milieu. Tous les autres coefficients de corrélation sont inférieurs à 0,45.

Les 3 premiers axes de l'analyse en composante principale totalisent 40,3 % de la variance totale (figure 2a).

La présence de lambris sous les tuiles et la distance entre la loge et l'espace boisé le plus proche sont les variables les plus corrélées à l'axe 1. L'existence d'un grenier dans la loge, la distance entre le bâtiment et la forêt et la typologie paysagère sont les 3 variables les plus corrélées à l'axe 2. L'axe 3 est lié essentiellement à la présence de foin ou de paille, à la présence de bétail et dans une moindre mesure à l'état général de la loge (figures 2b et 2c).

Les figures 3a et 3b montrent que l'analyse effectuée sépare bien les loges occupées par la Fouine de celles qui ne le sont pas. Une zone de recouvrement existe cependant.

La représentation selon les axes 1 et 2 classe les loges sur la base de critères propres à la construction elle même. Elle oppose les loges avec lambris, présentant un

TABLEAU 1

Matrice de corrélation entre les descripteurs des loges

	Surface	Etat général	Lambris	Grenier	Nombre d'ouvertures	Foin ou paille	Sciure	Bois	Tuile	Planche	Autre	Matériel agricole	Bétail	Distance 1er élément boisé	Distance forêt	Typologie paysagère
Surface	1,00	0,06	0,29	0,22	–0,04	0,41	0,14	0,20	–0,08	0,12	–0,06	0,27	0,12	–0,02	–0,03	–0,04
Etat général		1,00	–0,14	0,08	–0,42	0,32	0,03	–0,14	0,02	–0,21	0,21	–0,04	0,12	0,28	0,01	0,19
Lambris			1,00	0,28	0,13	0,26	0,11	0,25	0,23	0,25	–0,14	0,14	–0,12	–0,21	–0,03	–0,10
Grenier				1,00	0,03	0,43	–0,03	0,24	0,22	0,08	0,16	0,20	0,10	–0,13	0,00	0,08
Nombre d'ouvertures					1,00	0,03	0,11	–0,16	0,09	0,22	0,06	–0,03	0,14	–0,33	–0,02	–0,21
Foin ou paille						1,00	0,01	–0,02	–0,07	–0,06	0,11	0,18	0,17	–0,06	–0,01	–0,03
Sciure							1,00	0,07	–0,05	0,08	–0,04	–0,13	0,07	–0,16	–0,24	–0,19
Bois								1,00	0,38	0,09	–0,08	0,25	–0,28	–0,21	0,01	0,12
Tuile									1,00	0,15	–0,03	–0,04	–0,22	–0,06	0,10	0,05
Planche										1,00	–0,07	0,21	–0,44	–0,09	0,02	–0,12
Autre											1,00	0,12	–0,15	0,02	0,01	0,14
Matériel agricole												1,00	–0,28	–0,07	0,07	0,02
Bétail													1,00	0,01	0,05	0,02
Distance 1ère haie														1,00	0,54	0,44
Distance forêt															1,00	0,66
Typologie paysagère																1,00

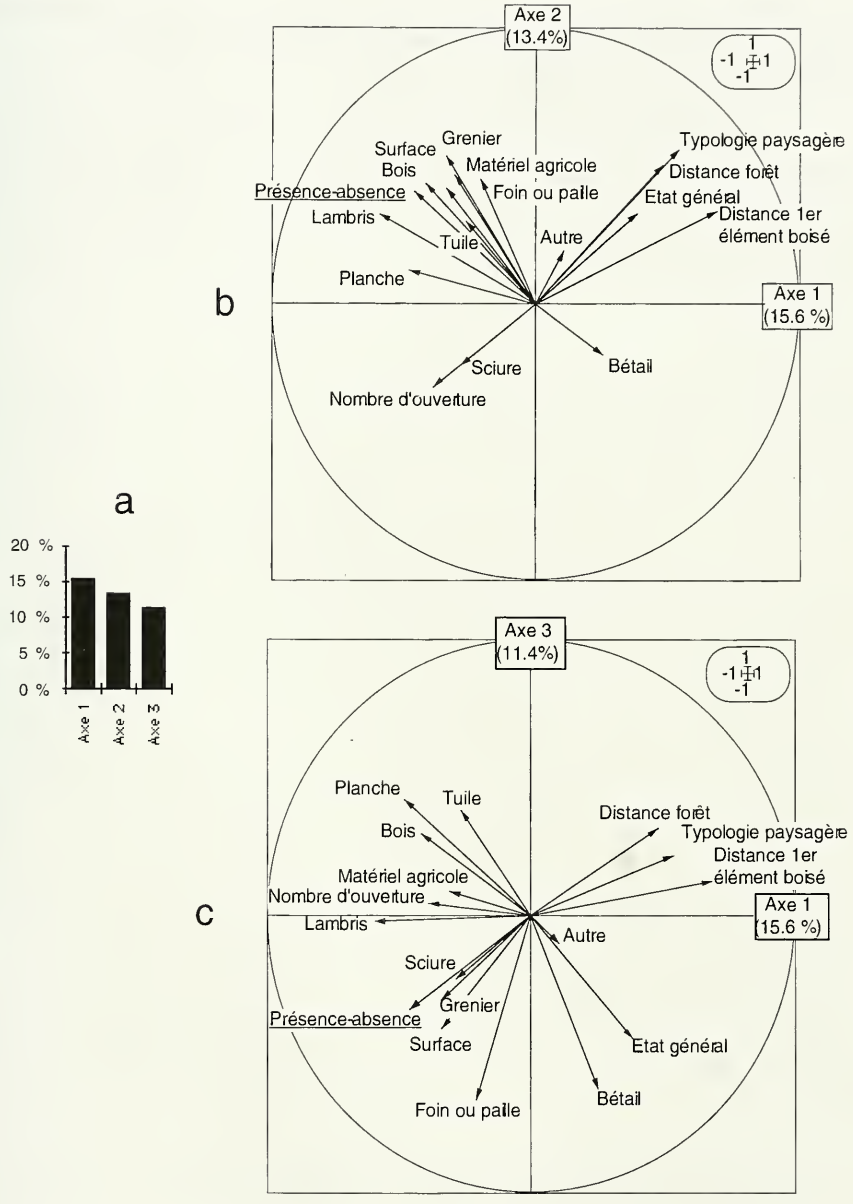

FIG. 2

a, Contribution relative des axes à l'inertie totale du tableau de données. b, position des différents descripteurs des loges selon les axes 1 et 2. c, position des différents descripteurs des loges selon les axes 1 et 3.

grenier, renfermant du foin, de la paille, du bois, des tuiles ou des planches et qui sont occupées par la Fouine aux loges qui ne possèdent pas ces caractéristiques et qui sont délaissées.

La représentation selon les axes 1 et 3 classe les bâtiments en fonction de leur environnement : distance entre la loge et l'espace boisé le plus proche, distance par rapport à la forêt et typologie paysagère. Elle montre que les loges occupées par la Fouine sont situées préférentiellement à proximité d'un milieu boisé (63 m en moyenne, écart-type 88 m pour les loges occupées, et 134 m en moyenne, écart-type de 165 m, pour les loges non occupées).

DISCUSSION

Le taux d'occupation des loges (67,3 %) permet une première réflexion : dans le Haut-Doubs, une proportion de la population de Fouine trouve refuge dans ces constructions. L'espèce doit de ce fait être moins tributaire des milieux rocheux et des constructions habitées par l'homme où elle n'est pas toujours appréciée en raison des dégâts qu'elle peut occasionner et du bruit qu'elle peut faire au moment de la reproduction. La fréquentation des loges se traduit par une présence plus largement répartie dans le paysage que dans les régions d'altitude ou de climat voisins. En Alsace, par exemple, les populations de Fouine forment des "noyaux" localisés dans les zones d'habitations humaines et accessoirement dans les carrières et d'autres sites rocheux (Waechter, 1975). Dans le Perche, l'espèce fréquente également les arbres creux, les tas de racines et de branchages amoncelés après l'arrachage d'une haie, mais ces types de gîtes semblent inutilisés en hiver (Léger, 1996). Malgré des recherches importantes, Léger (1996) n'a jamais trouvé d'autres types de gîte que les bâtisses contenant un stock de paille pendant les périodes enneigées. Compte tenu du caractère thermophile de l'espèce et du climat dans le Haut-Doubs (hivers froids et régulièrement enneigés), il est très peu probable que l'espèce puisse se maintenir dans des gîtes naturels tout au long de l'année. Le recours à des constructions humaines, mieux protégées des aléas climatiques, doit lui être indispensable. Cette hypothèse se trouve confirmée par le travail mené dans le Jura suisse par Lachat Feller (1993b). Au cours de son étude, cet auteur n'a trouvé que 41 gîtes hors constructions humaines sur un total de 518 (soit 7,9 %). L'utilisation de ces gîtes sauvages varie selon les saisons et atteint son maximum en automne. Mais d'une manière générale, les constructions humaines restent les plus recherchés durant toute l'année (86,5 % en moyenne, N = 462).

Nos analyses révèlent que la Fouine sélectionne des loges répondant à deux types de contraintes, les uns relevant des caractéristiques du bâtiment, les autres de sa position par rapport aux éléments paysagers.

La présence de foin, d'un grenier et/ou de lambris sous les tuiles corespond à la nécessité pour la Fouine de disposer d'une isolation thermique suffisante et de caches sûres. La Fouine est une espèce thermophile et recherche des endroits tamponnés du point de vue des écarts de température pour s'abriter (Bakeev, 1972 *in* Libois & Waechter, 1991; Kalpers, 1984; Skirnisson, 1986; Lachat Feller, 1993b).

Waechter (1975) a montré que l'occupation d'un gîte par la Fouine répond à un déterminisme d'ordre thermique. Une expérience réalisée en captivité sur les choix du gîte en fonction des conditions de température a montré qu'elle choisit le gîte chauffé lorsqu'il fait froid et un gîte plus frais lorsque les conditions de température extérieure sont plus douces. Dans le Jura neuchâtelois, Lachat Feller (1993b) explique la préférence de la Fouine pour les tas de paille par la plus grande isolation thermique que présentent ceux-ci par rapport au lambrissage. Les tas de foin dans les greniers fournissent également des possibilités de gîtes très fiables. La Fouine y aménage quelquefois des couloirs se terminant par des chambres dans lesquelles l'animal séjourne durant la journée. D'après Waechter (1975) et Léger (1996), ces galeries peuvent aussi servir à la mise bas et à l'élevage des jeunes. Dans le Jura suisse, la présence de paille ou de foin dans les gîtes étant la règle générale, les lambris ne sont pratiquement pas fréquentés par la Fouine (Lachat Feller, 1993b). Dans notre étude, la relative rareté de la paille et du foin l'oblige certainement à se rabattre sur l'espace entre les tuiles et les lambris. Ce choix offre par ailleurs au Mustélidé des caches très sûres d'où il est totalement à l'abri des regards. Pour Lodé (1991), la sélection d'un gîte n'est pas seulement conditionnée par la proximité des ressources trophiques ou la stabilité thermique mais aussi par la quiétude qu'apporte le site.

Les loges fréquentées sont situées à proximité d'un réseau de haies et/ou de la forêt. Broekhuizen (1983), dans un paysage agricole de Hollande, a remarqué que les Fouines circulent principalement dans les bosquets, les haies et surtout sur les digues et les talus. Les champs et les prairies sont par contre évités. Lodé (1991), Lachat Feller (1993a) ainsi que Léger (1996) font le même constat et parlent de couloirs de circulation le long des haies et des lisières. Skirnisson (1986) constate également que les prairies permanentes, les pâtures et les champs cultivés sont évités. Une restriction est faite pour les champs de colza et de maïs avant récolte mais ces deux types de cultures sont totalement absents de notre zone d'étude.

Dans la zone d'étude, les lisières forestières jouent vraisemblablement un rôle de corridor de déplacements. Cependant, contrairement à une idée reçue qui place la Martre en forêt et la Fouine en milieux semi-ouvert ou anthropique, nous avons constaté, en pistant les traces sur la neige depuis les gîtes, que la Fouine s'aventure régulièrement en forêt. Sur la base du témoignage d'un piégeur, Léger (1996) rapporte la fréquentation de la forêt par la Fouine, et l'interprète comme due à l'extrême rareté de la Martre dans les forêts étudiées. Dans le Haut-Doubs, la Martre est fréquente dans les forêts de conifères, et la présence de la Fouine en forêt pourrait s'expliquer par une meilleure accessibilité des ressources alimentaires, dont elle serait isolée par la neige dans les milieux ouverts. Dans le Jura suisse, Marchesi (1989), Marchesi *et al.* (1989) et Lachat Feller (1993a) indiquent également l'utilisation des milieux forestiers par la Fouine dans une proportion non négligeable mais l'étude du régime alimentaire fait état de très peu de ressources typiquement forestières.

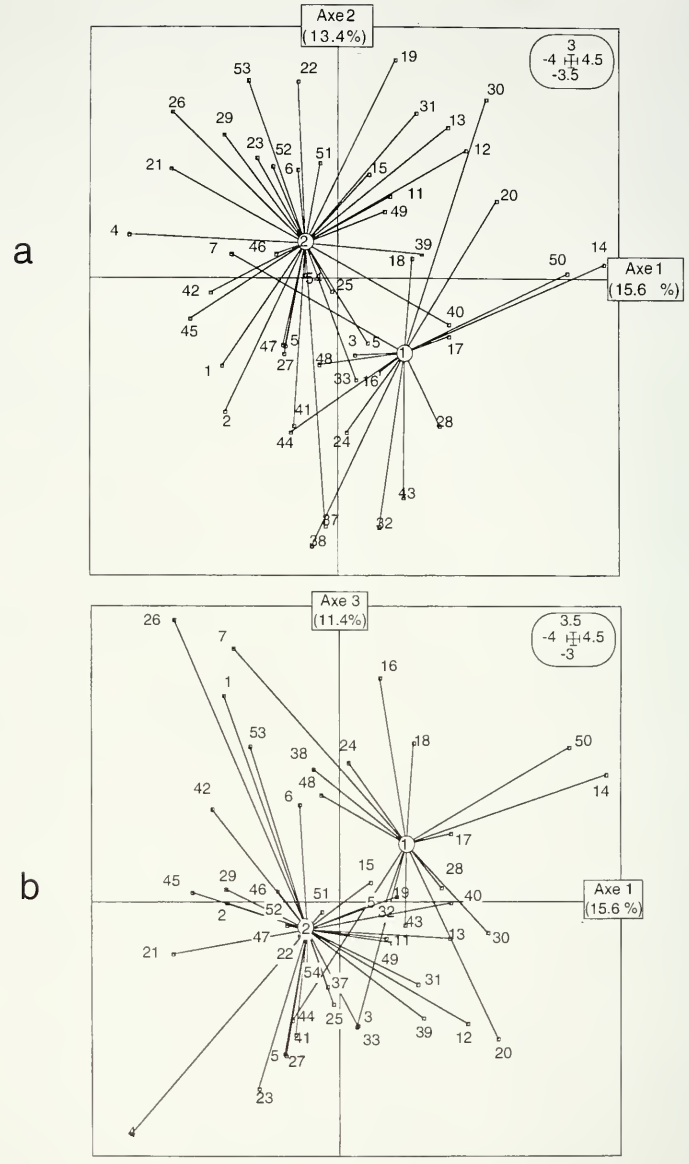

FIG. 3

a, Position des loges selon les axes 1 et 2. Les loges du groupe 1 ne sont pas fréquentées par la Fouine alors que les loges du groupe 2 sont utilisées comme gîtes. b, position des loges selon les axes 1 et 3. Les loges du groupe 1 ne sont pas fréquentées par la Fouine alors que les loges du groupe 2 sont utilisées comme gîtes.

CONCLUSION

A une altitude relativement élevée et sous un climat relativement rude pour cette espèce à affinité thermophile, certaines loges à bétail disséminées dans les pâturages du Haut-Doubs offrent à la Fouine des possibilités de gîtes favorables.

Le Mustélidé sélectionne les loges

- avec des lambris sous les tuiles, du foin ou d'autres matériaux entreposés qui lui offrent des caches et une isolation thermique suffisante,
- situées à faible distance d'une haie servant de corridor pour lui permettre un accès aux zones de recherche de nourriture,

Ces constructions offrent à l'espèce une occupation de l'espace plus uniforme par rapport aux régions au climat également rude dans lesquelles elle est strictement liée aux agglomérations, comme en Alsace par exemple (Waechter, 1975), en Lorraine ou en Côte d'Or (Léger, 1996), au Danemark (Jensen & Jensen, 1970) ou encore en Allemagne (Stubbe, 1989).

Dans le Haut-Doubs, il est vraisemblable que la conservation des loges, des haies et des bosquets permet à la Fouine d'exploiter toutes les zones ouvertes et de mieux participer à la régulation des populations des rongeurs prairiaux (*Arvicola terrestris* et *Microtus arvalis*) dont les pullulations posent de graves problèmes agronomiques (Delattre *et al.*, 1992, 1999; Giraudoux *et al.*, 1997; Duhamel *et al.*, 2000).

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A new species of *Bryconamericus* (Characiformes, Characidae) from Paraná basin in Misiones, Argentina

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A new species of *Bryconamericus* (Characiformes, Characidae) from Paraná basin in Misiones, Argentina. - The new species *Bryconamericus agna* sp. n. is described from one locality in the stream Tabay (55° 10' W - 27° 00' S), Paraná basin, Misiones. The 6-7 dentary teeth decreasing in size anteroposteriorly differentiate the species from other *Bryconamericus* species. Also, the new species has 19-22 branched anal-fin rays, prominent black humeral spot, wide lateral band, violet upper half of flanks and iridescent green the lower half upon capture.

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

INTRODUCTION

The genus *Bryconamericus* is distributed from Central America (Eigenmann, 1927; Géry, 1977) to the south of Buenos Aires province in Argentina (Menni *et al.*, 1988; Casciotta *et al.*, 1999). The new species possesses all generic characters defined by Eigenmann (1927). Monophyly of this genus has recently been discussed by several authors (see Malabaraba & Kindel, 1995). No phylogenetic studies have yet been carried out within the genus *Bryconamericus*. The objective of the present paper is the description of a new species from the Paraná river basin, in the province of Misiones, Argentina.

MATERIAL AND METHODS

Standard length was measured from tip of snout to hypural joint; head length includes the opercular flap. Specimens were cleared and stained (C&S) for cartilage and bone following Taylor & Van Dyke (1985).

The specimens examined belong to Academy of Natural Science of Philadelphia, USA (ANSP), Fundación Miguel Lillo, Tucumán, Argentina (FML), Muséum d'histoire naturelle, Genève, Switzerland (MHNG), Facultad de Ciencias Naturales y Museo, La Plata, Argentina (MLP).

Comparative material examined. *Bryconamericus agna* sp. n.: MLP uncat., 5 ex. (1 C&S), 52.2-62.2 collected with the holotype. *Bryconamericus iheringi*

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(Boulenger, 1887): MLP 9073, 110 ex., 39.9-44.3 (5 measured), **Argentina**, Buenos Aires, Sierra de la Ventana. MLP 9103, 15 ex., 34.8-49.2 (4 measured); Buenos Aires, Berisso, Los Talas (man-made ponds connected to Río de la Plata). Personal collection of MA, AA, and J. Casciotta: Buenos Aires, Berisso, Los Talas, 3 ex., 69.5-75.6; Buenos Aires, arroyo Las Mostazas, 33 ex., 30.0-71.8 (5 measured); Entre Ríos, Colón, río Uruguay, 10 ex., 35.5-46.3 (5 measured); Misiones, arroyo Piray-Miní, 5 ex., 46.0-60.8; Formosa, Reserva Ecológica El Bagual, arroyo Mbiguá, 3 ex., 42.0-45.5; Buenos Aires, Mar Chiquita coastal lagoon, 3 ex., 46.0-52.0; Chaco, flooding area of río Tragadero, near Resistencia, 3 ex., 29.4-34.0. **Uruguay**, Paysandú, arroyo de Los Chanchos, 4 ex., 34.7-40.0; Rocha, río Yaguarón, 5 ex., 37.5-52.0. **Brasil**, Rio Grande do Sul, São Lourenço do Sul, arroio Pinto, 2 ex., C&S, 32.7-38.0. *Bryconamericus exodon* Eigenmann, 1907: **Paraguay**, arroyo Ñacunday, 40 ex., 37.4-53.0 (5 measured). *Bryconamericus* cf. *stramineus* Eigenmann, 1908: **Argentina**, Entre Ríos, Isla Queguay Grande, río Uruguay, 3 ex., 40.0-43.0; Entre Ríos, Colón, río Uruguay, 6 ex., 37.4-52.0. *Bryconamericus thomasi* Fowler, 1940: **Argentina**, Jujuy, arroyo Saladillo, 7 ex., 49.5-52.8 (5 measured).

RESULTS

Bryconamericus agna sp. n. Figs 1 - 6, table 1

Holotype. FML 3700, female, 61.0 mm SL, Argentina, Misiones, Municipio Libertador General San Martín, arroyo Tabay (55° 10' W - 27° 00' S), Paraná basin. Coll. D. Aichino *et al.*, November 1998.

Paratypes. All specimens collected with the holotype. ANSP 177871, 4 ex., 54.0-57.3. FML 3200, 2 ex., 53.5-55.8. MHNG 2611.46, 4 ex., 54.3-60.0.

Diagnosis. *Bryconamericus agna* is distinguished from other species of the genus by a combination of characters: 6-7 dentary teeth decreasing in size anteroposteriorly; 4 inner teeth in the premaxilla, 3 of them heptacuspid; 2-3 pentacuspid maxillary teeth; 19-22 branched anal-fin rays; 36-38 perforated scales in the lateral line; large black humeral spot, and wide black lateral band. Upper half of flanks violet, lower half iridescent green.

Description. Morphometrics of holotype, 10 paratypes, and 5 non-paratypes specimens are presented in table 1. *Bryconamericus* with deep body (Fig. 1), maximum body depth at dorsal-fin origin. Dorsal profile of body very convex from tip of snout to dorsal-fin origin, almost straight under dorsal fin, slanting ventrally from this point to caudal peduncle. Dorsal profile of caudal peduncle scarcely concave or straight. Ventral profile of body less arched than upper one from tip of snout to origin of anal fin, straight over that fin, and slanted dorsally to caudal peduncle. Ventral profile of caudal peduncle convex. Body rounded between pectoral and pelvic fins. Body laterally compressed between pelvic and anal fins.

Dorsal-fin origin equally distant from tip of snout and base of caudal-fin rays. Dorsal-fin origin behind the vertical through last pelvic-fin ray insertion. Adipose fin present. Tip of pectoral fin never reaching pelvic-fin origin. Tip of pelvic fin reaching or surpassing anal-fin origin in males; in females, pelvic-fin tip not reaching that origin, usually far.

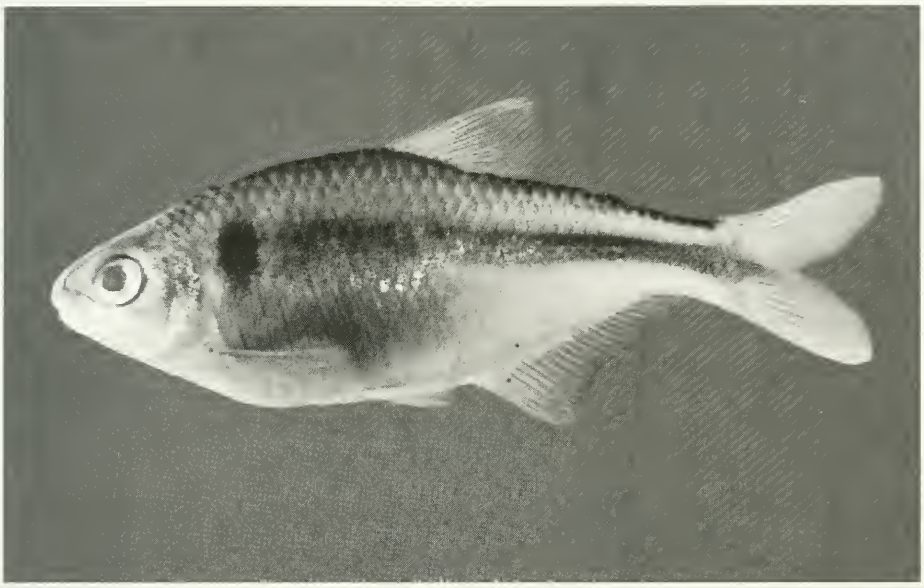


FIG. 1
Bryconamericus agna sp. n., holotype, FML 3700, 61.0 mm SL.

Dorsal fin ii,8 rays; posterior margin of dorsal fin rounded, first branched dorsal-fin ray longest. Anal-fin iii,19-22 rays (9 including holotype: 20), (4: 21), (2: 22), (1: 19). Posterior margin straight in males; in females, first three or four branched rays produced, forming a lobe. Anal fin of all males bearing very small hooks directed posteriorly and outward, curved dorsally. Hooks present on first to fourteenth branched anal-fin rays; hooks on posterior branch only (Fig. 2).

Caudal fin bearing one unbranched and nine branched principal rays in upper lobe; eight branched and one unbranched principal rays in lower lobe. Caudal lobes similar in size, in some specimens lower one scarcely wider than upper one.

Pectoral-fin i,10-12 rays (7: 11), (5 including holotype: 10), (4: 12); posterior fin margin straight.

Pelvic fin i,7-8 rays (14 including holotype: 7); posterior margin slightly rounded. Hooks developed on all branched rays in some specimens. Hooks larger than those of anal fin, placed lateroventrally, curved inward and dorsally, occasionally on two ray branches.

Dorsal profile of head gently convex, concave over supraoccipital. Snout rounded, mouth inferior, under level of lower orbital margin. Lower jaw completely included. Maxilla short, reaching or slightly surpassing anterior orbital margin.

Dentary bearing 6-7 teeth, decreasing in size anteroposteriorly. Symphysial tooth broad, with 6-7 cusps. Second and third teeth with 6 cusps, fourth and fifth teeth with 5 cusps, sixth and seventh teeth with 3 cusps (Fig. 3).

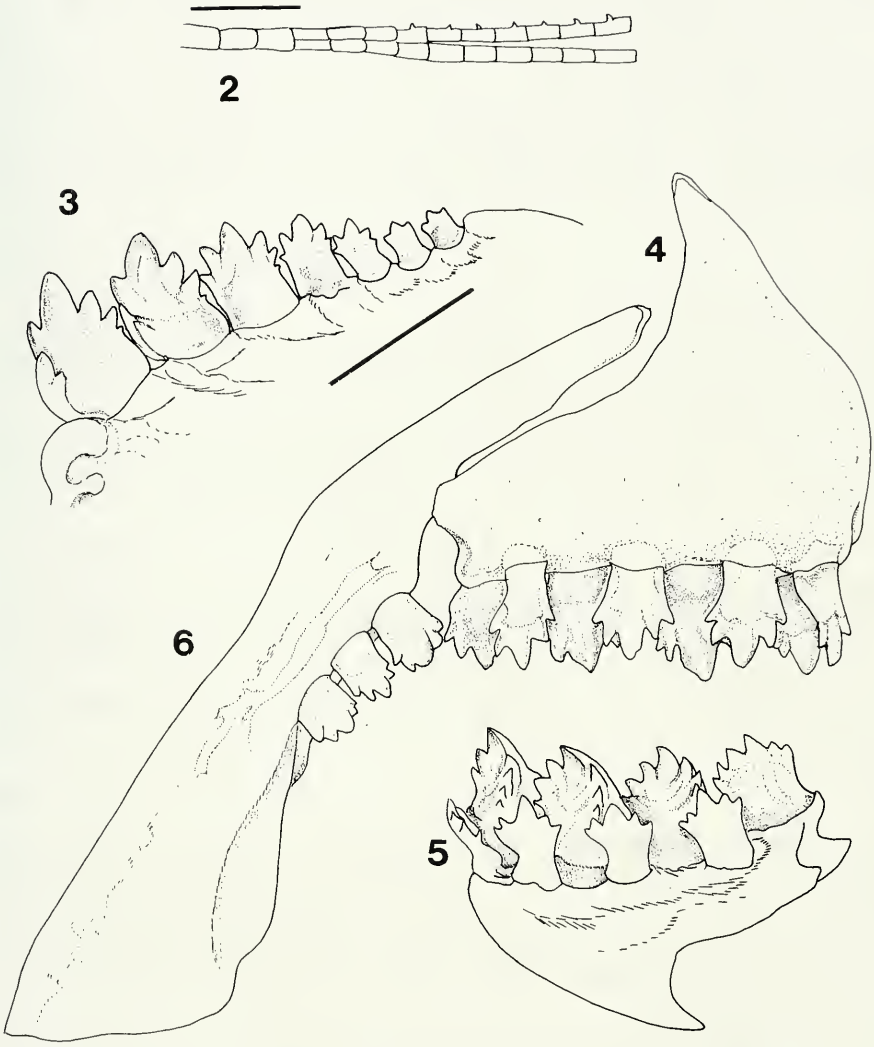
TABLE 1. Morphometrics of the holotype and 15 specimens of *Bryconamericus agna*. Standard length is expressed in mm. SD: standard deviation

	Holotype	range	mean	SD
Standard length	61.0	54.5-65.0		
% of SL				
body depth	39.8	34.1-39.8	36.3	1.419
head length	24.6	23.8-27.3	25.2	0.633
predorsal length	47.7	47.3-50.3	48.6	0.916
preventral length	45.0	43.0-47.8	45.1	1.414
preanal length	60.9	57.8-62.3	60.3	1.261
dorsal-fin base	12.5	11.8-13.9	12.9	0.550
anal-fin base	29.2	25.0-29.6	28.1	1.298
pelvic-fin length	14.7	14.3-17.1	15.7	0.919
pectoral-fin length	21.8	20.0-23.7	21.9	0.848
caudal peduncle depth	11.4	10.9-11.8	11.3	0.231
caudal peduncle length	13.6	12.9-14.6	13.7	0.568
distance between pectoral and pelvic fin origins	23.9	23.9-26.2	25.1	0.633
distance between pelvic and anal fin origins	16.3	14.4-19.2	15.8	1.205
% of head length				
interorbital width	33.3	29.7-36.2	33.4	1.648
head depth	84.0	78.7-88.0	84.0	3.019
orbital diameter	32.0	28.7-34.2	31.6	1.642
snout	22.0	19.3-25.1	22.8	1.565
premaxilla+maxilla length	39.3	34.1-41.0	37.5	1.619
maxillary length	20.0	17.4-22.5	20.1	1.304
% of pectoral-pelvic fin origins				
pectoral length	91.0	80.0-94.7	87.6	3.926

Premaxilla with ascending process short; alveolar ramus stout, bearing two series of teeth. Usually, outer series with 4 aligned teeth, all pentacuspid but symphysial one tetracuspid. Teeth scarcely wider distally (Fig. 4), with stronger median cusps. Inner series of premaxillary teeth consisting of 4 teeth (3 specimens: large 3 teeth on one premaxilla). Symphysial tooth narrower, with 7 cusps (Fig. 5). Second and third teeth with 7 cusps, outer cusps very small. Second tooth strongest. Fourth tooth with 6 cusps. Maxilla with lateral process laminar, ascending process very long, teeth placed equidistant from anterior and posterior tips. Two or three pentacuspid teeth, with a median cusp larger (Fig. 6). One specimen with maxilla edentulous on one side.

Eye small, interorbital wide. Third infraorbital contacting sensory tube of preopercle.

Scales cycloid. Lateral series with 36-38 perforated scales (9: 37), (4: 36), (3 including holotype: 38). Five or six scales between dorsal-fin origin and lateral line; 4 scales between lateral line and anal-fin origin. Fourteen scales around caudal peduncle (1 specimen: 12). Ten to fourteen scales not forming a regular median series between supraoccipital process and dorsal-fin origin in most specimens. Ten to



FIGS 2-6

Fig. 2. *Bryconamericus agna* sp. n., 55.5 mm SL, a detail of the small anal-fin hooks. Figs 3-6. *Bryconamericus agna* sp. n., 58.0 mm SL. 3, posterior view of dentary, with a detail of the dentary teeth; 4, anterior view of premaxilla with the outer series of teeth; 5, ventrolateral view of premaxilla showing cusps of the inner series of teeth; 6, anterior view of maxilla with three pentacuspid teeth. Scale bars = 0.5 mm.

thirteen scales in one row, covering eleven or twelve first anal-fin rays. Ventrally, one median series of scales, regularly placed in males only.

Coloration upon capture: Upper half of flanks violet; lower half of flanks iridescent green; fins pale.

Coloration in alcohol: Ground colour pale yellow, with upper area of flanks darker. On dorsum, dark chromatophores forming a stripe from supraoccipital to caudal peduncle. A large black rounded humeral spot on third to sixth scales, above perforated scales; in some specimens, humeral spot extended dorsally and ventrally.

A wide lateral band beginning two scales behind humeral spot, lateral band placed on two series of scales, wider on caudal peduncle, developing as a narrow band on middle caudal-fin rays.

Black chromatophores on dorsal-fin forming a faint distal stripe, excluding distal tip of last unbranched and two first branched rays; chromatophores specially placed on membranes and ray margins.

Anal-fin margin dark, with chromatophores concentrated on membrane and anterior margins of rays, especially in females. Caudal-fin margin dark gray, chromatophores on membranes and along ray margins. Chromatophores on pectoral and pelvic fins especially concentrated along margins of rays.

Dorsum of head black; black chromatophores on premaxilla, maxilla, opercle, and second suborbital.

Series of scales on upper half of body with chromatophores concentrated along posterior margin, forming a reticulate pattern.

Etymology: The specific epithet refers to the tupí-guaraní word añá which means devil.

DISCUSSION

Within the genus *Bryconamericus*, Eigenmann (1927) recognized three groups. The new species belongs to two of them according to the depth of the body and the number of anal-fin rays. Géry (1977) identified two groups, *B. agna* may be included within the *diaphanus*-group. Among the species of that group, *B. agna* has *Tetragonopterus*-like teeth, tip of caudal lobes hyaline, and more than thirty-two perforated scales in the lateral line.

The dentary teeth of *B. agna* differ from those of other species of the genus; as in *B. exodon* Eigenmann, 1907, most of the species have three or four large dentary teeth followed by several very small ones. Each dentary of *B. agna* bears 6-7 teeth decreasing in size anteroposteriorly.

The 19-22 branched anal-fin rays separate *B. agna* from other species of the genus, living in southern South America: *B. eigenmanni* (Evermann et Kendall, 1906) (15-17, Miquelarena & Aquino, 1999), *B. iheringi* (Boulenger, 1887) (15-18). *B. lambari* Malabarba et Kindel (14-19, Malabarba & Kindel, 1995), *B. thomasi* Fowler, 1940 (11-16, pers. obs.; Miquelarena & Aquino, 1995).

The presence of silvery band and the lower body depth (22.9-26.9 vs. 34.1-39.8) distinguish *B. stramineus* Eigenmann, 1908 from *B. agna*.

In the area, the most common species is *B. iheringi* which is also separated from *B. agna* by the dorsal fin equidistant from tip of snout and base of caudal lobes, larger eye, longer peduncle, greater length of premaxilla+maxilla, larger hooks on anal fin, and slender and short lateral band.

The black humeral spot and wide lateral band of *B. agna* resembles that of *B. ornaticeps* Bizerril et Peres-Neto, 1995 but it has slender body, with depth less than 30.0 % of SL, and a very short anal fin with 14-15 branched anal-fin rays (Bizerril & Peres-Neto, 1995).

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Description of three new Korean earthworms of the genus *Amynthas* Kinberg, 1867 (Oligochaeta, Megascolecidae) with multiple genital markings

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Description of three new Korean earthworms of the genus *Amynthas* Kinberg, 1867 (Oligochaeta, Megascolecidae) with multiple genital markings.- The presence of genital markings in sexually mature Amynthas species provides important taxonomic characters. An unusual number or distribution of markings are of particular interest. The present paper describes three new *Amynthas* species with multiple genital markings: *Amynthas songnisanensis* sp. n., *Amynthas ephippiatus* sp. n., and *Amynthas multimaculatus* sp. n. In *Amynthas songnisanensis* sp. n. and *Amynthas ephippiatus* sp. n. the ventral zone of the clitellar segments lacks clitellar development, making the clitellum saddle-shaped. This is very unusual among *Amynthas* and the perichaetine Megascolecidae as well. Complete descriptions of the new species are provided, including illustrations of ventral view and spermathecae.

Key-words: Earthworms - Megascolecidae - Oligochaeta - Korea - genital marking - taxonomy.

INTRODUCTION

Genital markings are present in many earthworms at the period of sexual maturity. They are of especial interest to the systematist for providing some of the most useful characters for the discrimination of species (Stephenson, 1930). The location and characteristic of genital markings, while variable, can be diagnostic (Tandy, 1969). Some genital markings have glands. In *Amynthas* these glands are of two types, sessile and stalked, and they correspond approximately in number and location to the externally visible markings. The gland type and detailed structure of the stalked glands are useful characters in the genus *Amynthas*.

In this paper, we report three new species with numerous genital markings on the ventral side. Although the large numbers of markings are unusual in the genus *Amynthas*, there are previously described cases such as *Amynthas varians* (Chen, 1938) and *Amynthas kinfunontis* (Chen, 1946). The present Korean *Amynthas* species have more markings and in different locations than the Chinese species.

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In two of the present species, the clitellum is not annular. *Amynthas songnisanensis* sp. n. and *Amynthas ephippiatus* sp. n. have saddle-shaped clitellums, a very rare situation in the genus, and possibly of some systematic importance. The saddle-shaped clitellum of these new species may be due to the presence of genital markings in the clitellum segments, a characteristic also unique to these species among Korean members of the genus. The type material is deposited in the Korean Institute for Biodiversity Research (KIBIO), Jeonbuk National University and in the Geneva Natural History Museum.

DESCRIPTIONS

Amynthas songnisanensis sp. n. Figs 1 A-C

Material: Holotype and 6 paratypes: Chungchongbuk-do, Boeun-gun, Mt. Songni, 350-500 m, litter layers in forest, 26 September 1997, Y. Hong, (KIBIO). Other material: Same data as for holotype, 8 clitellate specimens; Chungchongbuk-do, Boeun-gun, Mt. Songni, litter layers in forest, 15 clitellate, 12 August 1996, Y. Hong.

Etymology: The species is named for its type locality.

Diagnosis: Clitellum saddle xiv-xvi. Spermathecal pores in 6/7, 7/8. Genital markings discrete circular spots, from viii to xix, numbers variable; 6-18 in two rows viii-xiii, 0-11 xiv-xvi, 3-6 xvii-xix, from xiv-xix generally a single row or with one or two off main row. Intestinal caecum manicate.

Description: Dimensions 56-114 mm by 4.3 mm at segment x, 5.0 mm at xxx, 5.0 mm at clitellum; body cylindrical throughout, segments 62-100. Setae regularly distributed around segmental equators, numbering 53 at vii, 50 at xx; 16-18 between male pores, regular spacing; setal formula AA:AB:YZ:ZZ = 1.5:1.5:2:3 at xiii. Female pore single in xiv, 1.2 mm oval surround with indented 0.5 mm pores. Prostomium epilobic, with tongue open. Brownish dorsally and yellowish ventrally, clitellum coffee color, formalin preservation. First dorsal pore 12/13. Clitellum saddle xiv-xvi; setae invisible externally within clitellum, but 10 setae visible ventrally xiv-xvi.

Male pores in 0.4 mm circular pits at lateral margins of ventrum in xviii, within 0.8 mm raised area. Spermathecal pores in 6/7, 7/8; dark pore within conspicuous white spot at intersegment boundary. Genital markings discrete circular spots, slightly elevated, from viii to xix, numbers variable; 6-18 in two rows viii-xiii, 0-11 xiv-xvi, 3-6 xvii-xix, from xiv-xix generally a single row or with one or two off main row. Each marking with distinct central pore, markings increase in size posteriorly.

Septa 5/6, 6/7 thick, 7/8 thin with some muscle, 8/9-10/11 thin, 12/13, 13/14 thin with muscle. Gizzard globular in viii-x. Intestine begins xv, lymph glands from xxvii. Esophagous with vertical lamellae xii-xiii. Typhlosole small from xxvii. Intestinal caecum manicate, originating in xxvii, extending anteriorly about to xxiii, each consisting of 5 finger-shaped lobes, one larger finger directed towards dorsal vessel, attached to prostates. Hearts xi-xiii esophageal, x esophageal but not seen on right; ix lateral. Male sexual system holandric, testes, funnels in ventral paired sacs in x, xi. Seminal vesicles small two pairs in xi, xii. Prostates xviii large within xvi-xxii; thick ducts, both glandular portions consist of three main lobes, each lobe divided into leaflets, each with obvious vessel.

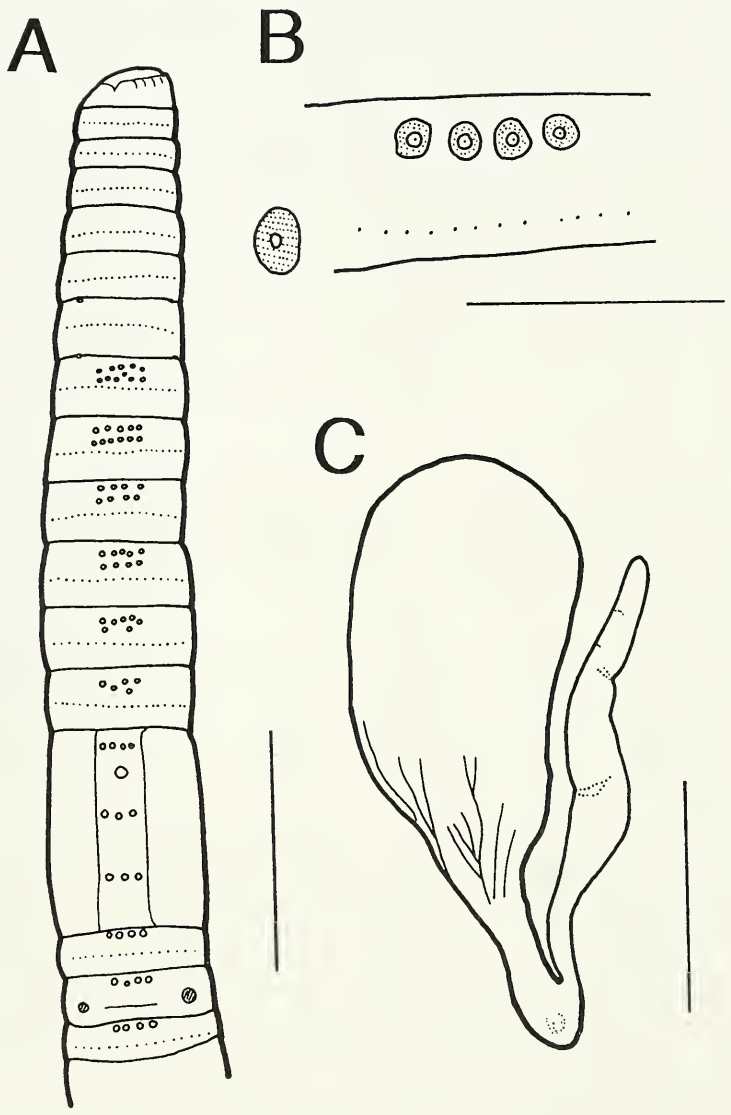

FIG. 1

Amynthas songnisanensis sp. n. A: ventral view; B: male pore region in xviii; C: spermathecae. Scales bars = 5 mm (A), 3 mm (C), 2 mm (B).

Ovaries in xiii. Paired spermathecae in vii, viii, viii flattened by gizzard; each ampulla large ovate to mitten-shaped; ducts short, thick, muscular; ectal part sharply narrowed and at right angle to main axis, diverticula stalks long, slender, chamber cayenne peppershape, as long as ampulla; no nephridia on spermathecal ducts. Genital

markings in all segments with small glands simple or lobed, stalks flat, composed of one or more canals; entire ventral body wall covered with dense clusters of mushroom-shaped glands.

Remarks: The present species appears to be closely related to *Amynthas multimaculatus* sp. n., but *A. multimaculatus* sp. n. has fewer and less extensively distributed genital markings, and the clitellum of *A. multimaculatus* sp. n. is annular. The clitellum of the present species is saddle-shaped, which is very rare among the members of the genus *Amynthas*. The male pore region surroundings are slightly elevated with a depression or invagination at the center, reminiscent of *Pheretima*, but without copulatory pouches. Aclitellates are of similar size (59-115 mm) and have the same male pore arrangement, and conspicuous genital markings from viii to xix. Aclitellate specimens only differ from clitellates by lacking the clitellum.

Amynthas ephippiatus sp. n. Figs 2 A-C

Material: Holotype and 5 paratypes: Gyungsangnam-do, Geochang-gun, Mt. Gaya, Haein-sa, 28 August 1968, Un-Jin Yang, (KIBIO). Other material: Same data as for holotype, 19 clitellate, 10 aclitellate specimens.

Etymology: The name *ephippiatus* is Latin for saddle, referring to the shape of the clitellum.

Diagnosis: Clitellum annular xiv or xiv-xv; saddle xv-xvi or xvi. Spermathecal pores in 6/7, 7/8. Genital markings mid-ventrally centered transverse rows or small groups ix-xii which broaden pre-setal halves of these segments; numbers 11-23 at ix, 10-22 at x, 0-15 at xi, 0-10 at xii, 0-5 at xv, 3-5 at xvi, 4-7 at xvii, 3-8 at xviii, 2-6 at xix. Intestinal caecum manicate.

Description: Dimensions 86-151 mm by 3.4-4.7 mm at segment x, 3.5-4.8 mm at xxx, 4.5-5.2 mm at clitellum; body cylindrical throughout, segments 99-105. Setae regularly distributed around segmental equators, numbering 53 at vii, 50 at xx; 14-16 between male pores, regular spacing; setal formula AA:AB:YZ:ZZ = 3.5:2:3:5 at xiii. Female pore single in xiv, 0.8 mm oval surround with indented 0.4 mm pores. Prostomium epilobic, with tongue open. Brownish dorsally and ventrally, clitellum coffee color, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv or xiv-xv; saddle xv-xvi or xvi; setae invisible externally within clitellum, but 8-11 setae visible ventrally xv-xvi.

Male pores within 0.8 mm raised pad at lateral margins of ventrum in xviii; male pores in slightly invaginated circular patches 0.4 mm diameter on equator, with central white male pore. Spermathecal pores in 6/7, 7/8 on oval bumps in furrows. Genital markings mid-ventrally centered transverse rows or small groups ix-xii which broaden pre-setal halves of these segments; genital markings fewer, larger from xv to xix; all pre-setal in single row; numbers 11-23 at ix, 10-22 at x, 0-15 at xi, 0-10 at xii, 0-5 at xv, 3-5 at xvi, 4-7 at xvii, 3-8 at xviii, 2-6 at xix.

Septa 5/6, 6/7, 7/8 thin, 8/9, 9/10 absent, 10/11-13/14 thin with some muscle. Gizzard medium size in viii-x. Intestine begins xv, lymph glands absent. Typhlosole

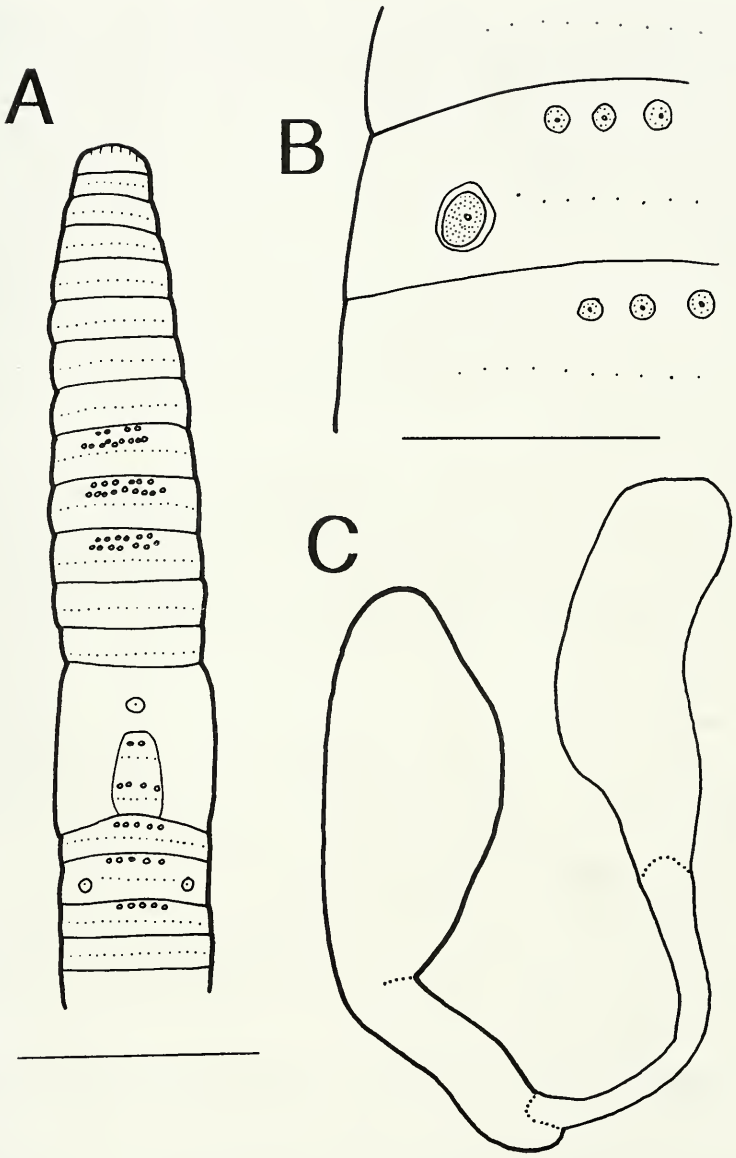

FIG. 2

Amynthas ephippiatus sp. n. A: ventral view; B: male pore region in xviii; C: spermathecae. Scales bars = 5 mm (A), 2 mm (B, C).

very small in xxvii. Intestinal caecum manicate, originating in xxvii, and extending anteriorly about to xxiii, each consisting of 6-7 finger-shaped lobes, uppermost 3 almost same size. Esophageal hearts xi-xiii, ix lateral. Male sexual system holandric, testes and funnels in paired sacs in x, sacs joined ventrally, in larger sacs enclosing seminal vesicles xi. No spermatozoal iridescence on funnels. Seminal vesicles large two pairs in xi, xii. Prostates xviii within xviii-xxi; ducts muscular, short of moderate thickness; glandular portions consist of one main solid lobe, sometimes lacking.

Ovaries in xiii. Paired spermathecae in vii, viii; each ampulla a large pouch, ducts short, muscular with 90° bend to ectal narrow portion with muscular stalk, diverticula stalks long slender, chamber cayenne pepper shape, longer than ampulla; no nephridia on spermathecal ducts. Genital papillae of ix-xii and xv-xix with small stalked glands corresponding approximately in number to the externally visible small spots; glands large blocky, angular, stalk broad, flat without circular muscle; variable size, triangular or squarish.

Remarks: The present species appears to be closely related to *Amynthas songnisanensis* sp. n., which has more genital markings on more segments. The clitellum of *A. songnisanensis* sp. n. is completely saddle-shaped, while the clitellum of the present species is partly saddle-shaped. In *Amynthas ephippiatus* sp. n. there is a relationship between clitellum development and genital markings. When segment xv has genital markings, there is no ventral clitellar thickening in xv; otherwise, the clitellum is annular in xv.

Amynthas multimaculatus sp. n. Figs 3 A-C

Material: Holotype and 6 paratypes: Jeollanam-do, Gurye-gun, Mt. Jiri, Piagol, 600-1,000 m, soil and litter layers, 22 August 1997, Y. Hong, (KIBIO). Other material: Same data as for holotype, 35 clitellate, 1 aclitellate specimens.

Etymology: The epithet *multimaculatus*, is derived from maculatus, the Latin for spot, with reference to the many genital markings.

Diagnosis: Clitellum annular xiv-xvi. Spermathecal pores in 6/7, 7/8. Genital markings mid-ventrally centered transverse rows or small groups xi-xv which broaden pre-setal halves of these segments; numbers 0-3 at xi, 2-40 at xii, 10-40 at xiii, 2-14 at xiv, 0-13 at xv. Intestinal caecum manicate.

Description: Dimensions 56-97 mm by 4.3 mm at segment x, 4.7 mm at xxx, 4.7 mm at clitellum; body cylindrical throughout, segments 69-92. Setae regularly distributed around segmental equators, numbering 53 at vii, 58 at xx; 14-18 between male pores, regular distance; setal formula AA:AB:YZ:ZZ = 2.5:2:2:3 at xiii. Female pore single in xiv, 0.5 mm oval surround. Prostomium epilobic, with tongue open. Red brownish dorsally and yellowish ventrally, clitellum reddish brown, formalin preservation. First dorsal pore 12/13. Clitellum annular xiv-xvi; setae invisible externally.

Male pores within 0.8 mm raised pad at lateral margins of ventrum in xviii; male patches circular 0.4 mm diameter slightly invaginated on equator, with central

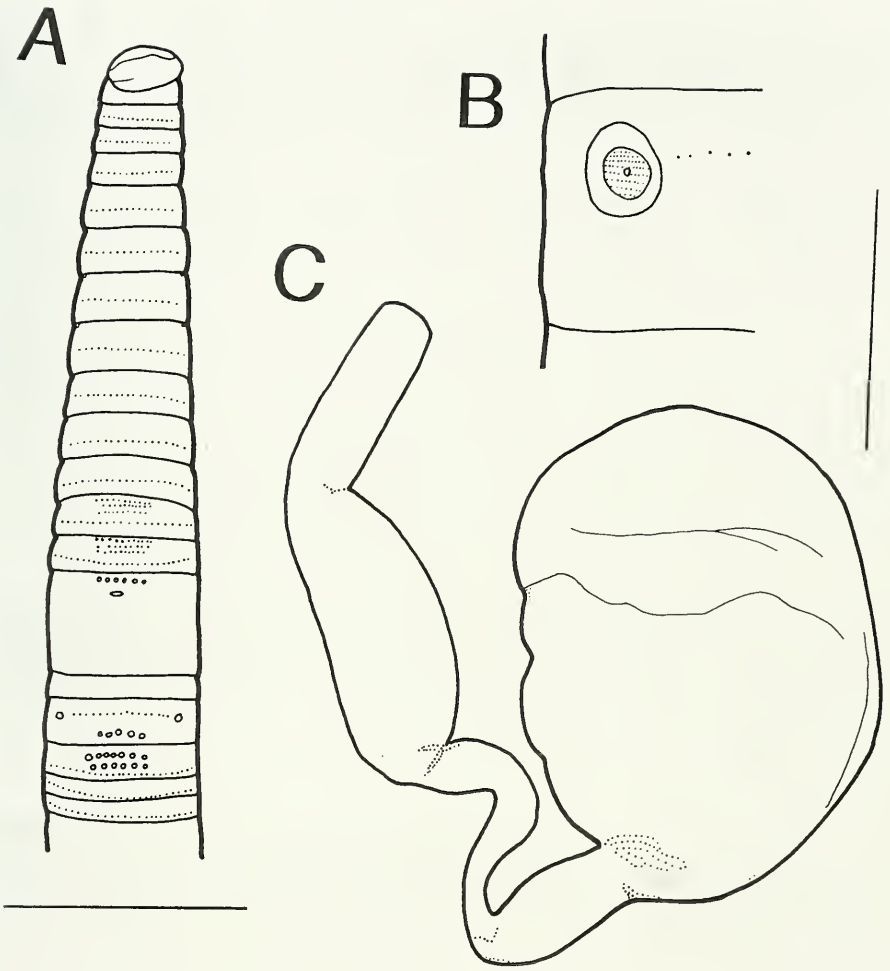

FIG. 3

Amynthas multimaculatus sp. n. A: ventral view; B: male pore region in xviii; C: spermathecae. Scales bars = 5 mm (A), 2 mm (B, C).

white male pore, 2 or 3 mid-ventral pre-setal groups of genital papillae on thickened areas in xviii-xx; segments xvii, xix shortened by enlargement of xviii, 0-8 papillae in xviii, 0-13 in xix, 0-13 in xx. Spermathecal pores in 6/7, 7/8 on oval bumps in furrows. Genital markings mid-ventrally centered transverse rows or small groups xi-xv which broaden pre-setal halves of these segments; genital markings fewer and larger in xii, xiii; smaller, more numerous posteriorly; numbers 0-3 at xi, 2-40 at xii, 10-40 at xiii, 2-14 at xiv, 0-13 at xv.

Septa 5/6 and 6/7 thick, 7/8 thin with some muscle, remnants of 8/9 may be present, 10/11-13/14 thin some muscle. Gizzard medium size in viii-x. Intestine begins xv, lymph glands small from about xxv. Small lamellae in esophageal wall xii, xiii. Typhlosole very small in xxvii. Intestinal caecum manicate, originating in xxvii, and extending anteriorly about to xxiv, each consisting of 5 finger-shaped lobes, uppermost 3 almost same size. Esophageal hearts xi-xiii, ix lateral. Male sexual system holandric, testes and funnels in ventral paired sacs in x, xi. Seminal vesicles large two pairs in xi, xii, but pushing 12/13 back to level of xiv. Prostates xviii very large within xv-xxiii; ducts muscular, short of moderate thickness; both glandular portions consist of five main lobes.

Ovaries in xiii. Paired spermathecae in vii, viii, viii larger than vii; each ampulla a large broad pouch with furrows, ducts short, muscular with 90° bend to ectal narrow portion with muscular stalk, diverticula large, red pepper shape, longer than ampulla; no nephridia on spermathecal ducts. Genital papillae of xii-xv and xviii-xx with small stalked glands corresponding approximately in number to the externally visible small spots; xii-xiv and xviii-xx; glands of xvii-xx large blocky, angular, stalk broad, flat without circular muscle; glands of xii-xiv variable size, triangular or squarish.

Remarks: The present species appears to be closely related to *A. songnisanensis* sp. n. by genital markings, but it differs from it in the number and location of genital markings. In particular, *A. multimaculatus* sp. n. lacks genital markings in segments xvi-xvii. Another difference is the consistently annular clitellum over all of xiv-xvi in *A. multimaculatus* sp. n.

ACKNOWLEDGEMENT

We would like to express appreciation to Dr. Samuel W. James, Maharishi University of Management, Iowa, USA, who kindly made valuable taxonomic suggestions to this study. This work was supported by the grant of Post-Doc. program, Jeonbuk National University (1999).

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Ornithostrongylus cristatus sp. n. (Nematoda, Trichostrongylina, Molineoidea), parasite de *Columbigallina talpacoti* (Temm., 1811) (Aves, Columbidae) au Paraguay

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***Ornithostrongylus cristatus* sp. n. (Nematoda, Trichostrongylina, Molineoidea), a parasite of *Columbigallina talpacoti* (Temm., 1811) (Aves, Columbidae) from Paraguay. -** The new species is closely related to *O. travassosi* described by Maplestone in 1932 from *Chalcophas indica* from India, to *O. minutus* and to *O. iheringi*, described by Travassos in 1941, from Brazil (Esto do Grosso), all three from Columbidae. *O. travassosi* is differentiated by rays 3 very far from rays 4, by rays 9 and 10 merged together and by the different shape of the gubernaculum. *O. minutus* is distinguished by the absence of cuticular ala and by the absence of a common trunk between rays 5 and 6 (caudal pattern of type 2-2-1). *O. iheringi* differs by the length of the females, twice longer, and different shape of the gubernaculum. In addition, *O. cristatus* sp. n. is characterized by the presence of small crests on the interno-dorsal branches of the spicules.
In one *Columbigallina*, *Ornithostrongylus cristatus* was present with four females belonging to the Pudicinae, more particularly to the genera *Heligmostrongylus* or *Fuellebornema*. A more precise identification is impossible without the examination of males. The Pudicinae are parasites of Caviomorpha and cricetid rodents and Neotropical sciurids. The occurrence of Pudicinae in a bird is discussed.

Key-words: Nematoda - Heligmosomoidea - Ornithostrongylidae - Ornithostrongylinae - *Ornithostrongylus* - Columbiform birds - Paraguay.

INTRODUCTION

Les Trichostrongylina, parasites d'Oiseaux sont relativement rares. Ils appartiennent aux Trichostrongyloidea avec la sous-famille des Amidostominae (Trichostrongylidae), représentée par trois genres parasites d'Oiseaux aquatiques dans le Monde entier et aux Heligmosomoidea avec la sous-famille des Ornithostrongylinae

Manuscrit accepté le 22.12.2000

(Ornithostrongylidae) représentée par 5 genres parasites de Columbiformes principalement néotropicaux mais également de l'Ancien Monde. Lors des missions du Muséum de Genève au Paraguay de 1979 à 1986, des Trichostrongles ont été récoltés chez des Columbiformes et des Tinamous. L'objet de cette note est la description d'une nouvelle espèce du genre *Ornithostrongylus* Travassos, 1914, parasite de *Columbigallina talpacoti*.

MATÉRIEL ET MÉTHODES

Les Nématodes ont été fixés au formol à 4% et conservés dans de l'alcool à 70°. Ils sont déposés dans les collections du Muséum de Genève (INVE) et dans celles du Muséum national d'Histoire naturelle de Paris (KP). Les données complètes concernant les mesures des spécimens sont déposées dans la bibliothèque du Laboratoire de Biologie Parasitaire du Muséum de Paris sous le n° 883 KP, N 18 055. La nomenclature suprafamiliale des Strongylida est celle de Durette-Desset et Chabaud (1993). Le synlophe est étudié selon la méthode de Durette-Desset (1985). La nomenclature utilisée pour la description du synlophe est celle de Durette-Desset et Vaucher (1999), pour la description de la bourse caudale celle de Durette-Desset et Chabaud (1981).

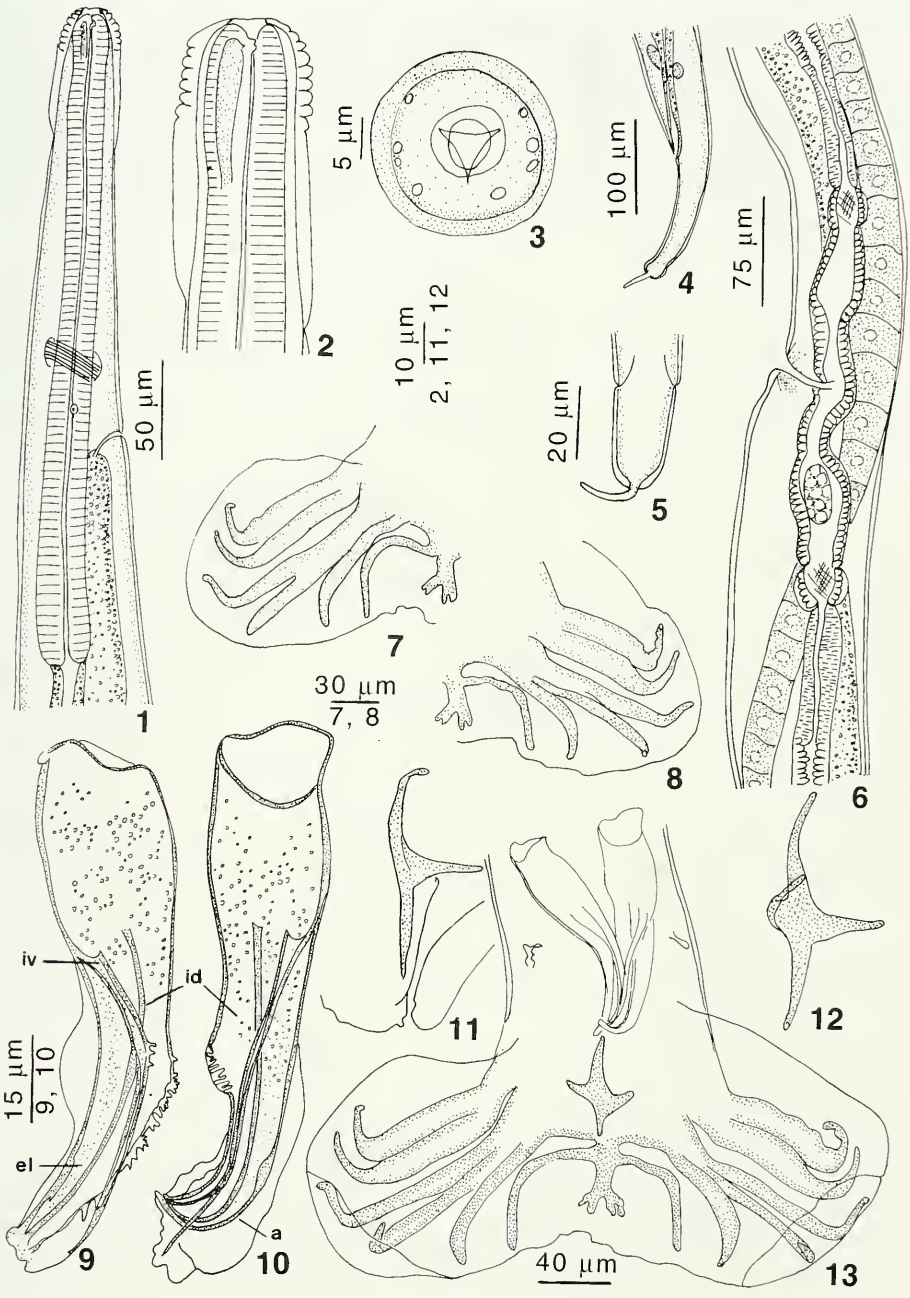
Ornithostrongylus cristatus sp. n.

Matériel-type
Chez *Columbigallina talpacoti* (Temm., 1811) (intestin grêle): Paraguay, prov. Itapua, San Benito, mâle holotype (29423 INVE), femelle allotype (29424 INVE), 1 mâle, 1 morceau antérieur, 1 morceau postérieur femelle paratypes (29425 INVE), 30/10/1982.

Autre matériel
Chez *Columbigallina talpacoti*: prov. Amambay, Apa-Mi, 3 mâles (29426 INVE), coparasites d'une femelle d'*Ornithostrongylus* sp. (29433 INVE) et de 4 femelles Pudicinae (29428 INVE), 13/10/1979; prov. Paraguari, Cerrito, 4 femelles (29427 INVE), 12/10/1982; prov. Misiones, Panchito-Lopez, 1 femelle (882 KP), 22/10/1982; prov. Itapua, San-Benito, 1 morceau postérieur femelle (29429 INVE), 30/10/1982; prov. Cordillera, Tobati, 1 mâle (29430 INVE), 21/03/1985; prov. Boqueron, estancia Pratts Gill, 1 mâle (29431 INVE), 11/10/1986; 1 mâle (29432 INVE), 11/10/1986; prov. Alto Parana, Acaray, 1 mâle, 1 femelle (881 KP), 31/10/1986; plusieurs spécimens fixés dans la muqueuse intestinale, débitée en coupes sériées (29434 INVE), 31/10/1986.

Figs 1-13

Ornithostrongylus cristatus sp. n. 1 - mâle, partie antérieure, vue latérale droite; 2 - mâle, tête, vue latérale droite; 3 - femelle, tête, vue apicale; 4 - femelle, queue, vue latérale gauche; 5 - femelle, pointe caudale, vue ventrale; 6 - femelle, ovéjecteur, vue latérale gauche; 7 - mâle, lobe droit de la bourse caudale étalé, vue ventrale; 8 - mâle, lobe gauche de la bourse caudale étalé, vue ventrale; 9 - 10: mâle, spicules disséqués, vue ventrale: 9 - spicule droit; 10 - spicule gauche; 11-12 – mâle, gubernaculum: 11 - vue latérale droite; 12 - vue ventrale; 13 - mâle, bourse caudale, vue ventrale.
Abréviations: a: aile; el: branche externo-latérale; id: branche interno-dorsale; iv: branche interno-ventrale.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2
5 µm
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100 µm
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DESCRIPTION

Petits Nématodes recourbés de façon irrégulière le long de leur ligne ventrale ou dorsale, ce qui leur donne une allure sinusoidale, ou complètement déroulés à l'exception de leur partie antérieure. Dans les deux cas, nous observons sur coupes histologiques que la partie antérieure du ver est recourbée le long de sa ligne ventrale et qu'elle assure l'accrochage grâce à un parcours sinueux entre les villosités intestinales (fig. 41). Deirides situées en avant du pore excréteur. Glandes excrétrices bien développées, visibles environ sur un cinquième à un quart de la longueur du corps.

Tête: Présence d'une vésicule céphalique et d'une petite dent oesophagienne dorsale (fig. 2). En vue apicale, bouche arrondie, entourée d'un anneau buccal; 6 papilles labiales externes et 2 amphides. Les papilles céphaliques n'ont pas été observées (fig. 3).

Synlophe: Etudié en coupe transversale du corps chez un mâle et une femelle. Dans les deux sexes, le corps est parcouru par des crêtes cuticulaires longitudinales continues dont le nombre et la disposition varient tout le long du corps (figs 14 à 26 pour la femelle, 27 à 36 pour le mâle). Deux ailes latérales triangulaires sont présentes dans les deux sexes. Elles débutent à environ 100 µm en arrière de la vésicule céphalique (fig. 14) et s'étendent sur le tiers antérieur de la longueur du corps. Chez le mâle, l'aile droite disparaît environ 500 µm plus postérieurement (figs 32, 33) que chez la femelle (fig. 21). Après la disparition des ailes, on n'observe plus de crêtes en face des champs latéraux (figs 21-24, 33-36). Les ailes atteignent leur largeur maximale au niveau du début de l'intestin (17 µm pour les deux ailes chez le mâle, fig. 27; 12 µm pour l'aile gauche, 7 µm pour l'aile droite chez la femelle, fig. 19). Elles sont orientées vers le dos. Chez la femelle, elles ne sont pas situées en face des champs latéraux mais légèrement décalées vers le ventre pour l'aile gauche et vers le dos pour l'aile droite. Au niveau vulvaire, il existe une petite aile, de forme rectangulaire, longue de 150 µm, haute de 6 sur 13 µm de large, située en face du champ latéral droit et orientée perpendiculairement à la paroi du corps (fig. 25).

Juste en arrière de la vésicule céphalique naissent quatre crêtes dorsales et quatre crêtes ventrales, soit le stade 4/4. Chez la femelle, à 100 µm en arrière de la vésicule céphalique, on obtient le stade 5/5 par l'apparition d'une crête dorsale et

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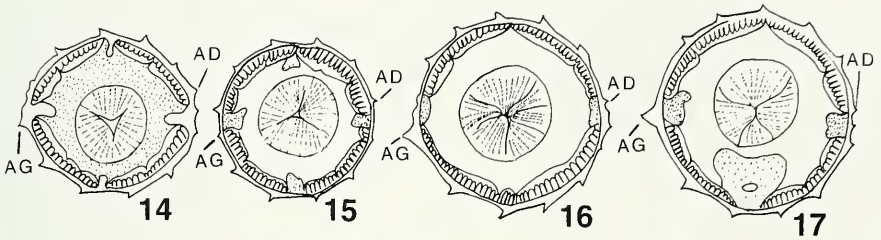
FIGS 14-24

Ornithostrongylus cristatus sp. n. Coupes transversales du corps d'une femelle longue de 8.5 mm: 14 - stade 4/4 en arrière de la vésicule céphalique, naissance des ailes; 15 - stade 5/5 à 100 µm en arrière de la vésicule céphalique; 16 - stade 4/5 à 120 µm en arrière de la vésicule céphalique; 17 - 18: stades 5/5: 17 - au niveau du pore excréteur; 18 - à 300 µm en arrière de la vésicule céphalique; 19 - stade 4/6, au niveau de la jonction oesophago-intestinale; 20 - stade 5/6 à 800 µm en arrière de la vésicule céphalique; 21 - stade 5/5 à 2.680 µm en arrière de la vésicule céphalique, fin des ailes; 22 - stade 4/4 à 1000 µm en avant de la vulve, au niveau de la partie proximale de la branche utérine antérieure; 23 - stade 4/3 à 830 µm en avant de la vulve; 24 - stade 4/3 à la limite vestibule, sphincter antérieur.
Abréviations: AD: aile droite; AG: aile gauche; g: gauche; v: ventre.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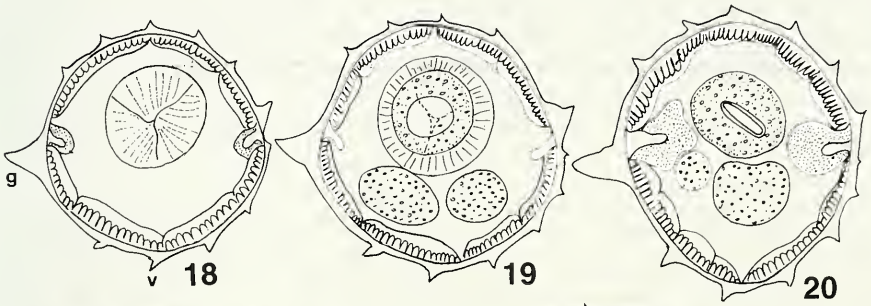
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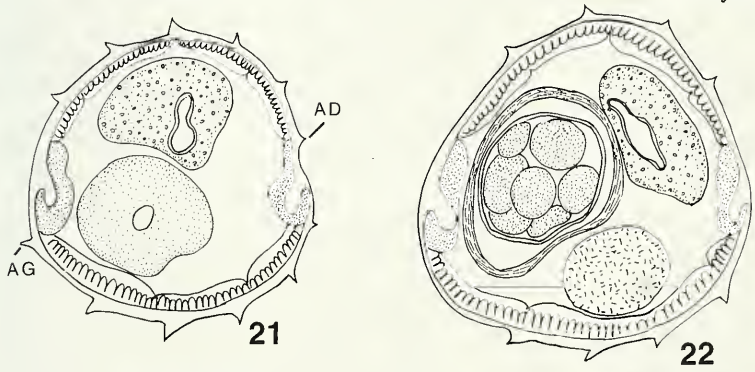
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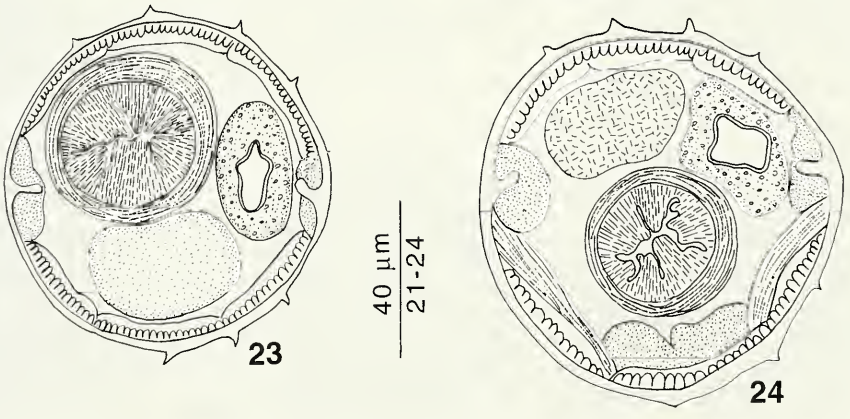
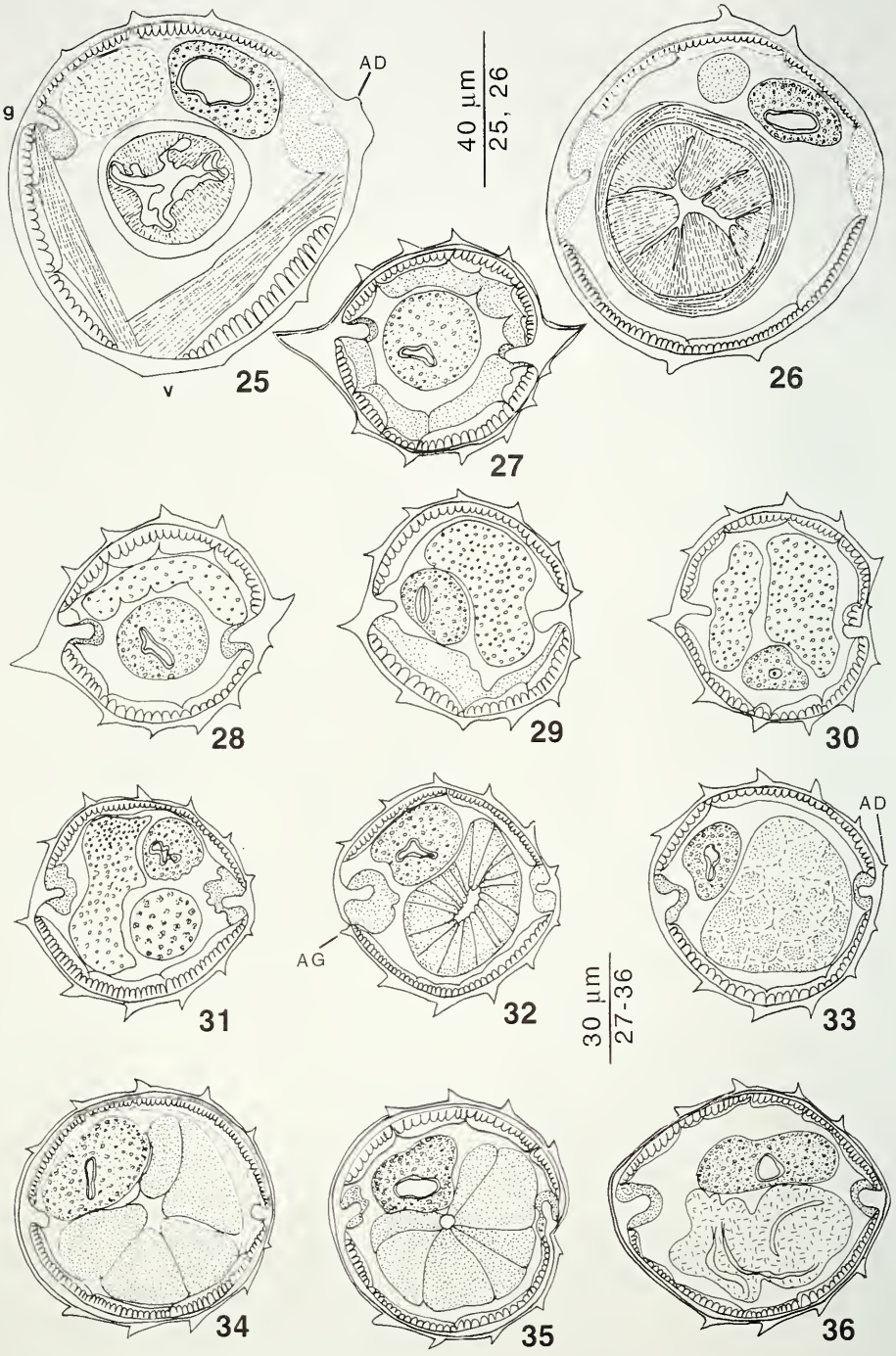

23
40 µm
21-24
24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27-36
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35
36

d'une crête ventrale sur le côté droit (fig. 15). Dans la région oesophagienne, ce chiffre de base varie selon le niveau de la coupe et oscille entre 5/5, 5/4, 4/5 et 4/6 (figs 15-19).

Chez la femelle, le stade 5/5 reste constant jusqu'à environ 3,8 mm en arrière de la vésicule céphalique, soit un peu moins que la moitié du corps. A ce niveau, la crête dorsale proche du champ latéral droit et la crête ventrale proche du champ latéral gauche disparaissent. On obtient le stade 4/4 (fig. 22) qui passe au stade 4/3 au niveau proximal de l'ovéjecteur (figs 23, 24), le stade 3/2 en avant de la vulve (fig. 25) puis le stade 2/2 en arrière de la vulve jusqu'à l'anus (fig. 26).

Chez le mâle, le stade 5/5 n'est atteint qu'au début de l'intestin (fig. 29) et persiste sur la première moitié du corps (fig. 34). Juste en arrière du milieu du corps (2,6 mm), la crête dorsale, proche du champ latéral gauche, disparaît (fig. 35) et on obtient le stade 4/5. Environ 150 µm plus postérieurement, la crête ventrale proche du champ latéral droit disparaît ce qui donne le stade 4/4 (fig. 36). Les huit crêtes disparaissent en avant de la bourse caudale.

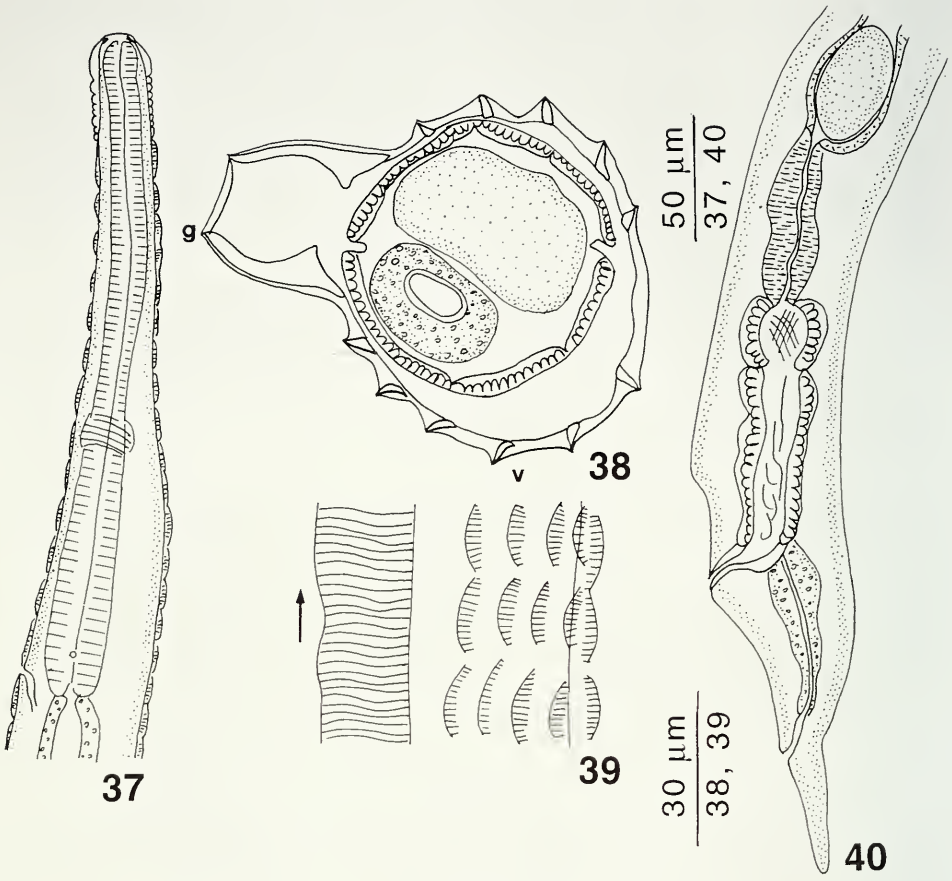
Les crêtes sont orientées de la droite vers la gauche selon un axe subfrontal. Elles sont de taille sub-égale, sauf chez la femelle dans la partie médiane du corps, où les crêtes ventrales sont légèrement plus développées que les dorsales (figs 14-36).

Mâle holotype: long de 5,5 mm et large de 60 µm dans sa partie moyenne. Vésicule céphalique haute de 70 µm sur 30 µm dans sa partie médiane. Anneau nerveux, pore excréteur et deirides situés respectivement à 155 µm, 205 µm et 185 µm de l'apex. Oesophage long de 320 µm, soit 5,8 % de la longueur totale du corps (fig. 1).

Bourse caudale de type 2-3 à tendance 2-2-1: les côtes 2 et 3 d'une part, les côtes 4, 5 et 6 d'autre part possèdent un tronc commun, mais les extrémités des côtes 6 sont très éloignées de celles des côtes 5 (figs 7, 8, 13). Lobes latéraux très développés et lobe dorsal réduit. Papilles prébursales bien développées. Côtes 2, 3 et 4 suivant un trajet parallèle et recourbées à leur extrémité. Côtes 2 et 3 de longueur équivalente. Côtes 4 plus longues que les autres côtes. Côtes 6 rectilignes. Côtes 8 naissant presque à la racine de la côte dorsale, perpendiculairement à celle-ci et dessinant un arc de cercle qui n'atteint pas le bord de la bourse. Côte dorsale réduite, divisée aux deux tiers de sa hauteur en deux branches. Chaque branche se subdivise en deux rameaux de longueur équivalente, l'un externe (côte 9), l'autre interne (côte 10). Phasmides non individualisées.

FIGS 25-36

Ornithostrongylus cristatus sp. n. 25, 26: coupes transversales du corps d'une femelle longue de 8.5 mm: 25 - stade 3/2, présence de l'aile vulvaire, juste en avant de la vulve; 26 - stade 2/2 au niveau de la trompe postérieure; 27-36: coupes transversales du corps d'un mâle long de 4.9 mm: 27 - stade 4/6, au début de l'intestin; 28 - stade 4/6 à 4 mm en arrière de la vésicule céphalique; 29 - 31: stades 5/5, montrant la diminution de la taille des ailes: 29 - à 650 en arrière de la vésicule céphalique; 30 - idem, à 700 µm; 31 - idem, à 900 µm; 32 - stade 5/5 au tiers antérieur du corps (1.65 mm), fin de l'aile gauche; 33 - stade 5/5 à 2.1 mm en arrière de la vésicule céphalique, fin de l'aile droite; 34 - stade 5/5 au milieu du corps (2.5 mm); 35 - stade 4/5 à 2.7 mm en arrière de la vésicule céphalique; 36 - stade 4/4 à 1.9 mm en avant de la bourse caudale. Abréviations: AD: aile droite; AG: aile gauche; g: gauche; v: ventre.



FIGS 37-40

Heligmonellidae, femelles d'*Heligmostrongylus* Travassos, 1917 ou de *Fuellebornema* Travassos et Darriba, 1929 (Heligmonellidae-Pudicinae); 37 - extrémité antérieure, vue latérale gauche; 38 - coupe transversale au milieu du corps; 39 - détail des crêtes cuticulaires interrompues, non alternées; 40 - extrémité postérieure, vue latérale gauche.
Abvéviations: g: gauche; v: ventre.

Spicules sub-égaux, longs de 105 µm (figs 9, 10). Manche de forme rectangulaire, légèrement plus court que la lame et portant des macules à sa surface. Lame divisée en trois branches: une branche externo-latérale, une branche interno-ventrale, une branche interno-dorsale. La branche externo-latérale, épaisse et l'interno-ventrale, fine, se détachent de la lame au même niveau et sont recourbées à leur extrémité distale vers la droite pour le spicule gauche et vers la gauche pour le spicule droit, soit vers le côté interne du corps (visible en vue médiane). La branche interno-dorsale naît beaucoup plus distalement et son bord interne porte des indentations uniquement dans

FIG. 41

Ornithostrongylus cristatus sp. n. Deux coupes voisines d'un individu en place entre les villosités intestinales, montrant que l'accrochage est réalisé grâce à un parcours sinueux de la partie antérieure du ver.

la partie proximale pour le spicule gauche et sur les trois quart de sa longueur pour le spicule droit. Les pointes des spicules sont enfermées dans une membrane et il existe une aile externo-latérale (figs 9, 10). Gubernaculum cruciforme, haut de 45 µm sur 30 µm de large. Les branches latérales sont dirigées vers l'avant (figs 11, 12). Rapport longueur des spicules sur longueur du corps: 2,35 %. Cône génital absent.

Mensurations du mâle paratype: longueur du corps: 5,1 mm sur 60 µm de large; anneau nerveux, pore excréteur et deirides respectivement à 165 µm, 200 µm et 185 µm de l'apex; longueur de l'oesophage: 325 µm; rapport longueur de l'oesophage sur longueur du corps: 6,4 %; longueur des spicules: 120 µm; rapport longueur des spicules sur longueur du corps: 2,35 %.

Moyennes, minima et maxima des principales mensurations des 8 autres mâles: longueur du corps 5,1 (4,1-6,8) mm; longueur de l'oesophage 314 (270-350) µm; rapport de la longueur de l'oesophage sur la longueur du corps 6,1 (5,1-6,5) %;

longueur des spicules 112 (105-120) µm; rapport de la longueur des spicules sur la longueur du corps 2,2 (1,8-2,8) %.

Femelle allotype: longue de 8,8 mm et large de 90 µm dans sa partie moyenne. Vésicule céphalique haute de 75 µm sur 32 µm dans sa partie médiane. Anneau nerveux, pore excréteur et deirides situés respectivement à 185 µm, 225 µm et 210 µm de l'apex. Oesophage long de 390 µm, soit 4,4 % de la longueur totale du corps.

Didelphie. Vulve située à 2,15 mm de la pointe caudale, soit au début du quart postérieur du corps (24,4 %). *Vagina vera* long de 55 µm, divisant le vestibule en deux parties de longueur équivalente, la partie antérieure étant légèrement plus longue que la postérieure. Branche génitale antérieure: vestibule, 150 µm; sphincter, 28 x 35 µm; trompe, 110 µm, branche utérine, 2,1 mm contenant 45 œufs. Branche génitale postérieure: vestibule, 130 µm; sphincter, 25 x 40 µm; trompe, 105 µm, branche utérine, 1,35 mm contenant 30 œufs (fig. 6). Les œufs au stade *morula* sont hauts de 50 µm sur 40 µm de large. Queue longue de 130 µm et portant une pointe caudale de 20 µm (figs 4, 5).

Moyennes, minima et maxima des principales mensurations des 6 autres femelles: longueur du corps 8,9 (6,7-11,5) mm; longueur de l'œsophage 370 (350-415); rapport de la longueur de l'œsophage sur la longueur du corps 4,2 (3,6-5,5); position de la vulve par rapport à la queue 2,2 (2,0-2,7) mm; rapport de la position de la vulve par rapport à la longueur du corps 25,6 (23,4-34) %; longueur du vestibule 290 (230-345) µm; longueur des trompes, antérieure 103 (80-115), postérieure 108 (95-135); longueur de la branche utérine antérieure 1300 (1000-1700) µm avec 27 (8-48 œufs); longueur de la branche utérine postérieure 1500 (950-1800) µm avec 16 (2-37) œufs; œufs hauts de 56 (50-65) sur 30 (25-38), queue longue de 147 (135-160) µm.

DISCUSSION

Les spécimens ci-dessus possèdent les principales caractéristiques du genre *Ornithostrongylus* Travassos, 1914 (Heligmosomoidea, Ornithostrongylidae), parasite cosmopolite d'Oiseaux et surtout de Colombiformes. Ce genre possède un synlophe avec un axe d'orientation sub-frontal, dirigé de la droite vers la gauche; la bourse caudale est de type 2-2-1 et la femelle est didelphe. Trois espèces présentent, comme les spécimens du Paraguay, un ensemble de caractères liés: une bourse caudale avec une côte dorsale courte et épaisse et des côtes 8 plus longues que la côte dorsale, des spicules courts avec un manche très large et une lame trifide de même longueur ou un peu plus longue que la lame. Il s'agit d'*O. travassosi* Maplestone, 1932, parasite de *Chalcophaps indica* (L.) en Indes, retrouvée par Schmidt et Kuntz, 1972 en Océanie, d'*O. minutus* Travassos, 1941, parasite de *Claravis pretiosa* (Ferrari-Pérez) au Brésil (Estado do Mato Grosso) et d'*O. iheringi* Travassos, 1941, parasite de *Columbigallina talpacoti* (Temm.), *Scardafella squamata* (Less.) et *Columbina picui* (Temm.) au Brésil (Estado do Mato Grosso). *O. travassosi* se différencie de nos spécimens par des côtes 3 très éloignées des côtes 4, par des côtes 9 et 10 confondues, et par la forme triangulaire et non cruciforme du gubernaculum. *O. minutus* se rapproche des spécimens du Paraguay par une longueur du corps équivalente et par la forme

identique du gubernaculum mais elle s'en différencie par l'absence d'ailes cuticulaires et par la naissance des côtes 6 indépendamment de celle des 5. *O. iheringi* possède comme les spécimens du Paraguay des ailes cuticulaires et des côtes 6 jointes aux côtes 5 dans leur partie proximale mais elle s'en différencie par des femelles deux fois plus grandes et par la forme allongée du gubernaculum avec des branches latérales très courtes, recourbées ventralement et dirigées perpendiculairement à l'axe du corps. De plus, les spécimens paraguayens se différencient de ces deux espèces par la présence d'indentations sur les branches interno-dorsales des spicules. Nous séparons les spécimens du Paraguay dans une nouvelle espèce, *Ornithostrongylus cristatus* sp. n., dont le nom spécifique fait référence aux indentations des spicules.

Prévalence et distribution

Dix hôtes sont parasités sur les 18 examinés. La nouvelle espèce a été rencontrée dans plusieurs localités réparties dans les différentes régions du pays.

Heligmonellidae: *Heligmostrongylus* Travassos, 1917
ou *Fuellebornema* Travassos et Darriba, 1929.

Un des *Columbigallina* était également parasité par 4 femelles présentant les principales caractéristiques des Heligmonellidae (Heligmosomoidea) et plus particulièrement des Pudicinae avec un synlophe sans symétrie bilatérale, pourvu d'une carène et de crêtes cuticulaires interrompues et non alternées. Le synlophe est formé de 5 crêtes dorsales et 6 crêtes ventrales, ce qui est caractéristique des genres *Heligmostrongylus* et *Fuellebornema*. L'absence de mâle ne nous permet pas une identification plus précise. Nous donnons ci-après une description de ces femelles (figs 37-40).

Petits Nématodes recourbés le long de leur ligne ventrale. Pore excréteur et deirides de position variable, situés entre l'anneau nerveux et la fin de l'œsophage, les deirides occupant toujours une position antérieure. Synlophe formé d'une carène et de crêtes cuticulaires longitudinales, interrompues environ tous les 15 µm dans la partie moyenne du corps et non alternées (figs 38, 39). Elles débutent en arrière de la vésicule céphalique et s'étendent jusqu'à la queue. En coupe transversale au milieu du corps on trouve 5 crêtes dorsales et 6 crêtes ventrales orientées de la droite vers la gauche selon un axe sub-frontal. Les crêtes ventrales sont de taille équivalente, les crêtes dorsales présentent un double gradient décroissant du dos vers les faces latérales. Le quart ventral-droit du corps est dépourvu de crêtes. Moyennes, minima et maxima des principales mensurations des 3 femelles entières: corps long de 5,2 (5,1-5,3) mm sur 72 (70-75) µm dans sa partie moyenne, carène non comprise. Carène haute de 25 µm. Vésicule céphalique haute de 46,7 (42-50) x 23 (22-25) µm. Anneau nerveux et pore excréteur situés respectivement à 155 (140-175) µm, 288 (260-315) µm de l'apex. Deirides de position variable, situées entre l'anneau nerveux et le pore excréteur. Oesophage long de 296 (270-320) µm. Monodelphie. Vulve située à 147 (125-160) µm de l'extrémité caudale. Ovéjecteur avec vestibule long de 78 (75-80) µm, sphincter 26 (23-30) x 30 (30-30) µm et trompe 75 (70-80) µm. Utérus long de 1250 (955-1500) µm, contenant de 6 à 25 œufs au stade *morula*, hauts de 53 (50-55) x 30 (25-38) µm. Queue arrondie, longue de 58 (50-65) µm.

La présence de ces femelles chez un Oiseau est tout à fait inattendue, les Pudicinae étant exclusivement parasites de Rongeurs Caviomorphes et Cricetidae et de Sciuridae néotropicaux. Si le phénomène de capture qui permet au parasite de passer d'un groupe d'hôtes à un autre a été le mécanisme princeps de l'évolution des Trichostrongles (Durette-Desset, 1985), il peut également rester un phénomène accidentel comme c'est le cas ici. Nous en connaissons d'autres exemples comme la présence d'une espèce de *Molineus* Cameron, 1923 chez un Crotale (Durette-Desset *et al.*, 2000) alors que ce genre est parasite de Carnivores dans le monde entier et de Primates néotropicaux.

Chez les Trichostrongles, le cycle étant direct et la pénétration ayant lieu par voie cutanée ou buccale, l'Oiseau a pu facilement se contaminer au contact de fèces de Mammifères. A notre avis, il s'agit d'un parasite transfuge (Chabaud, 1965). L'impossibilité de déterminer les spécimens jusqu'au niveau spécifique ne nous permet pas de préciser quel peut être l'hôte d'origine.

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A new tapeworm from the Amazon, *Amazotaenia yvettae* gen. n., sp. n., (Eucestoda: Proteocephalidea) from the siluriform fishes *Brachyplatystoma filamentosum* and *B. vaillanti* (Pimelodidae)

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A new tapeworm from the Amazon, *Amazotaenia yvettae* gen. n., sp. n., (Eucestoda: Proteocephalidea) from the siluriform fishes *Brachyplatystoma filamentosum* and *B. vaillanti* (Pimelodidae). - *Amazotaenia yvettae* gen. n. and sp. n. (Proteocephalidea, Monticelliidae, Peltidocotylinae) is described from the intestine of the black-backed filhote, *Brachyplatystoma filamentosum* and from the piramutaba, *B. vaillanti* (Siluriformes: Pimelodidae) from Itacoatiara, Amazonia State, Brazil. The new genus differs from all other members of Peltidocotylinae in the morphology of the scolex, position of the vitelline follicles grouped in two elongated patches in the equatorial part of the proglottis, a smaller size of the strobila (less than 3 mm), smaller number of proglottides and smaller number of testes.

The equatorial position of vitelline follicles, their shape in two elongated patches, the uterine development in *Amazotaenia yvettae* as well as the unusual behaviour of attachment in which individuals are grouped in compact clumps are peculiar within the Proteocephalidea. A key to the genera of the subfamily Peltidocotylinae is proposed.

The sampling and processing methodology is also described in detail.

Key-words: Eucestoda - Proteocephalidea - *Amazotaenia yvettae* gen. n., sp. n. - *Brachyplatystoma* spp. - Brazil - Techniques.

INTRODUCTION

Proteocephalidean tapeworms are among the most common platyhelminth parasites of freshwater fishes in neotropical area. Most proteocephalid species parasitize siluriform fishes, particularly Pimelodidae (de Chambrier & Vaucher, 1999). As part of a study on the Proteocephalidea in South America, some minute tapeworms were collected from the pimelodid catfish *Brachyplatystoma filamentosum*. These new minute specimens display a series of peculiar and distinctive characters that

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distinguish them from all known species and that justify the erection of a new genus. The new species is described below.

In this paper, I also give a detailed account of the preparation methods developed by Vaucher and myself since 1971 (Vaucher, 1971; de Chambrier, 1987, 1990; de Chambrier & Vaucher, 1994, 1999) and progressively adopted by other authors working on the protecephalidean cestodes (Takemoto & Pavanelli, 1996; Scholz *et al.*, 1997, Scholz & Hanzelova, 1998; Rego *et al.*, 1999).

MATERIALS AND METHODS

Sample collection

A total of 29 *Brachyplatystoma filamentosum* and 4 *B. vaillanti* were collected from the Amazon River near Itacoatiara, State of Amazonas, Brazil. The hosts were dissected and examined for parasites immediately after death. The digestive tract was dissected along its entire length and searched for cestodes under a field stereomicroscope. A few cestodes were removed immediately from the intestine, gently washed into petri dishes with distilled water, then placed into 80% alcohol or in liquid nitrogen for subsequent izoenzyme and DNA analysis. Small pieces of each of the latter specimens were isolated as vouchers for identification. Both remaining whole cestodes and voucher specimens were placed separately into vials containing a small quantity of distilled water. After 1 minute, a hot (almost boiling) 4% v/v neutral formaldehyde solution was poured directly onto the worms. In order to collect also the remaining specimens (left *in situ*), the dissected digestive tract was placed into a vial (minimum 10 times the volume of tissues) with a small amount of water. After one minute, a hot (almost boiling) 4% v/v neutral formaldehyde solution was poured directly onto the digestive tract. The worms were subsequently stored (after a minimum of 1 week) in 75% (v/v) ethanol.

Preparation of specimens

Worms were either stained in Mayer's hydrochloric carmine solution or in Weigert's Haematoxyline solution. Mayer's hydrochloric carmine as follows: 5 g Carmine Certistain (Merck) in 10 ml of a 18% HCl solution (left in contact for 1 hour) to which 200 ml of a 95% ethanol solution and a small piece of iron were added; the solution was then left to simmer for two hours and filtered when the solution was cold (modified from Langeron, 1949).

Staining with Carmine: worms were placed in Carmine for 15 minutes, rinsed with 75% ethanol, differentiated with acid 75% ethanol (HCl 0.5% in ethanol) until no carmine diffused from the worms (between 20 min and two hours), dehydrated in ethanol series (80, 95, twice 100% respectively - at least 30 minutes in each). Coiled specimens were placed carefully on a piece of Bristol board (about 25mm x 45mm) and soaked with 95% ethanol. On this surface, the worm was carefully spread, avoiding twisting, and then covered with a glass slide the same size. Bristol and glass slides will stick with one another. Specimens were placed in petri dishes with 95%,

then 100% ethanol for 30 min each. In the latter solution, the glass slide was removed carefully and the specimen was left for further 10 min. Then worms were cleared in increasing concentrations of Eugenol (clove oil) diluted in absolute ethanol (50, 75, 90 and twice 100%, at least 15 min each) and mounted as permanent preparations in Canada balsam (Fluka) (Vaucher, 1971; de Chambrier, 1987).

Staining with haematoxyline was done as follows: 5 ml 1% Haematoxyline (Fluka) in ethanol 95%, to which 5 ml of 1.2% FeCl3 filtered solution in distilled water and 5 drops of 18% HCl were added (modified from Langeron, 1949). The worms were placed in distilled water for 5 minutes then in the staining solution for 15 minutes, destained with acid 75% ethanol, placed in tap water until a blue colour appeared (about 10 min) and then dehydrated in an ethanol series as described above for the Carmine staining.

For histological sections, pieces of strobila were embedded in paraffin wax, sectioned transversely or frontally at 13-19 µm, and after dissolution of paraffin in toluol and hydration with an ethanol series (respectively 100, 95, 75% and distilled water, 2 min each), stained in Weigert haematoxylin (10 min.), destained briefly with acid 75% ethanol, then placed in tap water until a blue colour appeared, counterstained with 1% eosin B (Sigma) (2 min), immersed in increasing concentrations of ethanol for 2 min. each and finally in toluol before mounting in Canada balsam. Scoleces for scanning electron microscopy (SEM) were processed by following procedures: worms are deshydrated in an ethanol series (80, 95, twice 100% respectively) then transferred in amyl acetate, dried by critical point method, sputtered with gold and examined in Zeiss 940A SEM (see also Scholz *et al.*, 1998).

Type material was deposited in the Helminthological Collection of the Instituto Oswaldo Cruz (CHIOC), at the Natural History Museum (MHNG), Geneva, Switzerland and at the Natural History Museum, London (BMNH).

Measurements are in micrometers (mm) unless otherwise stated. The following abbreviations are used in the description: x = mean; n = number of measurements; CV = coefficient of variation (%).

RESULTS

Amazotaenia gen. n.

Diagnosis: Proteocephalidea, Monticelliidae, Peltidocotylinae. Very small tapeworms (less than 3 mm), with acraspedote proglottides. Unarmed scolex with four uniloculate suckers. Testes cortical, in one continuous dorsal field. Ovary medullary, with projections into dorsal cortex. Uterus cortical, ventral, with lateral and dorsal outgrowths extending into dorsal cortex. Vitelline follicles ventral, in two elongated groups in equatorial part of proglottis, occupying less than half of proglottis length. Vagina always posterior to cirrus pouch, possessing vaginal sphincter. Genital pore near anterior proglottis margin. Parasites of neotropical siluriform fishes (Pimelodidae).

Type and only species: *Amazotaenia yvettae* sp. n.

Remarks

Amazotaenia gen. n. belongs to the subfamily Peltidocotylinae on the basis of the presence of a medullary ovary, cortical testes and vitellaria and cortical uterus with outgrowths penetrating the medulla and the dorsal cortex. Recent taxonomic works on this subfamily resulted into the erection of the genera *Jauella* Rego & Pavanelli, 1985 and *Mariauxiella* de Chambrier & Rego, 1995 (see Rego & Pavanelli, 1985; de Chambrier & Rego, 1995), the redefinition of *Peltidocotyle* Diesing, 1850 and the supression of *Othinoscolex* Woodland, 1933 and *Woodlandiella* Freze, 1965 as its synonyms (de Chambrier & Vaucher, 1999; Zehnder & de Chambrier, 2000). Therefore, only three genera belong to this subfamily at present, i.e., *Peltidocotyle* Diesing, 1850, *Jauella* Rego & Pavanelli, 1985 and *Mariauxiella* de Chambrier & Rego, 1995.

Amazotaenia differs from the three members of the Peltidocotylinae by the morphology of the scolex which is relatively small and without metascolex. In contrast, *Peltidocotyle* and *Jauella* are characterised by the presence of metascolex, and the species of the genus *Mariauxiella* have massive scoleces. The position of the ventral vitelline follicles of *Amazotaenia* is in two groups in the equatorial part of proglottis, compared to the lateral vitelline follicles in the other three genera. In addition, the new genus can be distinguished by the smaller size of the strobila (less than 3 mm), the smaller number of proglottides (up to 7) and smaller number of testes (maximum 32) (see the diagnoses of the other three genera in the following key).

On the basis of the present results and previous studies (Rego & Pavanelli, 1985; de Chambrier & Rego, 1995; de Chambrier & Vaucher, 1999; Zehnder & de Chambrier, 2000), the following key to the genera of the subfamily Peltidocotylinae is proposed:

1a. Metascolex present 2
1b. Metascolex absent 3

2a. Suckers biloculate . . . . . *Peltidocotyle* Diesing, 1850
Diagnosis: Proteocephalidea, Monticelliidae, Peltidocotylinae. Worm of medium size. Scolex with four biloculate suckers forming two separate cavities. Metascolex present. Ovary medullar. Uterus cortical, ventral, with diverticula occasionally protruding across longitudinal musculature into medulla. Testes in dorsal cortex. Vitelline follicles cortical, in two bands, dorsal and ventral. In South American siluroid fishes.
Type species: *Peltidocotyle rugosa* Diesing, 1850 in *Pseudoplatystoma corruscans*, *P. fasciatum*.
Other species: *Peltidocotyle lenha* (Woodland, 1933) in *Paulicea luetkeni*, *Sorubimichthys planiceps*.

2b. Suckers uniloculate . . . . . *Jauella* Rego & Pavanelli, 1985
Diagnosis: Monticelliidae, Peltidocotylinae. Worm of medium size, wide. Scolex small, retractile. Suckers uniloculate, small. Metascolex cone-shaped, with transverse circular folds. Ovary medullar. Uterus medullar, with nume-

rous outgrowths from the diverticles to the ventral and dorsal cortex. Testes in cortex, in one dorsal field and in one or two layers. Vitelline follicles cortical, lateral, in two dorsal and ventral bands. Parasite of Neotropical siluroid fishes.
Type and only species: *Jauella glandicephalus* Rego & Pavanelli, 1985 in *Paulicea luetkeni*.

3a. Vitelline follicles lateral. Suckers uniloculate, with powerful circular musculature . . . . . *Mariauxiella* de Chambrier & Rego, 1985
Diagnosis (modified from de Chambrier & Rego, 1995): Monticelliidae, Peltidocotylinae. Worm of medium size. Strobila acraspedote. Scolex without defined metascolex. Four uniloculate suckers with powerful circular musculature in its distal parts. Vitelline field cortical, crescentic in cross sections, sometime extending posteriorly behind the ovary. Testes cortical in continous dorsal field and in one or two layers. Ovary medullar, with two lateral lobes, each lobulate with projections into the dorsal cortex. Uterus in ventral cortex, with numerous outgrowths from the diverticles to the dorsal cortex. Parasite of Neotropical siluroid fishes.
Type species: *Mariauxiella pimelodi* de Chambrier & Rego, 1995 in *Pimelodus ornatus*.
Other species: *Mariauxiella piscatorum* de Chambrier & Vaucher, 1999 in *Hemisorubim platyrhynchos*.

3b. Vitelline follicles equatorial. Suckers uniloculate, simple . . . *Amazotaenia* gen. n.
Diagnosis: see above.

Amazotaenia yvettae sp. n. Figs 1- 18

Type host: Brachyplatystoma filamentosum (Lichtenstein, 1819), common name: filhote da capa preta [black backed filhote].

Other host: Brachyplatystoma vaillanti Cuvier & Valenciennes, 1840, common name: piramutaba.

Material studied: Brazil, State of Amazonas, Itacoatiara, Rio Amazonas, holotype CHIOC 34363, 6 paratypes MHNG, 29732-29737 INVE and 2 paratypes BMNH 2000.9.4.1., all collected on 13.10.1995 by the author. Other material: MHNG, 29738-29741, 29743 INVE, 13.10.1995; 29742 INVE (*B. vaillanti*), 02.10.1995, collected by the author.

Prevalence: 1/29 = 3.4% for *B. filamentosum* and 1/4 = 25% for *B. vaillanti*.

Intensity: 66 - more than 250 specimens.

Site of infection: first twelfth of intestine, immediately posterior to the stomach. Always concentrated in small clumps of 14 to 66 individuals.

Etymology: The generic name refers to the geographic region; the specific name in honour of Yvette, the wife of the author.

Description: Monticelliidae, Peltidocotylinae. Very small cestodes, 516-2900 long and 120-475 wide, flattened dorsoventrally, forming isolated compact groups of 14-66 (x = 32, n = 10) individuals, all situated in the first twelfth of intestine, immediately posterior to stomach (Fig. 18). Strobila acraspedote, apolytic, consisting of 4-7 (n = 29) proglottides: 2-3 immature (up to appearance of spermatozoa in vas

deferens), 1 mature (up to appearance of eggs in uterus), 1 pregravid (up to appearance of hooks in oncospheres) and 1-2 gravid segments. Immature proglottides much wider than long (110-375 x 60-210; length/width ratio 1 : 0.40-1.00); mature proglottides slightly wider than long (200-430 x 140-400; ratio 1 : 0.48-1.60); pregravid proglottides wider than long to elongate (220-440 x 310-700; ratio 1 : 0.77-2.19); gravid proglottides (attached and detached) longer than wide (260-490 x 450-770; ratio 1 : 1.12-2.31) (Figs 1, 13). Tegument thick, covered with small, round microtriches on sucker margins (Fig. 14) and covered with dense filiform microtriches on anterior margin of mature proglottis (Fig. 16).

Scolex aspinose, small, slightly flattened antero-posteriorly, 230-400 (x = 330, n = 29, CV = 14%) in diameter, much wider than neck (Figs 1, 15, 17). Scolex containing antero-lateral uniloculate suckers, 95-165 (x = 130, n = 116, CV = 12%) in diameter. Apical organ absent.

Internal longitudinal musculature weakly developed, in particular in pregavid and gravid proglottides (Figs 11, 12), represented by fine bundles of muscular fibres (Figs 8-12). Fibres more numerous in immature and mature proglottides (Figs 8-10). Osmoregulatory canals situated at level of vitelline follicles, overlapping testes; ventral canals much wider than dorsals; at posterior extremity of each proglottis, one short, narrow secondary canal directed laterally (Fig. 2), separated from outside just by thin cytoplasmic layer of tegument.

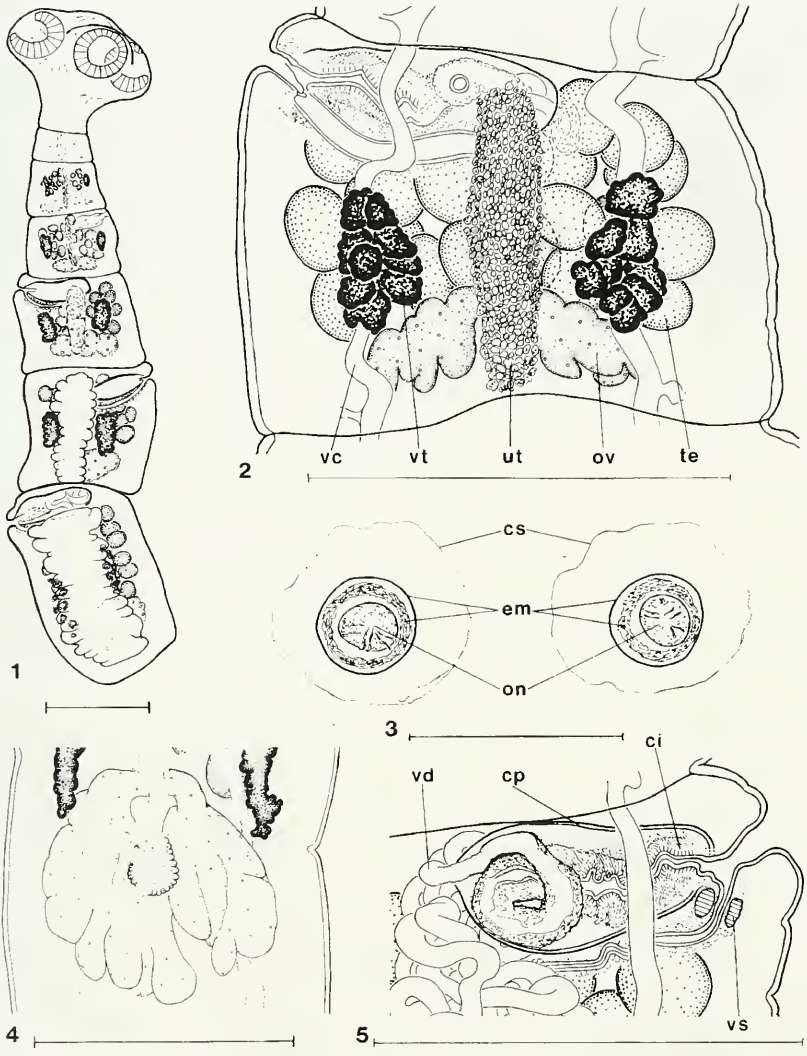
Testes cortical, numbering 19-32 (x = 25, n = 48, CV = 14%), spherical to oval, 45-70 (x = 55, n = 40, CV = 11%) in diameter representing 12-22% (x = 17%, n = 23) of proglottis width, medially forming 1-2 layers, with some testes in third incomplete layer (Figs 2, 6, 7). Testes overlapping dorsal osmoregulatory canals and vitelline follicles, degenerate in gravid proglottides. Cirrus-sac pyriform to elongate (Figs 2, 5), 110-225 (x = 160, n = 47, CV = 10%), basal portion extending beyond mid-line of proglottis, representing 42-64% (x = 52, n = 47, CV = 9%) of proglottis width. Internal vas deferens (sperm duct) forming few loops; ejaculatory duct thick-walled; unarmed cirrus occupying more than half the length of cirrus sac. External vas deferens (sperm duct) strongly coiled, situated in anterior central part of proglottis, occupying up to 45% of proglottis width and up to 48% of proglottis length. (Figs 6, 7).

Genital atrium present. Genital ducts passing between osmoregulatory canals. Genital pore irregularly alternating, situated anteriorly at 7 to 17% (x = 12%, n = 40; CV = 19%) of proglottis length.

Vagina always posterior (n = 76) to cirrus-sac, thin-walled, with higher concentration of chromophilic cells at proximal end (near genital pore). Circular vaginal sphincter present (Fig. 5).

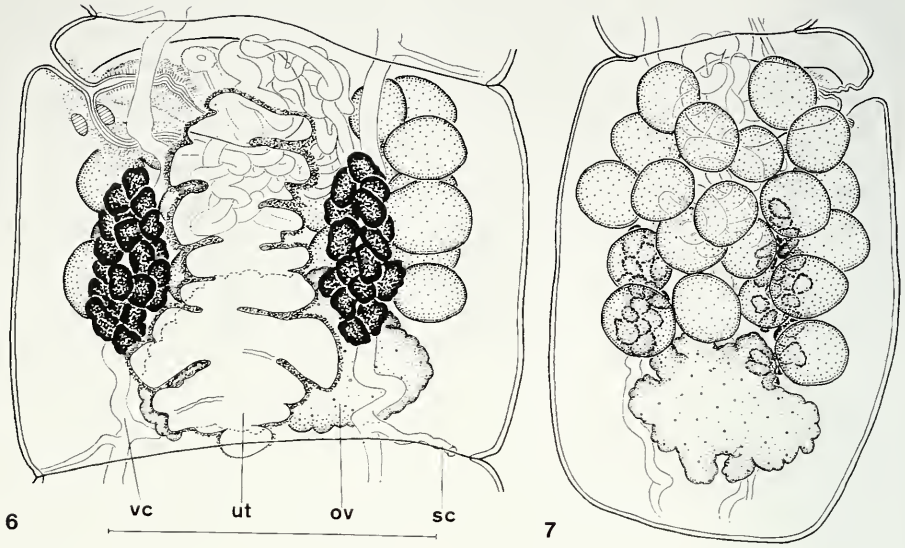
Ovary medullary, with dorsal outgrowth penetrating cortex, follicular, not clearly bilobed ventrally, occupying 42-71% (x = 57; N = 39; CV = 12%) of proglottis width (Figs 2, 4). Mehlis' glands 40-55 in diameter (Fig. 4).

Vitelline follicles cortical, tightly grouped together, arranged in two elongated groups in equatorial part of proglottis, representing porally 25-48% (x = 39, n = 37; CV = 14%) and aporally 23-54 % (x = 42, n = 36; CV = 17%) of proglottis length, respectively, overlapping testes (Figs 2, 6-8).



FIGS 1-5

Amazotaenia yvettae gen. n., sp. n. 1. Paratype 29733 INVE, entire worm, ventral view. 2. Holotype CHIOC 34363, premature segment, ventral view showing the disposition of vitelline follicles. 3. Eggs drawn in distilled water. 4. Holotype CHIOC 34363, detail of posterior part of a pregravid proglottis, ventral view, uterus is not figured. 5. Paratype 29734 INVE, cirrus-sac and vagina, ventral view, uterus is not figured. Abbreviations in all the figures: ci, cirrus; cp, cirrus pouch; cs, capsule; cv, vaginal canal; ; em, embryophore; lm, longitudinal internal musculature; on, oncosphere; ov, ovary; sc, secondary osmoregulatory canals; te, testes; ut, uterus; vc, ventral osmoregulatory canal; vd, vas deferens; vs, vaginal sphincter; vt, vitelline follicles. Scale bars: 1, 2, 4, 5 = 250 μm; 3 = 50 μm.



FIGS 6-7

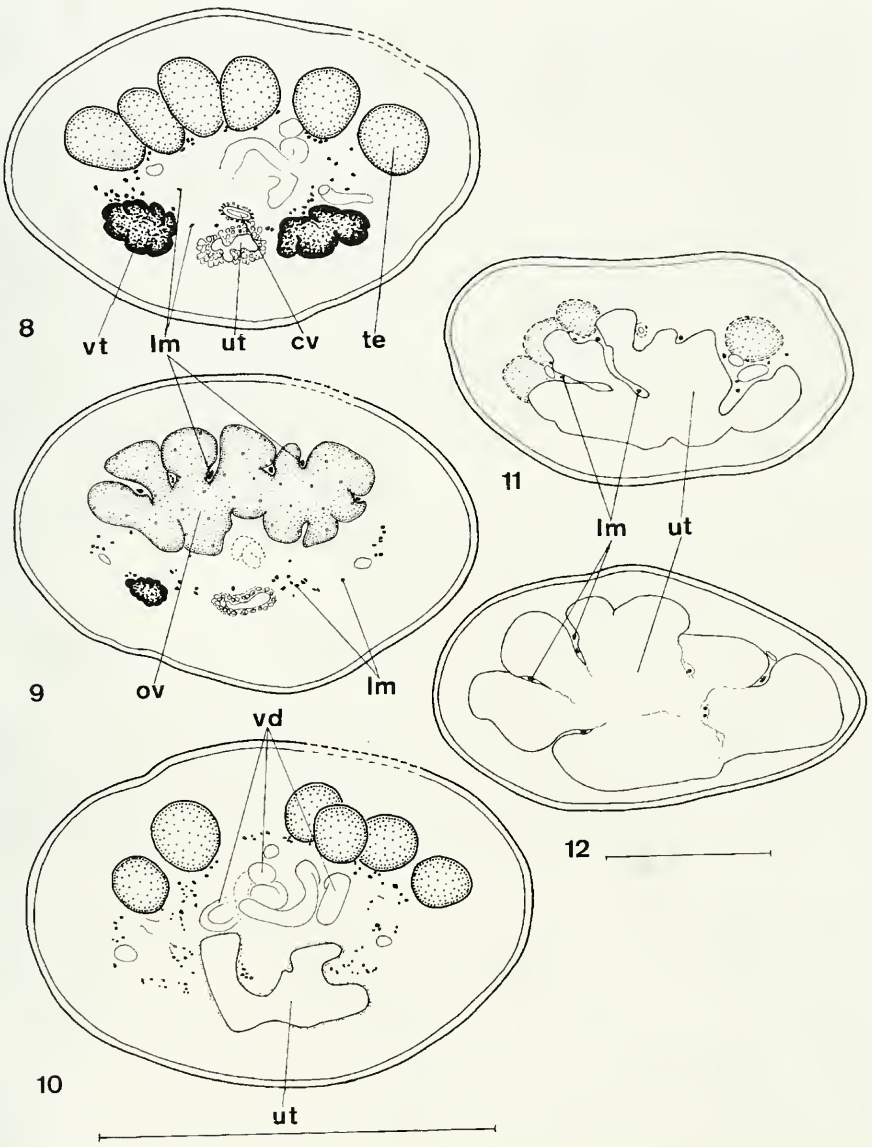
Amazotaenia yvettae gen. n., sp. n., pregravid proglottides. 6. Paratype 29732 INVE, ventral view. 7. 29742 INVE, dorsal view. Scale bar: 250 µm.

Primordium of uterine stem cortical, already present in immature proglottides. Formation of uterus: in immature proglottides, uterine stem straight, formed by tubular concentration of chromophilic cells (Fig. 2). Irregular lumen of uterine stem present in last immature and first mature proglottides, formed by lateral and dorsal outpocketings penetrating medulla. Diverticula formed before presence of first eggs in uterine stem. In pregravid proglottides, eggs completely filling uterine stem and thick-walled diverticula (Fig. 6). In gravid proglottides, diverticula occupying up to 90% of proglottis width (Fig. 12). Pregravid and gravid proglottides with dorsal outpocketings invading medulla, reaching dorsal cortex (Figs 11, 12). Uterus with 10-18 (n = 32) lateral branches on each side. Terminal proglottides without uterine opening. Proglottides released into the gut before opening of uterus.

Egg shell with hyaline membrane, irregular in shape, 45-55 in diameter, with spherical, bilayered embryophore, 19-21 in diameter, thick; diameter of internal layer containing granular material 17-18; oncosphere spherical to oval, 12-14 in diameter, with 3 pairs of hooks 5-6 long (n = 10) (Fig. 3).

DISCUSSION

In *Amazotaenia yvettae*, the equatorial disposition of the vitelline follicles and their disposition in two elongated patches are rare within the Proteocephalidea. This disposition is observed only in *Vermaia pseudotropii* (Verma, 1928) (Gangesiinae) a



FIGS 8-12

Amazotaenia yvettae gen. n., sp. n., 29738 INVE 8, 9. Mature proglottides, cross sections at level of vitelline follicles and at level of ovary respectively. 10. Pregravid proglottis, cross sections at level of anterior part showing the penetration of uterus in the medulla. 11, 12. Gravid proglottis, cross sections showing uterine outgrowths crossing the medulla and reaching the dorsal cortex. Scale bars: 8-10 = 250 µm; 11, 12 = 100 µm.

parasite of *Pseudeutropius garua* (Siluriforme) in India, but in the latter, the disposition is clearly lateral (Verma, 1928; Nybelin, 1942; Freze, 1965, Schmidt, 1986). In cross sections, the ventral position of vitelline follicles is similar to that found in another very peculiar proteocephalidean cestode, *Vaucheriella bicheti* de Chambrier, 1987 (Zygobothriinae) parasite of *Tropidophis* cf. *taczanowskyi* (Serpentes) in Ecuador, but the latter shows vitelline follicles in a posterior position (de Chambrier, 1987).

The minute size of *Amazotaenia yvettae* (500-2900 µm) is also remarkable and can be compared only with *Proteocephalus microscopicus* Woodland 1935, a parasite of Cichla spp. (Pisces: Cichlidae), which is 1540-2020 µm long according to Woodland (1935c) or 2050 to 2780 µm long according to Takemoto & Pavanelli (1996). The minute size is also linked with a very small number of proglottides in both species: 4-7 for *Amazotaenia yvettae* and 6-14 long according to Woodland (1935c) or 6-12 according to Takemoto & Pavanelli (1996) for *P. microscopicus*.

Amazotaenia yvettae is also characteristic by its unusual behaviour of attachment in which individuals are grouped in isolated compact clumps of 14 to 66 specimens. This behaviour is, to my knowledge, unique to the Proteocephalidea. They are all situated in most anterior part of the intestine (first twelfth) and are deeply embedded, perforating the epithelium into the lamina propria, generating a tissue reaction. Isolate attached specimens were never found. The specimens collected from *B. vaillanti* were identical to those from the type host and had the same site. Only one clump was found in *B. vaillanti*.

The type-host is pararasitized by three other proteocephalidean species which occur in particular sites in the gut (see de Chambrier & Vaucher, 1997): *Amphoteromorphus piraeeba* Woodland, 1934 occurs from the second twelfth to the five twelfth of the intestine; *Endorchis piraeeba* Woodland, 1934 occurs from the five twelfth to the eight twelfth of the intestine; *Nomimoscolex piraeeba* Woodland, 1934 lives in the six twelfth to the ten twelfth of the intestine. As *Amazotaenia yvettae* occured in the first twelfth, it did not share its site with any other co-parasite. *E. piraeeba* shared a part of its habitat with *A. piraeeba* and *N. piraeeba*, but the two latter species occured in distinct sites.

The uterine development is unusual among the Proteocephalidea and is similar to that of *Mariauxiella* (de Chambrier & Rego, 1995). The uterus possesses not only lateral branches, but also has outgrowths, fan-like in cross sections, crossing the medulla and reaching the dorsal cortex. Furthermore, another peculiarity is shared with *Mariauxiella*: the medullary ovary in *Amazotaenia yvettae* also possesses obvious outgrowths into the dorsal cortex. With regard to the classification of Woodland

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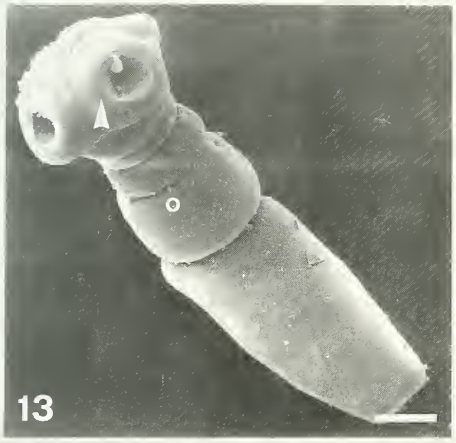
FIGS 13-18

Amazotaenia yvettae gen. n., sp. n. 13-17. Scanning electron micrographs. 13. Entire worm, (arrow and white circle indicate regions of tegument illustrated in Figures 14 and 16, respectively). 14. Enlarged view of margin of sucker. 15. Scolex, lateral view. 16. Enlarged view of anterior margin of mature proglottis. 17. Scolex , apical view. 18. Detail of the anterior part of the gut showing a compact clump of the new worms. SEM photos by Dr. J. Wüest (Geneva). Scale-bars: 13 = 100 µm, 15, 17 = 50 µm, 14, 16 = 1 µm, 18 = 1000 µm.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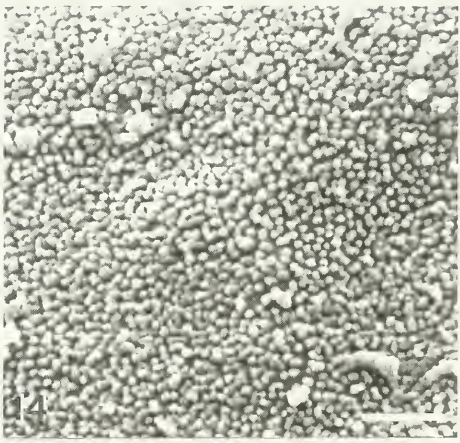
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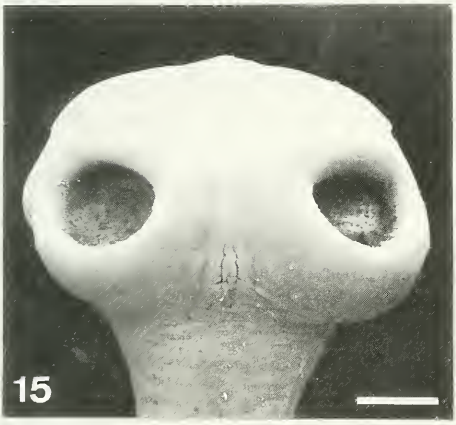
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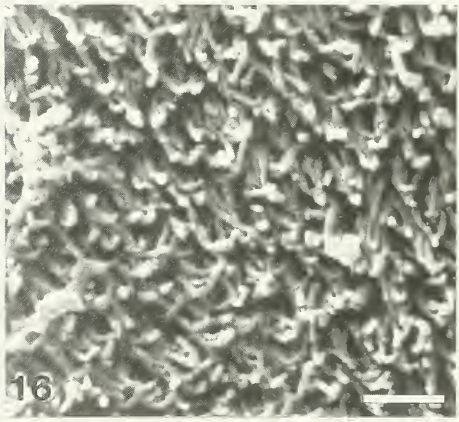
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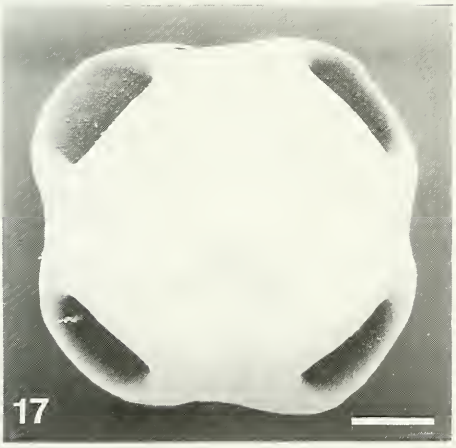
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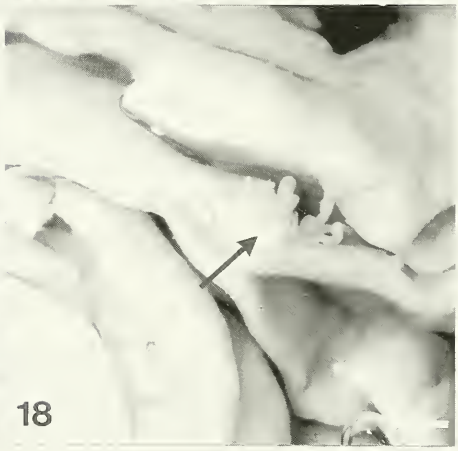
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(1933 a,b,c, 1934 a,b,c, 1935 a,b,c), we suggested (de Chambrier & Rego, 1995, p. 63) that *Mariauxiella* could be placed in a new subfamily. *Amazotaenia* shares with *Mariauxiella* these characters which could justify the placement of both genera in a new subfamily. Recent studies on proteocephalidean systematics with molecular techniques (Zehnder & Mariaux, 1999; Zehnder & de Chambrier, 2000; Zehnder *et al.*, 2000) demonstrated the paraphyly of the two Proteocephalid families, the Proteocephalidae and the Monticelliidae, and suggested the polyphyly of the genera *Proteocephalus*, *Nomimoscolex* and *Ophiotaenia*. In this respect, it is not appropriate now to create a new subfamily in order to accommodate those taxa, i.e. *Amazotaenia* and *Mariauxiella*. Molecular approaches integrating detailed morphological studies could be decisive for improving our understanding of the systematic structure of the Protecephalidea.

ACKNOWLEDGEMENTS

I am grateful to Dr. Claude Vaucher, Dr. Jean Mariaux and Dr. Boyko Georgiev who provided useful comments on earlier versions of the manuscript, to the two anonymous rewievers for constructive critisism, to Prof. John G. Lundberg, Philadelphia, to Prof. Heraldo A. Britski, Sao Paulo, for kindly identifying some Amazonian fishes and to Prof. Amilcar A. Rego, Rio de Janeiro, for help in collecting samples.

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Oribatids from Brunei III (Acari: Oribatida). (*Acarologica Genavensia* XCI)

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Oribatids from Brunei III (Acari: Oribatida). (*Acarologica Genavensia* XCI). – Thirty oribatid species are listed from Brunei; fourteen are new to science. Four new genera are established, one of them (*Luxtonia* gen. n.) also represents a new family (Luxtoniidae fam. n.) in the superfamily Oppioidea and the other three (*Bruneibelba* gen. n., *Coartobelba* gen. n., *Condylobelba* gen. n.) belong to the family Suctobelbidae. From the following genera new species are described: *Teraja* (1 sp. n.), *Eremobelba* (1 sp. n.), *Luxtonia* (1 sp. n.), *Arcoppia* (1 sp. n.), *Corynoppia* (1 sp. n.), *Karenella* (1 sp. n.), *Ptiloppia* (1 sp. n.), *Senectoppia* (1 sp. n.), *Bruneibelba* (2 spp. n.), *Coartobelba* (1 sp. n.), Condylobelba (3 spp. n.). A new combination is proposed: *Coartobelba campestris* (Balogh & Mahunka) comb. n. = *Suctobelba campestris* Balogh & Mahunka, 1981.

Key-words: Acari - Oribatida - taxonomy - new species, new genera, new family - Brunei.

INTRODUCTION

So far, I have published two papers discussing the oribatid fauna of Brunei (Mahunka, 1995, 1997). The very rich material collected by Dr. Bernd Hauser, former Head of the Arthropod Department of the Muséum d'histoire naturelle, Geneva, during his 1988 expedition to Brunei, organized together with Dr. Charles Lienhard, Research Officer at the same Department, contains numerous taxonomical novelties. The examination of the material was completed in 1996 due to the support of the Geneva Museum.

As I have already done when working on material from Sabah (Mahunka, 2000), i.e. I concentrated on one superfamily, the Oppioidea. In the course of selecting the material, however, I came across several highly interesting taxa belonging to other superfamilies, which I am treating here too.

The composition of the superfamily Oppioidea Grandjean, 1951, as well as its relationships, are still under heated debate and in recent years there have been many changes and modifications. For instance, Woas (1986) has completely rejected the concept of Balogh (1983) regarding genera and subfamilies. The same happened to

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the classification proposed by Subias & Balogh (1989), which is in fact an improved version of Balogh's system. Later Woas modified his original concept (Franklin & Woas, 1992) and gave new diagnoses and new evaluations, but basically his concept still strongly differs from that of other authors. Without doubt Woas's system comes far closer to a true phylogenetic classification than any other system proposed up to now. However, in practical work the lack of an easy survey makes progress highly difficult. I must confess that my opinion is much closer to Balogh's than to Woas's, because I am convinced that a profound knowledge of forms on world-wide material may in many cases substitute even basic phylogenetic analyses in establishing inherent relationships.

When describing species, I use morphological terms already applied in some of my earlier works (e.g. Mahunka, 1996).

LIST OF LOCALITIES

Bru-88/12: **Brunei** (Brunei-Muara District): près du pont sur le ruisseau "Sungai Lubang Barus" sur la route venant de Tutong, à 33 km de Bandar Seri Begawan, prélèvement de sol dans les angles formés par les contreforts de deux grands arbres proches des habitations, env. 20m; 16.XI.1988; leg. B. Hauser – (extraction par appareil Berlese).

Bru-88/21: **Brunei** (Belait District): "Andulau Forest Reserve", à 3.5 km S de Sungai Liang (= à 39,5 km de Labi), forêt primaire ("Mixed dipterocarp forest"), "Kompartment 7" (= K-7), prélèvement de sol dans les angles formés par les contreforts de grands arbres, 50m; 19.XI.1988; leg. B. Hauser – (extraction par appareil Berlese).

Bru-88/24: **Brunei** (Brunei-Muara District): "Berakas Forest Reserve" N de Bandar Seri Begawan sur la route, à 19.5 km de Muara (= à 102.5 km de Kuala Belait), forêt "Kerangas" (= "Tropical heath forest"), prélèvement de sol au pied de *Casuarina nobilis* Whitmore (Casuarinaceae), 30m; 20.XI.1988; leg. B. Hauser – (extraction par appareil Berlese).

Bru-88/29: **Brunei** (Belait District): Sungai Liang, "Arboretum Forest Reserve", forêt primaire ("Mixed dipterocarp forest"), prélèvement de sol dans les angles formés par les contreforts de deux arbres appelés "Nyatho", 90m; 21.XI.1988; leg. B. Hauser – (extraction par appareil Berlese).

Bru-88/32: **Brunei** (Belait District): "Labi Hills Forest Reserve", "Teraja", à 42 km S de Sungai Liang (= 12 km au Sud de Labi), environs de "Rumah Panjang" (= Longhouse du Kampong Teraja), forêt primaire ("Mixed dipterocarp forest"), prélèvement de sol dans les angles formés par les contreforts d'un très grand arbre, 40m; 22.XI.1988; leg. B. Hauser – (extraction par appareil Berlese).

Bru-88/35: **Brunei** (Belait District): "Badas Forest Reserve", à env. 10 km sur la route secondaire qui bifurque, à 32 km de Kuala Belait, vers S, forêt "Kerangas" (= "Tropical heath forest") formée presque exclusivement par *Agathis dammara* (Lambert) L. G. Rich. (Araucariaceae), prélèvement de sol au pied de *Agathis dammara*, 10m; 23.XI.1988; leg. B. Hauser – (extraction par appareil Berlese).

Bru-88/38: **Brunei** (Temburong District): "Peradayan Forest Reserve" (= "Bukit Patoi"), à 14.5 km de Bangar (= 2.5 km de Labu), forêt primaire ("Mixed dipterocarp forest"), prélèvement de sol dans les angles formés par les contreforts de grands arbres morts, 80m; 24.XI.1988; leg. B. Hauser – (extraction par appareil Berlese).

Bru-88/41: **Brunei** (Belait District): Sungai Liang, "Arboretum Forest Reserve", forêt primaire ("Mixed dipterocarp forest"), prélèvement de sol dans les angles formés par les contreforts d'arbres appelés "Kempas" (= *Koompassia malaccensis* Maing. & Benth. [Fabaceae), 20m; 25.XI.1988; leg. B. Hauser – (extraction par appareil Berlese).

Bru-88/46: **Brunei** (Belait District): "Andulau Forest Reserve", à 3.5 km S de Sungai Liang (= à 39.5 km de Labi), forêt primaire ("Mixed dipterocarp forest"), "Kompartment 8" (= K-8), prélèvement de sol dans les angles formés par les contreforts d'un grand arbre, 70m; 26.XI.1988; leg. B. Hauser – (extraction par appareil Berlese).

LIST OF IDENTIFIED SPECIES

Synichotritiidae Walker, 1965

Sabahtritia lienhardi Mahunka, 1995
Locality: Bru-88/32: 1 specimen.
Distribution: Brunei (hitherto known from the type locality only); second record for Brunei.

Temburongiidae Mahunka, 1990

Temburongia patoi Mahunka, 1990
Localities: Bru-88/29: 35 specimens; Bru-88/38: 8 specimens.
Distribution: Sarawak, Brunei; second record for Brunei.

Microzetidae Grandjean, 1936

Teraja tuberculata (Mahunka, 1987)
Locality: Bru-88/35: 2 specimens.
Distribution: Sarawak (hitherto known from the type locality only); first record for Brunei.

Teraja asymmetrica sp. n.
Locality: Bru-88/38.

Teraja sungai Mahunka, 1997
Locality: Bru-88/35: 2 specimens.
Distribution: Brunei (hitherto known from the type series only); second record for Brunei.

Teraja wongi Mahunka, 1995
Locality: Bru-88/32: 2 specimens.
Distribution: Brunei (hitherto known from the type locality only); second record for Brunei.

Damaeolidae Grandjean, 1965

Fosseremus laciniatus (Berlese, 1905)
Locality: Bru-88/12: 2 specimens.
Distribution: Cosmopolitan; first record for Brunei.

Eremobelbidae Balogh, 1961

Eremobelba porcella sp. n.
Localities: Bru-88/21, Bru-88/24.

Peloppiidae Balogh, 1943

Austroceratoppia serapi Mahunka, 1996
Locality: Bru-88/29: 2 specimens.
Distribution: Sarawak (hitherto known from the type series only); first record for Brunei.

Carabodidae C. L. Koch, 1837

Gymnobodes semengok Mahunka, 1996
Locality: Bru-88/35: 3 specimens.
Distribution: Sarawak (hitherto known from the type series only); first record for Brunei.

Hardybodes penicillatus Mahunka, 1995
Locality: Bru-88/24: 1 specimen.
Distribution: Brunei (hitherto known from the type locality only); second record for Brunei.

Tectocepheidae Grandjean, 1954

Tegeozetes tunicatus Berlese, 1913
Localities: Bru-88/32: 2 specimens; Bru-88/38: 2 specimens.
Distribution: Circumtropical; first record for Brunei.

Otocepheidae Balogh, 1961

Dolicheremaeus andulauensis Mahunka, 1995
Locality: Bru-88/24: 5 specimens.
Distribution: Brunei (hitherto known from the type series only); second record.

Luxtoniidae fam. n.

Luxtonia hauseri gen. n., sp. n.
Locality: Bru-88/35.

Oppiidae Grandjean, 1951

Arcoppia teraja sp. n.
Localities: Bru-88/21; Bru-88/32.

Corynoppia andulau sp. n.
Locality: Bru-88/21.

Graptoppia sundensis (Hammer, 1980)
Localities: Bru-88/21: 17 specimens; Bru-88/35: 5 specimens.
Distribution: Java, Sabah; first record for Brunei.

Karenella bruneiana sp. n.
Localities: Bru-88/21; Bru-88/46.

Oppiella nova (Oudemans, 1902)
Localities: Bru-88/24: 3 specimens; Bru-88/32: 6 specimens; Bru-88/35: 6 specimens.
Distribution: Cosmopolitan; first record for Brunei.

Ptiloppia lienhardi sp. n.
Localities: Bru-88/21; Bru-88/32; Bru-88/35.

Pulchroppia burckhardti Mahunka, 1987
Locality: Bru-88/35: 4 specimens.
Distribution: Sabah (hitherto known from the type locality only); first record for Brunei.

Senectoppia kerangas sp. n.
Locality: Bru-88/32.

Suctobelbidae Jacot, 1938

Bruneibelba separata gen. n., sp. n.
Localities: Bru-88/21, Bru-88/35

Bruneibelba tuberosa sp. n.
Locality: Bru-88/35

Coartobelba pauper gen. n., sp. n.
Localities: Bru-88/21; Bru-88/29; Bru-88/41; Bru-88/46.

Suctobelbella subcouplexa (Balogh & Mahunka, 1968)
Localities: Bru-88/21: 2 specimens; Bru-88/41: 1 specimen.
Distribution: Argentina (hitherto known from the type locality only); first record for Brunei and Asia.

Suctobelbella variosetosa (Hammer, 1961)
Localities: Bru-88/35: 2 specimens; Bru-88/38: 1 specimen; Bru-88/46: 2 specimens.
Distribution: Widely distributed in the Oriental and Neotropical Region; first record for Brunei.

Condylobelba agathis gen. n., sp. n.
Localities: Bru-88/21; Bru-88/29; Bru-88/35; Bru-88/46.

Condylobelba bruneiensis sp. n.
Localities: Bru-88/21; Bru-88/24; Bru-88/29; Bru-88/35; Bru-88/41; Bru-88/46.

Condylobelba sculpturata sp. n.
Locality: Bru-88/35.

Oribatellidae Jacot, 1925

Lamellobates orientalis Csiszár, 1961
Locality: Bru-88/35: 2 specimens.
Distribution: Java, Bali, Sabah, Philippines; first record for Brunei.

Galumnidae Jacot, 1925

Notogalumna praetiosa Sellnick, 1959
Locality: Bru-88/24: 1 specimen.
Distribution: Polynesia: Raivavae, Raiatea (hitherto known from the type series only); first record for Brunei.

DESCRIPTIONS OF NEW TAXA

Teraja asymmetrica sp. n. Figs 1-3

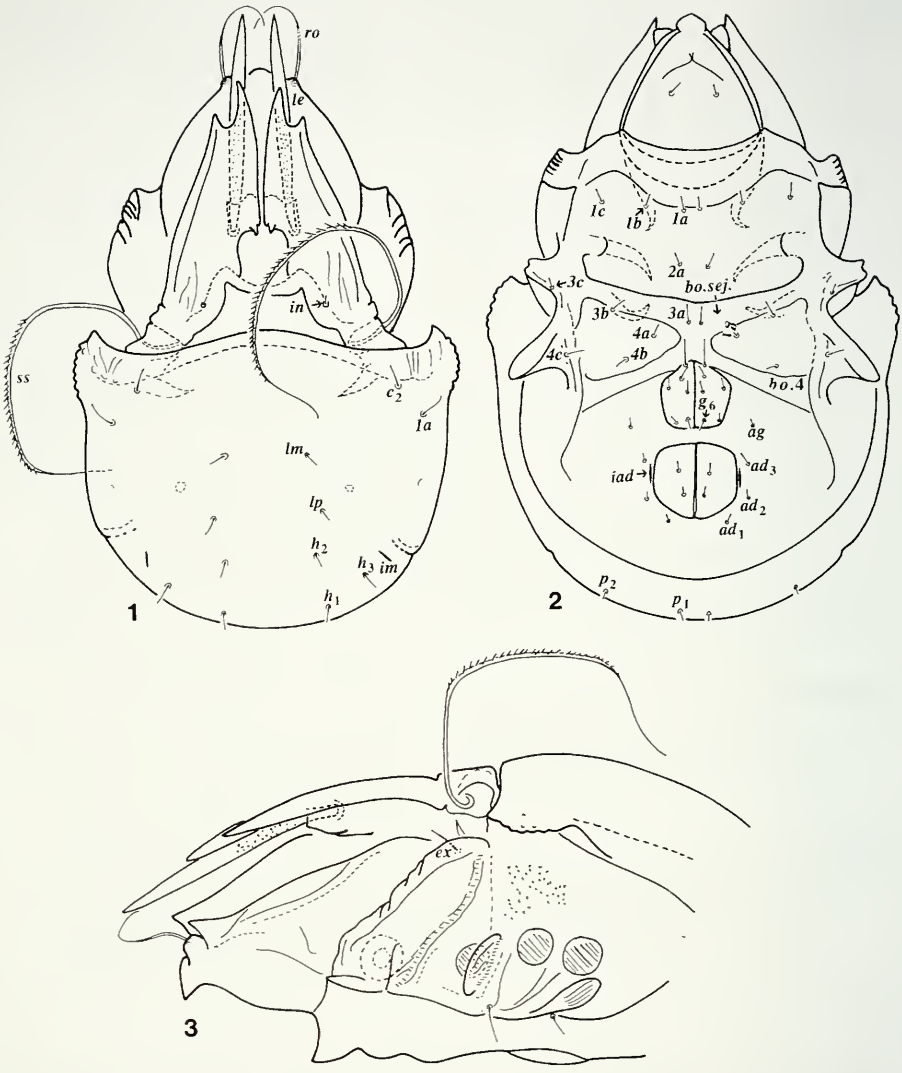
Material examined: Brunei: Holotype: Bru-88/38, 1 paratype from the same sample. Holotype: MHNG[1], paratype (1571-PO-96): HNHM[2].

Measurements: Length of body: 186-191 µm; width of body: 133-142 µm.

Prodorsum: Rostral part of prodorsum appearing straight in dorsal view, a short nasiform median apex and the two tubercles of the rostral setae protruding from

[1] MHNG = deposited in the Muséum d'histoire naturelle, Geneva.

[2] HNHM = deposited in the Hungarian Natural History Museum, Budapest, with indentification number of the specimen in the Collection of Arachnida.



FIGS 1-3

Teraja asymmetrica sp. n. - 1: body in dorsal view, 2: body in ventral view, 3: podosoma in lateral view.

it. Rostral apex beak-shaped in lateral view (Fig. 3). Lamellar apices asymmetrical, the outer one shorter, the inner one much longer with a sharp basal spur anterior to narrowing part basally. A well framed basal hollow present, as typical for the genus. Lamellar setae very thick, long, conspicuously spiculate in their basal part, arising from a thickening under the lamellae. Rostral setae long, flagellate, interlamellar setae minute. Sensilli very long, directed outwards and backwards, unilaterally ciliate (Fig. 3).

Notogaster: Its surface slightly undulate. Dorsosejugal suture convex. Pteromorphae small, their surface rugose, with some tubercles (Fig. 1). Nine pairs of simple, straight notogastral setae present.

Lateral part of podosoma: Tutorium with sharp, triangular apex, rostral setae arising on tubercles close to it. Pedotecta I very large with rugose dorsal margin. Pedotecta II-III and discidium also with mostly parallel rugae.

Ventral region: Typical for the genus, epimeral borders characteristically X-shaped (Fig. 2). All epimeral setae short and simple. Anogenital setal formula: 6 - 1 - 2 - 3. Anterior genital setae strikingly longer than the others.

Legs: Typical for the family.

Remarks: The species of the genus *Teraja* Mahunka, 1995 were surveyed by Mahunka (1997). The new species is close to *T. tuberculatus* (Mahunka, 1987) and *T. sungai* Mahunka, 1997. However, both these species have nearly symmetrical lamellar apices and the size of their lamellar setae is different from those of *T. asymmetrica* sp. n.

Derivatio nominis: Named after the form of the lamellar cusps.

Eremobelba porcella sp. n. Figs 4-7

Material examined: Brunei: Holotype: Bru-88/24, 8 paratypes from the same sample; 2 paratypes: Bru-88/21. Holotype and 7 paratypes: MHNG, 3 paratypes (1572-PO-96): HNHM.

Measurements: Length of body: 262-283 µm; width of body: 153-174 µm.

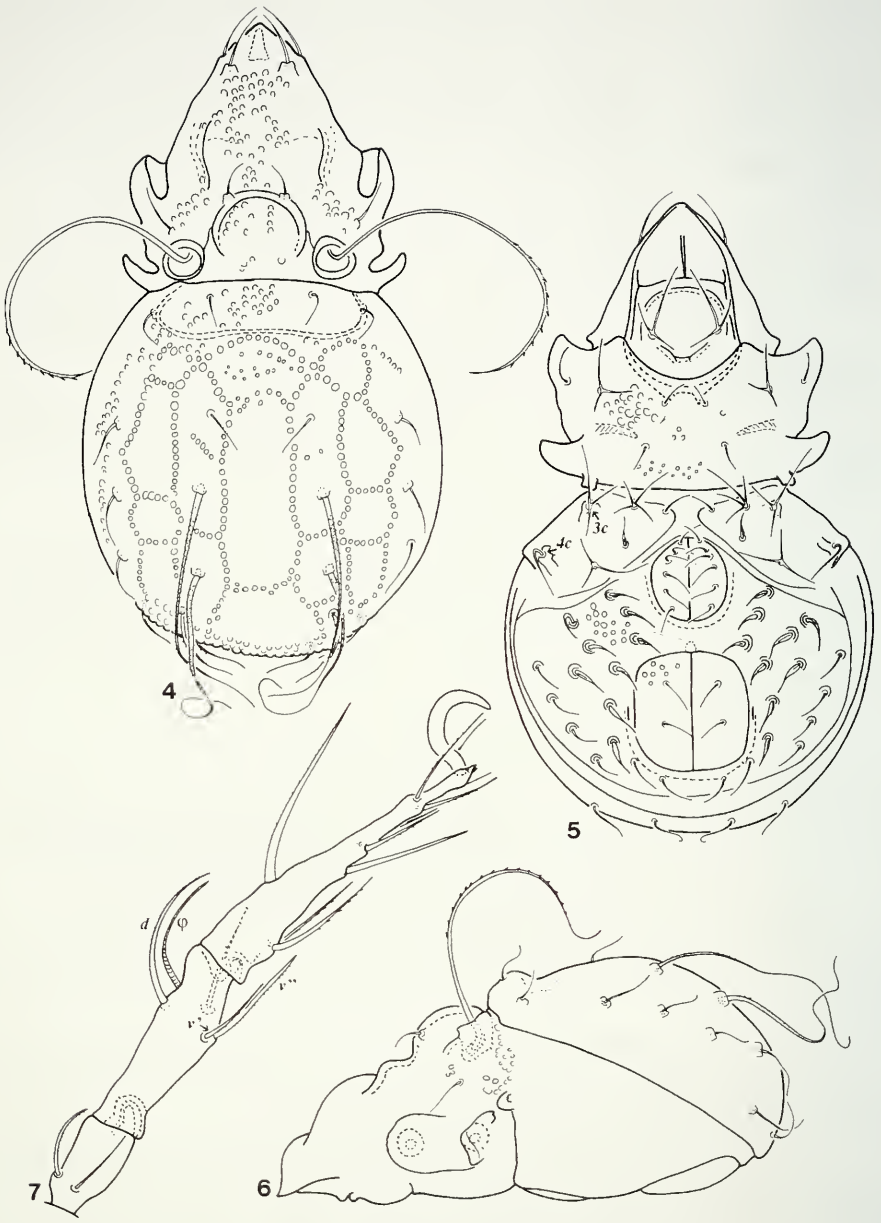
Integument: The whole body covered by a thick cerotegument layer; its cerotegument granules arranged in a polygonal pattern as typical for most species of this genus. Median field a narrow rectangle, all others divided by transversal lines of granules (Fig. 4).

Prodorsum: Lamellar and interlamellar setae arising on strong tubercles, the former far from each other, the latter arising medially on semicircular laths. All setae simple. Sensilli very long, the serrated marginal velum fine.

Notogaster: Eleven pairs of notogastral setae present, their length characteristically varying: two median pairs much longer than the others (Fig. 6). All setae slightly roughened.

Lateral part of podosoma: The structure of the prodorsum conspicuous (Fig. 6). Pedotecta I very large, rounded anteriorly.

Ventral region: Mentum with two conspicuously arched laths. Epimeral setal formula: 3 - 1 - 3 - 3. Some setae (*1b*, *3b*, *3c*, *4b*) stellate. Setae *3c* and *4c* arising on strong tubercles. On the ventral plate arise 15 (sometimes 14) pairs of setae, the marginal ones simple and fine, the others phylliform.



FIGS 4-7

Eremobelba porcella sp. n. - 4: body in dorsal view, 5: body in ventral view, 6: body in lateral view, 7: genu, tibia and tarsus of leg IV.

Legs: Claws of leg I much smaller and longer than those of legs II-IV. Seta *v''* much longer than *v'*, seta *d* slightly longer than the solenidion on leg IV (Fig. 7).

Remarks: The new species is closely related to *Eremobelba heterotricha* Mahunka, 1977, described from Malaysia, for which I give some corrections of the description after re-examination of the type series[3]. The two species are distinguished by the following characters:

E. heterotricha Mahunka, 1977	*E. porcella* sp. n.
1. Body large: 340-358 µm x 193-210 µm.	1. Body small: 262-283 µm x 153-174 µm.
2. Median field nearly twice as long as the one beside it.	2. Median field narrow, only slightly broader than the one beside it.
3. Second longitudinal field undivided.	3. Second longitudinal field divided by transversal rows of granules.
4. Mentum without any thickenings (arched laths).	4. Mentum bearing strong arched laths.

Derivatio nominis: Named after the snout-like structure in the interlamellar region. Noun in apposition.

Luxtonia gen. n.

Diagnosis: Belonging to the superfamily Oppioidea Grandjean, 1951. Rostrum undivided, rostral setae widened, with robust spines unilaterally. Head of sensilli dilated, bearing spines on their dorsal surface. Costula and crista absent, only a nearly U-shaped lath observable in interlamellar position. Dorsosejugal suture convex medially, reaching forwards between bothridia. Ten pairs of notogastral setae, 5 pairs of lyrifissures and glandular openings present. Setae c_2 penicillate. Coxisternal region well sclerotized, epimeral borders well developed. Epimeral setal formula: 3 - 1 - 3 - 3, these setae partly penicillate or stellate. Ventral plate with a pair of strong tubercles in the aggenital region and with an enigmatic saccular structure on its postanal surface. Anogenital setal formula: 5 - 1 - 2 - 3. The position of adanal setae unique in the superfamily. All leg segments normal, none of the elongated type. Leg setal formula (see below) also typical for the superfamily.

Type species: *Luxtonia hauseri* sp. n.

Remarks: The characteristics given in the generic diagnosis differ from those already known among oppioid taxa, like the position of the adanal setae, the structure of the coxisternum, the shape of the epimeral setae. The chaetotaxy of legs also displays characteristic features (ω_2 of tarsus I arising behind ϵ, ω_1 of tarsus II on the basis of the segment).

[3] I studied again the type specimens of this species. The main characters were well illustrated in the original description, but the interlamellar setae are nearly smooth, a superfluous pair of setae was figured on the epimeral region and the setae *4b* were figured as simple, whereas they are stellate. The body size is much smaller than given in the description.

Derivatio nominis: I dedicate the new genus (and family) to Dr. Malcolm Luxton (Cardiff, U. K.), the renowned oribatidologist, with thanks for his continuous help in reviewing my manuscripts. The new genus is female in gender.

Luxtoniidae fam. n.

Diagnosis: Belonging to the superfamily Oppioidea Grandjean,1951. Typical oppioid habitus. Posterior margin of notogaster divided, two lobes covering each other and connecting with an enigmatic saccular structure on the postanal surface of the ventral plate. Epimeral region well sclerotized, its unique structure characteristic. Discidium and a part of epimeral region tuberculate. Some of epimeral setae stellate or penicillate. The size of legs normal, but the position of some solenidia are characteristic (ω_2 of tarsus I arising behind ϵ, ω_1 of tarsus II on the basis of the segment).

Type genus: *Luxtonia* gen. n.

Remarks: The posteromarginal border of the notogaster is divided into overlapping lobes in the new taxon. Furthermore, the extraordinary postanal structure also makes it very different from all the other oppioid species. The strong tubercle on the ventral plate also differs from those of known forms. For these reasons, I find it justified to establish a new family within the superfamily Oppioidea Grandjean, 1951.

Luxtonia hauseri sp. n. Figs 8-14

Material examined: Brunei: Holotype: Bru-88/35, 9 paratypes: from the same sample. Holotype and 6 paratypes: MHNG, 3 paratypes (1573-PO-96): HNHM.

Measurements: Length of body: 232-253 µm; width of body: 114-149 µm.

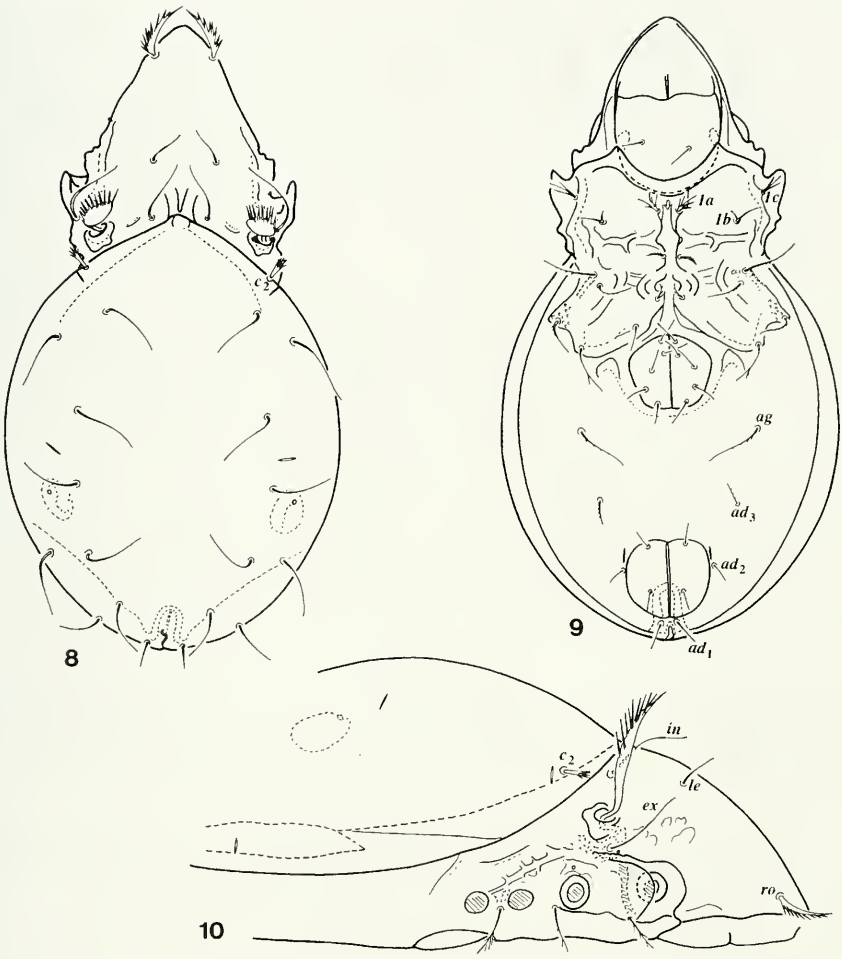
Integument: Cerotegument layer not observable.

Prodorsum: Rostral apex simply rounded. True costulae absent, but between the interlamellar setae a short, comparatively wide, furcate lath present basally and medially. Some irregular fields observable laterally and a pair of stronger ones medially. Rostral setae dilated, with very robust, spiniform cilia; other prodorsal setae smooth, their ratio: *ex* > *in* > *ro* > *le* (Fig. 10). Sensilli comparatively short, gradually thickened distally, with 10 long, bacilliform branches.

Notogaster: Crista absent. Dorsosejugal suture protruding forwards between bothridia. Posterior margin divided as shown in Fig. 14. Ten pairs of notogastral setae present, setae c_2 short, penicillate. All other setae simple, setiform, nearly smooth, setae p_1 and p_2 shorter than the others. Also five pairs of lyrifissures present, their position shown in Fig. 11.

Lateral part of podosoma: Well sclerotized, exobothridial region partly granulated, some longitudinal crests present, primarily a very strong one running over the acetabula of legs II and III posteriorly (Fig. 10). Pedotecta I small, rounded anteriorly, pedotecta II-III absent.

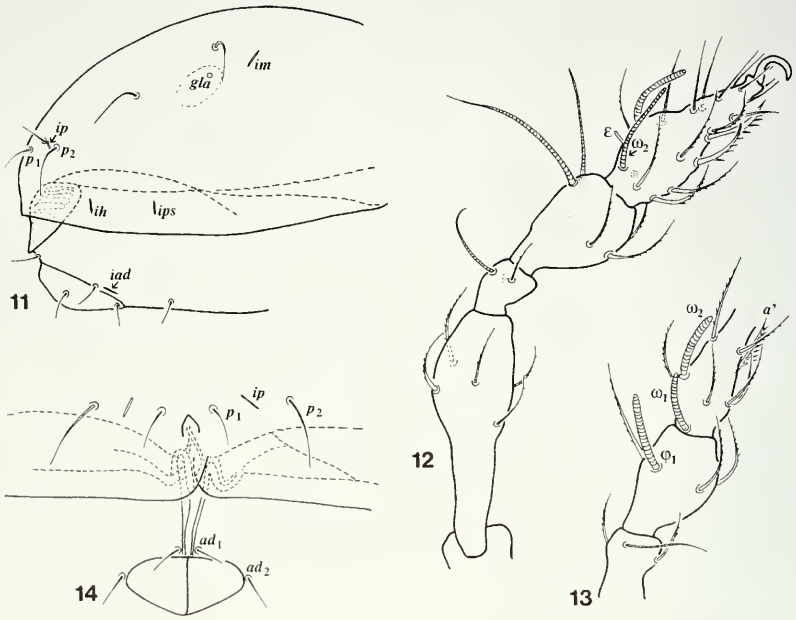
Coxisternal region: All epimeral borders (except *bo.* 3) well sclerotized, *bo.* 4 partly tuberculated. Some ponticular-like structures and longitudinal crests also observable on the borders, or on the epimeral surface, the latter medially with some concave structure. Epimeral setal formula: 3 - 1 - 3 - 3. Setae on epimere 1 stellate and/or penicillate. The other epimeral setae with long cilia.



FIGS 8-10

Luxtonia hauseri gen. n, sp. n. - 8: body in dorsal view, 9: body in ventral view, 10: body in lateral view.

Anogenital region: There is an unclear fissure with a saccular structure attached to it, at the posterior margin of the ventral plate. Its inner structure and its function unknown. Genital plates with 5 pairs of simple, comparatively long setae, all of the same length. Aggenital setae conspicuously ciliate and long, much longer than the other setae on the ventral plate. Two pairs of anal and three pairs of adanal setae present, setae ad_1 and ad_2 in a unique position, very near to the anal aperture. Lyrifissures *iad* also in apoanal position, in front of the insertion of setae ad_2.



FIGS 11-14

Luxtonia hauseri gen. n., sp. n. - 11: posterior part of the notogaster in lateral view 12: leg I, 13: genu, tibia and the basal part of tarsus of leg II, 14: posterior margin of the notogaster in posterior view.

Legs: Claws of all tarsi simple, calyciform. Leg setal formula characteristic:

1: 1 - 5 - 3+1 - 4+1 - 20+2 - 1 (Fig. 12)
IV: 1 - 2 - 2 - 3+1 - 10 - 1

Eupathidium ε and solenidium ω_2 on tarsus I located behind seta *ft*"(Fig. 12). Solenidion ω_1 of tarsus II originating on the basal surface. Solenidia ω_1 and ω_2 of tibia I short but dilated (Fig. 13). Setae *a*' of tarsus II very strong, dilated with spiniform branches.

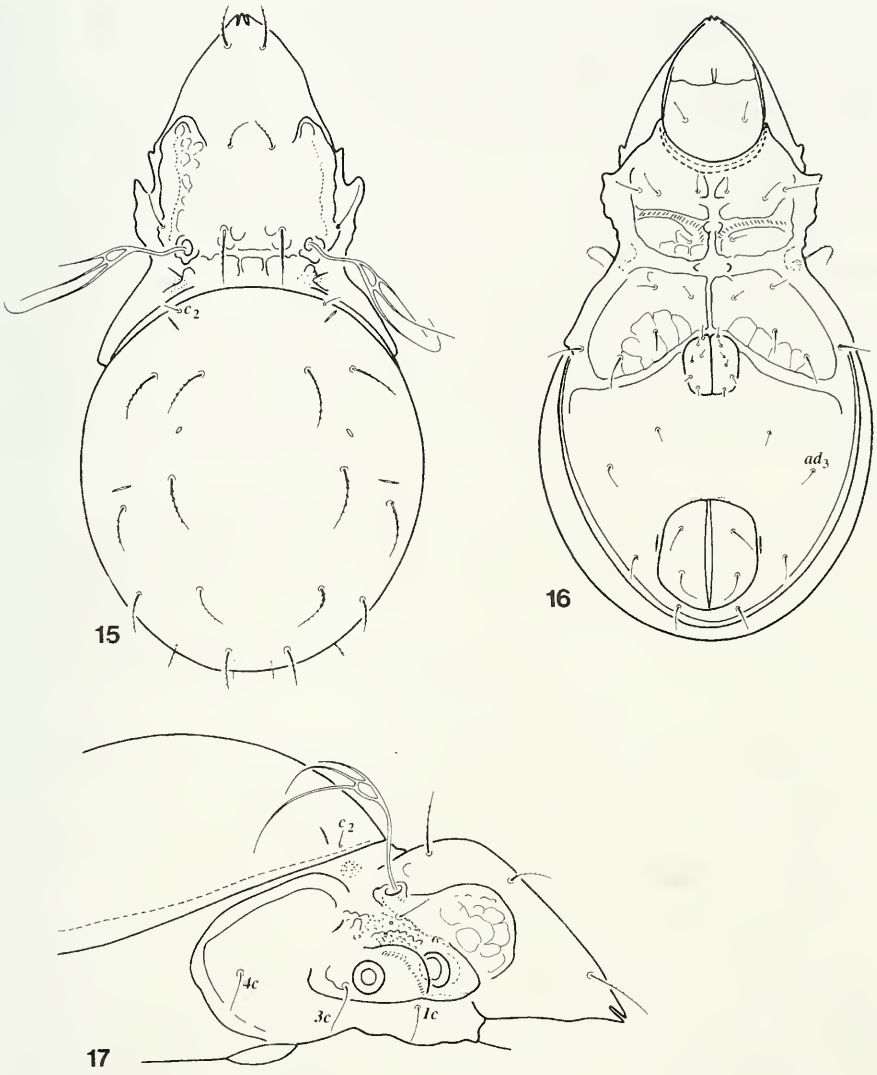
Remarks: See the remarks after the generic diagnosis.

Derivatio nominis: I dedicate the new species to my friend, Dr. B. Hauser (Museum d'histoire naturelle, Geneva), the collector of this very rich and interesting material.

Arcoppia teraja sp. n. Figs 15-17

Material examined: Brunei: Holotype: Bru-88/32, 2 paratypes: from the same sample; 2 paratypes: Bru-88/21. Holotype and 2 paratypes: MHNG, 2 paratypes (1574-PO-96): HNHM.

Measurements: Length of body: 286-297 µm; width of body: 99-109 µm.



FIGS 15-17

Arcoppia teraja sp. n. - 15: body in dorsal view, 16: body in ventral view, 17: podosoma in lateral view.

Prodorsum: Rostral apex tripartite, all three parts of equal size. The surface of prodorsum conspicuously punctate, lateral part granulate. Median costulae and transcostula completely absent, but a well developed arched lath present laterally, the exobothridial seta arising on its basal part. Basal part of the interbothridial region distinctly sclerotized, with two pairs of nearly round fields medially and some

irregular ones laterally. A pair of short crests running posteriorly in the sejugal region, there are a pair of porose areas and weak protuberances observable (Fig. 15). Ratio of the prodorsal setae *ro* = *in* > *le* = *ex*. Bothridium with a small tubercle basally; sensilli typical for the genus *Arcoppia*, having slightly dilated heads with three branches of different lengths.

Notogaster: Ten pairs of notogastral setae present, one of them (c_2) minute, the others setiform, finely ciliate.

Lateral part of podosoma (Fig. 17): Pedotecta I small, rounded anteriorly. Setae *1c* arising far from them.

Ventral region: Well sclerotized, typical for this genus. All epimeral setae simple, fine. Anogenital setal formula: 6 - 1 - 2 - 3. Anal and adanal setae subequal. Lyrifissures *iad* located near to the anal opening, in the adanal position.

Legs: Segments of legs elongated, tibia I without any processes or tubercles. Solenidia arising on the tibial surface, φ_1 and φ_2 arising near to each other. Solenidion of tibia IV very long and thin, seta *v*'' on tibia IV short spiniform, on tarsus IV plumose.

Remarks: The new species is well characterised by the completely reduced median costulae, the presence of which is one of the main characters of the genus *Arcoppia* Hammer, 1962. On this basis the new species is readily distinguishable from its congeners.

Derivation nominis: Named after the village of Teraja (Brunei). Noun in apposition.

Corynoppia andulau sp. n. Figs 18-21

Material examined: Brunei: Holotype: Bru-88/21, 2 paratypes from the same sample. Holotype and 1 paratype: MHNG, 1 paratype (1575-PO-96): HNHM.

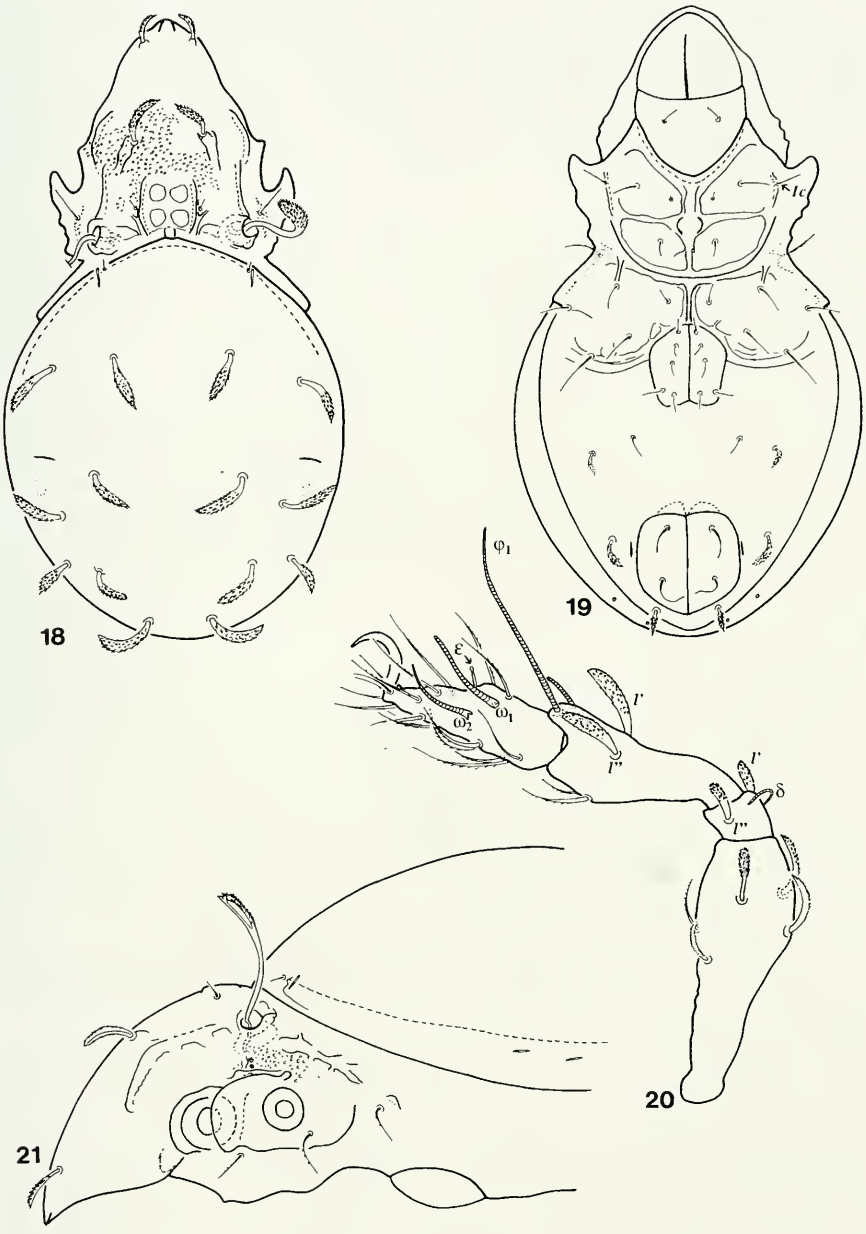
Measurements: Length of body: 252-268 µm; width of body: 138-149 µm.

Integument: A well-developed cerotegument layer covering almost the whole prodorsum, the trochanters and femora.

Prodorsum: Rostrum elongated, subtriangular, with two sharp keels near the apex. Rostral setae arising on small tubercles. Costula reduced, only a short part observable near the basis of lamellar setae. A pair of sharp crests represent the interbothridial region, two pairs of light spots are between them. Interlamellar setae arising near these crests. A pair of short lines also present medially. Interlamellar setae simple, short, exobothridial setae long. Rostral setae slightly dilated, distinctly spiculate, lamellar ones phylliform. Peduncle of sensilli curved, its dilated head spiculate.

Notogaster: A weak crista observable. Ten pairs of notogastral setae present. Setae c_2 minute, simple, all others, excepted the much smaller setae ps_2 and ps_3, nearly of equal size, dilated, nearly fusiform, distinctly spiculate. Lyrifissures *ih* and *ips* also observable.

Lateral part of podosoma: Pedotecta I rounded anteriorly, with a spur basally (Fig. 21). Exobothridial region granulated. A longitudinal lath directed posteriorly from the sejugal region.



FIGS 18-21

Corynoppia andalau sp. n. - 18: body in dorsal view, 19: body in ventral view, 20: leg I, 21: podosoma in lateral view.

Ventral region: Epimeral surfaces 1 and 2 well framed by a sharp arched line in the sejugal region, a pair of crests also present laterally, setae *1c* arising on them. Posterior border of the coxisternal region weakly developed, hardly observable at the acetabula of leg IV. All epimeral setae fine and simple. Epimeral setal formula: 3 - 1 - 3 - 3. Anogenital setal formula: 5 - 1 - 2 - 3. The genital, aggenital and anal setae simple, all three pairs of adanal setae dilated, their shape similar to the notogastral setae.

Legs: All leg segments squat. Tibia of leg I with a strong process, both solenidia arising on it (Fig. 20). Some of the leg's setae phylliform, well spiculate (e.g., setae *l* of tibia and genu I, seta *d* of femur IV, setae *d* and *l'* of genu IV and seta *v"* of tarsus IV). All solenidia slightly blunt at tip, mostly short (e.g., φ_1 of tibia II, III and IV), eupathidium ϵ far removed from both solenidia of tarsus I.

Remarks: All species of the genus *Corynoppia* Balogh, 1983 previously described are only known from the Palaearctic and Neotropical Region. The new species stands near to them, distinguished by its elongated rostrum with two short keels, the surface of the prodorsum (except for an interbothridial field) which is distinctly granulated, and the sensilli shorter and wider than in the other species.

Derivatio nominis: Named after the Forest Reserve Andalau. Noun in apposition.

Karenella bruneiana sp. n. Figs 22-26

Material examined: Brunei: Holotype: Bru-88/21, 2 paratypes from the same sample; 5 paratypes: Bru-88/46. Holotype and 4 paratypes: MHNG, 3 paratypes (1576-PO-96): HNHM.

Measurements: Length of body 495-520 µm; width of body: 313-322 µm.

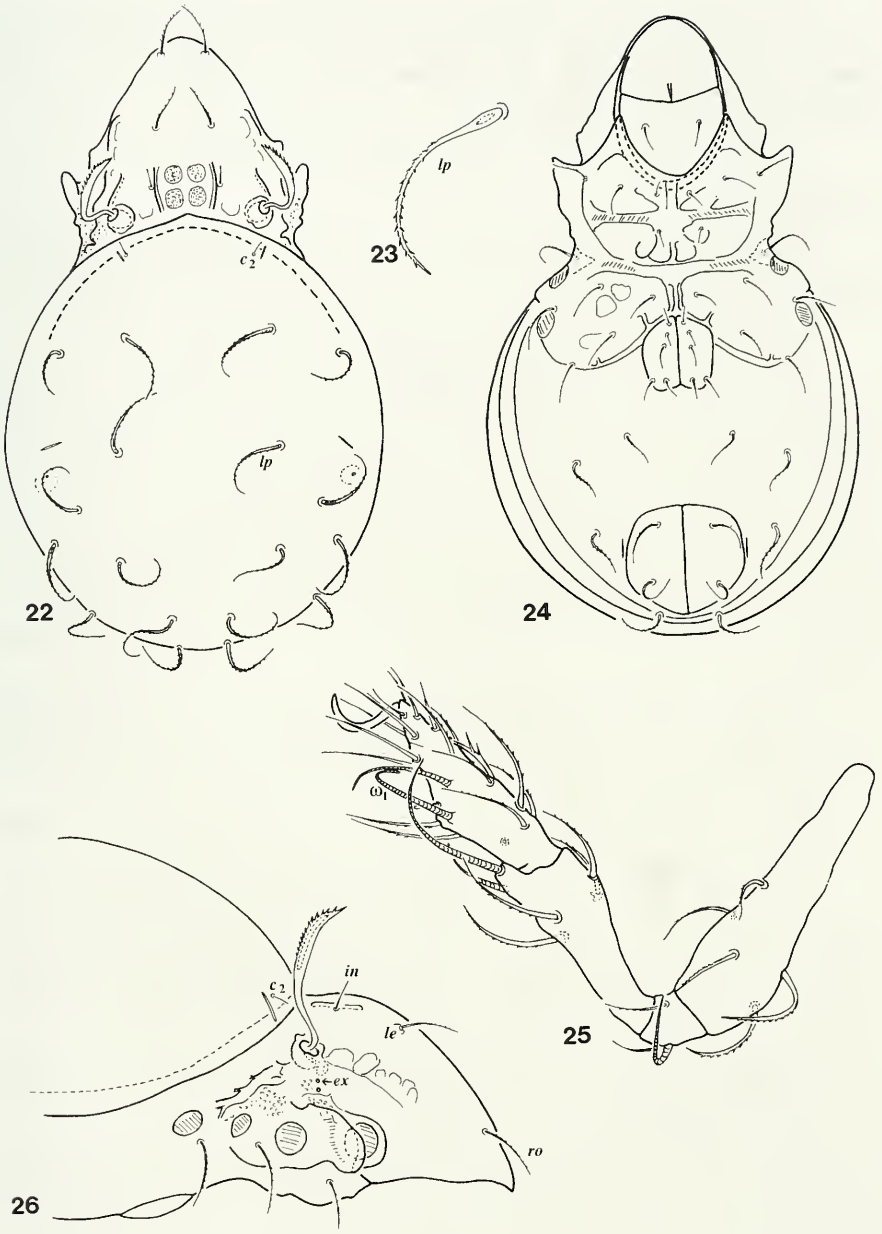
Prodorsum: Rostral apex very widely rounded, rostral setae arising on prodorsal surface. Neither costula nor lamellar line present, but a pair of typical and conspicuous interbothridial crests instead (Fig. 22), in between them two pairs of spots. Ratio of prodorsal setae *ro* > *le* > *in* > *ex*, the latter pair represented only by their alveoli, setae *ro* and *le* finely ciliated. Sensilli asymmetrically fusiform, with spicules on their distal half. Exobothridial region slightly granulate.

Notogaster: Anterior margin of notogaster convex. Ten pairs of characteristic notogastral setae (Fig. 23) present, setae c_2 minute, all others dilated basally, blunt at tip, comparatively long and well ciliated.

Lateral part of podosoma: A strong lath running from the bothridium posteriorly, the surface between it and the acetabula is mostly granulated (Fig. 26).

Ventral region: Coxisternal region well sclerotized. Epimeres 1 and 2 well separated from each other, borders 4 are weaker than the others, narrowing laterally. Epimeral surface ornamented by some irregular fields. Epimeral setal formula is typical for the genus, setae *1c* arising far from pedotecta I (Fig. 24). Adanal setae are similar to the notogastral ones, all others in the ventral plate are fine and somewhat roughend. Lyrifissures *iad* in adanal position.

Legs: Tibia of leg I (Fig. 25) with a strong process bearing two solenidia. Solenidion ω_1 strongly arched backwards and inwards. All femora and trochanter IV conspicuously long, the chaetom of all legs typical for the family.



FIGS 22-26

Karenella bruneiana sp. n. - 22: body in dorsal view, 23: seta *lp* of notogaster, 24: body in ventral view, 25: leg I, 26: podosoma in lateral view.

Remarks: The species of the genus *Karenella* Hammer, 1962 have been surveyed by Subias & Balogh (1989). The new species is clearly distinguished from those previously known by the form and length of the notogastral setae and by the gradually narrowing epimeral borders 4.

Derivatio nominis: Named after the country of its origin.

Ptiloppia lienhardi sp. n. Figs 27-30

Material examined: Holotype: Bru-88/21, 8 paratypes from the same sample; 4 paratypes: Bru-88/32; 13 paratypes: Bru-88/35. Holotype and 16 paratypes: MHNG, 9 paratypes (1577-PO-96): HNHM.

Measurements: Length of body: 213-239 µm; width of body: 109-124 µm.

Prodorsum: Rostrum tripartite, median apex also divided (Fig. 27). Rostral setae simple and smooth, arising on the prodorsal surface behind the apex. A pair of arched and narrow costulae present, with a shorter and also arched subcostula laterobasally; between them a pair of longitudinal tubercles visible. Lateral part of prodorsum granulated, some smaller granules observable along the distal part of the costulae (Fig. 30). The very short lamellar setae arise on the distal end of the costulae. Comparatively long interlamellar setae visible lateral to the tubercles. Exobothridial setae longer than the rostral or interlamellar ones. Bothridium well sclerotized, with a rounded basal protuberance. Sensilli very long, with dilated head bearing 6-7 long branches.

Notogaster: Anterior region of notogaster narrowing, no true crista discernible. Only seven pairs of notogastral setae present (I was not able to see either true setae or the alveoli of setae h_1- h_3). Setae c_2 very short, spiniform, setae *la* and *lm* long, with capitate distal ends (Fig. 27, 30).

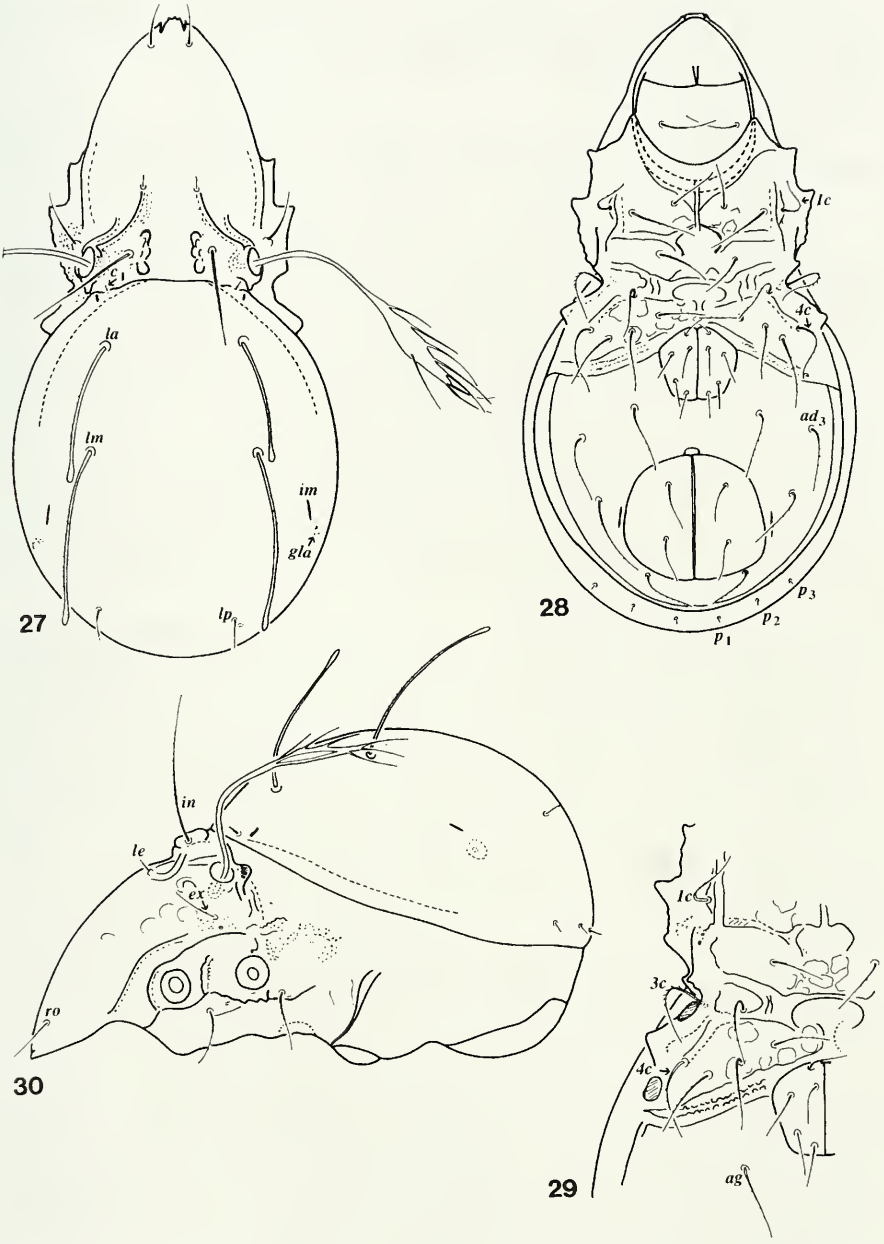
Lateral part of podosoma: Pedotecta I and II-III very small, crest-like. Exobothridial setae arising on small tubercles.

Coxisternal region: Epimeral borders well developed, *bo.* 2 and *bo. sej.* comprising foramen-like structures medially (Fig. 29), *bo.* 4 broad, with granules in its median hollow. All epimeral setae conspicuously long, most of them finely ciliated. Setae *1c* stand far from pedotecta I, setae *4c* also arising far from the pedotecta, inserted at the end of a lath. Epimeral setal formula: 3 - 1 - 3 - 3.

Anogenital region: All setae of this region also long. Anogenital setal formula: 5 - 1 - 2 - 3. Setae ad_3 originating far anteriorly and laterally from the anal aperture. Lyrifissures *iad* located in the adanal position.

Legs: All leg segments, primarily femora, tibiae and tarsi of leg III and IV elongated, long or very long. Tibia of leg I without tubercle, solenidion φ_1 very long, φ_1 on tibia IV also long and flagellate. Solenidion of genu of leg III short, fusiformly dilated.

Remarks: The rostrum, the prodorsal and ventral structures and some other features (e.g., reduction of the notogastral setae) of the new species are similar to those of *Oppiella bulanovae* Hammer, 1968, the type species of the genus *Ptiloppia* Balogh, 1983. However, the form of the notogastral setae is quite different.



FIGS 27-30

Ptiloppia lienhardi sp. n. - 27: body in dorsal view, 28: body in ventral view, 29: coxisternal region, 30: body in lateral view.

Derivatio nominis: I dedicate the new species to Dr. C. Lienhard (Muséum d'histoire naturelle, Geneva) for his help to Dr. B. Hauser during field trips in the tropics and for his help in correcting my manuscripts.

Senectoppia kerangas sp. n. Figs 31-33

Material examined: Brunei: Holotype: Brun-88/35, 1 paratype from the same sample. Holotype: MHNG, paratype (1578-P0-96): HNHM.

Measurements: Length of body: 341-372 µm; width of body: 198-213 µm.

Prodorsum: Rostrum elongated. Costulae well developed, not connected by transversal ridges. Two pairs of punctate and irregular interbothridial fields present. Bothridium with basal tubercle. Sensilli very long, pectinate, their 6 (7) branches different in length. Ratio of the prodorsal setae: *ro* > *le* > *in* = *ex* (Fig. 33).

Notogaster: Anterior region of notogaster narrowing. A pair of well-developed humeral processes present, the minute setae c_2 and lyrifissures *ia* observable. Among the other nine pairs of setae, four pairs arising in longitudinal rows and of nearly equal length, the others being much shorter; the four median pairs finely ciliate. Lyrifissures *ih* and *ips* located very near to each other, observable only in lateral view.

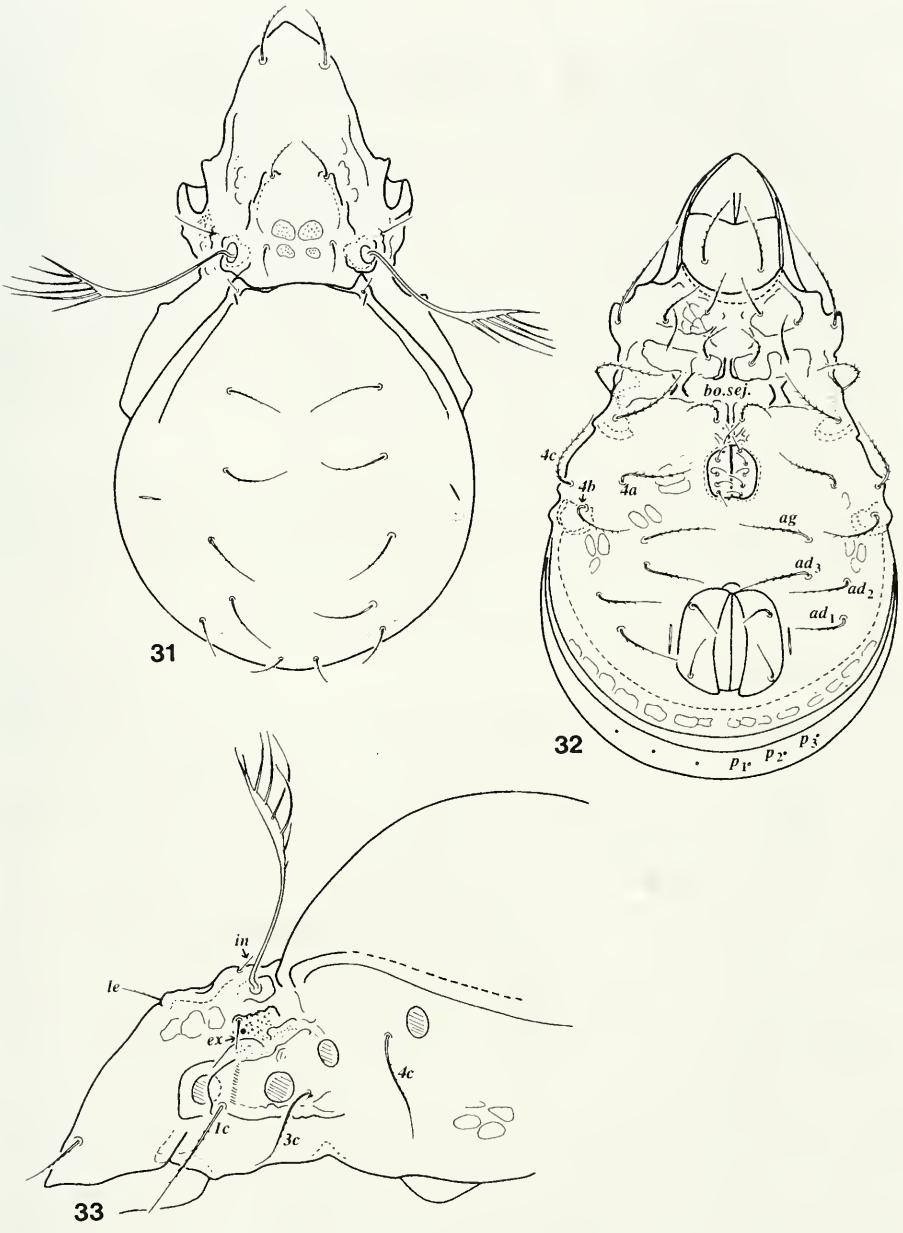
Lateral part of podosoma: Anterior part of this region well sclerotized, with some laths, the surface partly granulated (Fig. 33). Pedotecta I small, pedotecta II-III reduced.

Ventral region: Anterior part of the coxisternal region well sclerotized, among the epimeral borders *bo.* 2 and *bo. sej.* broad, with longitudinal ponticular crests. Epimeral surface with an irregular polygonate sculpture. Posterior part weakly sclerotized, *bo.* 3 and *bo.* 4 completely reduced, a weak sternal border and only some irregular fields observable in this part (Fig. 32). All epimeral setae very long and characteristically pilose, setae *1c* the longest of all. Ventral plate with some irregular fields behind the acetabula of legs IV. Genital aperture very small, six pairs of smooth setae arising on the genital plates (one pair difficult to see). The anterior setae much longer than the others. Aggenital setae with long cilia, adanal setae arising in paraanal and preanal position, only with short cilia. The distance between setae ad_1 and ad_2 equal to the distance between setae ad_2 and ad_3. Lyrifissures iad conspicuously long.

Legs: All segments of legs very long and narrow. Tibia of leg I without process. ϵ on tarsus I removed to the posterior part of the segment, behind the solenidion ω_1. Seta *v*" of tarsus IV plumose.

Remarks: Based on the shape of the sensilli and on the presence or absence of the characteristic sculpture of the notogaster, the species of *Senectoppia* Aoki, 1967 may be divided into two groups (Aoki, 1983). The sensilli of the new species are pectinate, the notogaster has no sculpture. Therefore it is very close to *S. pectinata* Aoki, 1983, however, the new species differs from it by the ratio of the prodorsal setae (setae *in* are the longest prodorsal setae in *S. pectinata*), by the length of the sensillar branches (shorter in *S. pectinata*), the number of the notogastral setae (c_2 absent in *S. pectinata*) and primarily by the absence of a strong epimeral border *bo.* 4 (present in *S. pectinata*) and by the position of the adanal setae.

Derivatio nominis: Named after the tropical heath forest "Kerangas". Noun in apposition.



FIGS 31-33

Senectoppia kerangas sp. n. - 31: body in dorsal view, 32: body in ventral view, 33: podosoma in lateral view.

Bruneibelba gen. n.

Diagnosis: Belonging to the family Suctobelbidae. Rostrum wide, its apex rounded, with 2-3 pairs of lateral teeth. Rostral setae simply geniculate. Tectopedial field present, lamellar knob divided into two parts fused with the interbothridial crests. Lamellar setae conspicuously long, arising on the distal tubercles. Sensilli long, directed outwards, with a rounded head. Anterior margin of notogaster with two pairs of condyles. Light median spot placed on a protuberance. Nine pairs of foliate notogastral setae. Gnathosoma typical for the family, palpal eupathidia fused, palpal solenidium very long. Palpal setal formula: 1 - 0 - 2 -7+1. Coxisternal region with a pair of large lobes near the genital opening. Discidium with a wide transversal crest. Four pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae present, setae ad_1 in adanal, setae ad_3 in preanal position. Legs are typical for the family.

Type species: *Bruneibelba separata* sp. n.

Remarks: The new taxon differs from the heretofore known genera of Suctobelbidae by its divided lamellar knob, by the large tubercles in the coxisternal region and by the 4 pairs of genital setae. This combination of features was hitherto unknown in the family.

Derivatio nominis: Named after the country of origin.

Bruneibelba separata sp. n. Figs 34-37

Material examined: Brunei: Holotype: Bru-88/35, 5 paratypes from the same sample; 3 paratypes: Bru-88/21. Holotype and 5 paratypes: MHNG, 3 paratypes (1579-PO-96): HNHM.

Measurements: Length of body: 198-209 µm; width of body: 106-117 µm.

Prodorsum: Rostral apex rounded, with 2-3 rostral teeth. Whole prodorsal surface bearing tubercles. Bothridium with large basal tubercles. Peduncle of the sensilli long, its head elongate, smooth, sometimes with a narrow, divided velum.

Notogaster (Fig. 34): Both pairs of notogastral condyles conspicuously developed, with long cristae directed backwards. Nine pairs of notogastral setae present, all setae lanceolate, except for setae p_2.

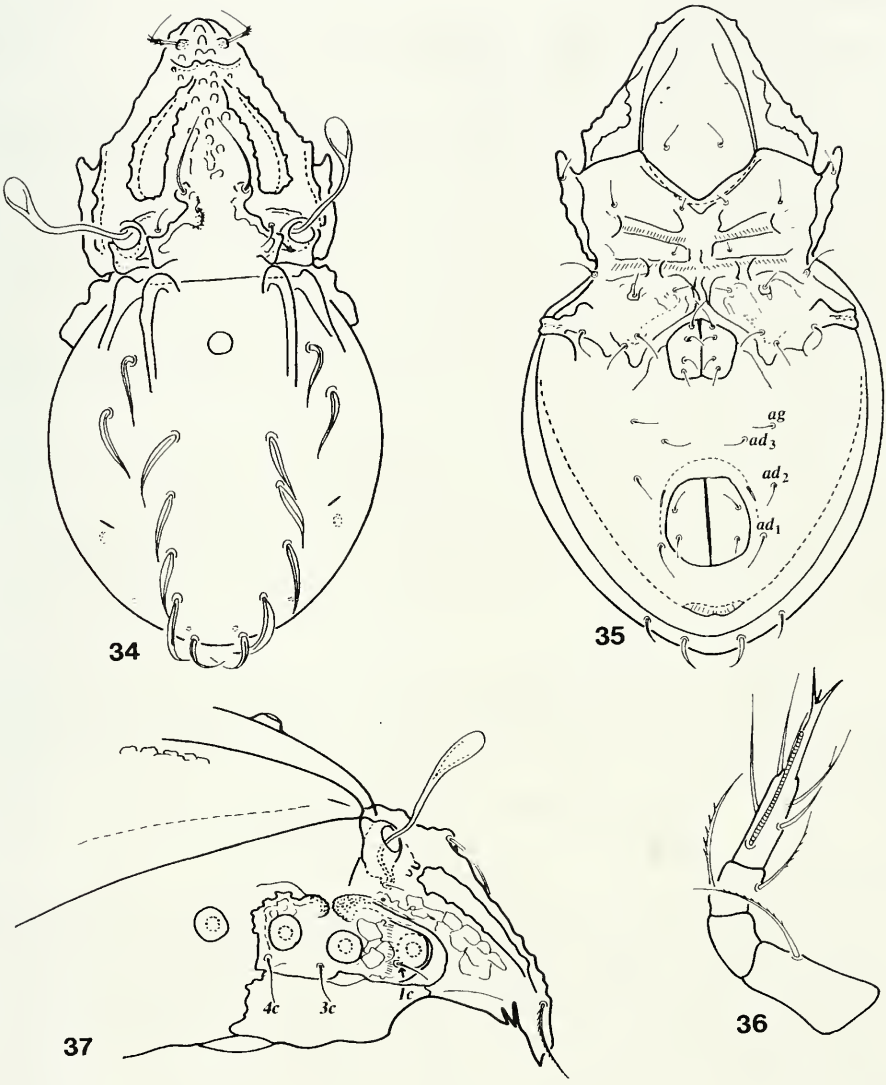
Lateral part of podosoma: Well ornamented by a polygonal sculpture (Fig. 37). Longitudinal lath in exobothridial region well granulate, opposite to it a similar tubercle in the sejugal region.

Ventral region (Fig. 35): Epimeral surface (except for epimeres 3-4) smooth, only a weak polygonal pattern observable on the last one. Basal lobus on the epimeral border 4 slightly protruding from the surface. Epimeral setae simple, setae *1c* arising laterally. Anogenital setal formula: 4 - 1 - 2 - 3. Adanal setae typical for the family, ad_1 in paraanal, ad_3 in preanal position, ad_3 stand conspicuously near to the aggenital setae. Behind the anal opening, a short undulate thickening observable.

Legs: Typical for the family.

Remarks: See after *Bruneibelba tuberosa* sp. n..

Derivatio nominis: Named after the shape of the structures in the lamellar region.



FIGS 34-37

Bruneibelba separata gen. n., sp. n. - 34: body in dorsal view, 35: body in ventral view, 36: palp, 37: podosoma in lateral view.

Bruneibelba tuberosa sp. n Figs 38-41

Material examined: Holotype: Brun-88/35, 3 paratypes from the same sample. Holotype and 2 paratypes: MHNG, 1 paratype (1580-PO-96): MHNG.

Measurements: Length of body: 173-184 µm; width of body: 96-106 µm.

Prodorsum: Rostral apex rounded, with 2 large, rounded rostral teeth (Fig. 39). Whole prodorsal surface bearing tubercles. Bothridium with large basal tubercles. Peduncle of the sensilli long, its head truncate, with a conspicuously spiculate velum.

Notogaster (Fig. 38): Both pairs of notogastral condyles conspicuously developed, with long cristae directed backwards. Median condyles wide, blunt at tip. Light median spot protruding. Nine pairs of notogastral setae present, slightly shorter than in the preceding species, all setae lanceolate, except for setae p_2.

Lateral part of podosoma: Well ornamented by polygonal sculpture, granules and tubercles (Fig. 41). Longitudinal lath in exobothridial region distinctly granulated, opposite to a similar tubercle in the sejugal region.

Ventral region (Fig. 40): Epimeral surface with only a slight polygonal pattern. Basal lobus on the epimeral border 4 slightly protruding from the surface. A conspicuous lath present behind this lobe, directed posteriorly. Epimeral setae simple, setae *1c* arising laterally. Anogenital setal formula: 4 - 1 - 2 - 3. Adanal setae typical for the family, setae ad_1 in paraanal, ad_3 in preanal position, ad_3 stand very near to the aggenital setae.

Legs: Typical for the family.

Remarks: The two species of the new genus can be separated by the size of the rostral teeth (sharply pointed, narrow in *B. separata*; large, rounded in *B. tuberosa*), and by the form of the sensilli (smooth marginally in *B. separata*; with a spiculate velum in *B. tuberosa*).

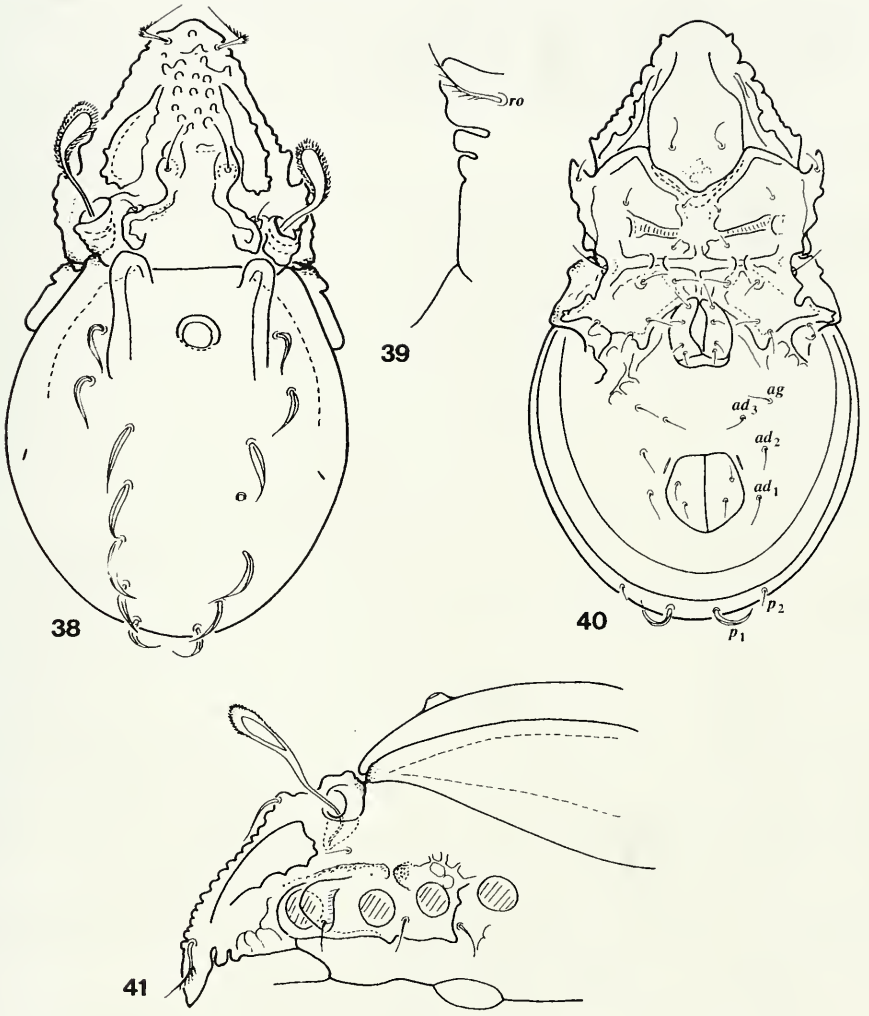
Derivatio nominis: Named after the sculpture of the prodorsum.

Coartobelba gen. n.

Diagnosis: Belonging to the family Suctobelbidae. Sejugal region of the body strongly narrowing in lateral view. Rostral apex wide, with one pair of large lateral teeth. Tectopedial field and lamellar knob present, all basal structures absent. Rostral setae geniculate, lamellar setae arising on the lamellar knob, interlamellar setae located laterally, very near to the bothridia. Peduncle of the sensilli conspicuously long, directed anteriorly. Dorsosejugal suture partly absent, anterior margin of notogaster with one pair of very large lateral condyles. Nine pairs of notogastral setae present. Coxisternal region simple, without tubercles or ponticular structures. Epimeral borders 4 very characteristic, forming a continuous sharp line (Fig. 44). Anogenital setal formula: 4 - 1- 2 - 3, adanal setae in typical position. Gnathosoma and legs typical for the family.

Type species: *Coartobelba pauper* sp. n.

Remarks: The new species is unique in the family by the strongly narrowing regio sejugalis and by the absence of the basal structures of the prodorsum. The



FIGS 38-41

Bruneibelba tuberosa gen. n., sp. n. - 38: body in dorsal view, 39: teeth of rostrum, 40: body in ventral view, 41: podosoma in lateral view.

conspicuous, undulate posterior border of the coxisternal region is also unknown in related taxa. *Suctobelba campestris* Balogh & Mahunka, 1981 = *Coartobelba campestris* (Balogh & Mahunka) comb. n. from Paraguay also belongs to this genus.

Derivatio nominis: Named after the dorso-ventrally strongly flattened body.

Coartobelba pauper sp. n Figs 42-46

Material examined: Brunei: Holotype: Bru-88/46, 4 paratypes from the same sample; 2 paratypes: Bru-88/21; 5 paratypes: Bru-88/29; 1 paratype: Bru-88/41. Holotype and 7 paratypes: MHNG, 5 paratypes (1581-PO-96): HNHM.

Measurements: Length of body: 208-221 µm; width of body: 113-120 µm.

Prodorsum: Rostral apex slightly nasiform, behind it a pair of wide lobes and a pair of sharp, large teeth, directed forwards (Fig. 43). Some tubercles present in the rostral part of the prodorsum. Tectopedial fields located near to each other. Lamellar knob large, bulbiform. Interbothridial part of prodorsum broad, some light fields present basally, but neither the costuliform structures nor other crests present. Interlamellar setae arising in an unusual position, near to the bothridium. The head of the sensilli asymmetrically lanceolate, with some spicules laterally.

Notogaster: Lateral condyles sharply pointed, directed forwards, very long (Fig. 46). Dorsosejugal suture thin. Nine pairs of short, simple notogastral setae present, no essential differences between them (Fig. 42).

Lateral part of podosoma: A well-developed, granulate longitudinal lath and a similarly granulate, large tubercle present in the sejugal region (Fig. 45).

Ventral region (Fig. 44): Shape of gnathosoma (chelicerae, palps) typical for the family. Palpal setal formula: 1 - 0 - 2 - 7+1. Eupathidia fused, typically furcate. Palpal solenidium very long. Epimeral borders of the coxisternal region well-developed; the longitudinal, sternal borders also continuous (Fig. 44). All epimeral setae short and simple. Setae of the ventral plate also simple, aggenital setae arising very far from each other, much further than from the anterior adanal setae (ad_3).

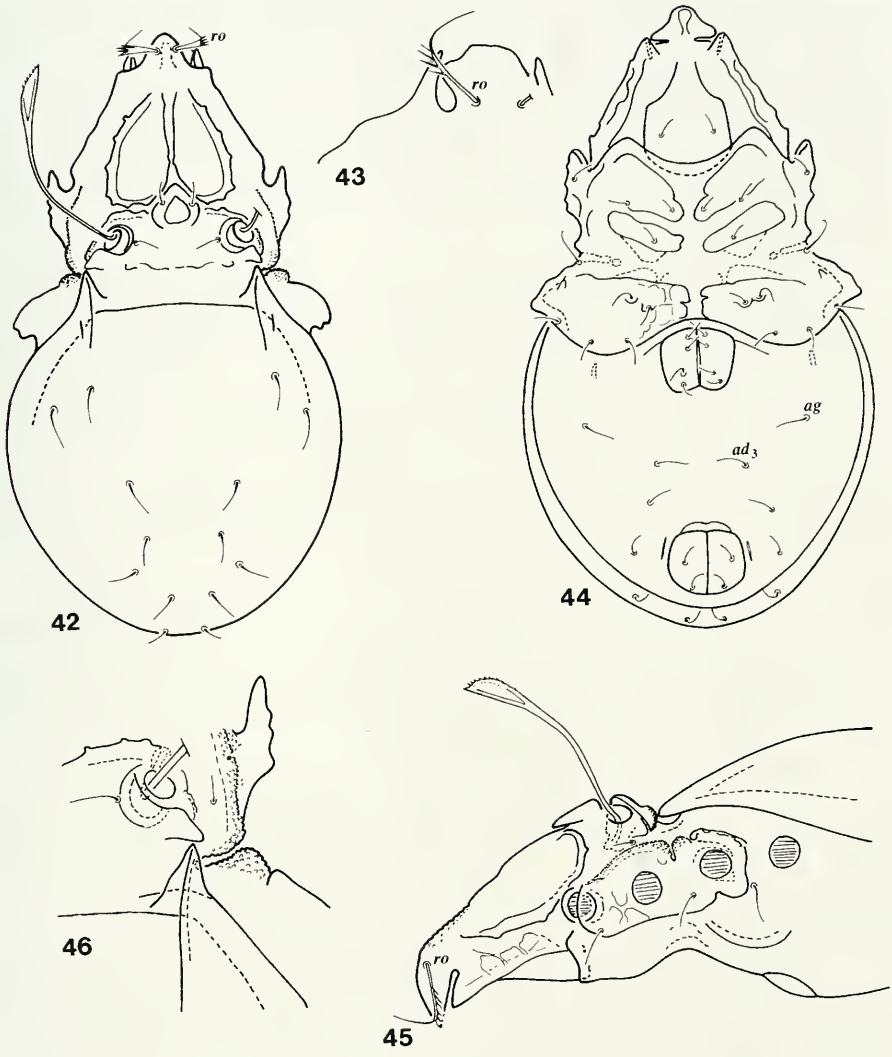
Legs: Their size and chaetotaxy typical for the family. Solenidion ω_1 long, but reaching only to the basis of the claw. Solenidia φ_1 and φ_2 very long and flagellate. Setae *v*" and *a*" strongly dilated, *v*" phylliform, well-pilose.

Remarks: See the remarks after the description of the new genus.

Derivatio nominis: Named after the missing structures of the prodorsum.

Condylobelba gen. n.

Diagnosis: Belonging to the family Suctobelbidae. Prodorsum with a broadened, wide rostrum and 4-5 large, mostly serrated pairs of lateral teeth. Behind the rostrum a transversal lath present, the geniculate rostral setae arising on it. Tectopedial fields and lamellar knob normally developed. Bothridium with basal tubercles. Anterior margin of notogaster with two pairs of condyles with crista, between them an unpaired, anteriorly rounded condylus present. At least the latter structure distinctly protruding from the notogastral surface. Nine pairs of notogastral setae present. Mentum and chelicerae typical for the family, palpal setal formula 2 - 0 - 2 - 7+1.



FIGS 42-46

Coartobelba pauper gen. n., sp. n. - 42: body in dorsal view, 43: rostral apex, 44: body in ventral view, 45: podosoma in lateral view, 46: bothridial region and lateral condyle of notogaster.

Distal eupathidia of palpal tarsus fused, furcate, solenidium long. Lateral region of podosoma and coxisternal region similar to that of the other taxa in the family. Four or five pairs of genital, one pair of aggenital, two pairs of anal and three pairs of adanal setae present. Setae ad_1 in paraanal position and ad_3 in preanal position, the latter always far anteriorly. Lyrifissures *iad* stand near to the anal aperture. Size and chaetotaxy of the legs typical for the family. Solenidia φ_2 and ω_1 of leg I peculiarly long, solenidion φ_2 on tibia IV short and blunt at tip, two setae on tarsus IV slightly dilated or spinose.

Type species: *Condylobelba agathis* sp. n

Remarks: In all so far known genera of the family Suctobelbidae condyles are either missing or appear in pairs (1 or 2 pairs) on the anterior margin of the notogaster. The unpaired, median condyle is characteristic for this new genus. Apart from this striking feature, the new genus may also be characterized by the extraordinarily broad rostral apex, the transverse lath behind it bearing rostral setae, the 3-4 conspicuously large lateral teeth and the less than 6 pairs of genital setae. This combination of features is entirely unknown in any of the genera belonging to the family of Suctobelbidae. In addition to the type-species two further new species are described below.

Derivatio nominis: Named after the condylar structure of the notogaster.

Condylobelba agathis sp. n Figs 47-51

Material examined: Brunei: Holotype: Bru-88/35, 13 paratypes from the same sample; 2 paratypes: Bru-88/21; 1 paratype: Bru-88/29; 1 paratype: Bru-88/46. Holotype and 11 paratypes: MHNG, 6 paratypes (1 582-PO-96): HNHM.

Measurements: Length of body: 163-179 µm; width of body: 82-89 µm.

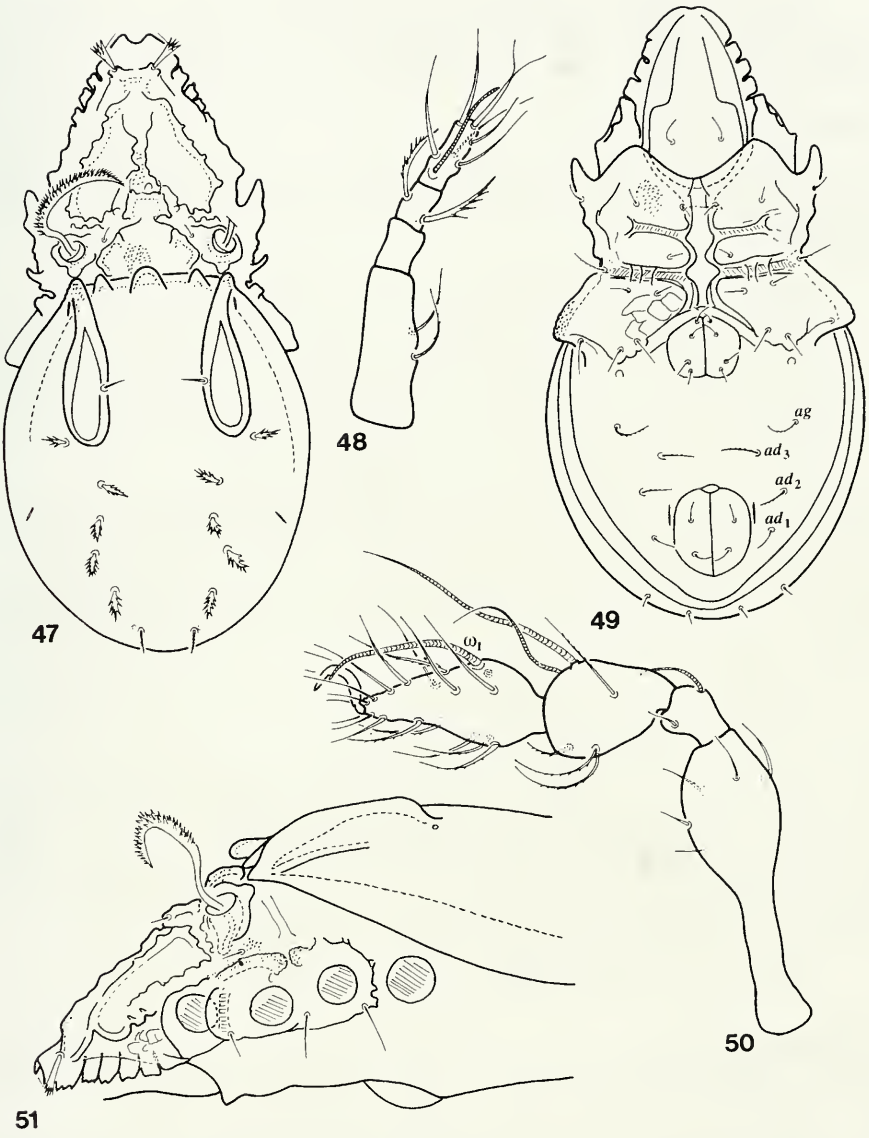
Prodorsum: Nearly the whole surface granulated. Rostral apex concave medially, with 2-3 sharp teeth on both sides laterally. Behind the deep apical incisure, 3-4 very large, partly serrated lateral teeth present. Tectopedial field wide, lamellar knob also wide, anterior margin nearly straight with two small lateral tubercles. Sensilli narrow, falciform, distinctly barbed, directed inwards.

Notogaster (Fig. 47): Apices of the lateral condyles granulated, continuing into long cristae forming teardrop-shaped structures. The unpaired rounded condyles being the largest of all, standing isolated without any sculpture. All condyles and the guttiform structures distinctly protruding from the notogastral surface. Nine pairs of notogastral setae present, five pairs dilated, strobiliform, the others spinifonn.

Lateral part of podosoma (Fig. 5 1): Pedotecta I small, seta *1c* arising on its basal margin. Exobothridial region granulated.

Ventral region (Fig. 49): All epimeral surfaces granulate, except for the median (sternal) field. A weak polygonal design also observable. Epimeral setae simple, setae *1c* arising laterally. Anogenital setal formula: 4 - 1 - 2 - 3. Adanal setae arising in typical position for the family, ad_1 paraanal.

Legs: Size and chaetotaxy of the legs typical for the family. Solenidion φ_1 of leg I (Fig. 50) long, fine, flagellate, ω_1 also long, reaching beyond the basis of the claw. Solenidion φ_1 of tibia IV short, conspicuously bent. Setae *v'* and *v"* pennate, slightly dilated distally.



FIGS 47-51

Condylobelba agathis gen. n., sp. n. - 47: body in dorsal view, 48: palp, 49: body in ventral view, 50: leg I, 51: podosoma in lateral view.

Remarks: See after *Condylobelba sculpturata* sp. n..

Derivatio nominis: Named after the *Agathis damara* (Araucariaceae) forest in Brunei, the unique natural monoculture of this species.

Condylobelba bruneiensis sp. n. Figs 52-54

Material examined: Brunei: Holotype: Bru-88/35, 3 paratypes from the same sample; 2 paratypes: Bru-88/21; 5 paratypes: Bru-88/24; 1 paratype: Bru-88/29; 2 paratypes: Bru-88/41; 1 paratype: Bru-88/46. Holotype and 12 paratypes: MHNG, 4 paratypes (1583-PO-96): HNHM.

Measurements: Length of body: 171-179 µm; width of body: 87-93 µm.

Prodorsum: Rostral apex rounded or straight medially, with a conspicuous transversal lath behind it. Nearly the whole prodorsal surface granulated, some individual tubercles also observable between the tectopedial fields or the lamellar knob. Margins of this last structure undulate. Bothridium with large basal tubercles, head of the sensilli distinctly dilated, with a spiculate dorsal surface.

Notogaster: All condyles of the notogastral margin well-developed, cristae running posteriorly from both lateral pairs. Median cristae interconnected posteriorly, forming a semicircular structure (Fig. 52). Median unpaired condyle very large, also semicircular. Nine pairs of notogastral setae present, all dilated, mostly wide, phylliform, except for p_2 which is only slightly spiculate. The median five pairs (*lp*, h_1-h_2, p_1) larger than the others. Some granules arranged longitudinally around the insertion of the median notogastral setae.

Lateral part of podosoma: Exobothridial region conspicuously granulated. Pedotecta I semicircular, seta *1c* arising on its margin.

Ventral region (Fig. 53): Surface of epimere 1 finely granulated, on the other epimeres only a weak polygonal pattern observable. Epimere 3-4 divided by a comparatively strong longitudinal lath. Epimeral setal formula: 3 - 1 - 3 - 3. All setae fine and simple. A well-developed lateral tooth present opposite to the epimeral borders 4. Anogenital setal formula: 4 - 1 - 2 - 3. Two pairs of adanal setae (ad_2 and ad_3) arising in preanal position; lyrifissures iad in paraanal position.

Remarks: See after *Condylobelba sculpturata* sp. n.

Derivatio nominis: Named after the country of origin.

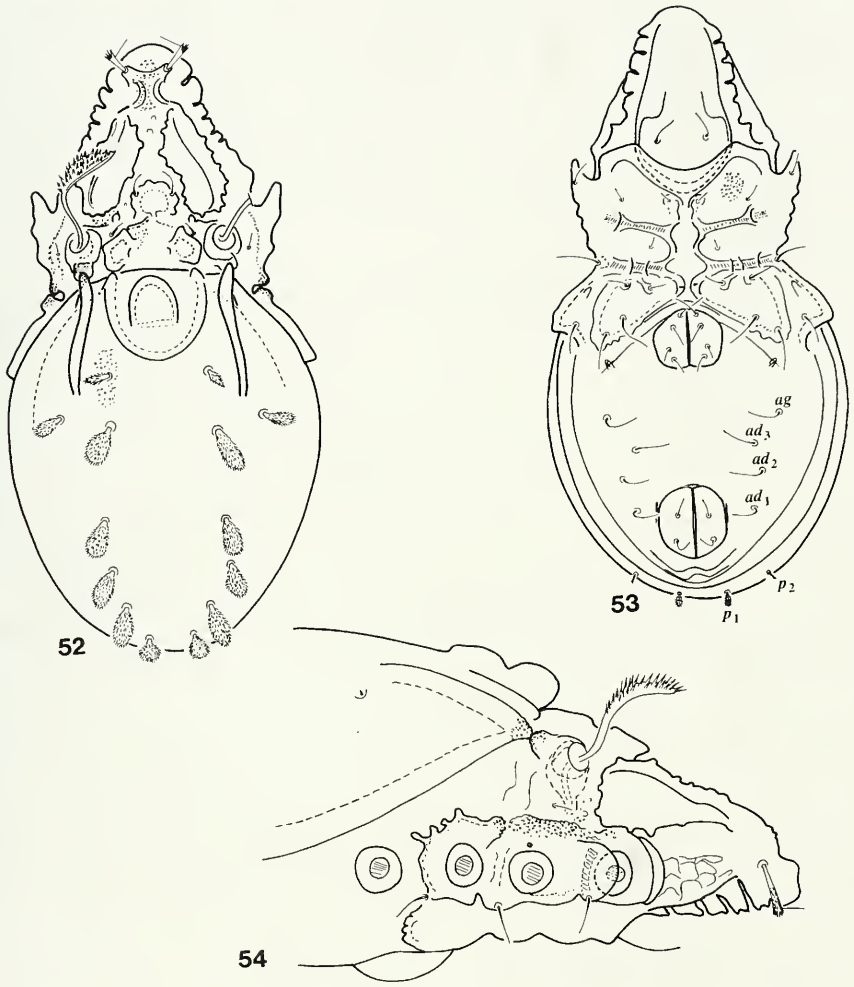
Condylobelba sculpturata sp. n. Figs 55-57

Material examined: Brunei: Holotype: Bru-88/35. Holotype: MHNG.

Measurements: Length of body: 211 µm; width of body: 122 µm.

Prodorsum: Rostrum wide, its anterior margin slightly concave, surface granulated. Behind the rostrum a typical transversal crest present, bearing the geniculate rostral setae. Tectopedial fields wide, their margins well-developed, between them some tubercles visible. Lamellar knob without median apex, its anterior margin nearly straight. Bothridium with a basal knob, sensilli bent inwards, with a dilated, approximately lanceolate and distinctly spiculate head.

Notogaster: The number and the size of the dorsosejugal condyles typical for the genus, both pairs of the lateral condyles continuing into long cristae. Notogastral



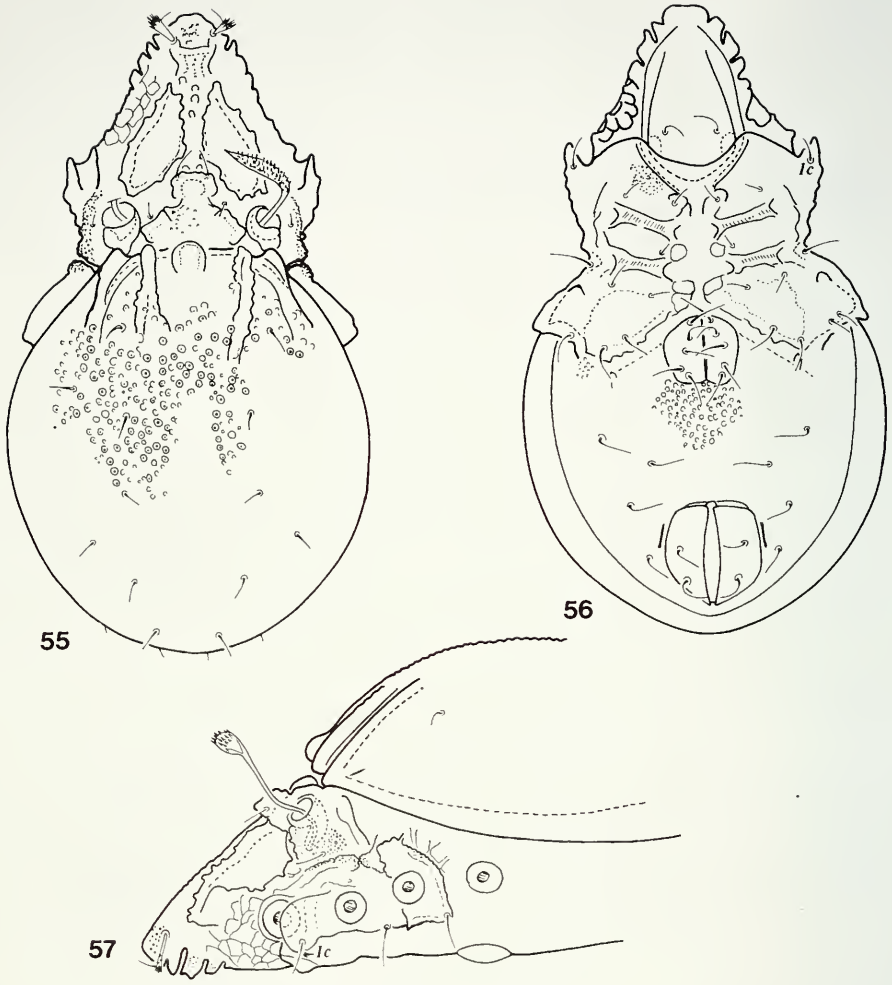
FIGS 52-54

Condylobelba bruneiensis gen. n., sp. n. - 52: body in dorsal view, 53: body in ventral view, 54: podosoma in lateral view.

surface (except for an anteromedian and a median part) covered by simple tubercles, mixed with ocellate pustules (Fig. 55). The nine pairs of notogastral setae short, simple, slightly dilated basally.

Lateral part of podosoma: Exobothridial region distinctly granulated. Pedotecta I large, with a rounded basal lobe, setae *1c* arising on it (Fig. 57).

Ventral region (Fig. 56): Epimeral surface (except for the median [sternal] field) covered by small granules, ventral plate with larger granules but without



FIGS 55-57

Condylobelba sculpturata gen. n., sp. n. - 55: body in dorsal view, 56: body in ventral view, 57: podosoma in lateral view.

ocellate formation. All epimeral setae short and simple, epimeral setal formula: 3 - 1 - 3 - 3(4). Five pairs of genital setae. The other setae on ventral plate in typical position, setae ad_1 arising in paraanal position.

Legs: Surface of all segments granulated. Their sizes and chaetotaxy typical for the family. Seta *v'* and *a'* slightly plumose.

Remarks: The three species of the new genus can be distinguished by using the following key:

1 Notogastral setae simple, notogastral surface ornamented with protruding granules or tubercles ..... *C. sculpturata* sp. n.
– Notogastral setae modified, strobiliform or phylliform; notogastral surface smooth 2
2 Cristae of the lateral notogastral condyles forming teardrop-shaped loops; notogastral setae strobiliform ..... *C. agathis* sp. n.
– Only one crista extending from lateral notogastral condyles; notogastral setae phylliform ..... *C. bruneiensis* sp. n.

Derivatio nominis: Named after the sculpture of the notogaster.

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Description of a new species of *Apteroloma* from China (Coleoptera, Agyrtidae)

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Description of a new species of *Apteroloma* from China (Coleoptera, Agyrtidae). - *Apteroloma qinlingense* sp. n. is described from China, Shaanxi Province. The new species is easily distinguished by the large size and shape of the body.

Newton (1997) reviewed the family Agyrtidae and defined its constituent higher taxa. *Apteroloma* Hatch, with 14 Palaearctic and 7 Northwest American species is the largest genus of the family. *Apteroloma* are generally rare and poorly represented in collections; they are usually found in cool, high altitude habitats. Palaearctic species are known from Pakistan, the Himalaya, Central Asia, Siberia, Korea and Japan (Newton, 1997; Nomura and Lee, 1993; Schawaller, 1991); only two, *A. davidis* (Fairmaire) and *A. potanini* (Semenov) and known from China. In 1993 I took *A. potanini* in large numbers in Beijing and Shanxi, and in 1995 the following new species in Shaanxi.

Apteroloma qinlingense sp. n.

♂ holotype, 2 ♂♂ & 2 ♀♀ paratypes: Shaanxi Province, Nanwutai (ca. 1200 m, under stones at edge of water on shingle bank of stream in dense forest), 17.I.1995, G. de Rougemont. Holotype ♀ 1 paratype in Museum d'histoire naturelle, Genève; paratypes in Staatliches Museum für Naturkunde in Stuttgart and in coll. Rougemont, London.

Length: 6.6 - 7 mm. Proportions of holotype: Length: 7 mm; median length of pronotum: 1.4 mm; breadth of pronotum: 2.2 mm; length of elytron: 4.6 mm; combined breadth of elytra: 3.4 mm; length of antenna: 3.6 mm. Outline of fore-body: fig. 1.

Piceous, lateral areas of pronotum paler, brunneous; mouthparts, antennae and legs dark reddish-brown. All dorsal surfaces shiny, the microsculpture distinct, irregular on head and pronotum, closely transverse on elytra.

Head coarsely and irregularly punctate, frons almost impunctate. Labrum with long fine erect yellowish setae; frons on either side with a pair of long erect setae; a further similar seta arises from a puncture on inner margin of eye. Antennae long, all antennomeres strongly elongate, the penultimate twice as long as broad.

Pronotum 1.5 time as broad as its median length, sub-cordiform, the anterior angles produced and rounded, the lateral margins briefly sinuate before acute

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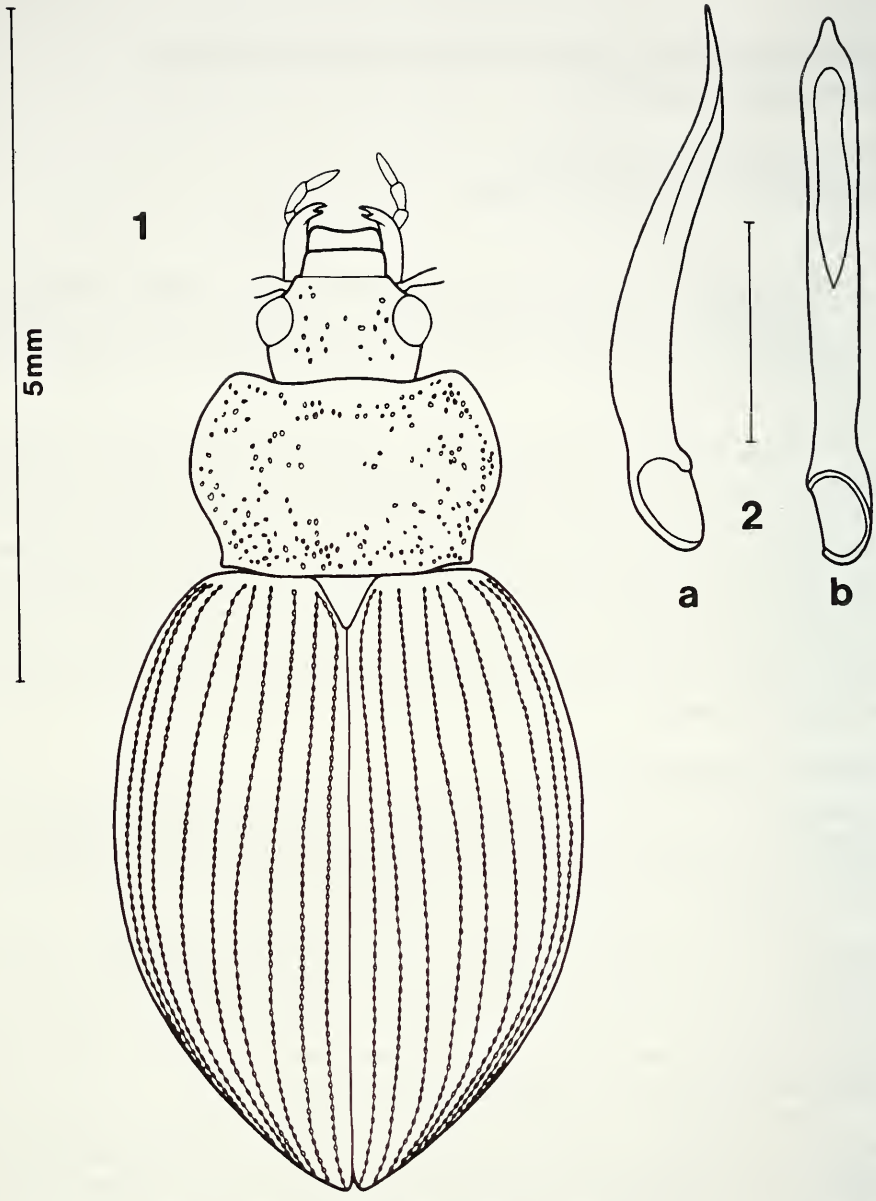

FIG. 1: outline of body (male) of *Apteroloma qinlingense* sp. n.
FIG. 2: aedeagus in ventral (a) and lateral (b) views

posterior angles; all margins bordered; surface irregularly and variably punctate, leaving broad impunctate areas on disc.

Elytra 1.4 time longer than their combined breadth, with nine punctate striae, the ninth situated in the gutter formed by the reflexed lateral margin; third stria with ca. 60 punctures; lateral margins behind humeral angles even.

Protarsi slightly more dilated in male than in female. Aedeagus: Fig. 2, a, b.

In Schawaller's key (1991, p. 19) *A. qinlingense* sp. n. runs to *A. neelumense* Schawaller, from which it is easily distinguished by it much greater size and the quite different shape of the pronotum. It is the largest species of *Apteroloma* after. *A. rosti* (Portevin) and as such is readily distinguished from all other known members of the genus.

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Oribatids from Switzerland V (Acari: Oribatida: Suctobelbidae 2). (*Acarologica Genavensia* XCVII)

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Oribatids from Switzerland V (Acari: Oribatida: Suctobelbidae 2). (*Acarologica Genavensia* XCVII). – Suctobelbid oribatids from soil samples in Switzerland have been examined. 29 species are listed, 3 of which (*Allosuctobelba hauseri* sp. n., *Suctobelba consimilis* sp. n. and *Suctobelbella besucheti* sp. n.) are new to science. 2 new combinations are presented: *Allosuctobelba centroamericana* (Woas) comb. n. = *Suctobelba centroamericana* Woas, 1986 and *Rhynchobelba ornithorhyncha* (Willmann) comb. n. = *Suctobelba ornithorhyncha* Willmann, 1953. Additional morphological characters are discussed for 8 species. A new terminology for the peculiar morphological features of the family is presented and a key to the swiss genera is given.

Key-words: Acari – Oribatida – Suctobelbidae –taxonomy – new species – new combinations – Switzerland.

INTRODUCTION

We are working on the exploration of the oribatid fauna of Switzerland. The final goal, as we have several times stated (e.g. Mahunka, 1996), is to write a monograph. However, before making the final touches, another 4-5 years will have to pass. Consequently, the publication of some interesting faunistic and zoogeographic data that crop up seems more than justified. For this purpose, we deemed it appropriate to launch this series of papers.

Lately we proposed to discuss some of the available information gained in connection with species belonging in the superfamily Oppioidea (Balogh, 1983; Subias & Balogh, 1989). In the first part of this work (Mahunka & Mahunka-Papp, 2000a) we studied and described some species belonging to the families Oppiidae and Quadroppiidae, in the following (2nd and 3rd) parts we related our results in connection with taxa of Suctobelbidae. In the second we described two new genera (Mahunka & Mahunka-Papp, 2000b). In the third, present, part we discuss the recently discovered 29 Swiss suctobelbid species.

In our taxonomic works we generally followed the system of Marshall, Reeves & Norton (1987), but perhaps the biggest changes occurred in this particular super-

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family, Oppioidea, following the appearance of this work, and the situation is more than problematic. We should stress that when we refer to the taxon Oppioidea then we adopt the system including, e.g. the following families: Oppiidae, Quadroppiidae and Suctobelbidae (Balogh & Balogh, 1992). We cannot accept the present subfamily level, although we are aware of the fact that it may indicate definite relationships. The composition of the family Suctobelbidae has significantly changed lately, but it plays only an insignificant role in the Palaearctic region. Of course, we hold the view that some changes will have to be made, and synonymizations will have to be carried out.

Data referring to this family from Switzerland were published by Schweizer (1922, 1948, 1956) and Borcard (1994). Schweizer's data bearing reference to only 5 species are uncertain. Among the species are: "*Suctobelba corniger*"[sic!], "*S. subtrigona*", "*S. trigona*", "*S. perforata*" and "*S. grandis*". "*S. trigona*" definitely belongs to the "*trigona*" species-group, as "*S. grandis*" belongs to the "*Allosuctobelba grandis*" species-group. The former could be any species belonging in that species-group, the latter in lacking the striking double rostral teeth may be identified with *Allosuctobelba hauseri* sp. n. described herein. On the basis of the drawings, "*S. subtrigona*" and "*S. perforata*" could be any of the species of the "*Suctobelbella acutidens* " species-group.

Borcard's data are reliable and acceptable and we have also found most species recorded by him, except for two: *Suctobelbella sarekensis* (Forsslund, 1941) and *S. tuberculata* (Strenzke, 1950).

The present paper deals with 29 species of Suctobelbidae Jacot, 1938 found on the territory of Switzerland. Two of them represent new genera and new species, which have been described elsewhere (Mahunka & Mahunka-Papp, 2000b). Of the remaining 27 species, 3 of them are new to science, 16 (some extremly rare) species are only briefly recorded with their locality data, whilst 8 species are discussed along with supplementary morphological details, corrections, new combinations and new diagnoses. A key to the 6 swiss genera is also given.

The family Suctobelbidae shows many peculiar morphological features found only in this group. Terminology is therefore of paramount importance when describing new taxa. Consequently, although we still use the accepted terminology (e.g. Forsslund, 1941), we here introduce a few terms (illustrated in Figs 1-2) in addition to the traditional terminology (e.g. Forsslund, 1941).

SOME MORPHOLOGICAL TERMS AND THEIR DEFINITION:

Rostral apex:

The shape of this unpaired structure is considered always in dorsal view (the terms nasiform or roundish frequently refer to frontal view).

Rostral tooth:

The first pair of teeth directly behind the rostral apex, being as a rule larger and more robust than the others.

Rostral incisure:

The pair of incisures behind the rostral teeth.

Accessory tooth:
The smaller teeth behind the rostral teeth on the lateral margin of the prodorsum; numbering starts from the rostral teeth; their shape is represented in lateral view.

Accessory incisure:
The incisures between the accessory teeth; their shape is represented in lateral view.

Rostral elevation:
A weak, often indistinct elevation medially, directly behind the rostrum, regularly bearing the rostral setae.

Rostral rib:
The ribs framing the rostral elevation.

Tectopedial field:
A window-like pair of large fields situated medially, mostly with a stronger outer and a weaker inner framing border.

Paratectopedial field:
A longitudinal, narrow pair of fields on the lateral part of the prodorsum, their inner frame is formed by the outer border of the tectopedial fields.

Lamellar knob:
As a rule, an unpaired tubercle in the middle bearing the lamellar setae. It may be divided, or may be strongly reduced.

Lateroprodorsal pattern:
The polygonate designs on both sides, above and behind the rostral teeth.

Prebothridial rib:
The pair of dentate laths in front of the bothridia.

Interbothridial field:
A pair of fields bordered by arcuate, often dentate ribs between the bothridia.

Bothridial lobe:
The fastigial thickenings on the basal margin of the bothridia on both sides.

Posterobothridial tubercle:
The independent tubercles behind the bothridia on both sides.

Exobothridial arch:
The arcuate pustulate ribs beside the outer margin of the bothridia on both sides; often separated into tubercles.

Podosomal tubercle:
The robust, mostly pustulate or granulate elevated formations, above the acetabula III and IV, at the anterior end of the discidium in dorsal view on both sides.

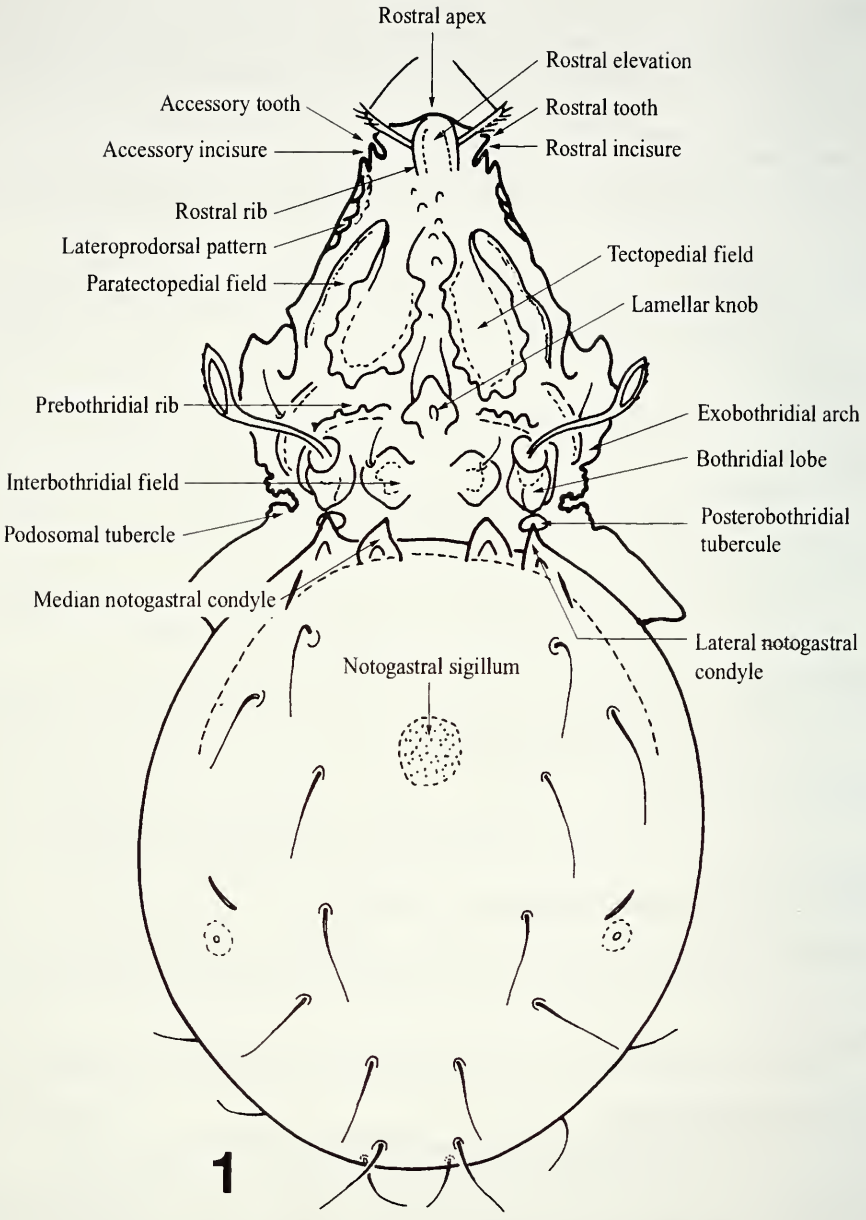


FIG. 1
A suctobelbid moss-mite – 1: body in dorsal view.

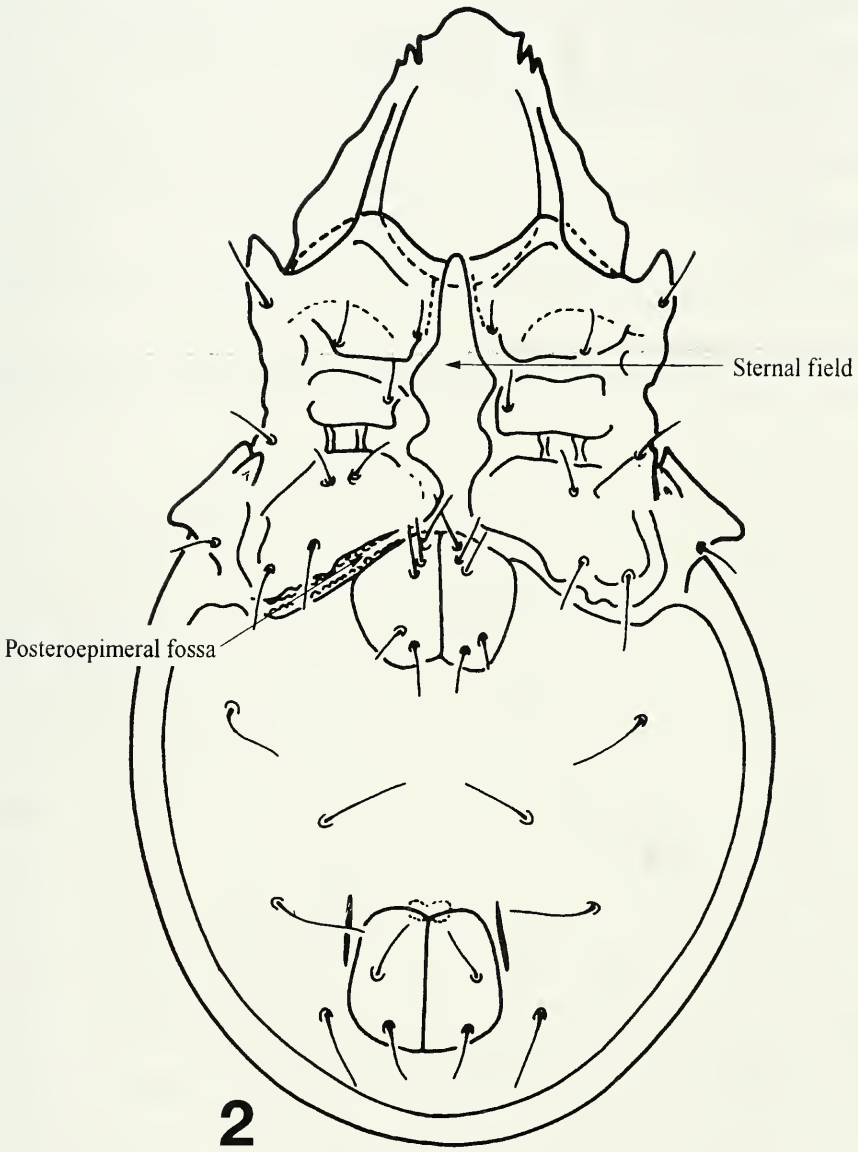


FIG. 2
A suctobelbid moss-mite – 2: body in ventral view.

Median notogastral condyle:
The inner pair of condyles on the dorsosejugal margin of the notogaster.

Lateral notogastral condyle:
The outer pair of condyles on the dorsosejugal margin of the notogaster.

Notogastral sigillum:
The roundish, porose, median light spot in the anterior half of the notogaster.

Sternal field:
The longitudinal surface of varying width between the epimeres lying somewhat deeper than the epimeres.

Posteroepimeral fossa:
A pair of channels of varying depth having a pustulate inner surface running parallel with the posterior epimeral borders.

LIST OF LOCALITIES

AP-1= SWITZERLAND: **Appenzell:** Hoher Kasten, sifting, 1600-1700m; 8.VIII.1982; leg. C. Besuchet — (86).

BE-3 = SWITZERLAND: **Berne:** Büren an der Aare, Häftli Nature Reserve, dry leaves; 27.IX.1987; leg. S. Mahunka & L. Mahunka-Papp — (137).

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

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

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

GL-2 = SWITZERLAND: **Glarus:** Hinterschwändi, peat-bog with *Sphagnum* sp., 1250m; 6.X.1994; leg. C. Besuchet — (87).

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

GL-4 = SWITZERLAND: **Glarus:** Klöntal, Richisau, hollow maple (*Acer* sp.), 1100m; 20.V.1993; leg. C. Besuchet — (84).

GR-1 = SWITZERLAND: **the Grisons:** Gafia St. Antönien, mosses and grass roots; 20.IX.1983; leg. C. Besuchet — (51).

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

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

GR-10 = SWITZERLAND: **the Grisons:** Trin-Flims, very wet mosses; 20.VIII.1999; leg. C. Besuchet — (139).

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

NW-1 = SWITZERLAND: **Nidwalden:** Musenalp, above Niederrickenbach, mosses in karren (= solution rills) on limestone, 1800m; leg. C. Besuchet — (113).

NW-2 = SWITZERLAND: **Nidwalden:** Pilatus, sifting of *Rhododendron* sp., 1800m; 14.VI.1984; leg. I. Löbl — (123).

SG-4 = SWITZERLAND: **St. Gall:** Quinten, dead leaves; 17.VIII.1999; leg. C. Besuchet — (138).

SO-6 = SWITZERLAND: **Solothurn:** Schottwill, Bucheggberg, litter in pine wood; 27.IX.1987; leg. S. Mahunka & L. Mahunka-Papp — (48).

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

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

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

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

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

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

TI-5 = SWITZERLAND: **Ticino:** Monadello - Moneto, in decaying leaves, 850m; 23.IV.1992; leg. C. Besuchet — (91).

TI-9 = SWITZERLAND: **Ticino:** Nufenen pass, leaf litter and rotten wood in larch forest; 15.VI.1979; leg. S. Mahunka & L. Mahunka-Papp — (18).

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

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

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

VD-7 = SWITZERLAND: **Vaud:** Le Séchey, Lac Ter, sifting under willows (*Salix* sp.), 1017m; 21.VI.1989; leg. C.Besuchet — (82).

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

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

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

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

VS-8 = SWITZERLAND: **Valais:** Finges forest, wrotten pine stumps (*Pinus* sp.); 14.VIII.1980; leg. C. Besuchet — (5).

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

VS-19 = SWITZERLAND: **Valais:** Praz-de-Fort, mosses and dead leaves, 1200m; 16.VIII.1989; leg. C. Besuchet — (80).

VS-20 = SWITZERLAND: **Valais:** Praz-de-Fort, mosses in swamp, 1200m; 26.VIII.1989; leg. C. Besuchet — (95).

VS-25 = SWITZERLAND: **Valais:** Vercorin, moss cover on the ground; 30.V.1989; leg. H. Borrer — (83).

LIST OF DETERMINED SPECIES

Suctobelbidae Jacot, 1938

Allosuctobelba grandis (Paoli, 1908)
Localities: GL-4; SG-4; TG-7; TI-5.
Distribution[1]: Holarctic Region.

Allosuctobelba hauseri sp. n.
Localities: GL-3; VS-20.

Helvetobelba dichotoma Mahunka & Mahunka-Papp, 2000
Localities: SG-4; TI-11.
Distribution: Switzerland.

Rhynchobelba ornithorhyncha (Willmann, 1953)
Locality: GL-3.
Distribution: Austria (hithero known from the type locality only); first record for Switzerland.

Suctobelba altvateri Moritz, 1970
Locality: VS-5.
Distribution: Europe.

Suctobelba atomaria Moritz, 1970
Localities: BL-1; GR-9; GR-10; VS-3; VS-8.
Distribution: Europe; first record for Switzerland.

Suctobelba consimilis sp.n.
Locality: TI-11.

Suctobelba granulata Hammer, 1952
Locality: TI-11.
Distribution: Europe, Caucasus; first record for Switzerland.

Suctobelba regia Moritz, 1970
Localities: GR-10; SG-4; TI-5; TI-11.
Distribution: Central Europe; first record for Switzerland.

Suctobelba reticulata Moritz, 1970
Localities: GR-10; TI-5.
Distribution: Europe; first record for Switzerland.

Suctobelba sorrentensis Hammer, 1961
Locality: VS-12.
Distribution: Europe.

Suctobelba trigona (Michael, 1888)
Localities: AP-1; GL-2; GR-1; GR-12; SO-6; TG-8; TG-10; TI-9; VS-4; VS-12.
Distribution: Europe, Crimea.

Suctobelbella acutidens (Forrslund, 1941)
Localities: GR-12; SG-4; VD-7; VD-9; VS-12; VS-19.
Distribution: Holarctic Region.

Suctobelbella alloenasuta Moritz, 1971
Localities: BE-3; GE-5; NW-1; SG-4; TG-10; TI-9; TI-11; VD-9; VS-5; VS-19.
Distribution: Europe; first record for Switzerland.

Suctobelbella arcana Moritz, 1970
Localities: AP-1; GR-10; SG-4; TI-3; TI-9.
Distribution: Europe.

Suctobelbella baloghi (Forsslund, 1958)
Localities: GR-10; SG-4; TI-11; VS-19.
Distribution: Europe; first record for Switzerland.

[1] All distributional indications are for a preliminary orientation only.

Suctobelbella besucheti sp. n.
Localities: GR-10; SG-4; VS-19.

Suctobelbella duplex (Strenzke, 1950)
Locality: TI-5.
Distribution: Europe, Caucasus; first record for Switzerland.

Suctobelbella falcata (Forsslund, 1941)
Localities: LU-1; TG-3; TG-9; TI-3; TI-9.
Distribution: Europe.

Suctobelbella forsslundi (Strenzke, 1950)
Localities: GR-10; SG-4; TI-10; TI-11; VD-7; VD-9; VS-19.
Distribution: Palaearctic Region.

Suctobelbella longirostris (Forsslund, 1941)
Locality: TG-3.
Distribution: Europe.

Suctobelbella nasalis (Forsslund, 1941)
Localities: BE-3; VD-9.
Distribution: Palaearctic Region; first record for Switzerland.

Suctobelbella palustris (Forsslund, 1953)
Locality: GR-10.
Distribution: Holarctic Region.

Suctobelbella paracutidens Mahunka, 1983
Localities: GR-8; T-11.
Distribution: Europe; first record for Switzerland.

Suctobelbella perforata (Strenzke, 1950)
Localities: GR-12; VD-7; VS-25.
Distribution: Europe, Caucasus.

Suctobelbella similis (Forsslund, 1941)
Localities: AP-1; GR-9; NW-2; TI-5; TI-9; UR-1; VS-4.
Distribution: Europe.

Suctobelbella subcornigera (Forsslund, 1941)
Localities: BE-3; GE-5; GE-6; GL-4; GR-10; LU-1; SO-4; SO-6; TG-3; TG-8; TI-11; VD-9; VS-4; VS-19; VS-25.
Distribution: Holarctic Region.

Suctobelbella subtrigona (Oudemans, 1916)
Localities: AP-1; BL-1; GR-10; SO-4; SO-6; TG-7; VS-4.
Distribution: Palearctic Region.

Unicobelba ypsilonsignata Mahunka & Mahunka-Papp, 2000
Locality: TI-5.
Distribution: Switzerland.

KEY TO THE SWISS GENERA OF SUCTOBELBIDAE:

1 (4) Anterior margin of notogaster with condyles (teeth) or median unpaired elevation

2 (3) Anterior margin of notogaster with two pairs – sometimes connected – condyles (teeth). Lateral margin of prodorsum with accessory teeth and incisures ..... ***Suctobelbella***

3 (2) Anterior margin of notogaster with one pair of lateral condyles and an unpaired median elevation ..... ***Unicobelba***

4 (1) Anterior margin of notogaster without condyles (teeth) or median unpaired elevation. Its margin gradually bent medially, smooth

5 (6) Lamellar knob undivided, lamellar setae arising on its lateral sides. Accessory teeths, incisions or lateral tubercles on the margin of prodorsum absent. 5 pairs of genital, 9 pairs of notogastral setae present ..... ***Suctobelba***

6 (5) Lamellar knob divided in two separate parts. Lateral part of prodorsum either smooth or divided (ornamented) by accessory teeth and incisions or lateral tubercles. 6 pairs of genital setae and 10 pairs of notogastral setae present.

7 (8) Anterolateral part of prodorsum without rostral teeth, smooth, gradually narrowed anteriorly. With some greater rounded tubercles ..... ***Rhynchobelba***

8 (7) Anterolateral part of prodorsum with rostral and accessory teeth

9 (10) Anterolateral part of prodorsum smooth, only one pair of large rostral teeth, without incisure present. Accessory teeth or incisures absent ..... ***Helvetobelba***

10 (9) Anterolateral part of prodorsum divided by teeth and incisions . ***Allosuctobelba***

DESCRIPTION AND REDESCRIPTION OF SOME OF THE SUCTOBELBID SPECIES

The genus ***Allosuctobelba*** Moritz, 1970

Allosuctobelba Moritz, 1970a: 137.

Introduction:

The genus *Allosuctobelba* was established by Moritz (1970a), who designated *Suctobelba grandis* Paoli, 1908 as the type species. He included also in this genus *Suctobelba ornithorhyncha* Willmann, 1953. According to our opinion the latter species does not belong here, but without doubt *Suctobelba grandis europaea* Willmann, 1933, *Suctobelba gigantea* Hammer, 1955, *A. nova* (Krivolutsky, 1971) (see also Mahunka, 1979), *A. bicuspidata* Aoki, 1984, *A. tricuspidata* Aoki, 1984, *Suctobelba centroamericana* Woas, 1986 ((= *Allosuctobelba centroamericana* (Woas, 1986) comb. n.), *A. tricuspidata tokara* Aoki, 1987 *A. bidentata* Zai-Gen, 1993, *A. haungshanensis* Zai-Gen, 1993 and *A. menglunensis* Wen, 1997 belong here. According to various authors and the placing of several similar species as *Allosuctobelba simplex* Fujikawa, 1972, *Rhinosuctobelba makarcevi* Golosova & Krivolutsky, 1974 and *Rhynchobelba machadoi* Pérez-Íñigo, 1976 is uncertain. We believe that for the time being the species *Suctobelba ornithorhyncha* Willmann, 1953 should be placed in *Rhynchobelba*, since there is neither a rostral tooth nor an incisure in the rostral region, which we consider as generic features.

The type species was described by Paoli (1908) on the basis of North-American specimens (Columbia, USA). Moritz briefly mentioned the species and Woas (1986) redescribed it on the basis of specimens collected in Germany. The occurrence of the species has been reported by several authors (e.g. Forsslund, 1941; Schweizer, 1956).

Woas (1986: 80) questioned the validity of the genus but, on the other hand, he accepted the existence of a species group (p. 88). He did not discuss the position of the species group, or the other genera related to it, although Pérez-Íñigo (1976) pointed out that it is highly probable that the two genera *Rhynchobelba* Willmann, 1953 and *Allosuctobelba* are identical. No solution is offered by the fact that simultaneously Woolley & Higgins (1969) and Higgins & Woolley (1976) also described related genera: *Rhinosuctobelba* Woolley & Higgins, 1969 and *Parisuctobelba* Higgins & Woolley, 1976. The problem is further aggravated by the description of *Rhynchobelba* by Willmann (1953). This article gives the description of *Suctobelba ornithorhyncha* which, in our opinion, is much closer to the genus *Rhynchobelba*, than to the other suctobelbid genera.

On the other hand, it is rather difficult to accept that Willmann would not have seen some kind of relationship between the type species of his genus and the newly described species, if there were any. The same holds for Higgins & Woolley (1976) who simultaneously described *Parisuctobelba* and *Suctobelba tumulata*, which again suggests that the latter species rather belongs to *Parisuctobelba* relatives, so might need to be relegated in the genera of *Rhinosuctobelba* or *Allosuctobelba*, and not to *Suctobelba*.

Consequently, it became necessary to examine the interrelationships of the genera *Rhynchobelba* Willmann, 1953, *Rhinosuctobelba* Woolley & Higgins, 1969, *Allosuctobelba* Moritz, 1970 and *Parisuctobelba* Higgins & Woolley 1976 by studying the types. Unfortunately, we were unable to examine the type of *Rhynchobelba* although, through the kind help of Drs D. Summers and P. P. Parillo (The Field Museum, Chicago), we had access to the type material of *Parisuctobelba* and *Rhinosuctobelba*. Furthermore, Dr. R. A. Norton kindly made an undescribed *Rhinosuctobelba* species from his own collection available for our study. Unfortunately, the types of the genera *Parisuctobelba* and *Rhinosuctobelba* mounted on slides, were in such a bad condition, that they were wholly unsuitable for a thorough examination. Nevertheless, we were able to ascertain that on the bases of the rostrum, the shape of rostral and accessory teeth and incisures of *Parisuctobelba*, this type should be placed into the genus *Allosuctobelba*. The genital plate could not be examined. In the other genus, *Rhinosuctobelba*, the rostrum shows no incisures. However, laterally, a robust, sharply pointed tubercle is present on both sides, which may be taken for a rostral tooth. Consequently, it belongs in the genus *Rhynchobelba*.

The "*Rhinosuctobelba*" species from the Norton-Collection has a strongly elongate rostrum (more strongly so than in *Parisuctobelba*), a robust rostral tooth and accessory teeth and can be differentiated from *Allosuctobelba* only by the shape of the rostrum.

Thus our opinion regarding this group is: the genera of this group, apart some definitely questionable genera (e.g. *Novosuctobelba* Hammer, 1977, *Flagrosuctobelba* Hammer, 1979), certainly from such a clade lineage, which widely differs from that of the *Suctobelba-Suctobelbella* relationship, or from other suctobelbids, specifically those described from tropical regions. Consequently, one or more genera should be retained. Still the question remains what is the degree of relationship among these

genera? Unfortunately, the type species of the key genus (*Rhynchobelba*) in this group cannot be studied. We cannot accept nor do Pérez-Íñigo (1976) and Moritz (1970a), its identity with *Allosuctobelba*. The subsequent generic diagnosis gives a basis for the relegation of species (see above) in the genus *Allosuctobelba* while we relegate *S. ornithorchyncha* to the genus *Rhynchobelba* Willmann, 1953, as a new combination. The type species of the genera described by Higgins & Woolley and Woolley & Higgins and the specimens of an undescibed American (USA) *Rhynchobelba* species were investigated by us. On the basis of the seven pairs of genital setae, the genus *Parisuctobelba* remains valid. However, the genus *Rhinosuctobelba* differs from *Allosuctobelba* only by its strongly elongated rostral apex. Thus, the validity of *Rhinosuctobelba* is rather questionable.

DIAGNOSIS:

Suctobelbid habitus, large bodied species. Rostral part convex or slightly elongated, with at least a pair of large rostral teeth and an incisure. Tectopedial fields weakly developed, their median margin indistinct or partly absent. Lamellar knob divided, consisting of two or more large separated tubercles. Prodorsal surface granulate, its basal part covered by large pustules. Rostral setae setiform, simple, curved. Sensillus setiform, bacilliform or spindle-shaped. Dorsosejugal region gradually convex or straight, slightly elongate, without condyles. Ten pairs of notogastral setae. Anogenital setal formula 6 - 1 - 2 - 3. Lyrifissures *iad* in normal paraanal position. Femora and tarsi of all legs only slightly dilated both basally and distally.

REMARKS:

The recently studied Swiss material yielded specimens from several localities identifiable, without doubt, with the genus *Allosuctobelba*. We have found the form that is unequivocally identical with the form redescribed by Woas. A second species of *Allosuctobelba* was also discovered, which shows several features widely differing from those known so far. Furthermore, we have also found Willmann's species *S. ornithorchyncha*.

We had no opportunity to study the type of Paoli (1908), nor the type of *S. grandis europaea* described by Willmann (1953). But we may safely state that the subsequently described form is not identical with any of the above two forms. However, there is a problem with one of Paoli's figures (Fig. 32): the shape of the sensillus is not really broadening, but the shape of the rostrum is identical with one species found by Woas (1986) and by us.

Allosuctobelba grandis (Paoli, 1908) Fig. 11

Suctobelba grandis Paoli, 1908: 78, Tav. IV: 32.
Allosuctobelba grandis: Moritz, 1970a: 137.
Suctobelba grandis: Woas 1986: 91, Abb. 39-40.

Material examined: Switzerland: TG-7.

Remarks: The two robust teeth in Paoli's figure may readily be identified on both sides, which is also supported by Woas (1986), who stated that the sensillus is

"spindelförmig" (= spindle-shaped). The specimens from Switzerland clearly demonstrate these features (Fig. 11). It might well be that Woas made a mistake in stating the number of genital setae (5 pairs), since the recently studied specimens show 6 pairs, as do the specimens from Hungary.

The difference between the new species and *A. grandis* are given in the remarks following the description of the new species.

Allosuctobelba hauseri sp. n. Figs 3-10

Material examined: Switzerland: Holotype: Glarus: GL-3; 2 paratypes: from the same sample; 1 paratype: Valais: VS-20. Holotype and 2 paratypes: MHNG[2], 1 paratype (1643–PO–99): HNHM[3].

Diagnosis: Rostrum with four teeth. Rostral setae arising near to each other. Sensillus setiform, unilaterally ciliate. Dorsosejugal margin medially straight. Notogastral setae simple. Anogenital setal formula: 6 - 1 - 2 - 3. Lyrifissures *iad* in normal, paraanal position. Setae *p* on tarsi II-IV spiniform.

Measurements: Length of body: 424-496 µm, width of body: 226-294 µm.

Prodorsum: Rostral region distinctly divided by narrow incisions (Fig. 4) and with four teeth, median rostral apex rounded. Lateral teeth sharply pointed, anterior ones larger than the others. Behind rostrum a rostral elevation is present bearing simple curved rostral setae arising close to each other and being bent inwards. Shape of tectopedial fields typical, their inner margin also distinct. Between them an indistinct lamellar knob present, consisting of some larger tubercles, the posterior ones bearing the long lamellar setae. Interbothridial fields weakly developed, costuliform, from them a line running to the lamellar knob. Bothridia large, well sclerotised, with relatively small, rounded bothridial lobes. Sensillus long (Fig. 8), setiform, without median or distal widening, unilaterally ciliate. Interlamellar and exobothridial setae simple and relatively short.

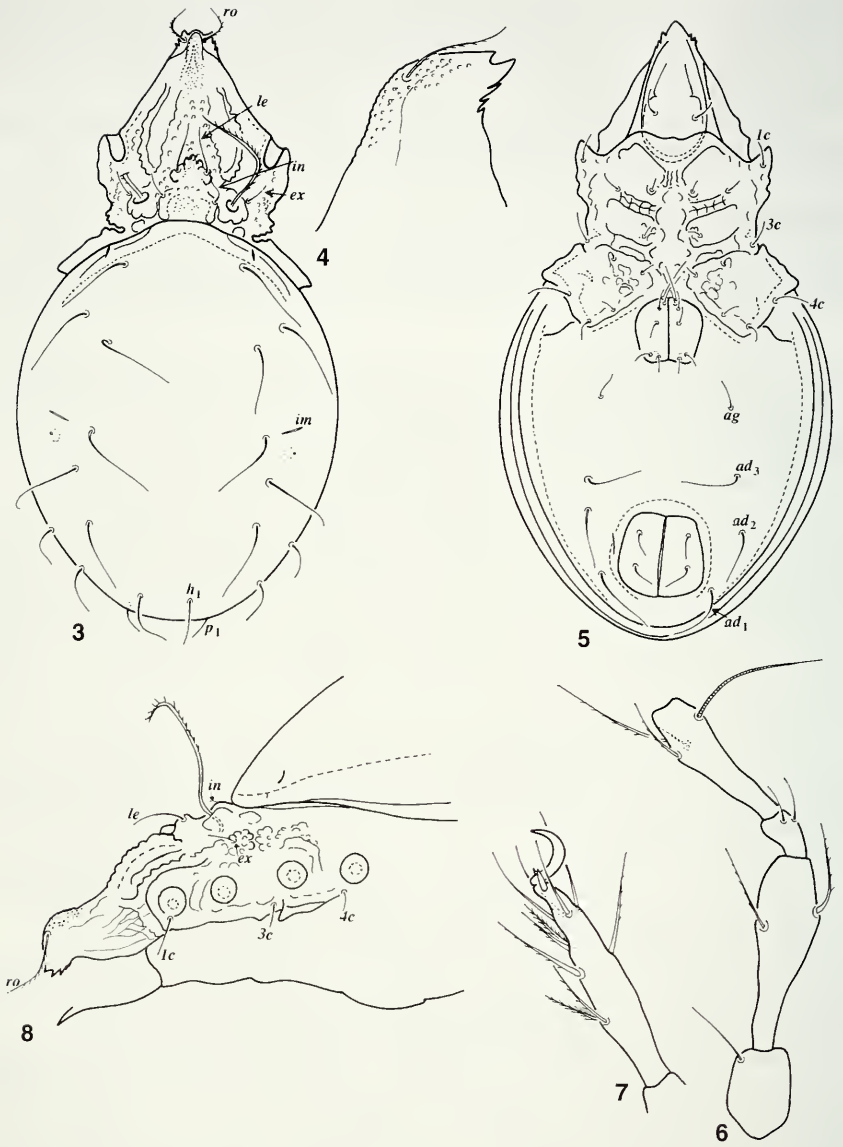
Notogaster: Comparatively large, dorsosejugal margin straight medially, without condyles. Ten pairs of notogastral setae present, all long and simple, setae *p* of the same size, but slightly shorter than the preceding ones (Fig. 3).

Lateral part of podosoma: Acetabula I–IV normal, lying on the same level (Fig.8). Exobothridial and acetabular region well sclerotised, partly granulated. Pedotecta I normal in size, pedotecta II–III reduced, discidium with tubercles.

Ventral parts: Median part of the mental tectum protruding anteriorly. Epimeral borders and apodemes normally developed, a wide sternal field present medially between the epimeral plates. Epimeres IV normal in shape, with slightly undulate posterior borders (Fig. 5). Epimeral setal formula: 3 – 1 – 3 – 3. Setae *1c* located laterally, on the surface of pedotecta I. Setae *4c* arising on basal part of discidium. Epimeral setae of normal size, apparently smooth. Setae *4a* and *4b* located conspi-

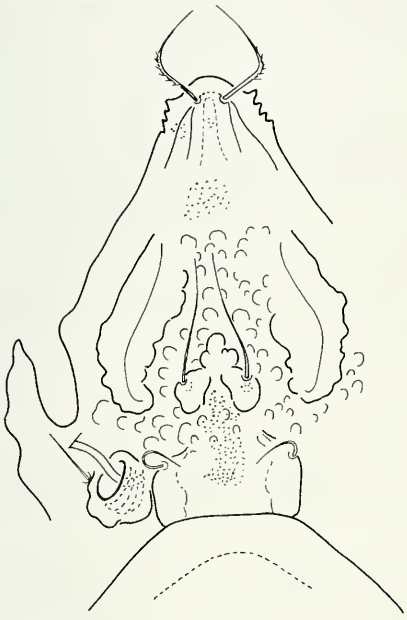
[2] MHNG: deposited in the Muséum d'histoire naturelle, Geneva.

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



FIGS 3-8

Allosuctobelba hauseri sp. n. – 3: body in dorsal view, 4: rostrum, 5: body in ventral view, 6: trochanter, femur, genu, tibia of leg IV, 7: tarsus of leg IV, 8: podosoma in lateral view.



FIGS 9-11

Allosuctobelba hauseri sp. n. – 9: prodorsum in dorsal view, 10: basal part of prodorsum. *Allosuctobelba grandis* (Paoli, 1908) - 11: Prodorsum in dorsal view.

cuously near to each other. Anogenital setal formula: 6 – 1 – 2 – 3. Anterior two pairs of genital setae much longer than the others. Position of aggenital setae normal, setae ad_1 in paraanal, setae ad_3 in postanal position. All setae in this region mostly smooth. Lyrifissures *iad* located in paraanal position.

Legs: Form and chaetotaxy of legs I and IV (Figs 6-7) typical for the family, setae *p* on tarsi II-IV spiniform.

Remarks: The new species is readily distinguishable from the other *Allosuctobelba* species, discussed above, by the simple setiform sensillus and by the form of its lamellar knob, which consists of large tubercles. Number and form of rostral teeth are also differen;, they are never elevated laterally.

Derivatio nominis: We dedicate the new species to our friend Dr. B. Hauser for his innovative efforts for the Oribatida Helvetica project.

The genus ***Rhynchobelba*** Willmann, 1953

Rhynchobelba Willmann, 1953: 501.

For the reasons pointed out in the previous chapter I cannot enter in a general discussion on this genus.

Rhynchobelba ornithorhyncha (Willmann, 1953) comb. n. Figs 12-17

Suctobelba ornithorhyncha Willmann, 1953: 500, Abb. 39a-b.
Allosuctobelba ornithorhyncha: Moritz 1970a: 137.

Material examined: GL-3.

The Swiss specimens studied are readily identifiable with the description and figures of Willmann. Unfortunately, Willmann did not discuss the ventral side and the legs. Consequently, some complementary remarks and figures are given here.

Measurements: Length of body: 436-488 µm, width of body: 252-286 µm.

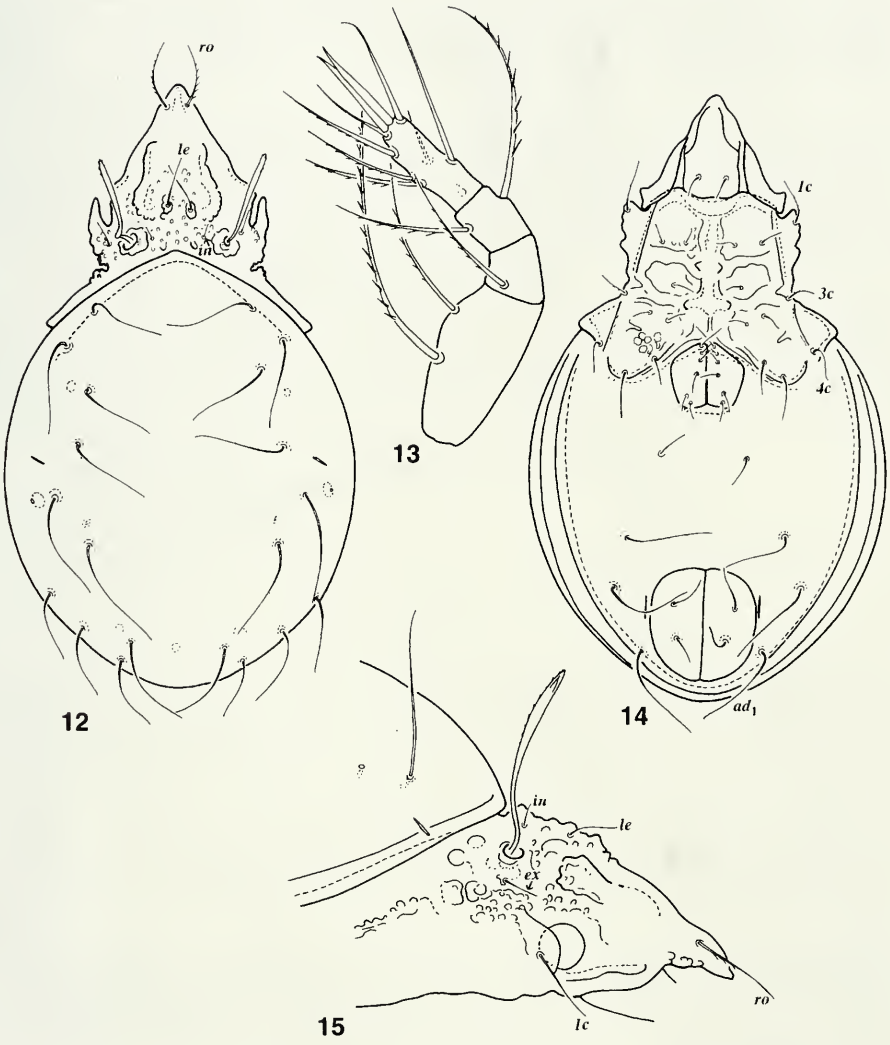
Prodorsum: Rostrum conical, lateral part of rostrum without teeth or "Vorsprünge" (= processes), but 2-3 rounded tubercles present (readily visible in lateral view: Fig. 12). Lamellar setae longer than shown in Willmann (1953).

Ventral parts: Mental tectum covered laterally by the lateral part of prodorsum (Fig. 14). Epimeral part framed by longitudinal ribs. Posterior border of epimeral plates not undulate or serrate. Anogenital setal formula: 6 - 1 - 2 - 3. Setae ad_1 in paraanal position, as are lyrifissures *iad*.

Palp and legs I-II: as shown in Figs 13, 16-17.

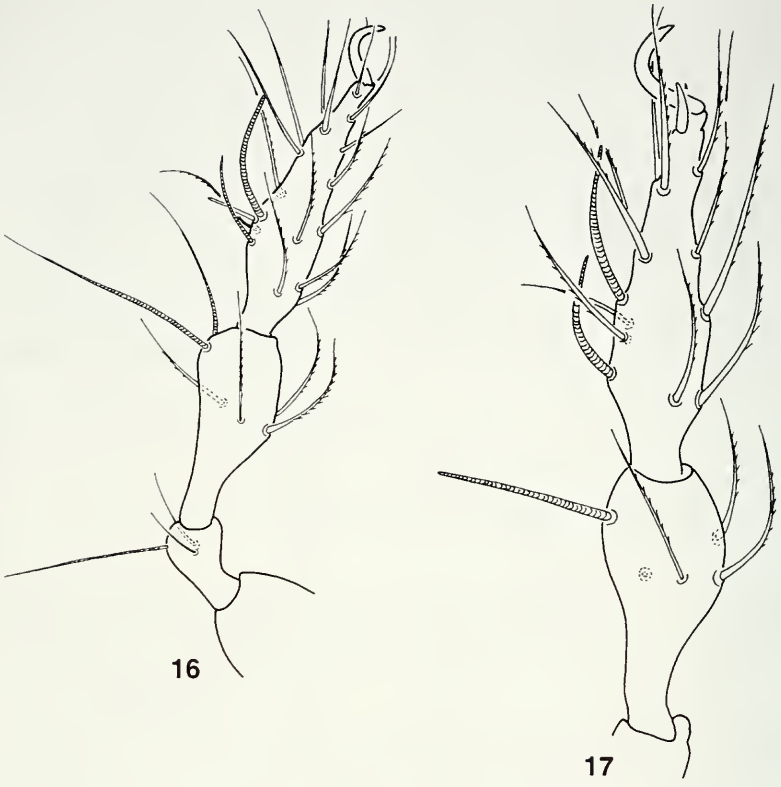
Remarks: The species was allocated to the genus *Suctobelba* Paoli, 1908 by Willmann (1953). Moritz (1970a) removed it and placed it in the genus *Allosuctobelba*, quite unaware of the work of Woolley & Higgins (1969), in which the genus *Rhinosuctobelba* was described. The relegation of this species is still equivocal but we refrain from synonymizing the genus *Allosuctobelba* without a thorough study of the types.

After comparing the species *ornithorhyncha*, now belonging in the genus *Rhynchobelba*, with the species of *Allosuctobelba*, we conclude that they differ in the presence or absence (as in *Rhynchobelba*) of rostral teeth and incisures. The structure



FIGS 12-15

Rhynchobelba ornithorhyncha (Willmann, 1953) - 12: body in dorsal view, 13: palp, 14: body in ventral view, 15: podosoma in lateral view.



FIGS 16-17
Rhynchobelba ornithorhyncha (Willmann, 1953) - 16: leg I, 17: tarsus and tibia of leg II.

of the epimeral region is also different: in *ornithorhyncha* they are straight, with strikingly long inner ribs present beside the pedotecta I and discidium, while in *grandis* (also in *hauseri*) they are much shorter and undeveloped. Unfortunately, there is no drawing or description of the ventral side of the type species of *Rhynchobelba inexpectata* Willmann, 1953.

The genus ***Suctobelba*** Paoli, 1908

Suctobelba Paoli, 1908: 73.

In contradiction with Woas (1986: 99), we are not convinced that the species group of "*Suctobelba trigona*", in other words, the genus of *Suctobelba* Paoli, 1908, should be synonymized with the other Suctobelbidae genera, or that the species *S. trigona* (Michael, 1888) and its allies should be synonymized. The study of the Swiss material strongly suggests that all the species in the genus *Suctobelba* Paoli, 1908

(sensu Jacot, 1937 and Moritz,1970a) are distinct. Moritz's generic diagnosis is acceptable with some complementation and corrections regarding the dorsal characteristics. However, the features of the ventral side are wholly lacking. These are supplemented, in the following.

Diagnosis: Rostrum wide, its apex rounded or straight in dorsal view. Rostral teeth large, well separated by the rostral incisure, accessory teeth missing. Rostral setae setiform, simple, directed outwards. Tectopedial fields well developed, clearly framed. Lamellar knob undivided, prebothridial ribs absent. Notogaster without condyles. Ten pairs of notogastral setae present. Anogenital setal formula: 5 - 1 - 2 - 3.

Type species: *Notaspis trigona* Michael, 1888.

Remarks: The features listed above may be complented by the fact that the paratectopedial field is always recognizable, the prebothridial ribs and the exobothridial arch may be in parts. The posterobothridial tubercles behind the bothridial lobe are frequently present. Notogastral sigillum absent, frequently the anterior margin of notogaster with a medial elevation or occasionally with a strong hollow.

Subsequently we give revised descriptions of some species.

Suctobelba altvateri Moritz, 1970

Suctobelba altvateri Moritz, 1970a: 152, Abb. 7a-d.

Material examined: Switzerland: VS-5.

Remarks: In the description of this species, Moritz (1970a) did not discuss the features of the ventral and the lateral sides. On the other hand, the dorsal characteristics are readily identified from his description, although the Swiss specimens are somewhat larger (242-292 µm). We observed no striking features on the ventral side. The mental tectum is evenly concave. The anterior part of sternal field is narrow, behind it gradually widens and then narrows again posteriorly. Posterior border of the epimeral region undulate. Discidium nearly triangular. Setae ad_2 arising far from each other, near to the lateral margin of ventral plate; the distance between them longer than setae ad_3.

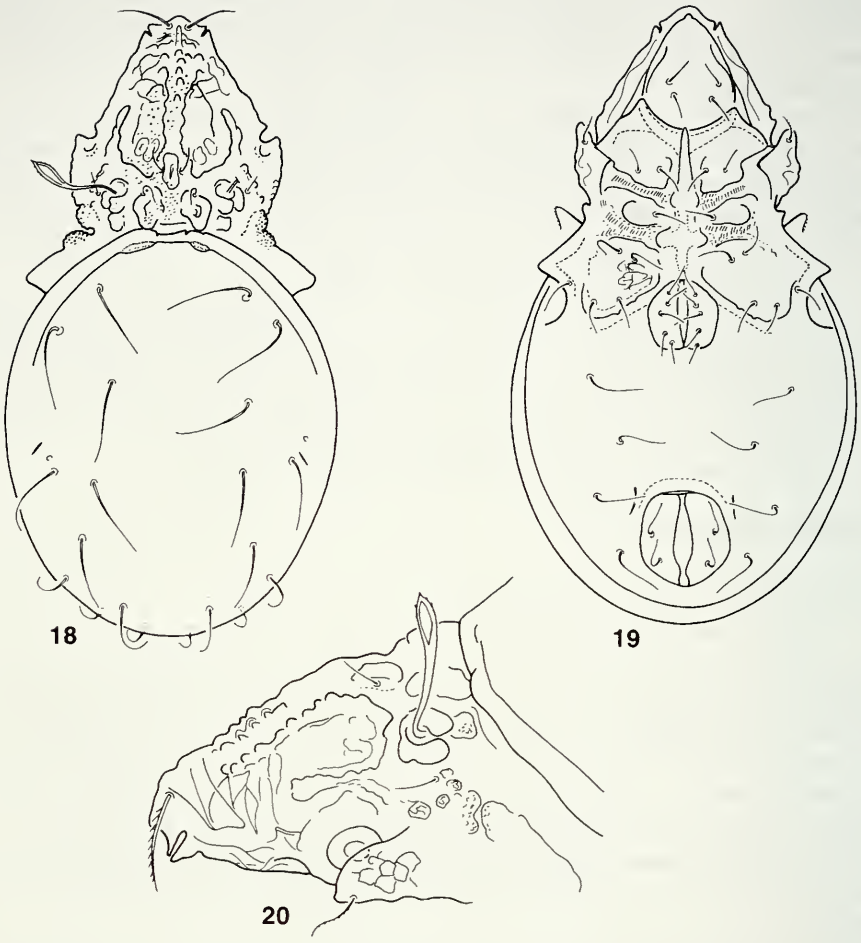
Suctobelba atomaria Moritz, 1970 Figs 18-20

Suctobelba atomaria Moritz, 1970a: 162, Abb. 11a-d.

Material examined: Switzerland: BL-1, VS-3, VS-8, GR-9.

Remarks: The specimens from Switzerland can easily be identified from the description and figures of Moritz. In our specimens the polygonal pattern in the tectopedial field is weaker and occasionally the number of medial tubercles is smaller. The head of the sensillus bears a few tiny spicules. Moritz did not describe the lateral side of the podosoma, or the ventral side. Since no illustrations to this species exist, we supply a short redescription as follows.

Lateral part of podosoma: Acetabula I–IV normal, lying at the same level (Fig. 20). Exobothridial and acetabular region well sclerotised, granulated, exobothridial arch composed of larger tubercles. Pedotecta I comparatively large, bearing setae *1c*; pedotecta II–III reduced; discidium with a sharp, triangular posterior corner.



FIGS 18-20

Suctobelba atomaria Moritz, 1970 – 18: body in dorsal view, 19: body in ventral view, 20: podosoma in lateral view.

Ventral parts: Median part of mental tectum protruding anteriorly. Epimeral borders and apodemes normally developed, a wide sternal field present medially between the epimeral plates. Epimeral surface with weak irregular polygonal pattern. Epimera IV normal in shape, with a serrated posterior border (Fig. 19). Epimeral setal formula: 3 – 1 – 3 – 3. Setae *1c* located laterally on the surface of pedotecta I. Setae *4c* arising on basal part of discidium. Epimeral setae of normal size, setae *1c* and *3c* clearly ciliate. Aggenital setae very far from each other, among the adanal setae ad_1

in paraanal, setae ad_3 in preanal position. Lyrifissures *iad* long and situated comparatively far from the anal opening.

Legs: Form and chaetotaxy of legs I and IV typical for the family.

Suctobelba consimilis sp. n. Figs 21-23

Material examined: Switzerland: Holotype: Ticino: TI-11; 5 paratypes: from the same sample. Holotype and 3 paratypes: MHNG; 2 paratypes (1644–PO–99): HNHM.

Diagnosis: Rostrum triangular, rostral setae simple. Rostral teeth large, one pair of deep incisions present. Prodorsal surface granulated, without larger tubercles medially. Tectopedial fields large, with serrate median margins. Dorsosejugal margin with one pair of short longitudinal laths. Ten pairs of pectinate notogastral setae. Anogenital setal formula: 5 - 1 - 2 - 3. Setae ad_1 in paraanal position. Lyrifissures *iad* far removed from the anal aperture.

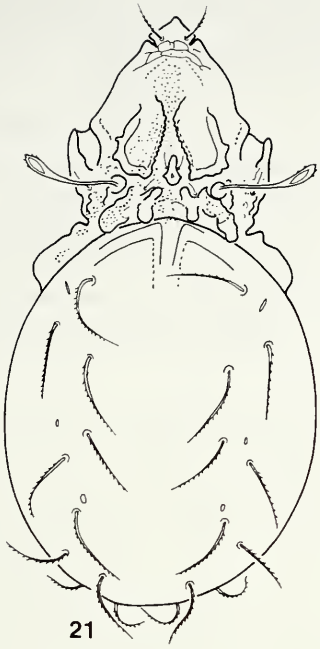
Measurements: Length of body: 196-207 µm, width of body: 102-112 µm.

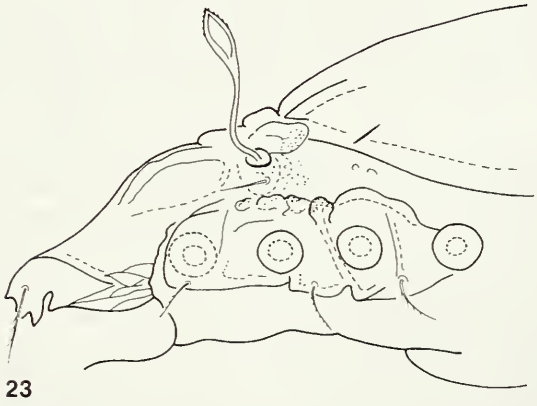
Prodorsum: Rostrum conspicuously protruding anteriorly, nasiform in dorsal view. This region divided by a pair of deep incisions, separating a pair of large, rounded rostral teeth (Fig. 21). Their apical part bearing straight, ciliate rostral setae. Nearly the whole prodorsal surface evenly granulated, without larger tubercles. A weak polygonal pattern visible behind the rostrum. Shape of tectopedial fields conspicuous, they are comparatively small, located in the posterior part of the prodorsum. Their inner margin distinctly serrate, outer one shorter but much thicker, with 2-3 larger tubercles. Between them an elongated lamellar knob present. A pair of well sclerotised narrow, almost costuliform interbothridial fields present. Lamellar and interlamellar setae fine and short. Bothridia large, also well sclerotised, with an extremely large, posteriorly rounded basal lobe. Exobothridial arch weak, consisting of some tubercles. Sensillus long (Fig. 23), with lanceolate head bearing some small spicules.

Notogaster: Elongated. Dorsosejugal margin elongated anteriorly, protruding into the interbothridial region. A pair of well sclerotised median teeth continuing backwards as longitudinal laths. Ten pairs of notogastral setae present, eight pairs longer than the remaining ones (p_1, p_2). All setae distinctly ciliate, nearly pectinate.

Lateral part of podosoma: Acetabula I–IV normal, lying at the same level (Fig. 23). Exobothridial and acetabular region well sclerotised, partly granulated, acetabular region well framed medially. Pedotecta I large, bearing setae *1c*. Pedotecta II–III reduced, discidium rounded posteriorly.

Ventral parts: Median part of mental tectum slightly protruding anteriorly. Epimeral borders and apodemes normally developed, a wide sternal field present between the epimeral plates medially. Epimera IV with serrated posterior border (Fig. 22). Epimeral setal formula: 3 – 1 – 3 – 3. Setae *1c* located laterally, on the surface of pedotecta I. Setae *4c* arising on basal part of discidium. Epimeral setae of normal size, all setae clearly ciliate. Genital opening much smaller than the anal one. Anogenital setal formula: 5 – 1 – 2 – 3. Anterior pair of genital setae much longer than the others. Position of aggenital setae and lyrifissures characteristic, setae ad_1 arising in paraanal





FIGS 21-23

Suctobelba consimilis sp. n. – 21: body in dorsal view, 22: body in ventral view, 23: podosoma in lateral view.

position, setae ad_2 far from each other, near to the lateral margin of ventral plate, setae ad_3 far anteriorly in preanal position. Lyrifissures *iad* large, located far from the anal aperture. All setae in this region - except genital ones - similar to the notogastral setae.

Legs: Form and chaetotaxy of legs I and IV typical for the family. Two setae on tarsus IV pennate.

Remarks: The new species is closely related to *S. secta* Moritz, 1970. The ventral side was not described by Moritz (1970b). Nevertheless, the new species is readily distinguishable from *S. secta* by the serrated median margin of the tectopedial field, the elongate median dorsosejugal border of the notogaster (straight in *S. secta*), by the absence of larger median prodorsal tubercles (present in *S. secta*), and by the characteristically pectinate notogastral setae (smooth in *S. secta*).

Derivatio nominis: Named after its relative.

Suctobelba regia Moritz, 1970 Fig. 24

Suctobelba regia Moritz, 1970a: 147, Abb. 5a-d.

Material examined: Switzerland: TI - 11, SG-4.

Remarks: The specimens examined are readily identifiable with the description and figures of Moritz. Here we give an illustration of the ventral side, complemented by some further data: Mental tectum protruding, sternal field behind it being narrow but strongly widening posteriorly. Setae *3a* and *3b* arising conspicuously close to each other on weak, round protuberances (Fig. 24). Posterior border of epimeral region undulate. Anogenital setal formula: 5 - 1 - 2 - 3. All genital setae conspicuously long. Position of aggenital setae characteristic, arise very far from each other. Setae ad_1 arising in paraanal, setae ad_3 far anteriorly in preanal position. Lyrifissures *iad* located anteriorly and slightly transversally from the anal aperture.

Suctobelba sorrentensis Hammer, 1961 Fig. 25

Suctobelba sorrentensis Hammer, 1961: 114, Fig. 1.
Suctobelba sorrentensis: Moritz 1970a: 144, Abb. 4a-e.

Material examined: Switzerland: VS-12.

Remarks: Our specimens are readily identifiable on the basis of Moritz's redescription of Hammer's species. The Swiss specimen clearly shows the same prodorsal sculpture as given in Moritz's (1970a) Fig. 4b.

The ventral side: Not treated by Moritz (1970a), thus, we give an illustration (Fig. 25) of this aspect. Some further complementary remarks are necessary: the middle of the dorsosejugal border of notogaster is narrowed, emitting a characteristic line posteriorly. Also discernible in Hammer's (1961) figure, but there rather resembling a similar feature in *S. secta* Moritz, 1970. Mental tectum protruding , the sternal region in front is conspicuously wide. Epimeral borders without longitudinal ribs. Posterior borders of epimere IV denticulate. Anogenital setal formula: 5 - 1 - 2 - 3. Lyrifissures *iad* originating at the corner of the anal opening. Setae ad_1 arising in paraanal, setae ad_3 far anteriorly, in preanal position. Most of the ventral setae pilose or roughened.

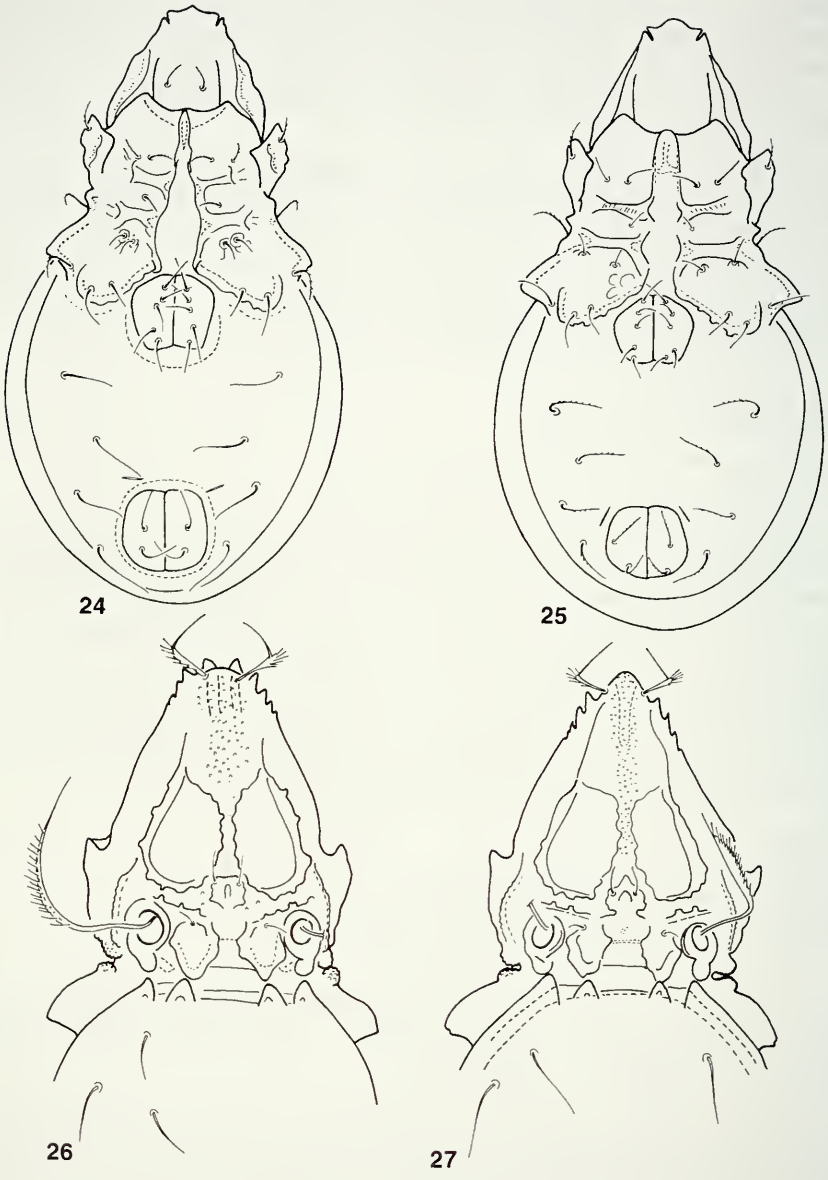


FIG. 24-27

Suctobelba regia Moritz, 1970 – 24: body in ventral view. *Suctobelba sorrentensis* Hammer, 1961 – 25: body in ventral view. *Suctobelbella baloghi* (Forsslund, 1958) – 26: prodorsum in dorsal view. *Suctobelbella forsslundi* (Strenzke, 1951). – 27: prodorsum in dorsal view.

Measurements: Length of the body: 189 µm, width of the body: 100 µm.

The genus ***Suctobelbella*** Jacot, 1937

Suctobelbella Jacot, 1937: 361.

The latest diagnosis has been given by Moritz (1970a). We feel that some complementary remarks are pertinent.

Diagnosis: Rostrum indented, rostral teeth followed by several accessory teeth. Basal part of rostral setae heavily ciliate, their ends geniculate, smooth. Tectopedial field, prebothridial ribs, interbothridial field and exobothridial arch well developed. Lamellar knob undivided. Two pairs of notogastral condyles present. Nine pairs of notogastral setae. Anogenital setal formula: 6 - 1- 2- 3.

Type species: *Suctobelbella serratirostrum* Jacot, 1937.

Remarks: These complementary features suggests that within the genus two groups may be distinguished. In the first one the rostrum is elongate, nasiform, while in the second the rostrum is broad and concave medially. Notogastral sigillum may occasionally be discernible.

Suctobelbella baloghi (Forsslund, 1958) Figs 26-27

Suctobelba baloghi Forsslund, 1958: 85, Abb. 17a-c.
Suctobelbella baloghi: Moritz 1971: 94, Abb. 4c,7a-d.

Material examined: Switzerland: GR-10; SG-4; TI-11; VS-19.

Remarks: A comparatively rare species, which is difficult to separate from its allies (*nasalis*-group). It is more than certain that the literature data of *S. forsslundi* (Strenzke, 1950) and *S. baloghi* are badly confused. Both species were collected in Switzerland, thus figures were made (Figs 26-27) to show some features. The two species may be distinguished by the median condyles of the notogaster (much smaller in *forsslundi*) and, furthermore, by the lengths of notogastral setae (shorter in *baloghi*), by the granulation of rostral part (rather fine in *forsslundi*) and by the thickness of the sensillus (narrower in *baloghi*).

Suctobelbella besucheti sp. n. Figs 28-30

Material examined: Switzerland: Holotype: St. Gall: SG-4; 2 paratypes: from the same sample; 1 paratype: the Grisons: GR-10; 1 paratype: Valais: VS-19. Holotype and 2 paratypes: MHNG, 2 paratypes (1645–PO–99:) HNHM.

Diagnosis: Rostral apex nasiform. Five lateral teeth present, separated by wide incisions. A pair of conspicuous oval formations visible in front of the tectopedial fields. Sensillus setiform, with very long cilia. Median notogastral condyles much smaller than lateral ones. 9 pairs of simple notogastral setae. Notogastral sigillum present. Posterior border of epimeral region simple, without serrate margin. Anogenital setal formula: 6 - 1 - 2 - 3.

Measurements: Length of body: 193-206 µm, width of body: 94-102 µm.

Prodorsum: Rostral region strongly divided by long and/or wide, mostly deep incisions (Fig. 28), separating 5 pairs of well developed, sharply pointed teeth. Rostral apex nasiform, rounded, distinctly protruding anteriorly, bearing geniculate rostral setae. Some of the lateral cilia of the basal stock being conspicuously long and strong. Rostral elevation and rostral ribs clearly discernible behind the rostrum. Rostrum covered by larger granules, median and basal part of the prodorsal surface - except for the surface of the tectopedial fields and the exobothridial region - by small granules. Tectopedial fields wide and large, located medially, their margins serrate, their inner surface smooth. Between them, a well developed, nearly triangular lamellar knob present, carrying short lamellar setae. A pair of weakly sclerotised interbothridial fields present, connected with each other, their frame basally and laterally thicker and finer medially. Bothridia large, well sclerotised, each with a very large, rounded basal lobe. Sensillus long (Fig. 30), its median part slightly incrassate, its distal part setiform, covered with long cilia, except for its basal and distal part. Exobothridial region with large granules, exobothridial arch present.

Notogaster: Rounded. Dorsosejugal suture straight, narrowing medially. Dorsosejugal margin with two pairs of condyles, lateral pair much larger than the median ones. An unpaired notogastral sigillum present medially. Nine pairs of simple notogastral setae present, setae *p* of the same size, but shorter than the preceding ones (Fig. 28). All setae smooth.

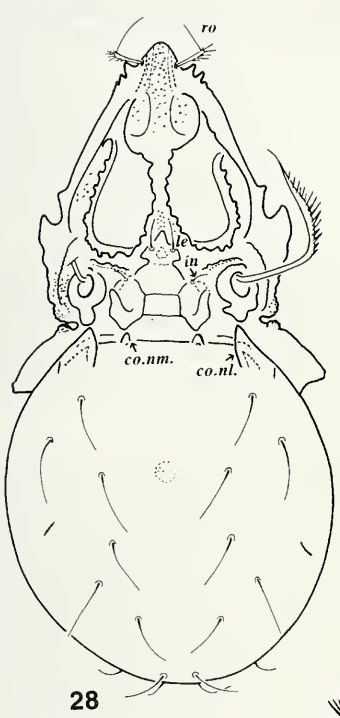
Lateral part of podosoma: Acetabula I–IV normal, lying on the same level (Fig. 30). Exobothridial region well sclerotised, partly granulated. An exobothridial arch clearly discernible, its basal part conspicuously granulated, also a granulate discidial tubercle exists in the opposing position. Pedotecta I small, pedotecta II–III reduced, discidium also with some tubercles in posteromarginal position.

Ventral parts: Median part of the mental tectum concave. Epimeral borders and apodemes normally developed, a wide sternal field discernible. Posterior border of the epimeral region flatly undulate, epimeral fields with polygonal pattern (Fig. 29). Setae *3a* and *3b* arising near to each other, all setae simple. Genital opening slightly larger than the anal one. Anogenital setal formula: 6 – 1 – 2 – 3. Anterior pairs of genital setae longer than the others. Setae ad_1 and lyrifissures *iad* in paraanal position. All setae in this region smooth.

Chelicera and palps: conspicuously narrow and long. Palps setal formula 2 - 0 - 1 - 6.

Legs: Form and chaetotaxy of legs I and IV typical for the family.

Remarks: The new species belongs to the *nasalis*-species group. It is well characterised by the structure of the rostral region, especially the oval formation behind the rostrum. On the basis of the presence of 5 pairs of rostral teeth we consider *S. besucheti* sp. n. to be nearest to *S. forsslundi* (Strenzke, 1950) and *S. baloghi* (Forsslund, 1941). *S. besucheti* sp. n. is distinguished from the other two species by: the conspicuously small median notogastral condyles (much larger in *forsslundi* and *baloghi*) and the distinctly serrate median border of the tectopedial fields (sparsely serrate in *forsslundi* and *baloghi*).



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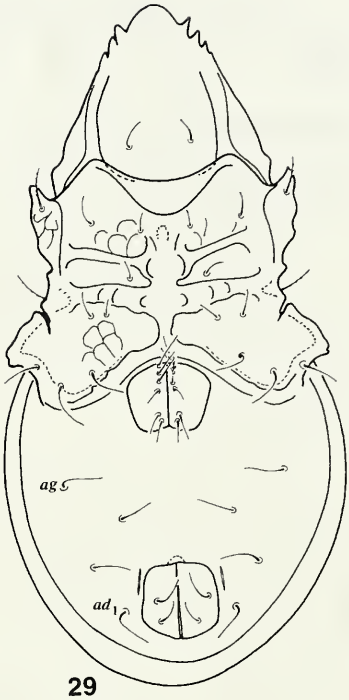

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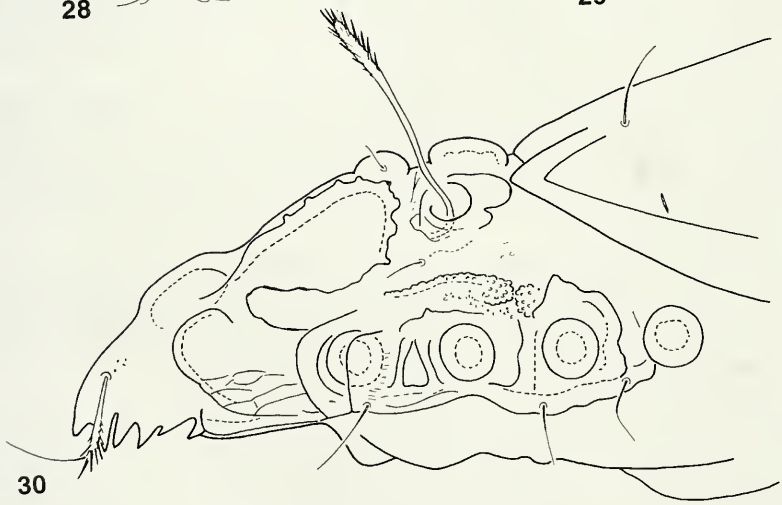

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FIGS 28-30

Suctobelbella besucheti sp. n. – 28: body in dorsal view, 29: body in ventral view, 30: podosoma in lateral view.

Derivatio nominis: We dedicate the new species to Dr. C. Besuchet (Museum d'histoire naturelle, Geneva), the renown coleopterologist and the collector of this species.

Suctobelbella duplex (Strenzke, 1950) Figs 31-33

Suctobelba duplex Strenzke, 1950: 342.
Suctobelba duplex: Strenzke 1951: 153, Abb. 8-9.

Material examined: Switzerland: TI-5.

Remarks: Since its description the species has also been recorded from the Caucasus (Krivolutskij in Giljarov, 1975), but this reference has to be confirmed. In his original, and later in his complementary descriptions, Strenzke gave only partial figures and brief notes. Therefore, we here provide supplementary remarks and more detailed figures (Figs 31-33).

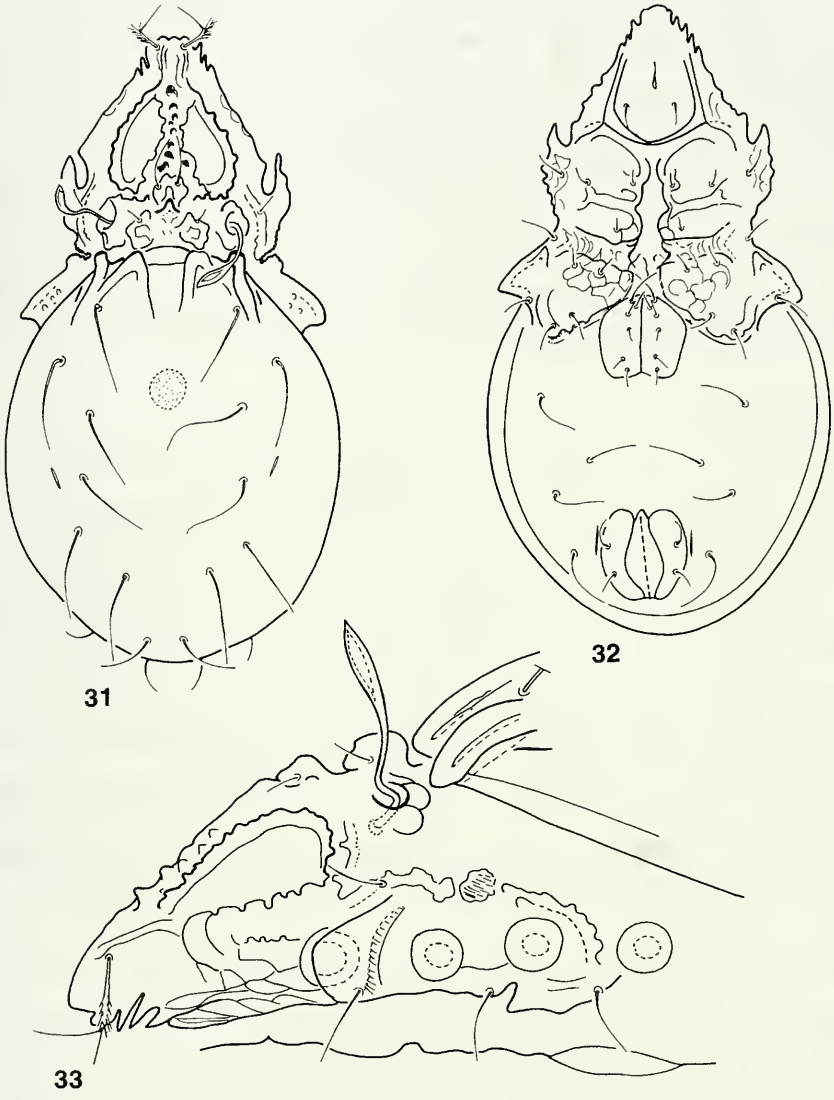
Measurements: length of body: 250 µm, width of body: 132 µm.

Prodorsum: Rostral region strongly divided. Rostral teeth wide, three pairs of well developed, mostly sharply pointed accessory teeth present. Median rostral apex rounded. Rostral elevation conspicuous, bearing the geniculate rostral setae. Some of the basal lateral cilia conspicuously long and strong. Tectopedial fields wide and large, their margins serrate, their surface smooth on the inside. Between them 7-8 large tubercles and a well developed, nearly quadrangular lamellar knob present bearing long lamellar setae. A pair of well sclerotised interbothridial fields present, their frame thick. They are connected with each other. Bothridia large, well sclerotised, with small, rounded basal lobes. Sensillus lanceolate, smooth. Exobothridial region with tubercles, exobothridial arch present.

Notogaster: Rounded. Dorsosejugal suture convex, narrowing medially. Dorsosejugal margin with two pairs of large and blunt condyles connected with each other. An unpaired large notogastral sigillum present medially. Nine pairs of long and simple notogastral setae present, setae *p* of the same size, but shorter than the preceding ones (Fig. 31). All setae smooth.

Lateral part of podosoma: Acetabula I–IV normal, lying on the same level (Fig. 33). Lateroprodorsal pattern polygonate, clearly visible. Exobothridial region well sclerotised, partly granulated. An exobothridial arch clearly discernible, in opposition to a granulate discidial tubercle. Pedotecta I rounded anteriorly, pedotecta II–III reduced, discidium and custodium well developed, convex laterally.

Ventral parts: Median part of mental tectum concave. Epimeral borders and apodemes (except the sternal apodeme) normally developed, a wide sternal field visible. Posterior border of the epimeral region flatly undulate, epimeral fields with a polygonal pattern (Fig. 32). Insertion of some setae (e.g. *1a*, *2a*, *3a*, *3b*) with annular basal elevation. Setae *3a* and *3b* arising near to each other; all setae simple. Anogenital setal formula (6 – 1 – 2 – 3) typical. Anterior pair of genital setae longer than the others. Setae ad_1 and lyrifissures *iad* in paraanal position, setae ad_2 and ad_3 arising conspicuously far anteriorly, both in preanal position. All setae in this region mostly smooth.



FIGS 31-33
Suctobelbella duplex (Strenzke, 1950) – 31: body in dorsal view, 32: body in ventral view 33: podosoma in lateral view.

ACKNOWLEDGEMENTS

First and foremost we wish to thank the collector Dr. C. Besuchet for this interesting material. Our hearty thanks are also due to Dr. V. Mahnert and Dr. B. Hauser for the opportunity to study the material. We further thank Dr. B. Hauser for his efforts in editing this paper. For the loan of material we especially thank Dr. R. A. Norton, who kindly provided specimens from his private collection and Drs P. P. Parrillo and D. Summers of The Field Museum, Chicago, who sent us several types of Woolley's and Higgins's Suctobelbidae. We are grateful to Dr. C. Lienhard for his good advice on several taxonomic questions and to Dr. L. Zombori for reading the manuscript, translating some parts and linguistically revising others. For the conscientious corrections and the many good advices incorporated in the text, we extend our sincere thanks to Dr. M. Luxton.

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The genus *Cloeodes* (Ephemeroptera: Baetidae) in Madagascar

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The genus *Cloeodes* (Ephemeroptera: Baetidae) in Madagascar. - The genus *Cloeodes* has been recently reported from Madagascar by a single species. In this paper, I describe three new species: *Cloeodes bicoloratus*, *C. freitagae* and *C. pseudoglodius*. Features on mouthparts, gills, paraproct as well as general pattern and coloration allow to distinguish them easily. The four Malagasy species constitute an homogenous lineage, that can be separated from all the other species of *Cloeodes* by the shape of the third segment of the labial palp, the general habitus, the shape of the legs and the presence of setae between prostheca and mola.

Key-words: Ephemeroptera - Baetidae - *Cloeodes* - new species - Madagascar

INTRODUCTION

The genus *Cloeodes* has been erected by Traver for specimens collected in Puerto-Rico. Waltz and McCafferty showed that this genus is also present in South and Middle America as well as in the Oriental region (Waltz & McCafferty, 1987a, 1987b). Additional species have recently been described from Africa (Waltz & McCafferty, 1994), Australia (Lugo-Ortiz & McCafferty, 1998) and Madagascar (Lugo-Ortiz *et al.*, 1999). Consequently *Cloeodes* presents an unusual pantropical distribution (Sartori *et al.*, 2000). I shall describe herein three new species. At the present time, the Malagasy fauna has four species; they present all the important apomorphies of the genus *Cloeodes*. However, they also possess different features such as a stocky general habitus, stocky legs and presence of setae between prostheca and mola that clearly indicate they form a distinguishable lineage among the genus.

One of the species presents high adaptation of the mouthparts for scrapping. These modifications are unique among the genus. Three other Malagasy genera exhibit similar adaptations. These similarities must be considered as strict convergences and in any case as synapomorphies (Lugo-Ortiz & McCafferty, 1997; Gattolliat, 2001; Gattolliat & Sartori, 2000) .

The holotypes and part of the paratypes are housed in the Museum of Zoology, Lausanne, Switzerland. Other paratypes are deposited in the Museum National d'Histoire Naturelle, Paris.

Manuscript accepted 31.10.2000

Cloeodes bicoloratus sp. n. Figs 1-12

Material examined

Holotype. One larva, P0199, Madagascar, Bas. Antongombato, Riv. Makis, Roussette station, Long. 49°10'21" E, Lat. 12°31'38" S, Alt. 1075m, 2.4.1994. J.-M. Elouard and M. Sartori.

Paratypes. 5 larvae 199a, 199b, 199c, 199d, 199e (on slides) and 52 other larvae, P0199, same data as holotype. One larva, P0196, same locality as holotype, 30.3.1994. J.-M. Elouard and M. Sartori. One larva, P0806, same locality as holotype, 20.3.1999. J.-L. Gattolliat and Z. Rabeantoandro.

Larva.

Maximal length (fully grown specimen): Body 5.0 mm. Cerci 2.2 mm. Terminal filament 2.0 mm.

Head. Middle brown with vermiform marking on vertex and front, lighter between antennae. Antennae pale yellowish brown. Eyes and ocelli black, turbinated eyes brown.

Labrum (Fig. 1) as broad as long; rounded with a narrow anteromedial emargination; distal margin bordered with bifid or trifid setae; dorsally with a single submedial pair of symmetrical long setae, short arc of about 7 long setae from the lateral margin to the first third of the labrum.

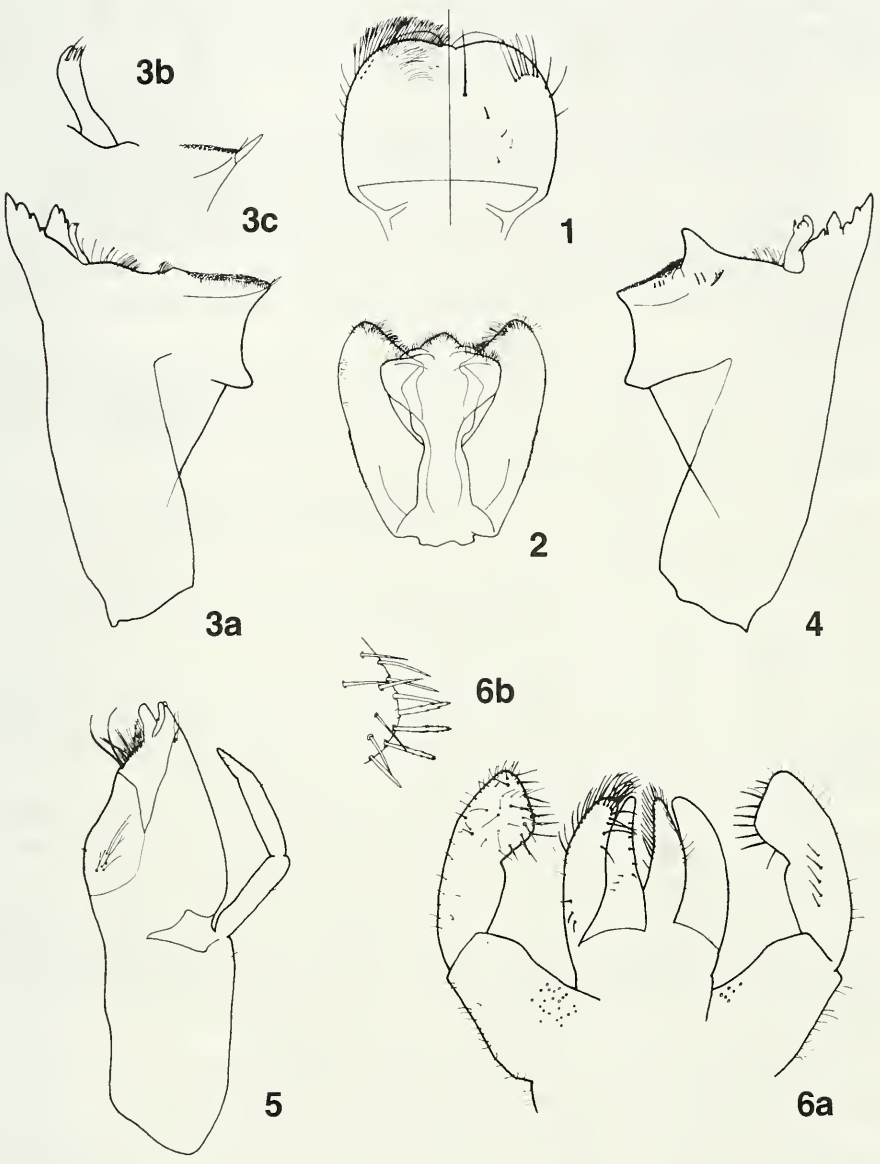
Hypopharynx as in figure 2; lingua covered with thin setae but without bristle tuft at the apex; superlingua poorly expanded.

Right mandible (Fig. 3a) with two sets of 4 and 3 incisors; prostheca short and stout (Fig. 3b); relatively scarce setae between prostheca and mola; small tuft of thinner setae beneath the mola; tuft of setae at the apex of the mola reduced to a spine-like seta and a thin seta (Fig. 3c); basal half without setae dorsally.

Left mandible (Fig. 4) with two sets of incisors almost fused to a group of 2 major and 4 smaller teeth; prostheca well-developed, with 3 teeth together with a comb-shaped structure; tuft of setae between prostheca and mola present; bases of the mola with a depression covered with thin setae; tuft of setae at the apex of mola absent; basal half without setae dorsally.

Maxillae (Fig. 5) with 4 teeth, inner one opposite to the three others; 2 rows of setae formed by abundant small setae and long stout setae ending with two setae twice as long as the others; in middle of range, no pectined or spine-like setae; 5 to 6 sometimes bifid setae at bases of galea not arranged in a row; 1 single very small seta perpendicularly to the margin of the galea; palp 2-segmented, first segment shorter than the second; second segment pointed and slightly constricted.

Labium (Fig. 6a) with glossae subegal to paraglossae; 2/3 apical of the inner margin of glossae with stout setae, outer margin with thinner setae, few small stout setae on the ventral side; paraglossae apically rounded, with 2 rows of simple setae, second row forming an arc subparallel to margin; 3 stout simple setae on outer bases of paraglossae. Labial palp 3-segmented; first segment stout, shorter than the second and third combined, inner margin partially covered with micropores, very thin setae on the outer margin; dorsal side of second segment with a row of about five setae,



FIGS 1-6

Larval structures of *Cloeodes bicoloratus*. 1: labrum (left: ventral; right: dorsal). 2: hypopharynx. 3a: right mandible. 3b: right prostheca. 3c: apex of the mola. 4: left mandible. 5: left maxilla. 6a: labium. 6b: apex of the third segment of the labial palp.

outer margin with very thin setae, almost absent on inner margin; third segment truncated, slightly broader at apex than at bases, margin covered with stout setae, the most apico-laterally feathered (Fig. 6b), few long and thin setae randomly distributed.

Thorax. Dark brown (Fig. 7).

Forewing pad brown, yellow at apex; hindwing pad absent.

Forelegs (Fig. 12a) with coxa ventrally with feathered setae.

Femora with a dorsal row of long setae restricted to 5 to 6 marginal setae and three subparallel setae in proximal half, distal half of the dorsal margin with a row of extremely long and thin, bifid or trifid setae ending in an arc; setae on the ventral margin blunt or feathered; apex of the femora crenate with a distal patch of 3 to 4 setae (Fig. 12b).

Tibiae with dorsally a subproximal arc of extremely long and thin bifid or trifid setae, without other setae; apex dorsally with a single long and curved seta (Fig. 12c); ventral margin with few pointed setae (Fig. 12c), apically with two feathered setae; tibio-patellar suture absent.

Tarsi with dorsally an arc of extremely long and thin bifid or trifid setae; ventrally, with a row of feathered setae (Fig. 12d); tarsal claws stout without tooth, subapical pair of setae absent.

Second and third legs similar to foreleg, except the setae not feathered, the dorso-distal curved seta of the tibia absent and tibio-patellar suture present.

Abdomen. Yellow and dark brown (Fig. 7).

Tergum 1 dark brown distally lighter; terga 2, 3 and 4 yellow with darker pattern in the middle; distal margin of terga 4 dark brown; terga 5, 6 and 7 dark brown; tergum 8 yellow with the distal margin darker; tergum 9 slightly darker than tergum 8; tergum 10 yellow with only a darker pattern in the middle

Terga (Fig. 8) with abundant scale bases; insertions of setae randomly arranged between the scale bases, generally arranged by couple; posterior marginal spines irregular, blunt, triangular, less than two times longer than wide.

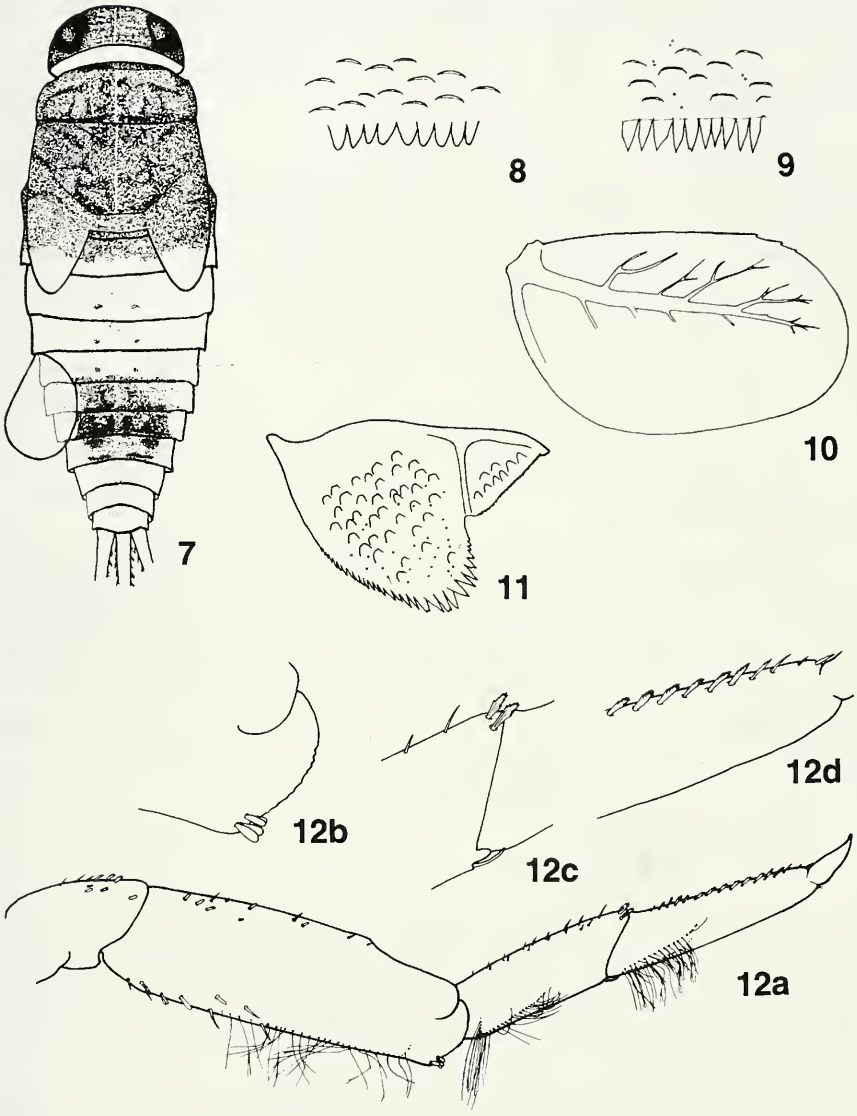
Sternum 1 dark brown; sterna 2 to 4 light yellow, sterna 5 to 10 yellow slightly darker; covered with numerous scale bases; insertions of setae randomly arranged between the scale bases, generally grouped by couple; posterior marginal spines pointed, triangular, more than two times longer than wide; 2 symmetrical rows of 6 to 10 insertions of setae on segments 2 to 6.

Gills on abdominal segments 1 to 7 (Fig. 10), tracheation poorly developed and hyaline; slightly serrated at the apex; distal margin extremely smooth.

Paraproct (Fig. 11) with about 30 irregular and pointed marginal spines, longer at the apex; surface covered with more than 30 scale bases; insertion of setae randomly distributed mostly abundant near the apex; postero-lateral extension with numerous small denticles along the margin; about 8 scale bases subparallel to the margin.

Cerci and median caudal filament light brown, darker at the apex; tuft of setae on the inner margin of the cerci and on both margins of the median filament.

Male and female imagoes unknown.



FIGS 7-12

Larval structures of *Cloeodes bicoloratus*. 7: habitus (dorsal view). 8: distal margin of the fourth tergum. 9: distal margin of the fourth sternum. 10: fourth gill. 11: paraproct. 12a: left foreleg. 12b: apex of the forefemur. 12c: apex of the foretibia. 12d: detail of the foretarsus.

Etymology: This species is named because of the dark brown and white colours of its habitus.

Cloeodes freitagae sp. n. Figs 13-22

Material examined

Holotype. One female subimago 194b with corresponding larval skin (on slide), Madagascar, Bas. Antongombato, Riv. Makis, Loc. Camp base WWF, Long. 49°10'09" E, Lat. 12°31'40" S, Alt. 1075m, 29.3.1994. J.-M. Elouard and M. Sartori.

Paratypes. One female larva 204a (on slide), Madagascar, Bas. Antongombato, Riv. Makis, Loc. Camp base WWF, Long. 49°10'21" E, Lat. 12°31'27" S, Alt. 1030m, 3.4.1994. J.-M. Elouard and M. Sartori. One female larva 810b (on slide) and six other larvae, P0810, same locality as 204a, 21.3.1999. J.-L. Gattolliat and Z. Rabeantoandro.

Larva.

Maximal length (fully grown specimen): Body 5.5 mm. Cerci and terminal filament broken.

Head. Coppery brown, except on vertex and front yellow. Eyes and ocelli black, turbinated eyes brown.

Labrum (Fig. 13) broader than long, with a smooth anteromedial emargination; distal margin bordered with thin setae, bifid or trifid apico-laterally; dorsally with a submedial pair of long setae and a one pair of smaller setae, arc of setae from the lateral margin to the first third of the labrum, few small setae randomly distributed; ventrally with a row of very small, stout setae subparallel to the lateral margin.

Hypopharynx, right and left mandibles, maxillae and labium similar to those of *C. bicoloratus* (Figs 2, 3a, 4, 5 and 6a).

Thorax. Coppery brown, with yellow spots.

Hindwing pad absent.

Forelegs (Fig. 19a) quite stocky.

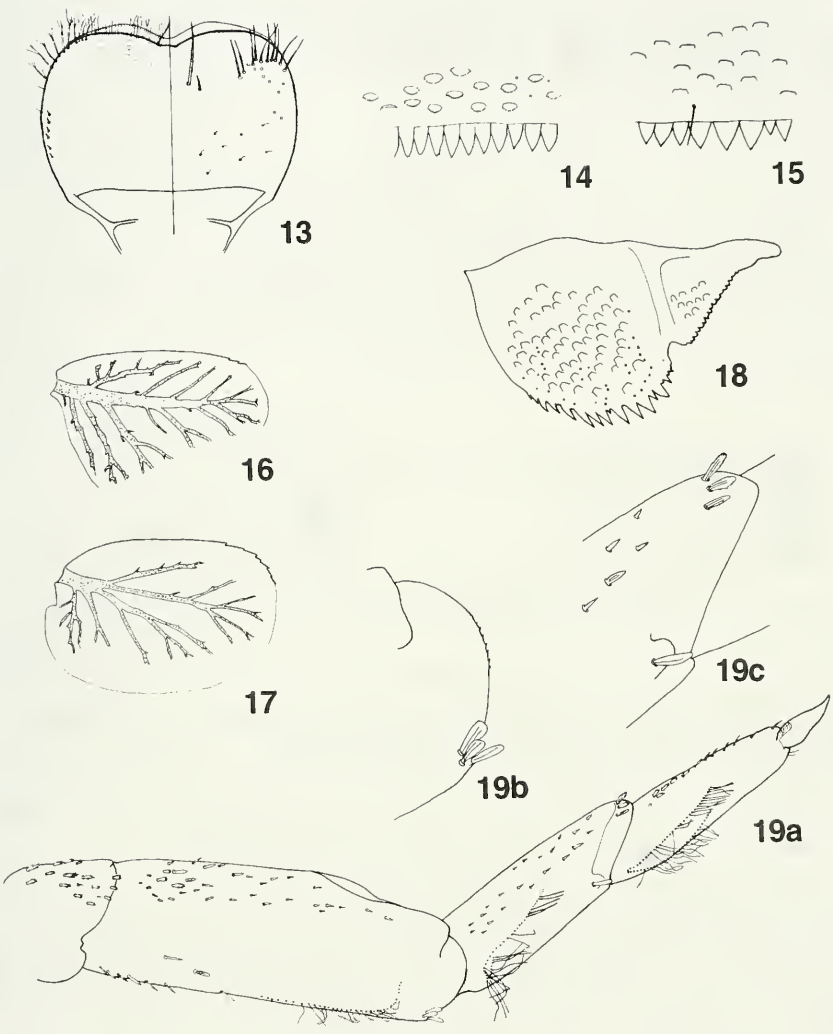
Coxa with feathered setae.

Femora with micropores and scale bases; dorsal row of long setae restricted to 8 marginal setae and 2 submarginal setae in the proximal half, distal half of the dorsal margin with a row of hyaline, tubular and generally not bifid setae, ending in an arc; setae on the ventral margin blunt or feathered; apex of the femora crenate with minute teeth, distal patch of 3 flattened setae (Fig. 19b)

Tibiae with dorsally a subproximal arc of hyaline and tubular setae, without other setae; apex subdorsally with a single spatulated seta (Fig. 19c); ventral margin with pointed setae, apically with two feathered and one acute setae (Fig. 19c); tibio-patellar suture absent.

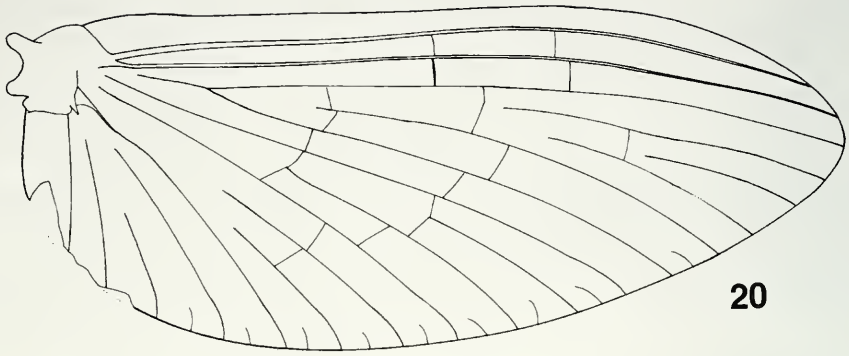
Tarsi with dorsally an arc of long and hyaline and tubular setae; ventrally, with a row of feathered setae; tarsal claws (Fig. 12) stout without tooth, subapical pair of setae absent.

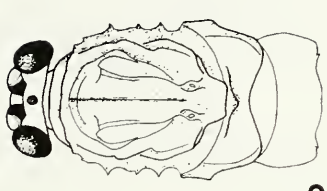
Second and third legs similar to foreleg, except setae not feathered, the dorso-distal spatulated seta of the tibia absent and the acute setae on the ventral margin less abundant and tibio-patellar suture present.



FIGS 13-19

Larval structures of *Cloeodes freitagae*. 13: labrum (left: ventral; right: dorsal). 14: distal margin of the fourth tergum. 15: distal margin of the fourth sternum. 16: fourth gill. 17: sixth gill. 18: paraproct. 19a: left foreleg. 19b : apex of the forefemur. 19c: apex of the foretibia.





FIGS 20-22

Subimaginal structures of *Cloeodes freitagae*. 20: forewing (marginal setae not drawn). 21: head and thorax (dorsal view). 22: head and thorax (lateral view).

Abdomen

Segments 1 to 4 with well-marked postero-lateral projection.

Terga 1 to 6 and 9 to 10 coppery brown, with yellowish brown triangular patterns laterally. Terga 7 and 8 yellowish brown.

Terga (Fig. 14) with abundant scale bases with scales especially near the lateral margin; very few insertions of setae randomly arranged between the scale bases; posterior marginal spines irregular, triangular, about two times longer than wide.

All sterna (Fig. 15) uniformly light yellow; covered with numerous scale bases; very few insertions of setae; posterior marginal spines pointed, triangular, slightly longer than wide; 2 symmetrical rows of 7 to 11 insertions of setae on segments 2 to 6.

Gills (Fig. 17) on abdominal segments 1 to 7, tracheation well-developed and dark; serrated at the apex; only the leading edge sclerified, distal margin extremely smooth.

Paraproct (Fig. 18) with about 20 irregular and pointed marginal spines; surface covered with more than 50 scale bases; setae insertion randomly distributed

most abundant near the margin; postero-lateral extension with small blunt spines along the margin; about 10 scale bases in 3 rows.

Tuft of setae on the inner margin of the cerci and on both margins of the median caudal filament.

Female subimago

Body length: 5 mm, hindwing: 5,9 mm.

Head yellow with black eyes (Figs 21 and 22).

Thorax brown; metascutellar hump projecting dorso-posteriorly (Fig. 22).

Forewing (Fig. 20) with single intercalary veins; pterostigma without visible cross-veins. Hindwing absent.

Terga yellow with the distal margin brown; terga 3, 5 and 6 with brown patches laterally.

Male and female imagoes unknown

Etymology: This species is dedicated to the entomologist Anne Freitag.

Cloeodes pseudogladius sp. n. Figs 23-34

Material examined

Holotype. One larva 644, Madagascar, Bas. Namorona, Riv. Namorona, Loc. Ranomafana (Hôtel Manja), Lat. 21°15'40" S, Long. 47°27'28" E, Alt. 725m, 8.11.1996. J.-L. Gattolliat and C. Rochat.

Paratypes. 4 Larvae 644c, 644d, 644e, 644f (on slides) and fifteen larvae, P0644, same data as holotype

Other material. One larva 91d (on slide) and two larvae, P0091, Madagascar, Bas. Manampanihy, tributary of Manampanihy riv., Loc. Fenoevo, Long. 46°53'39" E, Lat. 24°41'00" S, Alt. 70m, 15.4.1992, J.-M. Elouard. One larva, P0045, Madagascar, Bas. Betsiboka, Riv. Manankazo, Loc. Manankazo, Long. 47°12'39" E, Lat. 18°09'23" S, Alt. 1425m, 17.4.1991. J.-M. Elouard.

Larva.

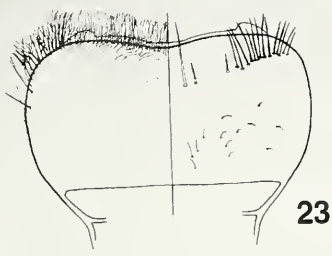
Maximal length (fully grown specimen): Body 3.8 mm. Cerci 1.7 mm. Terminal filament 1.5 mm.

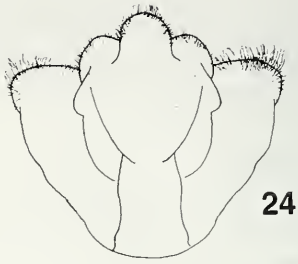
Head. Almost uniformly light brown without visible vermiform marking on vertex and front. Antennae pale yellowish brown. Eyes and ocelli black, turbinated eyes brown.

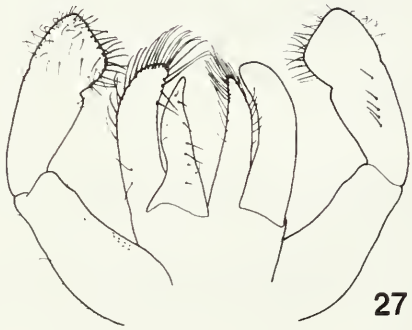
Labrum (Fig. 23) rectangular almost without anteromedial emargination; apical lip with two apophises laterally; distal margin bordered with thin setae, multifid apico-laterally; dorsally with a submedial pair of long setae and a pair of smaller setae, arc of 14 to 18 long and stout setae from the lateral margin to the first half of the labrum, few randomly distributed setae in the proximal half.

Hypopharynx (Fig. 24) with well developed lingua, especially the median lobe; lingua and superlingua covered only with thin setae.

Right mandible (Fig. 25) with straight extern margin; two sets of incisors, the extern formed only by an extremely developed tooth with outer margin reinforced, the

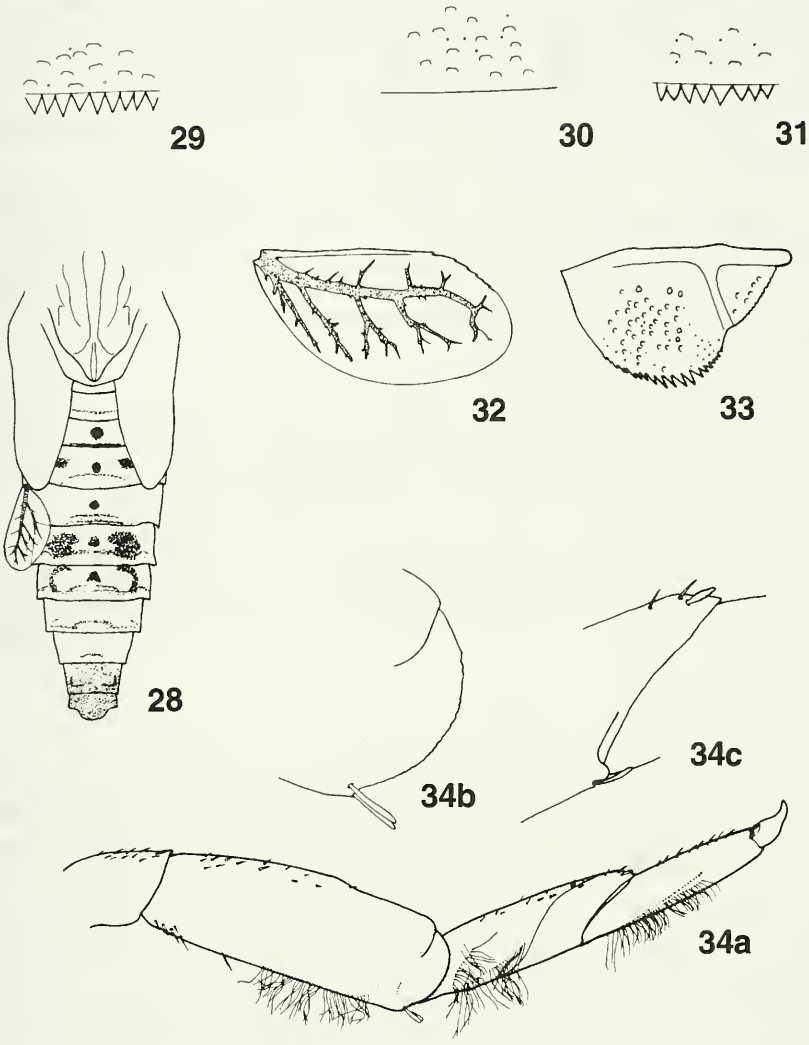






FIGS 23-27

Larval structures of *Cloeodes pseudogladius*. 23: labrum (left: ventral; right: dorsal). 24: hypopharynx. 25: right mandible. 26: left mandible. 27: labium.



FIGS 28-34

Larval structures of *Cloeodes pseudogladius*. 28: abdomen (dorsal view). 29: distal margin of the fourth tergum. 30: distal margin of the fourth sternum. 31: distal margin of the sixth sternum. 32: fourth gill. 33: paraproct. 34a: left foreleg. 34b: apex of the forefemur. 34c: apex of the foretibia.

inner incisor reduced to a minute tooth; prostheca long and slender, with apical tooth extremely long and thin; tuft of setae between prostheca and mola very long near prostheca much smaller near mola; tuft of small setae beneath the mola; tuft of setae at the apex of the mola reduced to a single seta, sometimes with two additional small and thin setae; lateral margin under the mola concave; basal half without short thin setae dorsally.

Left mandible (Fig. 26) with incisors fused in a single extremely developed tooth with outer margin reinforced; prostheca long and slender, with an extremely developed tooth and few minute ones; tuft of setae between prostheca and mola very long near prostheca much smaller near mola; tuft of small setae beneath the mola; tuft of setae at the apex of the mola absent; lateral margin under the mola concave; basal half without short thin setae dorsally.

Maxillae similar to figure 5.

Labium (Fig. 27) with glossae slightly shorter and thinner than paraglossae; 4/5 apical of the inner margin of glossae with stout setae, outer margin with thinner setae, setae randomly distributed on the ventral side; paraglossae apically rounded, with 2 rows of simple setae; 2 simple long setae on the outer bases of paraglossae. Labial palp 3-segmented; first segment slender, subequal in length to the second and third combined, inner margin with few micropores, very thin setae on the outer margin; second segment with a row of about five setae; third segment truncated broader at the apex than at the bases, margin covered with stout but not feathered setae, few long and thin setae .

Thorax. Dark brown.

Forewing pad brown.

Legs yellows, except dorsal faces and 2/3 proximal of the tibia dark brown.

Forelegs (Fig. 34a) with coxa covered with stout setae, without feathered setae.

Femora with a dorsal row of long setae restricted to 2 marginal setae and a patch of 2 to 5 setae close to the margin in the proximal half, distal half of dorsal margin with a row of extremely long and thin, sometimes bifid or trifid setae ending in an arc; distal patch formed by 2 long and spatulated setae (Fig. 34b); ventral margin with pointed setae, no feathered setae.

Tibiae with dorsally a subproximal arc of extremely long and thin, sometimes bifid or trifid setae, without other setae; apex dorsally with a single long curved seta (Fig. 34c); ventral margin with few pointed setae, apically with one feathered and one stout setae; tibio-patellar suture absent.

Tarsi with dorsally an arc of extremely long and thin bifid or trifid setae; ventrally, with a row of stout setae; tarsal claws stout without tooth, subapical pair of setae absent.

Second and third legs similar to foreleg, except the dorsal margin of the femora with 4 to 5 stout setae and tibio-patellar suture present.

Abdomen. Terga yellow with dark brown patterns, except terga 9 and 10 brown.

Terga (Fig. 29) with abundant scale bases; few insertions of setae; posterior margin of terga 1 to 3 without spine, terga 4 to 9 with spines irregular, triangular, less than two times longer than wide.

Sterna yellow except terga 9 light brown; covered with numerous scale bases; insertions of setae; posterior marginal of sterna 1 to 4 without spine (Fig. 30), sterna 5 to 9 with spines irregular, triangular (Fig. 31); 2 symmetrical rows of 9 to 12 seta insertions on segments 2 to 6.

Gills (Fig. 32) on abdominal segments 1 to 7, tracheation well developed and dark; serrated at the apex; only the leading edge sclerified, distal margin extremely smooth.

Paraproct (Fig. 33) with about 20 irregular and pointed marginal spines, longer in the middle; surface covered with more than 30 scale bases, few with scales present; few insertions of setae; postero-lateral extension with about 15 small blunt spines along the margin; about 6 scale bases subparallel to the margin.

Cerci and median caudal filament brown; tuft of brown setae on the inner margin of the cerci and on both margins of the median filament.

Male and female imagoes unknown

Etymology: This species is named after *Dabulamanzia gladius* Gattolliat to point out the similar adaptation of the mouthparts of these species for scraping.

DISCUSSION

The four Malagasy species *C. portabilis* Lugo-Ortiz & McCafferty, *C. bicoloratus* sp. n., *C. freitagae* sp. n. and *C. pseudogladius* sp. n. can be easily distinguished from all the other species of *Cloeodes* by the presence of setae between prostheca and mola (Figs 3a, 4, 25, 26), maxillary palp apically pointed, two-segmented but second segment slightly constricted giving the impression that 3 segments are present (Fig. 5), third segment of the labium truncated, straight or slightly falcate (Figs 6a, 27), general habitus stocky, short and stocky legs with tibiae and tarsi extremely closely attached (Figs 12a, 19a, 34a). However, these four species possess all the main apomorphical characters of *Cloeodes* such as an arc of very long and thin setae on the tibiae and tarsi (Figs 12a, 19a, 34a) and presence of 2 symmetrical rows of setae on the sterna 2-6 and tapering claws without teeth (Figs 12a, 19a, 34a) (Waltz & McCafferty, 1987a, 1987b, 1994) .

Cloeodes pseudogladius presents high-modified mouthparts: bladelike mandibles with prostheca long and slender (Figs 25, 26) and broad labrum with an almost straight distal margin (Fig. 23). This kind of adaptation for scrapping is unique among the genus *Cloeodes*, but occurs independently in different lineage of Baetidae in Madagascar. In certain genera, such as *Xyrodromeus* Lugo-Ortiz and McCafferty and *Rheoptilum* Gattolliat, all the species present these adaptations (Lugo-Ortiz & McCafferty 1997; Gattolliat, 2001). In *Dabulamanzia* Lugo-Ortiz and McCafferty, only *D. gladius* has evolved this character (Gattolliat & Sartori, 2000) .

Cloeodes bicoloratus can be distinguished by the labrum very narrow (Fig. 1), gills with reduced hyaline venation (Fig. 10) and ventral margin of the foretibiae with feathered setae (Fig. 12d).

Cloeodes freitagae possesses a rectangular labrum (Fig. 13), gills with dark well-developed venation (Figs 16, 17) and stocky legs with abundant setae on the ventral margin (Fig. 19a).

Cloeodes portabilis is the only Malagasy species with the third labial segment falcate (Lugo-Ortiz, *et al.* 1999). In the material that I have studied, this species presents some variations between the different populations: the size and the number of setae on the ventral margin, the number and the shape of the setae of the femoral patch, the shape of the tarsal claw can vary. However, these variations must be considered as intraspecific because all the intermediate stages are present.

Moreover, the coloration and pattern of the abdomen allow the four species to be distinguished easily.

Ecology and distribution

Based on extensive studies led during 8 years by the LRSAE (Laboratoire de Recherche sur les Systèmes Aquatiques et leur Environnement, Antananarivo, Madagascar) at over 660 different localities (more than 1000 sampling points), I can assume that the distributions of the species of *Cloeodes* are very different. *C. bicoloratus* and *C. pseudogladius* appear to be very localised but quite abundant. On the other hand, *C. portabilis* exhibits a large distribution but is never abundant. *C. freitagae* appears to be both rare and localised.

C. bicoloratus lives on dead wood in deep pool with slow current, close to a waterfall. Conversely, *C. pseudogladius* lives in little depth streams with fast current. All the species have been mainly found in cold and well-oxygenated streams. They are able to swim quite fast and to move their gills.

A lot of similarities can be found between the two closely related genera *Cloeodes* and *Dabulamanzia*. They both possess one species with a large distribution and other living in restricted area; such situation is quite usual among the Malagasy mayfly fauna (Elouard & Sartori, 1997; Gattolliat & Sartori, 1998, 2000). Moreover, they both possess a species specialised for scraping stones. In one sampling, both species have been collected.

Key to the Malagasy species of *Cloeodes*

1. Bladelike mandibles with both prostheca long and slender (Figs 25, 26); broad labrum with an almost straight distal margin (Fig. 23): cerci and median caudal filament brown . . . . . *C. pseudogladius*
– Mouthparts without particular adaptations for scrapping; cerci and median caudal filament uncoloured 2
2. Labrum narrow (Fig. 1); body clearly bicolour, head thorax and terga 1 and 5 to 7 dark brown, other part of the body yellow (Fig. 7) . . *C. bicoloratus*

– Labrum broad (Figs 13, 23); body with other pattern of colour (Fig. 28) 3

3. Third segment of the labial palp truncated (Fig. 6a); stocky femora with abundant setae on the ventral margin (Fig. 19a), some of them feathered; max. length > 5mm . . . . . *C. freitagae*

– Third segment of the labial palp slightly falcate; femora slender with less abundant simple small setae; max. length < 5mm . . . . . *C. portabilis*

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Revue suisse de Zoologie 108 (2): 403-440; juin 2001

A synopsis of the platyrhacid millipeds of Borneo (Diplopoda: Polydesmida: Platyrhacidae)[1]

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A synopsis of the platyrhacid millipeds of Borneo (Diplopoda: Polydesmida: Platyrhacidae). - The 37 species of Platyrhacidae known to inhabit Borneo are surveyed in the context of a modern classification, with historical summary and discussion of taxonomic characters. Three tribes and eight genera are recognized: Platyrhacini with *Stenoniodes*, *Acanthodesmus*, *Eurydirorhachis*, and *Arbelorhacus* gen. n. (type *A. magirus*, sp. n.); Phyodesmini with *Phyodesmus* only; and Hoplurorhachini (trib. n.) with *Hoplurorhachis* (type *H. everetti* Pocock, also *H. oeceter* sp. n. and *H. crassipes* (Carl) comb. n., *Creagronopus* gen. n. (type *hosei* Pocock), and *Sabarhacus* gen. n. (type *S. derodontus* sp. n., also *sucidus* Attems). Keys to tribes, genera, and the species of some genera are provided.

Key-words: Diplopoda - Polydesmida - Platyrhacidae - Borneo.

INTRODUCTION

During several expeditions to northern and western regions of Borneo in 1982, 1987 and 1988, Dr Bernd Hauser (former Curator, Department of Arthropods and Lower Insects, Geneva Natural History Museum, Switzerland) made particular efforts to obtain material of the soil and litter fauna of arthropods. Among the numerous forms of Diplopoda thus collected were several interesting species of the polydesmidan family Platyrhacidae which were entrusted to me for identification and possible report. This makes a suite of three preceeding studies (Mauriès, 1989; Hoffman, 1993; Golovatch, 1996).

Platyrhacid millipeds comprise a large and diverse group of arthropods with an interesting distribution. One faunule occupies the Neotropical region between Peru and Nicaragua, a second occurs in southeast Asia and the Greater Sunda islands, and the third is confined to the Philippine-Papuan archipelagos from Luzon and Sulawesi to the Solomons. The vast disjunction between Neotropical and Australasian components invites careful study and analysis of its history, as do the patterns of speciation in the south Pacific island chains. Platyrhacids are large, conspicuous and often colorful animals, they are well represented in museum collections, and should have attracted the devoted attention of many systematists.

[1] Diplopoda from Borneo in the Muséum d'histoire naturelle de Genève. 4.
Manuscript accepted 19.12.2000

Regrettably, this bounty of biogeographic potential has so far been only marginally investigated, thus sharing the common heritage of Diplopoda generally. Although the family is distinctly set off from other polydesmidans by rather clear characters, its internal classification has become increasingly more confused and unsatisfactory over the past century instead of achieving progressively greater maturity as one might expect from the analogy of most other groups of organisms.

Aside from the failure of any systematist to undertake a revision of the entire family, most of the problems afflicting the Platyrhacidae, precluding any comprehension of its former distributional dynamics, can be attributed to the influence of Carl Attems and R. V. Chamberlin, the two specialists who contributed most to knowledge of the group after 1900.

Attems followed an extremely conservative taxonomic approach, and by all conventional criteria could only be considered as a "lumper". His interest in both millipeds and centipeds worldwide allowed scant time for deliberate, meditative evaluation of the species he described, he utilized "key character" diagnosis for both species and genera, ignored inconvenient rules of nomenclature, paid scant attention to biogeographic implications, and tended to recognize genera of awe-inspiring heterogeneity. Most of these mannerisms were not unusual for his time, however, and, to his credit, Attems made special efforts to provide useful keys and literature citations for the groups that he studied.

Chamberlin likewise worked with many kinds of organisms: millipeds, centipeds, and spiders, all on a world-wide basis, so that his time and energies were extended to a maximum. Perhaps as a result his major interest appears to have been the publication of new names with an absolute minimum of documentation or comparison with already known taxa: he was uncontestably a radical "splitter". Most of his later work was simply naming and describing the contents of various collections which came to his hand; preparation of syntheses rarely played more than an occasional and very superficial role. Probably the majority of his new species could not be recognized from the original descriptions, even when illustrations were included, making examination of his types mandatory.

It can be appreciated from this prologue that the combined effects of an ultraconservative synthesis approach and one of irresponsible analysis brought the classification of the Platyrhacidae into a condition of essential incomprehensibility by the middle of this century. Since that time, some efforts have been made at revision of selected genera using modern systematic principles, but the critical monographic treatment has not yet been undertaken. Until that effort has been made, studies either of isolated genera or regional faunas offer the only hope for amelioration.

Even the flawed state of current knowledge reveals that the greatest generic diversity of platyrhacids occurs on the island of Borneo. Therefore, a clarification of that fauna is obviously crucial for any better understanding of relationships in the entire family. At various times in the past, it has been my good fortune to examine material which facilitated some elementary taxonomic and nomenclatorial studies of some Bornean genera (e.g., *Phyodesmus* in 1978, *Acanthodesmus* in 1984). Other major components have been studied to some extent also, but not accorded formal

treatment until the examination of Dr Hauser's Sabah collections afforded the necessary impetus and opportunity.

It will be immediately obvious that the present synoptic review is scarcely more than an annotated outline, yet it is presented with the conviction that natural generic groups, composed largely of species either poorly-known or rescued from the obscurity of placement in "*Platyrhacus*", are defined for possible later attention. The status of several species must here be passed over in virtual silence, for reasons to be accounted in a subsequent paragraph.

In addition to the material of the Geneva Natural History Museum [MHNG], I have examined some relevant types in The Natural History Museum, London [BMNH], the Natural History Museum, Vienna [NMW], the Natural History Museum, City of Genova (MCSNG) and the Museum of Comparative Zoology [MCZ], several specimens submitted for identification by Dr John Kethley of the Field Museum of Natural History [FMNH], and a few others in the Virginia Museum of Natural History, Martinsville [VMNH] from Sarawak kindly presented by Dr J. G. E. Lewis. The acronym SMF is used to designate the type depository of several species in the Senckenberg Museum, Frankfurt am Main.

Family **PLATYRHACIDAE** Pocock

Platyrrhachidae Pocock, 1895: 788.
Platyrhachidae Attems, 1938: 202.
Platyrhacidae Hoffman, 1980: 162.

Diagnosis: A family of Chelodesmoidea characterized by the unmodified anterior legs and sterna in males, ozopores surrounded by broadened discoid peritremata, often at some distance from paranotal margin, apical broadening of the epiproct, and presence of "compound" setae on labrum (and often also on the epiproct). Prozonal texture finely to coarsely granulate. Stigmata, especially the anterior of each pair, distinctly enlarged and elevated. Tibiae of legs with distinctly enlarged, apparently socketed, dorso-apical macroseta. Vasa deferentia open flush on ventral surface of coxae of 2nd pair of legs. Gonopods typically simple in form, without prefemoral process. Gonosternal elements reduced or missing.

Components: 29 nominal genera are admitted to the family in the most recent list (Hoffman, 1980), to which total three additional genera are proposed in this paper.

Gonopod structure: The male genitalia of most platyrhacids are basically of very simple construction: the coxae lack apophyses, the prefemora lack processes in all but one or two species, and the telopodite usually terminates in a small slender solenomere and larger, shielding tibiotarsal element. This pattern is completely pervasive in the American fauna and dominant elsewhere, sometimes even the tibiotarsal element may be missing. However, in Borneo, the Lesser Sundas, and the Papuasian archipelagos, the telopodite is frequently equipped with as many as four additional processes.

It is still unclear to me whether a lesser number represents secondary loss or an additive stage, on the way to five. If the derivation of polydesmidan gonopods from modified 7th legs is emphasized, then the simplest (most leg-like) gonopod would

seem ipso facto to be the generalized condition. A complex telopodite could then only be regarded as derivative. But the capricity of animal evolution almost guarantees that some "simple" gonopods represent an early stage in a transformation series, and some have resulted from secondary reductions. At the present time I cannot distinguish which is which. From a strictly pragmatic and functional standpoint, it is reasonable to defer concern over this point and deal simply with the situation as it occurs. Among the known extant fauna, the most complex gonopod occurs in the genus *Parazodesmus*, endemic in the Solomon Islands and New Britain. In my 1984 paper on *Acanthodesmus* I provided an account of this pattern, basically five similar telopodite processes, and mentioned some of the many permutations that could be derived from it. For ease of reference and the relevance to the Borneoan fauna, I give now an expanded version of that discussion, the more so as it gives the basis for the nomenclature here employed as the major basis for generic differentiation.

Because of substantial random convergence in the apparent loss or retention of telopodite branches in the Platyrhacidae, the identification of these processes and establishment of homologies is extremely difficult. The pioneering work of Attems, although an obvious step in the right direction, is now known to be inconsistent and unreliable. During the past two decades I have been able to study a large number of Indomalayan and Papuan platyrhacids and have been able in consequence to develop a classification and terminology for the gonopod elements which appears to be satisfactory. Reference should be made to Figure 1, showing the telopodite of *Parazodesmus verrucosus* in dorsal aspect, in connection with the following description.

The maximum number of processes so far known to occur is five. The solenomere, which is always present as the termination of the telopodite, is indicated by the letter **a**. The other four may be variously suppressed or enlarged in many ways and a large number of combinations has been recognized. Process **b** is the distalmost process adjacent to **a** and usually parallel to it; process **c** is typically much smaller than either **a** or **b** and is placed near their point of juncture. Process **e** is usually also quite small, and is located near the midlength of the telopodite. Of these five, processes **b** and **d** are located on the **outer** side of the prostatic groove as the gonopod is viewed in dorsal aspect (Fig. 1), whereas **c** and **e** occur on the **inner** side.

It is possible to express the foregoing symbolism in the form of simple formulae which are useful in mapping the distribution of species groups or genera. If some processes are distinctly larger or smaller than the others, upper and lower case letters reflect this fact. When two or more processes are grouped onto a common stalk the appropriate letters can be enclosed in brackets. I give below the gonopod formulae for several genera by way of illustration:

Parazodesmus: A, B, c, D, E
Psaphodesmus: (a,b,c) D, E
Ozorhacus: a, d, e
Hoplurorhachis: a, C, d
Acanthodesmus: A, b, c
Platyrhacus: A, D
Derodesmus: a

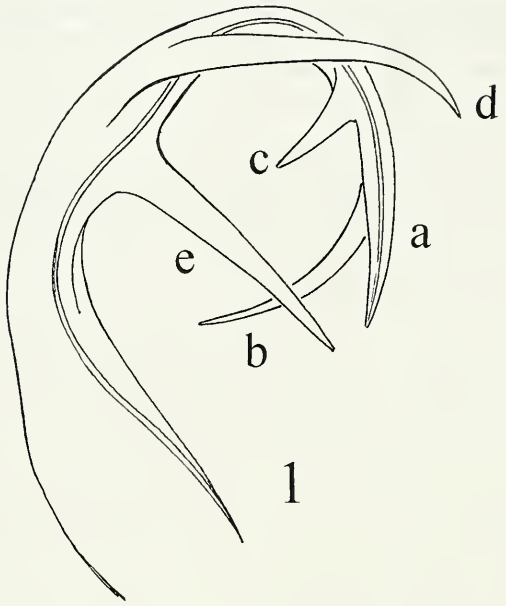


FIG. 1

Parazodesmus verrucosus (Pocock), left gonopod, dorsal aspect, showing basic psaphodesmine pattern of five telopodite processes from which all others can be derived by loss or shape modifications. Identification of structures by letters discussed in text.

As the addition, loss, or modification of individual gonopod parts is obviously liable to random expression, a certain amount of flexibility in the application of generic definitions is desireable. Thus some platyrhacid genera may be expected to contain species which do not conform to a formal diagnosis in every respect, but which are manifestly close relatives to most of the typical included taxa.

CLASSIFICATION OF BORNEAN PLATYRHACIDS

The first platyrhacids described from Borneo were five species collected mostly in the southern part by the malacologist E. von Martens and named by W. C. H. Peters in 1864. The next period of activity came in the 1890s, with the description of various new species by Silvestri (1896, 1899), Attems (1897), Cook (1896), and Pocock (1897). The last two in particular contributed most of our knowledge of this faunule, setting up new local genera as well as species. By 1914, Attems could list 26 species of Bornean platyrhacids; regrettably he discarded all of the available generic categories and lumped all species in his "Platyrhacus".

Subsequent to 1914, a few species were added by Chamberlin (1921) and Attems (1932). In 1938, Attems slightly liberalized his rigid generic concept, and recognized several of the older names in the status of subgenera. Since then, essen-

tially nothing was added to our knowledge of Borneo species until my short revisions of *Phyodesmus* (1978) and *Acanthodesmus* (1984) appeared. A full century after the promising early work by Pocock and Cook, the time for an overview of Borneo platyrhacids is long overdue, and thanks to the catalytic effect of Dr Hauser's collections, can now be attempted.

In terms of general relationships, some groupings are evident and may be examined briefly. Cook's pioneering survey of the Indomalayan fauna (1896) recognized 126 genera, some of which were based on specimens he personally studied in the Berlin museum and others on published descriptions, and several which had been proposed by Pocock, Peters, or Silvestri.

Regrettably, some of the Cook genera were based on genitalic characters, others on peripheral body form, so it was impossible to evaluate or compare these taxa consistently. Nonetheless, he went so far as to propose an intuitive suprageneric classification which proposed four subfamilies populated, in Cook's words, as follows (in 1896, Cook used the ending "-ini" instead of "-inae" which he later adopted):

"The Phyodesmini and Taphodesmini include as yet but a single genus each... To the Psaphodesmini may be referred Derodesmus and Zodesmus, while the remaining Malayan genera can be provisionally included in the Acanthodesmini, from which the separation of other subfamilies will doubtless be found convenient."

In the light of an additional century of investigation and a vast increase in the number of known taxa, Cook's inferences seem remarkably prescient. Although subfamily rank is probably too exalted, prior to a revision of the entire family, there seems to be justification for adopting the Cook categories at the level of tribe to imply magnitudes of similarity and differences.

Within the Borneo fauna, *Phyodesmus* is obviously disjunct, without apparent relatives there or elsewhere. The three taxa *Hoplurorhachis*, *Creagronopus*, and *Sabarhacus* comprise a cohesive endemic group (tribe). *Acanthodesmus*, *Eurydirorhachis*, *Stenoniodes*, and *Arbelorhacus* are provisionally combined into a tribe with *Platyrhacus* of the Java-Sumatra-Malaya region. The first two named are together somewhat disjunct and may later be extracted into a discrete tribe.

The tribal groupings of the Borneo genera are summarized in the following outline:

Phyodesmini Cook
- *Phyodesmus* Cook, 1896 (revised by Hoffman, 1978)

Platyrhacini Pocock
- *Acanthodesmus* Peters, 1865 (revised by Hoffman, 1984)
- *Eurydirorhachis* Pocock, 1897 (revised by Hoffman, 1984)
- *Stenoniodes* Pocock, 1897 (treated in this paper)
- *Arbelorhacus* new genus

Hoplurorhachini new tribe
- *Hoplurorhachis* Pocock, 1897 (treated in this paper)
- *Sabarhacus* new genus
- *Creagronopus* new genus

It may be emphasized that some of the foregoing names may be later shown to be synonymous with others proposed a year earlier (Cook, 1896) for species in the Indomalayan fauna.

Species of uncertain generic and tribal position

The enigmatic species described as *Platyrrhacus doryphorus* by Attems in 1899 cannot be placed anywhere with confidence in light of present knowledge, as the gonopod was only briefly described and no illustration was provided. Although the type specimen was said to be in the Berlin museum, I could find no trace of it there during four visits, and it was not documented by Moritz & Fischer (1978). Nor have searches in the collection at Vienna been any more successful. Unless the specimen or a gonopod preparation are located by serendipity, or topotypic material is obtained at Sintang, Borneo, the status of *doryphorus* will remain a mystery. Attems described the gonopod as follows. "... von der wie gewöhnlichen birnförmig angeschwollenen Basis des Schenkels ein schlanker, spitzer, langer Dorn entspringt. Der Schenkel setzt sich in einem einfachen, eingekrümmten, allmählich sich verjüngenden Endhaken ohne Verzweigung oder Seitenhaken fort." This description calls to mind an apparently similar structure that characterizes *Acanthodesmus anambasius* (cf. Fig. 37). Attems referred the species to his nominal subgenus *Haplorhacus*, but that taxon, as defined by the "simple" telopodite, is manifestly polyphyletic and it is unknown whether *doryphorus* is cladistically congeneric with *Haplorhacus haplopus*, the type species.

Lastly, a species described by Attems (1897) as *Platyrhacus amauros* from "Batjan - Borneo - Ternate" from female specimens remains unknown to me, and resolution of its status may require some kind of arbitrary intervention. It is unlikely that such a species occurs both on Borneo and Ternate; mislabeling seems likely.

Key to the Borneo tribes of *Platyrhacidae*

1. Telopodite of gonopod (Fig. 23) nearly straight, occasionally slightly sinuous as seen in mesal aspect, the long prefemoral region apparently with a distal ensiform process on dorsal side (absent only in *P. longispinosus*); paranota large and almost horizontal, widest across anterior corners, lateral edge deeply incised and dentate (Fig. 22); dorsum brightly colored with blue, yellow, and black markings; very large species, adults more than 90 mm long. . . . . **Phyodesmini** Cook

– Telopodite of gonopod curved or bent dorsad over coxa, rarely (one exception) with trace of prefemoral process; paranota variable but never dentate laterally; dorsum without bright color patterns; adults less than 90 mm long 2

2. Epiproct apically broadened with posterolateral corners acutely projecting, acute median projection often present (Fig. 6); paranota nearly rectangular in profile, anterior edge strigilate (Fig. 5). **Hoplurorhachini,** trib. n.

– Epiproct otherwise shaped; paranota variable but without strigilate anterior edge . . . . . **Platyrhacini** Pocock

Hoplurorhachini new tribe

Component: *Hoplurorhachis* Pocock, 1897, *Creagronopus* new genus, *Sabarhacus* new genus.

Diagnosis: Body form generally parallel-sided over segments 4-16; collum small, widest anteriorly; paranota of segments 2-4 small; those of midbody segments large, subhorizontal, appearing nearly square, with anterior edges strigilate, lateral smooth and straight, and posterior crenulate. Ozopores large, located near center of paranotal length, removed from lateral edge by varying distances. Metazona convex, faintly coriarious, posterior row of tubercles developed on most segments, anterior two rows evanescent. Epiproct with prominent caudolateral angles (Fig. 6). Sterna with four long acute subcoxal spines, directed ventrad or slightly caudad.

Gonopods large, coxae with setiform or penicillate dorsal hairs; prefemoral region of telopodite elongated, nearly straight; acropodite region recurved mesad. Process **e** of telopodite consistently absent, **c** always present.

Key to genera of *Hoplurorhachini*

1. Process **d** of gonopod reduced, smaller than **a** (Fig. 8); gonocoxa without paracannular setae; ozopores removed from lateral edge of paranota by about 4X diameter of a peritreme (Fig. 5) . . . . . *Hoplurorhachis*
– Process **d** of gonopod enlarged, longer than main termination of telopodite (Fig. 10); gonocoxa with field of setae subtending base of cannula; ozopores removed from lateral edge of paranota by about 1 or 2X diameter of a peritreme (Fig. 13) 2
2. Prefemoral region of telopodite unusually long, becoming broadest distally at point of curvature; process **d** very large, falciform, prolonged distad and curved beyond end of main termination, processes **a**, **b**, and **c** grouped at end of common stem (Figs 10, 11). . . . . *Creagronopus*
– Prefemoral region of telopodite tapering gradually distad and much shorter relative to total length of gonopod, third distal only gradually curved mesad, not bent at 90° angle; process **d** large and laminate, but not recurved falciform and but slightly longer than main termination, process **b** absent, **a** and **c** widely separated (Fig. 19) even though on a common stem . . . . . *Sabarhacus*

Hoplurorhachis

Hoplurorhachis Pocock, 1897: 437. Described with two new species. Type species: *H. everettii* Pocock, by original designation.
Hoplurorhachis: Hoffman 1980: 163.

Diagnosis: Gonopod coxa subcylindrical, with slender unmodified setae in a sparse dorsal field. Prefemur about half length of telopodite, latter curved dorsomesad with three apical processes, **a** slender and recurved laterad, **b** and **e** missing, **c** enlarged and laminate, **d** small and etiolated, arising from a broadened area just

proximad to **c** on the mesal side (Figs 4 and 9). Formula: **a, C, d**. Collum broadest in front of midlength, but anterior corners not projecting. Paranota large, anterior edges strigilate (in at least one species), posterior finely crenulate, ozopores placed near center of paranotal surface. Epiproct large, notably "tridentate" with caudolateral and median tubercles enlarged (Fig. 6). Legs long, podomeres slender (fig. 7).

Comments: This genus was proposed with two species, *H. everettii* and *H. hosei*. In 1921 an additional species *H. lamprus* was added by R. V. Chamberlin, with no further locality than "Borneo." Although the general body form is similar in all three of these species, the gonopod structure clearly reflects such a sharp dichotomy that separate generic status is mandated for the last two species mentioned.

Previous descriptions of species in this and related genera have referred to the anterior paranotal edges as "crenulate", "finely serrate", "serrulate", or "kerbzahnig". These terms are misleading in their implication of a single series of surface irregularities when, in fact, if the paranota are examined with sufficient magnification, the anterior edge is seen to be distinctly thickened and invested with a multiseriate field of minute spicules (Fig. 5). The effect is quite similar to the condition already noted and designated as the *strigilus* (Hoffman, 1962) in *Polylepiscus campanulae* and since observed in numerous Neotropical species of Euryurinae. Within the Bornean fauna, the character is apparently a synapomorphy of *Hoplurorhachis*, *Creagronopus*, and *Sabarhacus*, reflecting the similarities in gonopod structure. I have not observed it in genera of the tribe Psaphodesmini, such as *Parazodesmus*, *Zodesmus*, and *Ozorhacus*.

The identification of one of the telopodite processes is not asserted with confidence. Although tentatively labeled as **d** on the drawings, it might as readily be **b**, carried out of normal position by an evident rotation of the distalmost telopodite region. Future studies of different species may cast some light on this point.

Distribution: Known only from Brunei (and "N.W. Borneo", presumably Sabah).

Name: From the Greek *hoplos* (armed) + *uros* (tail) + *rhachis*, a common combining element in this family. Gender feminine.

Species: Three nominal species are referred to this genus.

Key to the species of *Hoplurorhachis*

1. Ozopores of midbody segments located posterior to midlength of paranota and about one peritrematic diameter from lateral edge; sterna with four polished knobs. . . . . *crasssipes* (Carl)
– Ozopores of midbody segments located near center of paranota, and at least four peritrematic diameters from lateral edge; sterna with four long sharp caudally declined spines 2
2. Small species, body width 10.5 mm at midlength; process **c** of gonopod narrower, parallel-sided, apically truncate (Fig. 8) . . . . . *oeceter* sp. n.
– Larger species, body width 13 mm; process **c** of gonopod a broad, suboval, apically rounded lobe (Fig. 3) . . . . . *everetti* Pocock

Hoplurorhachis everettii Pocock Figs 2, 3

Hoplurorhachis everettii Pocock, 1897: 437, figs 12, 12a. Three male syntypes [BMNH 1895.11.4.2-4] from "N.W. Borneo", A. Everett leg. One of the males (1895.11.4.2) has been labeled as lectotype of this species; the gonopod structure of this individual is illustrated.

Platyrrhacus (Pleorhacus) everettii: Attems, 1914: 264.
Platyrhacus (Psaphodesmus) everettii: Attems, 1938: 279.

Material: The male lectotype and two male paralectotypes were examined in the British Museum (Natural History), London (currently called "The Natural History Museum"). These specimens carry no data except "N.W. Borneo" but probably originated in either Brunei or Sarawak.

Description (adapted from Pocock): Dorsum black or piceous, the dark color extending laterad to but not around the peritremata, all three margins of paranota thus broadly yellowish, as are the antennae, legs, and projections of the epiproct.

Terga finely granular to coarsely coriaceous; three rows of small tubercles evident, those of the 3rd row largest.

Anterior edge of paranota of midbody segments thickened, the anterolateral angle rectangularly rounded; posterior edge finely crenulate, forming straight line with median posterior edge of tergum, produced basally into a triangular lobe; caudolateral angle subacute; ozopore removed from lateral edge by distance about 4X diameter of a peritreme. All paranotal edges entire, nearly straight, the anterior strigilate.

Gonopod structure (drawn from lectotype) as shown (Figs 2, 3): coxal setae sparse, slender, not apically penicillate; process **c** of telopodite broad, apically rounded, originating very close to **a**.

Hoplurorhachis crassipes (Carl) comb. n. Fig. 4

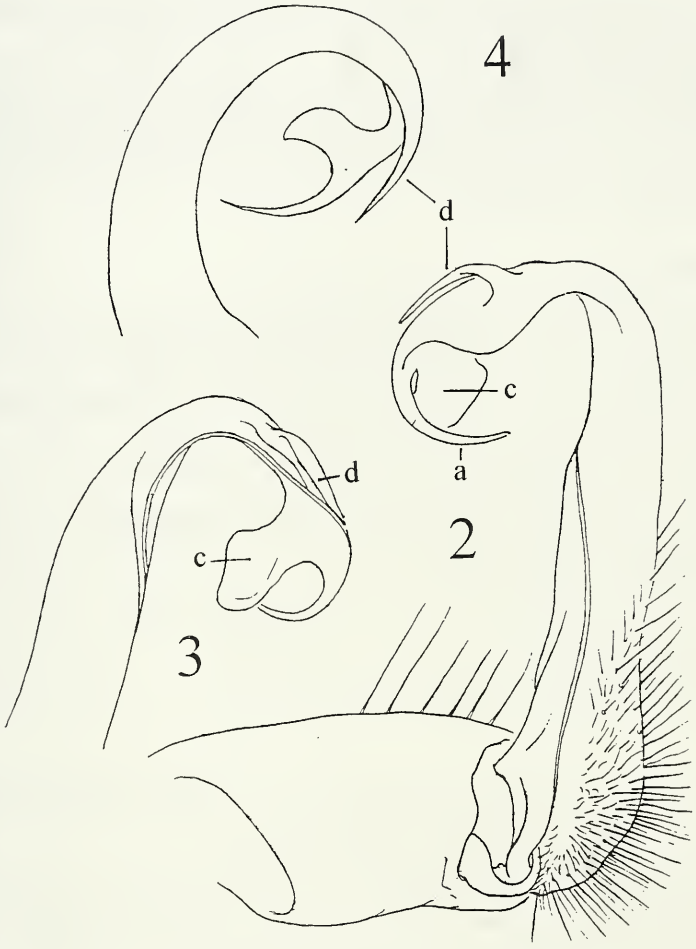
Platyrrhacus crassipes Carl, 1909: 253, fig. 19. Male holotype (location, if extant, unknown) from "Borneo" without further locality.
Platyrhacus (Pleorhacus) crassipes: Attems, 1914: 267.
Platyrhacus (Psaphodesmus) crassipes: Attems, 1938: p. 277, fig. 315.

The holotype of this species has not been found in the Geneva collection. Carl's description and gonopod drawing are so precise, however, as to leave no doubt whatever about the systematic position of *crassipes*. The strongly reduced sternal spines seem to be a significant specific character fo later recognition. The parts of Carl's original description that do not apply to all members of this genus are reproduced below (loose translation by author):

"Uniformly brown, basal podomeres and outer part of paranota yellowish-brown.

Collum narrow, not wider than the head, with small triangular depressed lateral lobes; a row of flat tubercles along anterior margin, a wide, shallow, transverse groove between posterior base of lateral lobes, posterior edge with a large tubercle on each side, dorsal surface rather thickly granulate with scattered larger flattened tubercles.

Metazona with dense flat granules, somewhat larger on paranota than middorsum, granulation becoming finely and fainter from front to back. Posterior row of



FIGS 2-4

Fig. 2. *Hoplurorhachis everettii* Pocock, left gonopod of male lectotype (BMNH). Fig. 3. Tne same gonopod, distal half of telopodite, dorsal aspect. Fig. 4. *H. crassipes* (Carl), distal half of telopodite of gonopod of holotype, redrawn from Carl, 1909.

tubercles most distinct on anterior segments and becoming weaker posteriad; first two rows appear first on posterior segments.

Ozopores large, placed behind midlength on paranota and near their lateral edge, hardly more than a peritreme diameter removed from the latter.

Epiproct broad, shovel-shaped, with weakly convex posterior edge, convex lateral edges, and rounded posterior corners, somewhat constricted at the base; dorsal side sparsely granular, with two longitudinal swellings ending in a bristle. Hypoproct

with two very small paramedian tubercles. Sterna glabrous, with sparse fine granules and four low, polished projections.

Length of male 57 mm, collum 6.5 mm, 11.segment, 11.5 mm, 18th, 9 mm."

Despite the differences noted in pore location and reduction of sternal armature, Carl's drawing of the gonopod of this species (reproduced here as Figure 4) so closely resembles the form seen in *hosei* and *oeceter*, there can be little doubt that *crassipes* is congeneric with them.

Hoplurorhachis oeceter sp. n. Figs 5-9

Material: Male holotype and male paratype (MHNG) from **East Brunei**: Bangar, Bukit Patoi Nature Reserve, 60-300 m, 24 October 1988, B. Hauser leg. (field no. Bru-88/37).

Name: Approximate Latinization of the German surname Hauser ("householder" in English), bestowed in recognition of the collector's contributions to knowledge of the soil and litter arthropods of Borneo.

Diagnosis: Distinguished from the known related forms by the characters stipulated in the foregoing key to species.

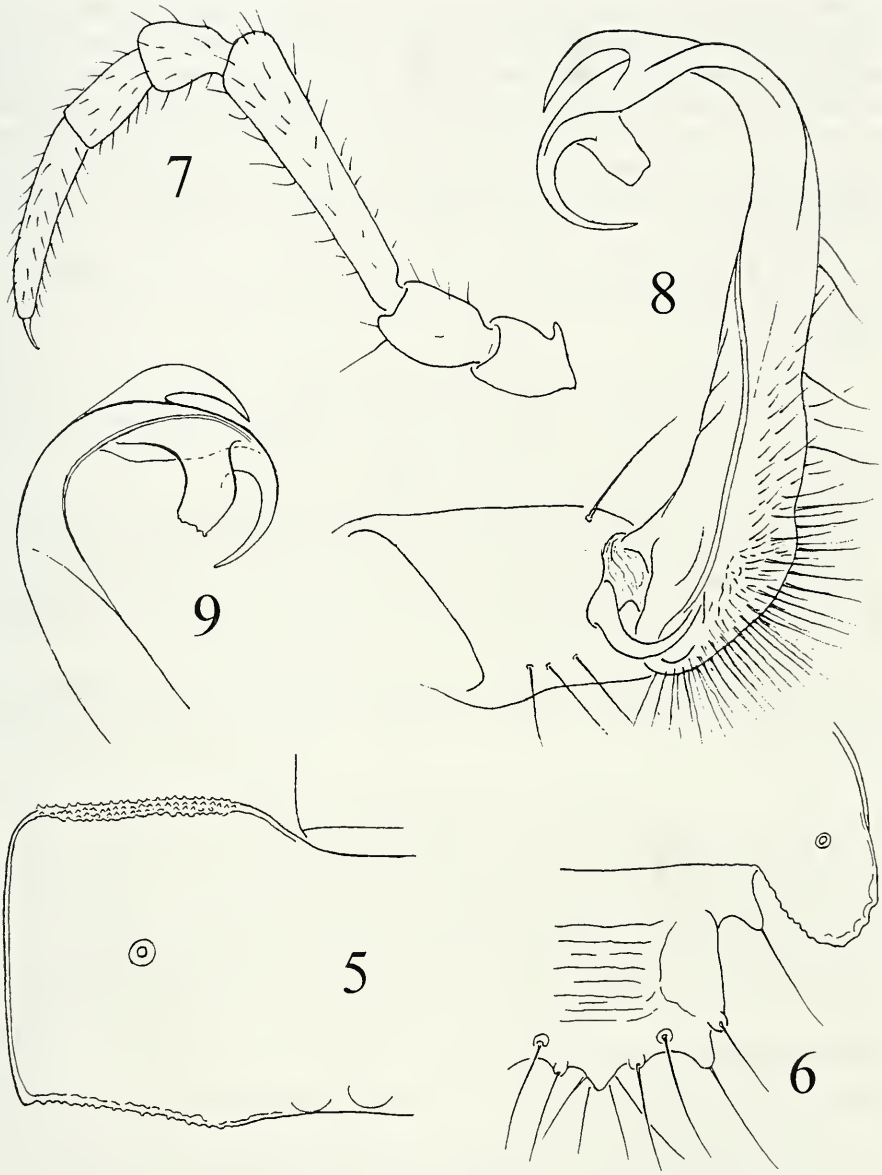
Holotype: Length ca. 62 mm (specimen broken), width/length ratio ca 18% at midbody; widths of selected segments

1 - 5.8 mm	10 - 10.9 mm
2 - 8.5	12 - 10.8
4 - 9.9	14 - 10.7
6 - 11.0	16 - 10.4
8 - 11.0	18 - 8.5

Dorsal color generally uniform, light brown, outer two-thirds of paranota, distal half of epiproct, antennae, and legs yellowish.

Epicranium coarsely granulate, with 3-2 setae in transverse series, rims antennal sockets high and prominent medially, lower ventrad and dorsad, genae with shallow median depression. 4+4 frontal hairs, 2+3 clypeal, 5+5 labral, 2+2 lower genal, all these hairs in fasicles as usual. Width of head across genae equal to transmandibular width. Antennae short and robust, unmodified.

Collum widest near anterior corner, posterolateral quadrant strongly elevated, forming transverse ridge bearing 6-6 prominent polished tubercles in a curved row along the edge; 5-5 low and indistinct tubercles along front margin; surfacee finely tuberculate-microcoriarious. Surface of 2nd metatergum granular, caudal edge elevated, with 6-6 acute tubercles preceeded by a transverse row of 4-4 small rounded tubercles; paranota extended beyond ends of collum, edges smooth except for two blunt lateral projections. Metatergum of 3rd segment with 7-7 tubercles, surface of paranota nearly smooth. Paranota of 5th and subsequent segments about 50% larger than 3rd and 4th; dorsal surface of these segments increasingly granulose posteriad, caudal edge of metaterga becoming gradually lower until plane with prozona at midbody. Shape of paranota at midbody as in Fig. 5. Epiproct of the shape shown in Fig. 6. Hypoproct lacking median projection; paramedian tubercles large and pro-



FIGS 5-9

Hoplurorhachis oeceter, sp. n., holotype. Fig. 5. Left paranotum of midbody segment, dorsal aspect, showing strigilate anterior margin. Fig. 6. Right side of epiproct and paranotum of 19th segment, dorsal aspect. Fig. 7. Leg from midbody segment. Fig. 8. Left gonopod, mesal aspect. Fig. 9. Distal half of telopodite of left gonopod, dorsal aspect, slightly enlarged.

minent. Podosterna moderately elevated and densely setose, each with four ventrally-directed spines, those between posterior pair of legs the larger. Legs relatively long and slender, at midbody of the form shown in Fig. 7. Lower sides of metazona with large blunt tubercle near caudal edge just above dorsal coxal condyle. Stigmata large and auriculate, their dorsal rims thickened and elevated above segmental surface, posterior stigma elongate oval and nearly centered above the coxal condyles, anterior stigma placed lower, merging with dorsal condyle and overlapping onto posterior edge of stricture.

Gonopods (Figs 8, 9) similar to those of *everettii*, from which differing in shape and position of process **c**.

Creagronopus gen. n.

Type species: *Hoplurorhachis hosei* Pocock, 1897.

Name: A neologism combining the Greek word *kreagra* (meathook) with the frequently-used element "*gonopus*" (gonopod), in allusion to the shape of process **D** of the telopodite in this genus. Gender masculine.

Diagnosis: Femoroid region of gonopod greatly elongated, up to twice that in *Hoplurorhachis*, postfemoral region bent at nearly right angle to prefemoral stem, the angulation prominently broadened; process **D** greatly enlarged, falciform, extending over and beyond apex of primary stem; process **b** smaller than **a** and recurved toward it; process **c** enlarged and laminate (Fig. 12). Formula: **(a,b) C, D**.

Remarks. The nominal species recognized in this genus are so far known only from a very few specimens, and *Creagronopus* is not represented in the Geneva collections.

KEY TO THE SPECIES OF *CREAGRONOPUS*

1. Process **D** of gonopod slender, apically sinuous; process **c** shorter, not projecting beyond base of **a** as seen in mesal aspect (Fig. 10) . . *hosei* (Pocock)
– Process **D** evenly curved apically, not sinuous; process **c** longer, extending dorsad beyond base of **a** when seen in mesal aspect (Fig. 11) . . . . . *lamprus* (Chamberlin)

Creagronopus hosei (Pocock) comb. n. Fig. 10

Hoplurorhachis hosei Pocock, 1897: 437, fig. 13. Male holotype [BMNH. 1897.3. 30.14] from "Baram", Borneo, C. Hose leg.

Platyrrhacus hoplurorhachis Attems, 1899: 340 (new name proposed to correct junior homonymy with *Rhyodesmus hosei* Pocock, 1897, occurring when Attems transferred both into his omnibus genus *Platyrrhacus*).

Platyrhacus (Pleorhacus) hoplurorhachis: Attems, 1914: 264, 268.

Platyrhacus (Psaphodesmus) hosei: Attems, 1938: 280.

Material: The male holotype [BMHN]; also **Sarawak**: along the Linjar, Nibong, and Dapoi rivers, November 1932, Oxford Univ. Exped. [BMNH 1♂]; Gunung Mulu National Park, 29 July 1977, Alec Panchen leg. [VMNH 1♂], 30 July 1977, J. M. Anderson leg. [VMNH 1♀].

Remarks: Attems created several unjustified secondary homonyms in 1899 by combining all of the existing generic categories under his very inclusive *Platyrrhacus*. In 1938, however, he revived *Hoplurorhachis hosei*, presumably under the impression that placement of the earlier name *Pluyodesmus hosei* in the subgenus *Acanthodesmus* removed the homonymy.

In his 1914 key to 32 species of the subgenus *Pleorhacus*, Attems brought *everettii* and *hosei* out in couplet 10, separating them by small details of paranotal structure. In a footnote, he explained that "Die von Pocock zur Unterscheidung dieser beiden Arten angegebenen Merkmale lassen vermuten, dass es sich höchstens um geringe Varietäten derselben Art handelt." In 1938, he granted the two unchallenged specific status. In 1998, the two are in different genera, apparently a case of taxonomic inflation but in actuality only the result of examination of the type material. Attems had to rely on Pocock's brief descriptions and minuscule drawings.

The very limited material which I have examined suggests the occurrence of either one randomly variable species in this genus, or several closely related sibling species differing more in peripheral characters than in gonopod structure. I give here comparable drawings made from the types of *hosei* and *lamprus*. Until more material is available, further speculation on these options is pointless. For the present, *lamprus* is retained as a valid name, and no new names are proposed for the different gonopod variations.

Creagonopus lamprus (Chamberlin) comb. n. Figs 11, 12

Platyrrhacus lamprus Chamberlin, 1921: 83. Male holotype [MCZ: 4673] labeled only "Borneo", H. W. Smith, leg.

Platyrhacus (Psaphodesmus) lamprus: Attems, 1938: 280.

This species was adequately described and correctly compared with *Hoplurorhachis hosei* by its author, but in the absence of gonopod illustration, its degree of distinctness could not be estimated. Examination of the holotype permitted correction of the deficiency, and the present drawing suggests that *lamprus* is at least subspecifically distinct in the ways verbalized in the foregoing key. However, since comparison is being made only between two single males, it seems possible that only normal intrapopulational, rather than geographic, variation is being expressed. Regrettably, no precise locality is known as the provenance of *lamprus*.

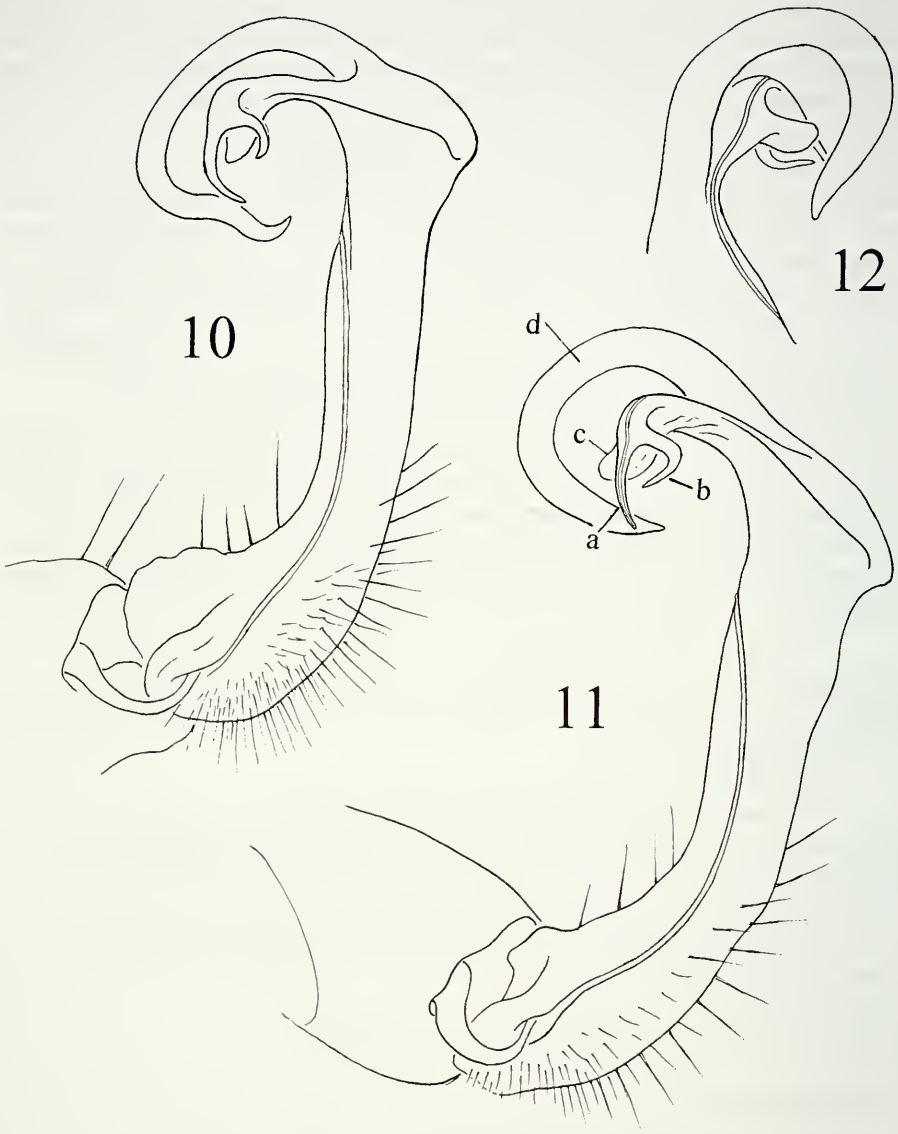
Sabarhacus gen. n.

Type species: *S. derodontus* sp. n.

Name: A neologism composed of the elements "Saba-" (from Sabah) + "rhacus", a root element commonly used in genera of this family. Gender masculine.

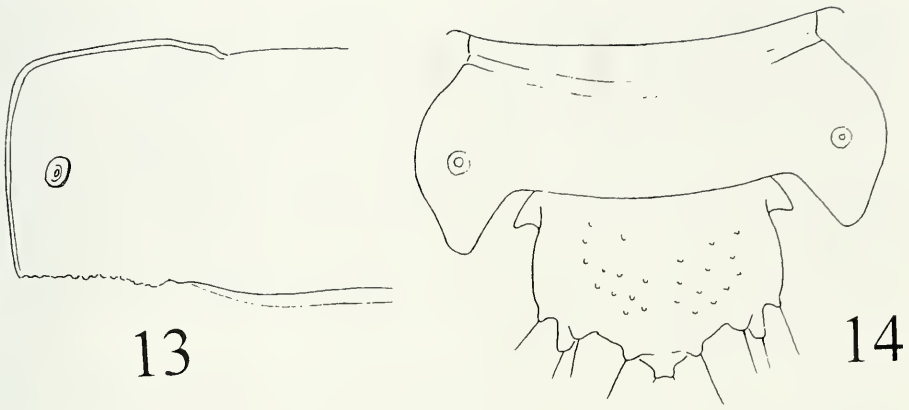
Components: In addition to the new species described here, this genus includes *Platyrhacus sucidus* Attems, 1932 and possibly *Platyrrhacus gongylodes* Attems, 1899 (see discussion following).

Diagnosis: Process **D** of gonopod enormously enlarged, projecting above and beyond major branch of telopodite (**a** + **c**); gonocoxa with dorsal and paracannular



FIGS 10-12

Creagronopus hosei (Pocock), lectotype (BMNH). Fig. 10. Left gonopod, mesal aspect. *Creagronopus lamprus* (Chamberlin). Fig. 11. Left gonopod, mesal aspect. Fig. 12. Distal half of left telopodite, dorsal aspect from holotype (MCZ).



FIGS 13-14

Creagronopus cf. *lamprus*, specimen from Mulu Caves National Park, Sarawak (VMNH). Fig. 13. Left paranotum of midbody segment, dorsal aspect. Fig. 14. Epiproct and 19th segment, dorsal aspect.

fields of unmodified macrosetae (Fig. 19); posterolateral corner of collum occupied by several triangular tubercles, anterior corner projecting acutely laterad (Fig. 15); paranota nearly square in outline at midbody; metaterga with three rows of tubercles, those of rows 1 and 2 small and widely spaced, those of 3 larger and projecting beyond caudal tergal edge. Legs distinctly shorter and stouter than in *Hoplurorhachis* (cf. Figs 7 and 18).

Remarks: A species from Deli, Sumatra, named *Platyrrhacus gongylodes* by Attems (1899) may possibly be referable to *Sabarhacus*. A specimen in the Geneva collection labeled "Sumatra" and identified as *gongylodes* by J. Carl shows a lobed expansion of the gonopod apex that seems exactly homologous with process **c** of the two Borneo species. This modification is not shown in Attems' illustration of the holotype, which now must be examined in this context. If the two specimens are not conspecific, there remains the possibility that the one considered by Dr. Carl to be *gongylodes* was mislabeled and actually came from Borneo. Lastly, of course, it is not impossible that *Sabarhacus* is represented by endemic Sumatran species.

KEY TO SPECIES OF *SABARHACUS*

1. Outer half of paranota yellowish; antennae brown; posterior margin of collum with about 15 enlarged tubercles, ozopores located near midlength of paranota; gonopods as in Fig. 21 . . . . . *sucidus*
– Outer two-thirds of paranota yellowish; antennae yellow; posterior margin of collum with about eight enlarged tubercles; ozopores (at midbody) located posterior to midlength of paranota; gonopods as in Fig. 19 . . . . . *derodontus*

Sabarhacus sucidus (Attems) comb. n. Fig. 21

Platyrhacus sucidus Attems, 1932, Treubia, v. 14, p. 34, figs 12-15. Syntypes [NMW] labeled only "Soela Inseln" [a variant spelling of "Sulu Islands"].
Platyrhacus (Psaphodesmus) sucidus: Attems, 1938: 278, figs 317, 318.

I have examined type material of this species at Vienna, and prepared a new gonopod drawing for contrast with those of *S. derodontus*; unfortunately I did not illustrate other characters, and must infer some differences with *derodontus* on the basis of the published description. Gonopod structure is much the same in the two taxa, and more numerous diagnostic features occur in body form, such as coloration of the antennae and paranota, tuberculation of the collum, and location of the ozopores, as mentioned in the foregoing key.

Attems' drawings of the gonopod (1932: Figs 14, 15) appear to have been made from a slide preparation which deformed the normal position of the apical branches. I give here (Fig. 21) a new drawing which shows the correct formation of the appendage.

Sabarhacus derodontus sp. n. Figs 15-20

Material: Male holotype [MHNG] from **Sabah**: Sandakan Residency: Kabili-Sepilok Forest Reserve, in lowland dipterocarp forest, B. Hauser leg. 22 April 1982 (field no. Sab-82/2).

Name: Neologism composed of the Greek terms *deiros* (neck) + *odontos* (tooth), in reference to the prominent dentations on lateral margins of collum. Gender masculine.

Diagnosis: Anterolateral corner of collum acutely angular instead of a rounded lobe, posterolateral with three prominent dentations (the enlarged outermost members of the usual posterior marginal series) (Fig. 15); ozopores located in posterior third of paranotal length (Fig. 16); setae of gonocoxae unusually large and robust (Fig. 19).

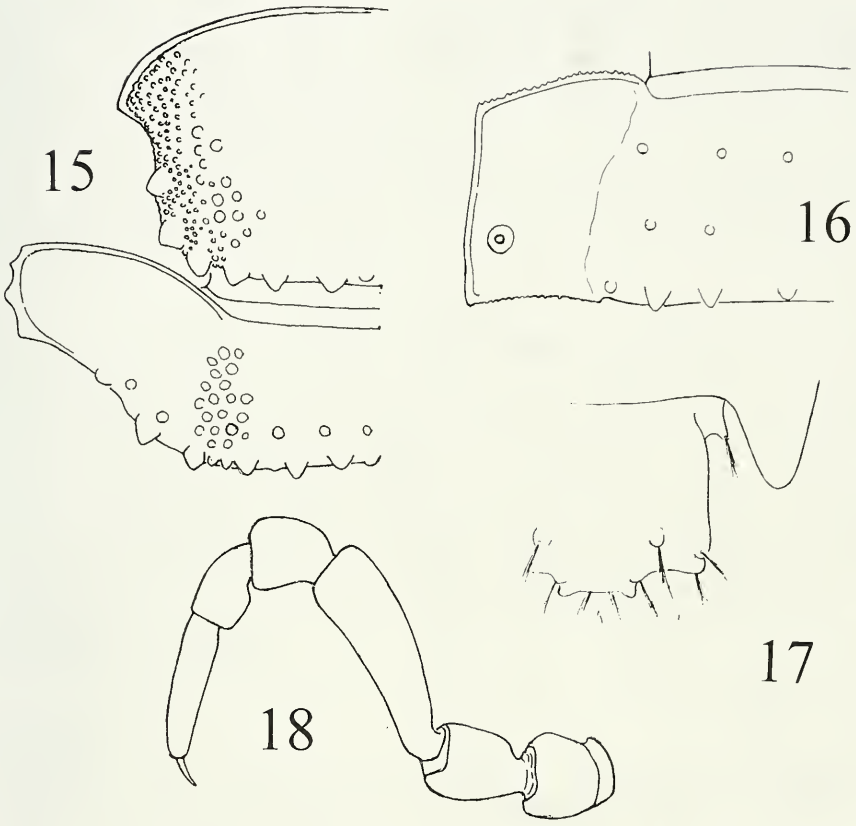
Holotype: Adult male, length ca. 62 mm (specimen broken), width/length ratio ca. 18%; widths of selected segments:

1 - 5.8 mm	10 - 10.9 mm
2 - 8.5	12 - 10.8
4 - 9.9	14 - 10.7
6 - 11.0	16 - 10.4
8 - 11.0	18 - 8.5

Dorsal color generally uniform light brown, with outer two-thirds of paranota, distal half of epiproct, antennae, and legs yellowish.

Epicranium coarsely granulate, with 3-2 setae in transverse series, rims of antennal sockets high and prominent on median side, lower ventrad and dorsad; genae with shallow median depression. 4+4 frontal hairs, 2+3 clypeal, 5+5 labral, 2+2 lower genal, these hairs all fasciculate as usual. Width of head across geneae = to transmandibular width. Antennae short and robust, without evident modification.

Collum (Fig. 15) widest near anterior corner, posterolateral quadrant strongly elevated, forming transverse ridge bearing 6+6 prominent tubercles in a curved row along edge; 5+5 low and indistinct tubercles along front margin; surface finely

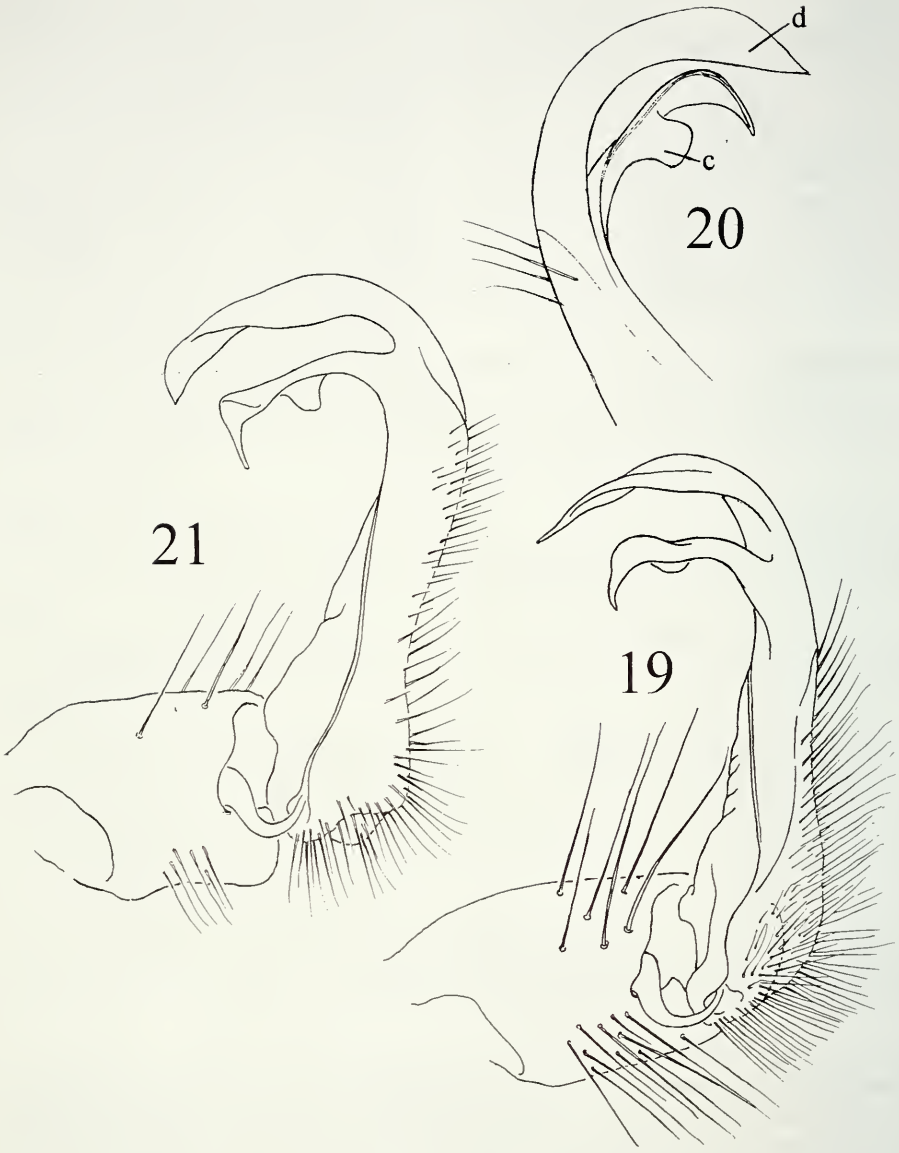


FIGS 15-18

Sabarhacus derodontus, sp. n., holotype (MHNG). Fig. 15. Left side of collum and 2nd body segment. Fig. 16. Left paranotum of midbody segment. Fig. 17. Right side of epiproct, dorsal aspect. Fig. 18. Leg from midbody segment (setae omitted).

tuberculate-microcoriarious. Surface of 2nd metatergum granular, caudal edge elevated, with 6+6 tubercles (Fig. 15) preceeded by a transverse row of 4+4 small rounded tubercles; paranota extended beyond ends of collum, edges smooth except for two blunt lateral projections. Metatergum of 3rd segment with 7+7 tubercles, dorsum of paranota nearly smooth. Surface of segments 4-19 becoming increasingly granulose caudally, caudal edge of these terga also becoming lower until even with prozona near midbody. Paranota of segments 5 *et seq.* about 50% larger than those of 3rd and 4th segments. Profile of paranotum of midbody segment, Figure 16.

Epiproct as illustrated (Fig. 17), marginal setae compound/fasciculate; hypoproct large with two large apical paramedian tubercles, the edge between their bases straight. Podosterna moderately elevated, densely setose; acute, ventrally directed



FIGS 19-21

Sabarhacus derodontus, sp. n., holotype (MHNG). Fig. 19. Left gonopod, mesal aspect. Fig. 20. Distal half of left telopodite, dorsal aspect. *Sabarhacus sucidus* (Attems), holotype (NMW). Fig. 21. Left gonopod, mesal aspect.

subcoxal spines present, those of posterior legpair distinctly larger. Dorsal coxal condyles large, anterior stigmata prominent, dorsally auriculate, posterior stigmata slightly smaller, elongate-ellipsoid, not notably auriculate, placed almost equidistant between coxal condyles; small setose knob just dorsad to each posterior dorsal condyle. Legs relatively short and stout (Fig. 18), unusually hairy: setae of anterior legs virtually as long as diameter of podomeres.

Gonopods (Figs 19-20) similar to those of *sucidus*, process **D** more acuminate apically, process **c** less conspicuous, apex of telopodite evenly curved (mesal aspect) rather than bent at right angle.

Tribe **Phyodesmini** Cook

Phyodesmini Cook, 1896: 4 (as subfamily). -- Hoffman, 1980: 163 (as tribe).

Diagnosis: Large to very large species (length of males to about 110 mm). Collum broadest across front edge, anterior corners often produced forward as rounded lobes. Meteterga smooth to coriaceous, with transverse series of obscure tubercles. Paranota (Fig. 22) large, set high on body and nearly horizontal, lateral edges deeply incised, anterior corner usually projecting further laterad than posterior. Gonopods very large, telopodites long, nearly straight, parallel to each other, without torsion, the prostatic groove visible for most of its length in mesal aspect, ending on a small digitiform solenomere; prefemoral region very elongated, comprising up to two-thirds length of telopodite.

Component: *Phyodesmus* Cook, 1896.

Phyodesmus

Phyodesmus Cook, 1896: 1. Described with one species. Type species: *Polydesmus pictus* Peters, 1864, by monotypy and original designation.-- Hoffman, 1978: 245 (revision).

Diagnosis: With the characters of the tribe.

Components: *P. longispinosus* (Silvestri, 1896), *P. scutatus* Peters, 1864), *P. sublimbatus* (Silvestri, 1897), *P. laticlavius* Hoffman, 1978, *P. pictus* (Peters, 1864), *P. hosei* Pocock, 1897, *P. ornatus* Pocock, 1897, *P. magnificus* (Silvestri, 1896).

Range: The genus is autochthonius in southwestern Borneo.

Remarks: My revision (1978) of this group of striking millipeds clarified the status of most names referable to it, but left unsettled both the systematic position of the genus and the status of the several species of the "*Pictus* Group".

Despite the great size and marvelous colors of these animals, there are remarkably few specimens available with precise locality data, and until this situation is alleviated, the relative status of the names *ornatus*, *pictus*, and *magnificus* will remain uncertain. I still have no insights into the relationships of the genus. The possibility may be noted, that what I referred to as the "ensiform process" of the gonopod may be homologous with "process **d**" that is readily recognized in the Psaphodesmini of the Papuan Region.

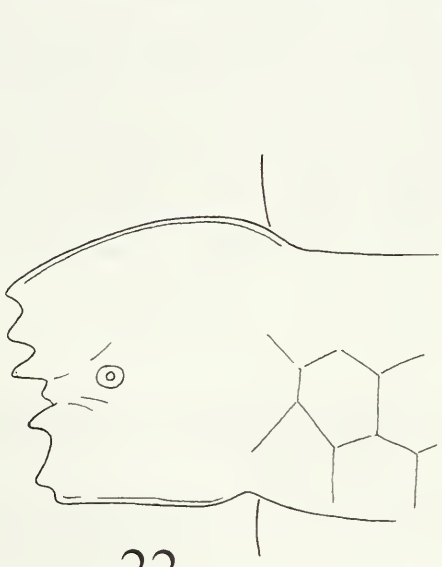
Phyodesmus magnificus (Silvestri) Fig. 23

Platyrhachus magnificus (Silvestri, 11896: 23, fig. 3. Holotype male [MCSNG] from "Sarawak".

Phyodesmus magnificus: Cook, 1896: 4 --Hoffman, 1978: 254, fig. 15.

Material: **Sarawak**: Sabal (Forest Reserve Station), southeast of Serian, 180 m, 10 December 1987, B. Hauser leg. (MHNG Sar- 87/71, 2♂♂).

The recently-preserved material retained much of its original coloration when examined in October of 1991. The metaterga are slaty-blue, each with a middorsal orange-ochre marking, widest posteriorly, extending the entire metatergal length and continued onto the prozonum as a much narrower, triangular, yellow median marking. Prozona black dorsolaterally, with a rounded white spot in front of paranotal base. Dark prozonal color extends caudad onto metazonum in three digiform lobes which



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FIGS 22, 23

Phyodesmus magnificus (Silvestri). Fig. 22. left paranotum of midbody segment, specimen, specimen from southeast of Serian, Sarawak (MHNG). Fig. 23. Left gonopod, mesal aspect, from holotype (MSNG).

lack the appended small round black spots that usually appear in specimens of *P. ornatus*.

The specimens follow the key to species in my 1978 revision without difficulty, and the gonopod structure agrees well with that of the holotype (Fig. 23), which I studied and illustrated at Genoa in 1975.

Tribe **Platyrhacini** Pocock

Platyrhacini Hoffman, 1980: 163 (as tribe). Nomen correctum et translatum ex Platyrrhachidae Pocock, 1895.
Acanthodesmini Cook, 1897: 4 (as subfamily).

Components: *Acanthodesmus* Peters, 1864; *Arbelorhacus* gen. nov.; *Barydesmus* Cook, 1896; *Eurydirorhachis* Pocock, 1897; *Nyssodesmus* Cook, 1896; *Platyrhacus* Koch, 1847; *Rhypodesmus* Cook, 1896; *Stenoniodes* Pocock, 1897; and *Tirodesmus* Cook, 1896.

Diagnosis (Borneo taxa only): A probably polyphyletic group of genera distinguished from Phyodesmini by gonopod shape and from Hoplurorhachini by structure of the paranota and epiproct as stated in the foregoing key. Gonotelopodite with two distal branches (**a, d,** or **a, b**) or three (**a, b, c**).

Remarks: The present composition of this taxon is by no means asserted as monophyletic, and future studies may show the desireability of segregating the Neotropical genera (*Barydesmus*, *Nyssodesmus*, and *Tirodesmus*) into a discrete tribe. *Platyrhacus* in its restricted sense (typified by *P. fuscus* Koch) is widespread in Java, Sumatra, and the Malay peninsula, where the species express considerable diversity in body form, less so in gonopod structure, which is essentially identical with that of the nominal genus *Stenoniodes* (see comments under that generic heading). Despite its disjunct occurrence in Guyana [*olim* British Guiana], the single species of *Rhypho-desmus* (*druryi* Newport, 1844, with the synonyms *terminalis* Cook, 1897, and *amphelictus* Chamberlin, 1921) has a genitalic structure like that of *Platyrhacus*, and the possibility exists that it is an Indomalayan species transported by commerce into Guyana. It has not, however, been rediscovered in southeast Asia despite its large size.

Key to Bornean genera of *Platyrhacini*

1. Sterna without subcoxal spines; process D of gonopod long, broad, very thin, resembling a curved knife blade; epicranium with a distinct smooth transverse belt immediately preceeding from edge of collum . . . . . *Arbelorhacus*
– Sterna with an acute ventral spine subtending base of each coxa; epicranium without distinct transverse smooth band 2
2. Paranota of segments 2-4 small and narrowed, much smaller than at midbody; front edge of collum medially elevated and reflexed above level of epicranium (Fig. 24); epiproct spatulate, not notably constricted at base, posterior corners rounded (Fig. 33); legs long (Fig. 25); gonopods short, massive, the two processes **a** and **d** curved dorsal and then laterad, subparallel to each other (Fig. 26) . . . . . *Stenoniodes*

– Paranota of segments 2-4 large and horizontal, nearly as broad as those at midbody, latter subrectangular, posterior corner acute or projecting anterior edge of collum not abruptly elevated above adjacent surface of head; epiproct short, constricted basally, broadest distally (Fig. 40), posterior corners rounded; gonopods less massive, prefemoral region smaller than coxa, apical elements not as described 3

3. Gonopod telopodite relatively short and straight, with three distal processes (Fig. 39) . . . . . *Acanthodesmus*

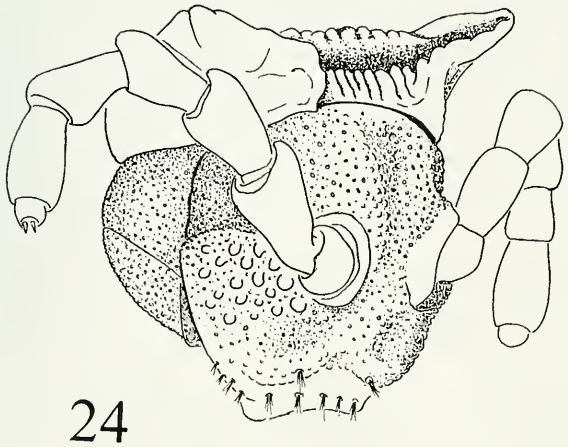
– Gonopod telopodite long and curved, with two distal processes (Fig. 46) . . . . . *Eurydirorhachis*

Stenoniodes

Stenoniodes Pocock, 1897: 430. Described with four new species. Type species: *Stenoniodes catorii* Pocock, by original designation. – Hoffman, 1980: 163.

Diagnosis: Collum small, trapezoid, broadest across anterior edge, median section of latter abruptly elevated above head surface and reflexed caudad (Fig. 24), anteriormost paranota elevated about 45° above horizontal, narrow and widely separated from each other, their apices rounded; paranota at midbody narrow, widely separated, laterally rounded, peritreme set in about midsurface (Fig. 32); legs long and relatively slender (Fig. 25). Gonopods short and massive, the setose prefemoral region about equal in size to coxa, process **a** small, slender, curved dorsal and then laterad into about a half-circle; process **b** larger than **a** and curved more or less subparallel to it (Fig. 26).

Remarks: Knowledge ot this genus is unsatisfactory in two respects. One is that its status vis-à-vis *Platyrhacus* itself in the Malaya-Sumatra-Java region requires clarification. These two nominal genera cannot be maintained on gonopod structure alone, but the general body form of *Stenoniodes* – the small, modified collum, wide slender paranota, and long legs – argues that some supraspecific level of differentiation has been achieved by the Borneo contingent. Until the composition of *Platyrhacus* itself has been thoroughly reviewed, it seems justifiable to continue recognition of *Stenoniodes*. A more complicated problem, one less amenable to an arbitrary solution, is the status of the various specific names that have been based on members of this group. Pocock set up the genus to contain five new species, three of them from Sandakan, which he distinguished primarily by appeal to coloration, size, shape of collum, and similar peripheral details, all of these bases for distinction being only relative. Gonopodal differences were cited in only a secondary sense, and these appendages were illustrated only for two of the species. Since all of Pocock's named forms were known from one or two specimens only, it was difficult to distinguish actual specific differences from those attributable to normal intraspecific variation. Subsequent additions to the genus by Attems (e.g., 1932) were made without reference to the existing Pocockian names, and only intensified the confusion. It is remarkable that in the description of *Platyrhacus bengitanus*, for instance, Attems (1932: 31) compared the new species only to four in Sumatra and a fifth restricted to Guyana. Had he given the slightest attention to Pocock's 1897 paper, he could



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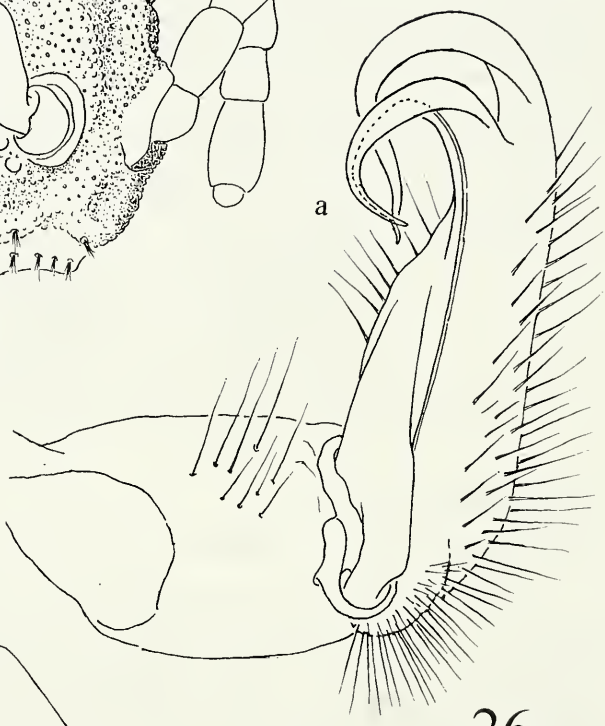

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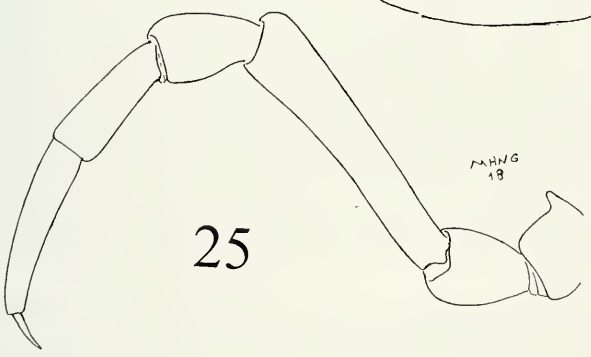

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FIGS 24-26
Stenoniodes creaghii (Pocock), specimen from Sepilok, Sabah (MHNG). Fig. 24, oblique anterolateral view of head and collum. Fig. 25. Leg from midbody segment, showing elongated podomeres. Fig. 26. Left gonopod, mesal aspect.

scarcely have failed to see the near identity of the gonopod structure in *bengitanus* (Attems' Fig. 7) and *Stenoniodes angulicollis* (Pocock's Fig. 5), a Bornean species.

For these reasons, it seems desireable to attempt a survey of this nominal genus, even though it must be a very provisional one in light of the few specimens examined. In 1975 I had the opportunity to examine Pocock's types in a cursory way and prepare gonopod and collum sketches for several of them. With this reference material it has been possible to associate Dr. Hauser's Sabah material with two of the Pocock names, and to infer something about the status of those of Attems. However, an adequate revision of the genus can only be accomplished by someone able to assemble all existing material in one place for direct comparison.

The following chronological list gives the names, type localities, and type depositories of the nominal taxa which I think belong in *Stenoniodes*.

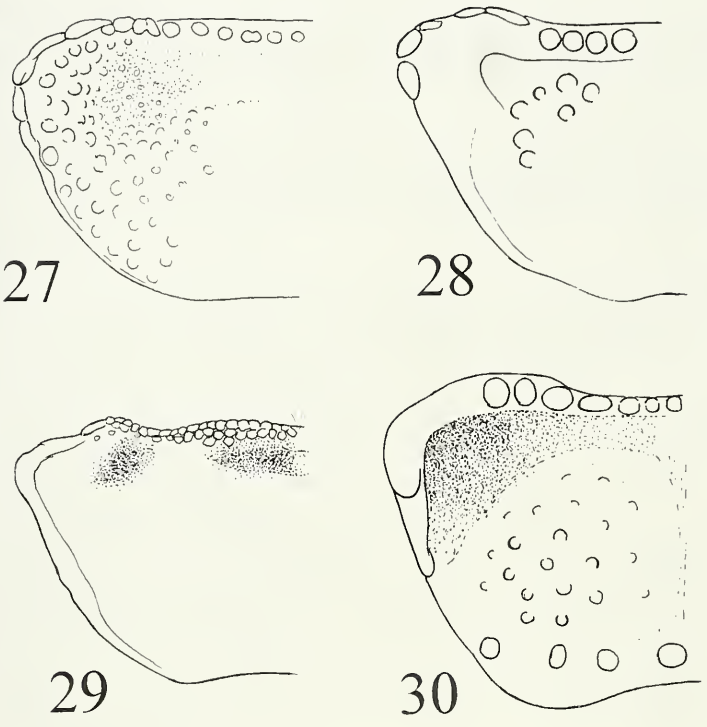
Stenoniodes	*catori* Pocock, 1897	Sandakan	BMNH ♂
"	*angulicollis* Pocock, 1897	Sandakan	BMNH ♂
"	*creaghi* Pocock, 1897	"Sandakan coast"	BMNH ♂
"	*baluensis* Pocock, 1897	Mt Kinabalu	BMNH ♀
"	*sibutensis* Pocock, 1897	Sibutu Island	BMNH ♂
Platyrhacus	*arrogans* Attems, 1932	"Soela-Eiland"	NMW ♂
"	*bengitanus* Attems, 1932	Mahakam River	NMW ♂

Stenoniodes creaghii Pocock Figs 24-27

Stenoniodes creaghii Pocock, 1897: 432, fig. 5. Male holotype [BMNH] from "North Borneo, Sandakan coast."

Material: Male [MHNG] from **Sabah**: Sandakan Residency: Sepilok, on the road between "Forest Research Center" and "Orange-Utan Rehabilitation Station", 22 April 1982, B. Hauser leg. (field no. Sab-82/1). Male [MHNG] from **Sabah**: Sandakan Residency: Sepilok, "Kabili-Sepilok Forest Reserve", in forest near "Orang-Utan Rehabilitation Station", 22 April 1982, B. Hauser leg. (field no. Sab-82/2). Female [MHNG] from **Sabah**: Sandakan Residency: Sepilok, near "Forest Research Center", 2 May 1982, B. Hauser leg. (field no.Sab. 82/24). Two males [MHNG] from **Sabah**: Sandakan Residency: Sepilok, "Kabili-Sepilok Forest Reserve", in forest near pond, 3 May 1982, B. Hauser leg. (field no. Sab-82/25). Male [MHNG] from **Sabah**: Sandakan Residency: Sepilok, "Kabili-Sepilok Forest Reserve", in forest near "Orang-Utan Rehabilitation Station", 3 May 1982, B. Hauser leg. (field no. Sab-82/26). Two males from **Sabah**: Sandakan Residency: Sepilok, "Kabili-Sepilok Forest Reserve", in forest near "Orange-Utan Rehabilitation Station", path to mangrove before the "Ridge", 6 May 1982, B. Hauser leg. (field no. Sab-82/30).

Remarks: A male specimen at hand concurs well with the original description and drawings. The gonopod structure differs from that in *angulicollis* in the presence of numerous setae in a dorsal coxal field (against only three or four, as well as in the course of the prostatic groove as seen in mesal aspect (cf. Figs 26 and 34). In *creaghii* the primary telopodite stem faces more directly mesad, so that the groove runs continuously up the mesal side of its base; in *angulicollis* the stem is basally more turned dorsal, so that the groove curves around to the dorsal side and is less visible in mesal aspect. Of course the much longer and more sinuously curved process **d** is an additional feature of *creaghii*.



FIGS 27-30

Fig. 27. *Stenoniodes creaghii* Pocock, specimen from Sepilok, Sabah. (MHNG), left half of collum, dorsal aspect. Fig. 28. *Stenoniodes angulicollis* Pocock, holotype (BMNH), left half of collum. Fig. 29. *Stenoniodes catorii* Pocock, holotype (BMHN), left half of collum. Fig. 30. *Stenoniodes baluensis* Pocock, holotype (BMNH), left half of collum. Drawings to same scale.

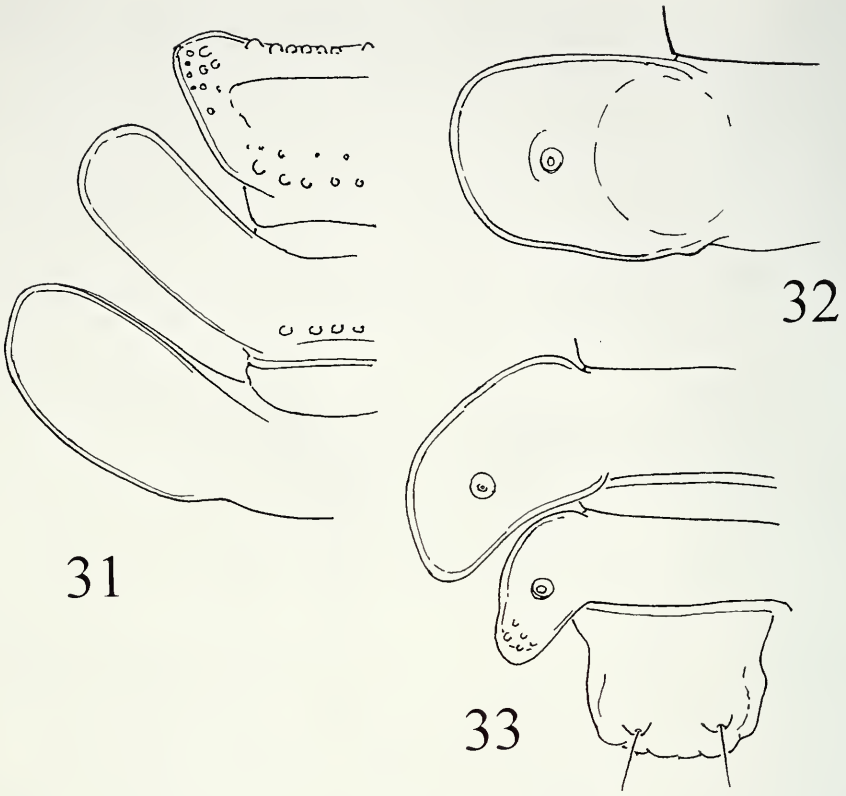
Stenoniodes angulicollis Pocock Figs 28, 31-34

Stenoniodes angulicollis Pocock, 1897: 432. Male holotype [BMNH!] from "Sandakan" without further locality.

Platyrhacus bengitanus Attems, 1932:30, figs 5-7. Male holotype [NMW] from Ben Gitan on the Mahakam River, Kalimantan. **New Synonymy!**

Material: Male [MNHG] from **Sabah**: Interior Residency: road to Kimanis, 10 miles from Keningau, in secondary forest at 1170 m, 13 May 1982, D. Burkhardt leg. (field no. Sab-82/51). Male [FMNH] from **Kalimantan**: Nunukan Island, East Kalimantan District, January 1934, R. von Hentig leg. Three males [VMNH] from **Sarawak**: vicinity of Mulu caverns, Gunung Mulu National Park, 1977-1978, J. G. E. Lewis & P. J. Chapman leg. Male type of *bengitanus* [NMW] from **Kalimantan**: Ben Gitan, Mahakam River.

Remarks: Examination of Attems' type specimen of *bengitanus* in the Vienna collection confirms the suspicion, based on the original gonopod drawings of this species and *angulicollis*, that these two names are strictly synonymous.



FIGS 31-33

Stenoniodes angulicollis Pocock, specimen from Nunukan Island, Kalimantan (FMNH). Fig. 31. Left half of collum and segments 2 and 3, to show anterior reduction in width. Fig. 32. Paranotum of midbody segment. Fig. 33. Epiproct and left paranota of segments 18 and 19.

Stenoniodes arrogans (Attems) comb. n.

Platyrhacus arrogans Attems, 1932: 29, figs 1-4. Male holotype [location unknown, perhaps NMW] labeled only "Soela Inseln" [a variant spelling of Sulu Islands, presumably the archipelago between Borneo and Mindanao].

If my interpretation of the type locality data is correct, the name *arrogans* should be contrasted with the description (or type specimen) of *sibutensis* Pocock, based on material from the same region as assumed of *arrogans*.

Stenoniodes baluensis Pocock Fig. 30

Stenoniodes baluensis Pocock, 1897: 433. Male holotype [BMNH] from Mount Kinabalu, Sabah.

Stenoniodes catorii Pocock Fig. 29

Stenoniodes catorii Pocock, 1897: 431, fig. 4, 4a. Male holotype [BMNH] from Sandakan, Sabah.

Stenoniodes sibutensis Pocock

Stenoniodes sibutensis Pocock, 1897: 433. Male holotype [BMNH] from Sibutu Island [politically a part of the Philippines, despite close proximity to northeastern Borneo].

Acanthodesmus

Acanthodesmus Peters, 1864: 547. Proposed as a subgenus of *Polydesmus*, with five species. Type species: *Polydesmus pilipes* Peters, 1864, by simultaneous subsequent designation of Silvestri, 1896, and Cook, 1896. – Hoffman, 1980: 164; 1984: 254 (revision).

Diagnosis: Medium-sized platyrhacids (length of females to 110 mm), paranota of anterior segments (especially segment 2) large and horizontal imparting a notably broadened appearance to front half of body. Paranota of midbody segments large, nearly quadrate, lateral edge with three to six rounded lobes (Fig. 36); ozopores prominent, removed from lateral edge by distance about equal to one peritrematic diameter; dorsal surface of metaterga granular, with three or four transverse rows of tubercles. Epiproct strongly constricted basad, broadest near slightly convex caudal edge (Fig. 40). Sterna typically with four spines directed ventrad or caudoventrad. Telopodite of gonopod (Fig. 37) long and slender, distally curved over (dorsally) coxa and torsate about 100° dextrad, only proximal part of prostatic groove visible in mesal aspect; typically three apical processes, formula **A, b, c,** the solenomere far larger than either of the adjunct processes.

Remarks: This genus (which is endemic to Borneo) was summarized in my 1984 revision, and no additional relevant information has come to my hand during the past 12 years. I provide here only some illustrations of the type species *pilipes* and a list of the known species. Since the species are distinguished by subtle differences in gonopod structure, no key is attempted and investigators are referred instead to the drawings in the revision.

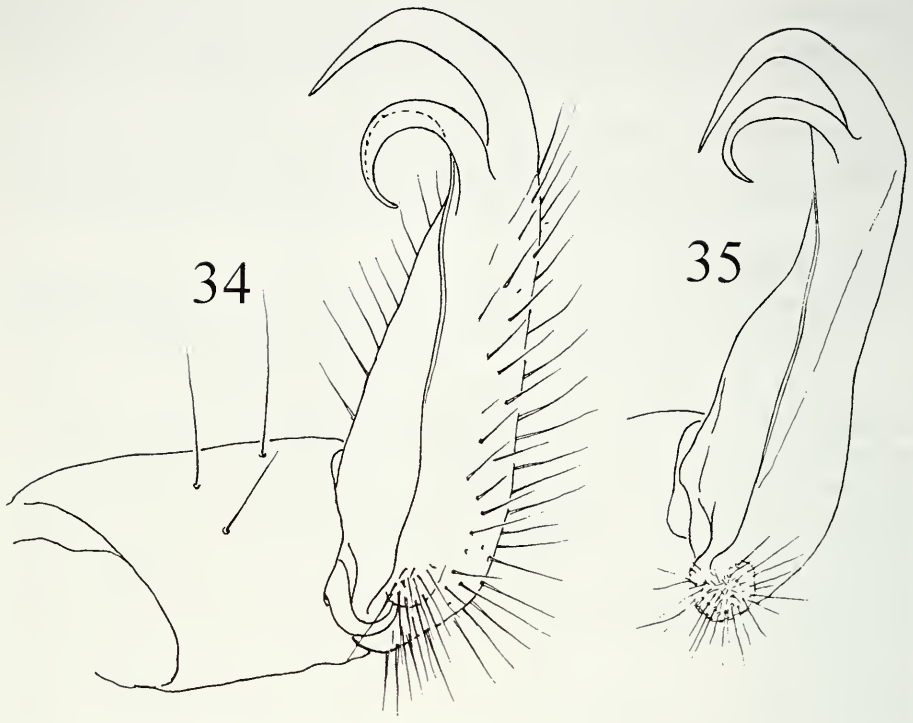
The overall similarity in genitalic structures suggests the possibility of only a subspecific level of differentiation, a point to be considered when more material with accurate collection data becomes available. It is astonishing that all of the following species are still known only from their original type specimens; at least I have not found any material referable to this genus in museum collections examined over the past three decades.

Acanthodesmus anambasius (Attems) Fig. 37

Platyrhacus anambasius Attems, 1932: 36, figs 16-19. Type material (NMW) from "Anambas Inseln."

Platyrhacus (Acanthodesmus) anambasius: Attems, 1938: 251, figs 279, 280 ("Natoena-Insel" cited as additional locality).

Attems' enigmatic species *Platyrhacus anambasius* requires consideration as a member of this genus. Until examining the holotype at Vienna in 1997, I suspected



FIGS 34, 35

Stenoniodes angulicollis Pocock. Fig. 34. Left gonopod of specimen from Interior Residency, Sabah. Fig. 35. Left gonopod of holotype (BMNH).

that the long acute prefemoral projection shown in the original drawings might be some kind of artifact. A very critical inspection showed that the structure is quite real, a most unusual development for this family. The remainder of the gonopod conforms so closely to the normal appearance for this genus (cf. Figs 37 and 38), that I believe the best disposition for *anambasius* is placement in *Acanthodesmus*. An addition justification for this option is the occurrence of a small "anlage" in the same position in *A. mortoni* (cf. Fig. 38).

It is not clear to me whether the reference to "Natoena" (=Natuna) Island in Attems' 1938 work represents an additional locality from which he saw material, or is merely an attempt to localize the original locality "Anambas Inseln." These two names actually apply to two separate island groups in the South China Sea.

Acanthodesmus attenuatior (Chamberlin)

Platyrrhacus attenuatior Chamberlin, 1921: 84. Female holotype [MCZ] from "Ladong, Sarawak".

Acanthodesmus attenuatior: Hoffman, 1984: 258.

Although the peripheral characters of the female holotype clearly mandate reference of the species to *Acanthodesmus*, only the examination of a conspecific male from the type locality will establish whether *attenuatior* is a valid species or only a junior synonym of one of the older names.

Acanthodesmus discrepans (Pocock)

Eurydirorhachis discrepans Pocock, 1897: 436. Holotype male [BMNH] from "Borneo" without specific location.
Platyrhacus discrepans: Attems, 1938: 229.
Acanthodesmus discrepans: Hoffman, 1984: 258.

Acanthodesmus dorsalis (Silvestri)

Platyrhachus dorsalis Silvestri, 1896: 22. Syntypes [MCSNG] from "Sarawak" without specific locality.
Platyrhacus (Pleorhacus) anthropophagorum: Attems, 1914: 267. New name for *P. dorsalis*, ipso facto with the same type specimens.
Acanthodesmus dorsalis: Hoffman, 1984: 258, figs 8, 9.

Attems proposed *anthropophagorum* ("of the man-eaters") to replace the homonymy resulting from his inclusion of Peter's older name *dorsalis* in *Platyrhacus*. However, the homonymy is only secondary because Peter's *dorsalis* had never been associated with *Platyrhacus* prior to Silvestri's use of the combination in 1896. As the two species represented by the name *dorsalis* are now referred to quite different genera (neither of them *Platyrhacus*!) no problem with homonymy now exists.

Acanthodesmus mortoni (Carl) Figs 38-40

Platyrrhacus mortoni Carl, 1909: 255, figs 10, 11. Male holotype [MHNG] from "Borneo" without specific locality.
Acanthodesmus mortoni: Hoffman, 1984: 260, figs 2-4, 10, 11.

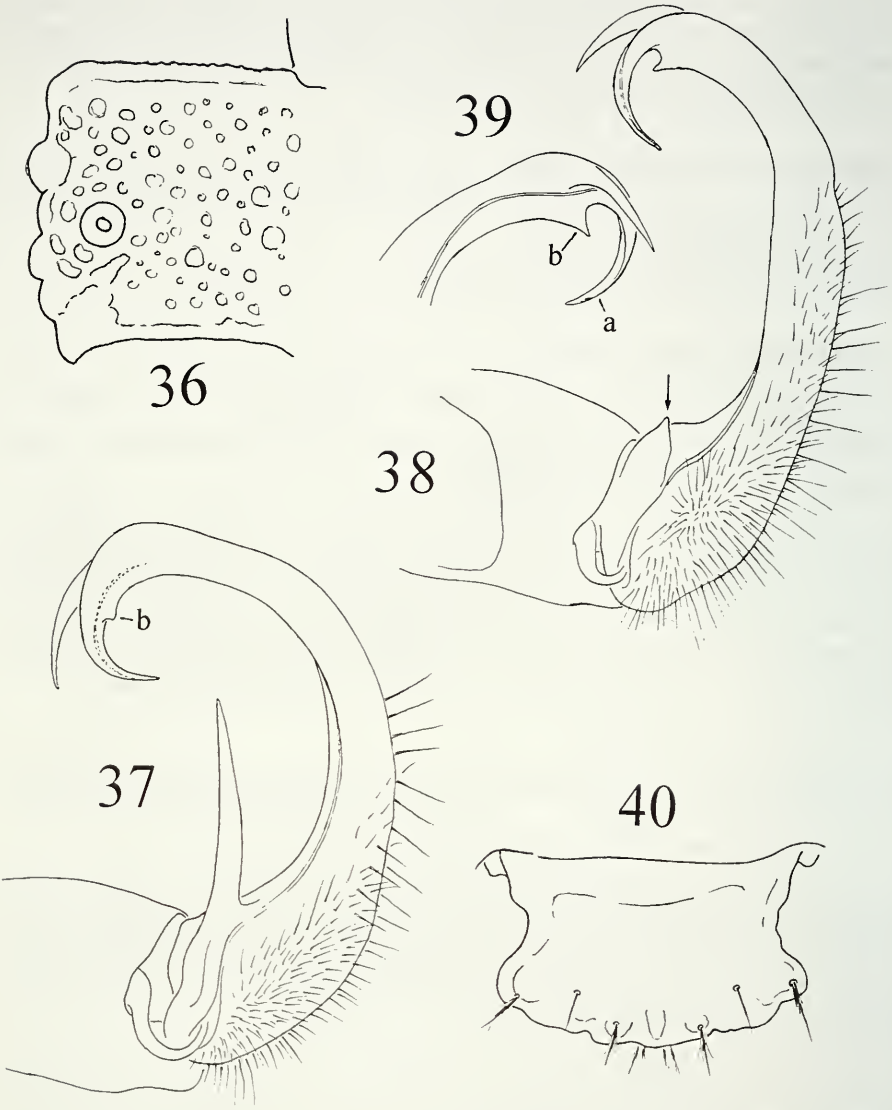
Remarks: The gonopod prefemur of the holotype presents a small but distinct acute projection in the same position (Fig. 38, arrow) as the much larger and longer process depicted by Attems for *A. anambasius*. Little would be required in the way of an annectant condition to bridge the existing difference, an additional justification for referring *anambasius* to this genus.

Acanthodesmus picteti (Silvestri)

Eurydirorhachis picteti Silvestri, 1899: 332, pl. 15, figs 1, 2. Lectotype and paralectotypes [MHNG] from "Sarawak" without specific locality.
Acanthodesmus picteti: Hoffman, 1984: 260, figs 12, 13.

Acanthodesmus pilipes (Peters) Fig. 36

Polydesmus (Acanthodesmus) pilipes Peters, 1864: 544. Lectotype and paralectotype [ZMB] from "Pulo Matjan" [in error].
Acanthodesmus pilipes: Silvestri, 1896: 191.-- Hoffman, 1984: 261, figs 5-7, 14, 15.



FIGS 36-40

Acanthodesmus pilipes (Peters), holotype (ZMP). Fig. 36. Left paranotum of midbody segment. *Acanthodesmus anambasius* (Attems), holotype (ZMB). Fig. 37. Left gonopod, mesal aspect. *Acanthodesmus mortoni* (Carl), holotype (MHNG). Fig. 38. Left gonopod, mesal aspect; arrow indicates vestigial prefemoral process. Fig. 39. Distal half of telopodite of left gonopod, dorsal aspect. Fig. 40. Epiproct, dorsal aspect.

Arbelorhacus new genus

Type species: *A. magirus* sp. n.

Diagnosis: A genus of relatively small platyrhacids, in which the gonotelopodite terminates in two processes only, a smaller, arcuately curved, subterminal solenomere **(a)** and a much larger and longer **d** which is laminately flattened, provided with a distinct subapical dentation, and is evenly curved more or less parallel to **a** (Figs 44 and 45).

Head granular, clypeal and labral compound setae set on enlarged, polished tubercles. Collum with distinct transverse ridge along median sector of anterior edge. Paranota of anterior segments gradually increasing in size posteriad, at midbody mostly transverse with anterior corner rounded, posterior rectangular, edges smoth back to posterior third, where anterior and posterior edges are notably denticulate; ozopores small, set about 3 diameters inward from lateral edge and near midlength of paranota. Surface of metaterga uniformly granular, without evident transverse rows of enlarged tubercles. Epiproct spatulate, constricted at base, distal edge slightly convex and shallowly crenulate. Legs attached to moderately elevated, narrow, unspined podosterna.

Name: A neologism composed of *arbelos* (Gk., a shoemaker's rounded knife) + *-rhacus*, a common element in this family, referring to the blade-like, apically hooked, process **D** of the gonopod. Gender masculine.

Remarks: This rather distinct genus, composed of species smaller than average for the Borneo fauna, includes also *Platyrrhacus baramanus* Attems, 1897. The two species are distinguished as follows:

KEY TO THE SPECIES OF *ARBELORHACUS*

1. Smaller species, ♂ 53 mm, width 8.0 mm; anterior edge of paranota of segments 12-17 with a row of 8-10 acute spicules; legs entirely yellow; transverse metatergal rows of tubercles scarcely visible . . . . . *magirus*
– Larger species, ♂ 63 mm, width 9.5 mm; anterior edge of paranota smooth; distal podomeres brown; transverse metatergal tubercle rows distinct . . . . . *baramanus*

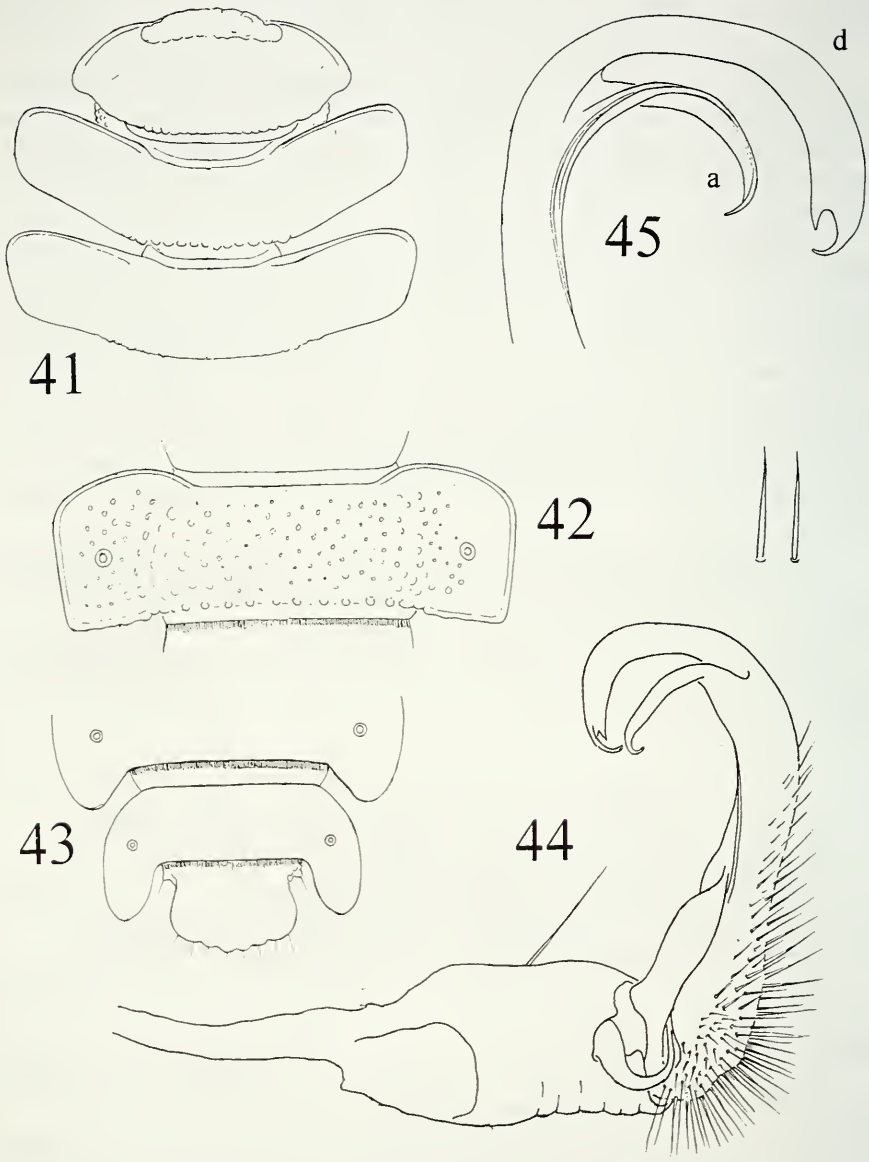
Arbelorhacus magirus sp. n. Figs 41-45

Material: Male holotype and three male paratypes [VMNH], male paratype [MHNG], from Mulu Caves National Park, **Sarawak**; J. M. Anderson leg. 2 September 1977.

Name: A Latinized form of the Greek word *mageiros* (a cook), commemorating the fundamental contributions of O. F. Cook to the classification of this family.

Holotype: Adult male, curled and broken, reconstructed length ca. 53 mm, widths of selected segments across paranota:

1 - 5.0 mm	10 - 8.0 mm
2 - 6.8	12 - 8.1
4 - 7.4	14 - 7.9
8 - 8.0	16 - 7.7



FIGS 41-45

Arbelorhacus magirus, sp. n., holotype (VMNH). Fig. 41. Collum and first two body segments. Fig. 42. midbody segment. Fig. 43. Epiproct and segments 18 and 19. Fig. 44. Left gonopod, mesal aspect, with two prefemoral setae (above) showing correct proportions. Fig. 45. Distal half of telopodite of left gonopod, dorsal aspect, enlarged.

Specimen discolored by preservation, but metaterga and posterior half of prozona brown, darker in and adjacent to stricture, entire dorsal surface of paranota, and most of epiproct, yellow; undersides and antennae nearly unpigmented, probably light yellowish-white in life.

Head granulate, clypeal setae 2-2, labral setae 3-3, lower genal setae 2-2, in all series borne on enlarged, polished tubercles; genae with distinct median depression, laterally an evident labroclypeal offset. Antennae relatively slender, articles at least twice as long as maximum width, none strongly clavate; interantennal isthmus about equal to length of basal antennomere.

Collum small, surface uniformly granular, a prominent elevated ridge formed from coalesced tubercles along median sector of anterior margin; shape of collum and next two metaterga as in Fig. 41. Paranota of midbody segments moderate in size, set high on body and nearly horizontal, of the shape shown in Fig. 42. Edges smooth back to about 13th segment, from whence both anterior and posterior edges are set with a single row of acute denticles. Ozopores small, remaining at about midlength of paranota on even posteriormost segments. Metatergal surface moderately and uniformly granulate, without transverse series of enlarged tubercles except traces of a row along posterior margin. Epiproct of the shape illustrated (Fig. 43), hypoproct of typical form, subtrapezoidal with enlarged paramedian distal tubercles. Legs set on elevated, narrow podosterna; no trace of subcoxal spines, intercoxal width about equal to length of a coxa. Legs long and slender, end of femora visible beyond paranota when extended laterad. Sides of metazona essentially smooth. Stigmata slightly auriculate with raised edges, posterior stigmata somewhat narrower as longer than anterior.

Gonopodal aperture small, rounded-oval, with lateral edges raised. Gonopods as described in generic diagnosis and illustrated in Figs 44 and 45. Coxae without enlarged or apically penicillate setae; coxae with distinctly thickened prefemoral setae (Fig. 44, above).

Arbelorhacus baramanus (Attems) comb. n.

Platyrrhacus baramanus Attems, 1897: 495, fig. 15. Male and female syntypes [NMW] from the Baram River, 900-1000 m., Kalimantan, Indonesia, W. Kükenthal, leg.

Platyrhacus baramanus: Attems, 1899: 331, fig. 320; Attems, 1914: 255; Attems, 1938: 218, fig. 237.

Description (abridged from Attems, 1897): Length 63-68 mm, width ♂ 9.5 mm, ♀ 11 mm. Prozona and anterior half of metaterga dark brown; posterior half of metaterga lighter brown. Paranota, venter, and basal podomeres yellow, distal podomeres brown.

Collum subellipsoid, anterior edge almost straight, slightly wider than the head, both anterior and posterior margins with a row of enlarged tubercles; disk with a transverse depression behind anterior margin.

Metaterga coarsely granulated, with three transverse rows of enlarged tubercles, those of the third row the largest; sides of metazona and entire prozona finely granulate. Dorsum somewhat convex, paranota nearly horizontal, broad, narrowly

margined, the anteriormost directed anteriad, from 15th segment becoming increasingly produced caudad; anterior and lateral edges smooth, posterior finely serrulate. Ozopores located near center of paranota, distant from lateral edge. Epiproct broad, lateral sides somewhat divergent caudad; posterior edge rounded, with 7-8 shallow indentations and large bristles. Hypoproct truncate, with a small median projection and two larger paramedian setiferous projections. Sterna densely setose, without spines.

Remarks: The elevation recorded for the type collection suggests a point near the headwaters of the Mahakkam River in the Müller Range, therefore about 360 km south of the type locality for *A. magirus*.

Eurydirorhachis

Eurydirorhachis Pocock, 1897: 435. Proposed with three new species. Type species: *E. dulitensis* Pocock, by subsequent designation of Hoffman, 1956.
Eurydirorhachis: Hoffman, 1984: 262.

Diagnosis: A genus of Bornean platyrhacids agreeing closely with *Acanthodesmus* in external structure, differing in (1) apical processes **a** and **b** present, slender, subequal, (2) no trace of process **c**, (2) telopodite much longer, acropodite region much longer than prefemoral and arcuately curved.

Remarks: Curiously, no specimens referable to this genus, aside the original types, have been found in the various collections available to me over the past several decades. No useful comments can thus be added to what I noted in 1984.

Eurydirorhachis dulitensis Pocock — Fig. 46

Eurydirorhachis dulitensis Pocock, 1897: 436, fig. 10. Male holotype [BMNH] from "Mount Dulit, N. Borneo".
Eurydirorhachis dulitensis: Hoffman, 1984: 263, fig. 16.

Eurydirorhachis plakodonota (Attems)

Platyrrhacus plakodonotus Attems, 1897: 497, pl. 22, fig. 16. Syntypes [SMF] from "Borneo, Baramfluss."
Eurydirorhachis plakodonotus: Hoffman, 1984: 263.

As the publication date of Attems' description has still not been determined (and must be provisionally dated as 31 December 1897), it is unknown whether this name actually antedates the two published by Pocock in November of 1897.

Eurydirorhachis baramanensis Pocock

Eurydirorhachis baramensis Pocock, 1897: 436. Female holotype [BMNH] from "Baram, N. Borneo."

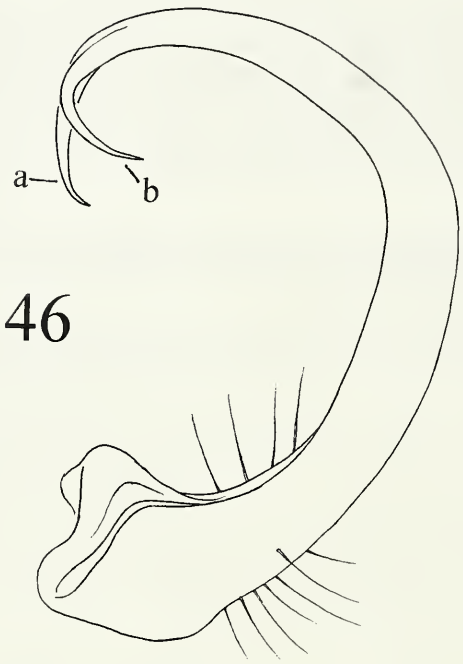


FIG. 46
Eurydirorhachis dulitensis Pocock, telopodite of left gonopod, holotype (BMNH).

BIOGEOGRAPHIC INFERENCES

Inasmuch as all of the platyrhacid species (including those of immediately adjacent islands) recorded for the Borneo fauna are endemic, information about the geographic affinities of these millipeds must be sought at generic and tribal levels. Even here, owing to the absence of any comprehensive modern classification of the family, meaningful comparisons are difficult to derive.

Two of the tribal groups (Hoplurorhachini with the three genera *Hoplurorhachis*, *Creagrogonopus*, and *Sabarhacus*, and Phyodesmini with only one genus) appear to be endemic to the island, without even close relatives elsewhere (the case of the supposedly Sumatran species *gongylodes* is excluded, pending verification of the locality data by the collection of new material). In their peripheral structure and coloration, the species of *Phyodesmus* resemble Sumatran species like *princeps* (Gervais) and *mirandus* Pocock (neither yet assigned to the correct genus), but the gonopod structure is distinctly different.

In the tribe Platyrhacini, *Arbelorhacus*, *Acanthodesmus*, and *Eurydirorhachis* are endemic. Only *Stenoniodes* appears to have affinities with the large and multiformous genus *Platyrhacus* which is widespread in Java, Sumatra, Malaysia, and "Indochina". In this case, whilst the gonopods are quite similar in the two nominal taxa, the form of the collum and paranota is strikingly different.

The absence of any members of the Papuan tribe Psaphodesmini from Borneo is notable. These millipeds appear to have been constrained by the factors contributing to "Wallace's Line". Equally interesting is the absence of any Bornean genera on the southern islands of the Philippines, as those known so far from Mindanao and Negros are endemics, of uncertain tribal assignation.

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