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A NEW GENUS OF INDO-AUSTRALIAN GEMPYLODINI WITH NOTES ON THE CONSTITUTION OF THE COLYDIIDAE (COLEOPTERA)

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Abstract

The genera of Gempylodini are reviewed and a key is given to them and to some related tribes of Colydiidae. The following new taxa are described: *Pseudendestes* gen. n., *P. australis* sp. n., *P. robertsi* sp. n. The following new synonymy and new combinations are proposed within the tribe: *Gempylodes* Pascoe = *Mecedanops* Reitter syn. n., *Munaria tmetus* (Olliff) comb. n., *Pseudendestes andrewesi* (Grouvelle) comb. n. The mature larva of *P. robertsi* is described, with notes on an early instar and pupa. Comparisons are made with other known colydiid larvae. A discussion is presented dealing with the constitution of the family Colydiidae, including a list of genera removed from the family since the publication of the last world catalogue. The following genera and species are moved from Colydiidae to the families and subfamilies indicated: *Aglenus* Erichson to Othniidae, Trogocryptinae; *Derolathrus* Sharp to Jacobsoniidae; *Larinotus* Carter and Zeck to Trogossitidae, Egoliinae; *Neotrichus acanthacollis* Carter and Zeck to Bostrychidae, Lyctinae. The following new synonymies and new combination are proposed: *Larinotus* Carter and Zeck = *Nebophilus* Crowson syn. n.; *L. umbilicatus* Carter and Zeck = *N. hirsutus* Crowson syn. n.; *Minthea acanthacollis* (Carter and Zeck) comb. n. = *Minthea armstrongi* Vrydagh syn. n. The genera *Caanthus* Champion, *Enhypnon* Carter, and *Mnionychus* Carter are moved from Tenebrionidae to Colydiidae, Colydiinae, Coxelini. Relationships of the Bothriderinae are discussed, and *Rhizonium* Sharp is moved from Bothriderinae to Colydiidae *incertae sedis*.

Introduction

The tribe Gempylodini was proposed by Sharp (1893) for several extremely elongate and subcylindrical colydiids often found in the tunnels of wood-boring insects. Although Hetschko (1930) restricted the tribe to the genus *Gempylodes* Pascoe, later authors, such as Pope (1961) and Dajoz (1977), included as well *Mecedanum* Erichson, *Endestes* Pascoe, and *Aprostoma* Guérin-Méneville, all of which were encompassed by Sharp's original concept. The group is usually characterised by the combination of concealed antennal and mandibular insertions, broadly closed procoxal cavities, a non-articulated, external spine at the apex of all tibiae, and narrowly separated metacoxae (narrow and acute abdominal intercoxal process), in addition to the general form.

A request by Dr H. Roberts, Forest Research Station, Bulolo, for the identification of a beetle predaceous on Platypodidae led to the following description of a new genus of gempylodines, as well as a second new Australian species and the first known larva for the tribe. This material is presented as part of a review of the genera of Gempylodini and is accompanied by a brief discussion dealing with the present constitution of the family Colydiidae.

The following acronyms are used to indicate the deposition of specimens: AMS, Australian Museum, Sydney; ANIC, Australian National Insect Collection, CSIRO, Canberra; AWH, A. P. Walford-Huggins Collection, Julatten; BMNH, British Museum (Natural History), London; BPBM, Bernice P. Bishop Museum, Honolulu; DPIQ, Queensland Department of Primary Industries, Indooroopilly; FICB, Forest Insect Collection, Bulolo; FMT, Frey Museum, Tutzing; MCZ, Museum of Comparative Zoology, Harvard University, Cambridge; MNHN, Museum National d'Histoire Naturelle, Paris; QMB, Queensland Museum, Brisbane; RNHL, Rijksmuseum van Natuurlijke Historie, Leiden; USNM, United States National Museum, Smithsonian Institution, Washington.

Review of the tribe Gempylodini

The tribe, as here defined, includes seven genera distributed throughout the warmer parts of the Old World, with one of them occurring also in the Neotropical Region. Distinguishing characters of the tribe and its included genera (with the exception of *Stematosoma* Fairmaire, p. 305) are presented in the following key.

1. Antennal insertions completely visible from above .. .. BOTHRIDERINAE
   Antennal insertions concealed from above by frons .. .. COLYDIINAE, 2

2. Mandibular bases visible from above; eyes entire; head without supraorbital ridges; body elongate, cylindrical, subglabrous; procoxal cavities broadly closed posteriorly; intercoxal process of prosternum moderately broad and flat; all tibiae with spine at outer apical angle .. .. .. NEMATIDIINI, **Nematidium** Erichson

Mandibular bases concealed from above; without other characters in combination 3

3. All tibiae with large, non-articulated spine or tooth at outer apical angle; frons above antenna laterally compressed, exposing most of antennal segment 1 and usually forming distinct ridge; procoxal cavities broadly closed posteriorly; intercoxal process of prosternum not abruptly declivous at apex; body elongate, at least 3 times as long as wide, subglabrous or clothed with short, fine hairs only 4

Tibiae almost always simple or with 2 to several smaller spines at outer apical angle; without other characters in combination 10

4. Body more or less depressed; antennal insertion not separated from mandibular articulation by carina; intercoxal process of prosternum at least as wide as coxal cavity; metacoxae distant PYCNOMERINI

Body subcylindrical; antennal insertion separated from mandibular articulation by distinct carina; intercoxal process of prosternum narrower than coxal cavity, usually sublaminate; metacoxae approximate .. .. GEMPYLODINI, 5

5. Intercoxal process of prosternum moderately broad, about half as wide as coxal cavity, extending below coxal apices and slightly overlapping them, strongly and abruptly expanded behind coxae; antennal groove formed between genal ridge and eye **Aprostoma** Guérin-Méneville

Intercoxal process of prosternum sublaminate, not or barely extending to coxal apices and never overlapping them, only gradually expanded behind coxae (Fig. 7); antennal grooves absent 6

6. Pronotum with 3 basal pits, without paramedian carinae; procoxae contiguous, meeting below intercoxal process, which is more or less interrupted at middle .. .. **Gempylodes** Pascoe

Pronotum without basal pits, almost always with 2 or 4 paramedian carinae; procoxae narrowly separated but not contiguous 7

7. Each elytron with 7 puncture rows and 3 carinae; supraantennal ridges separated from supraorbital ridges by pair of narrow, oblique furrows (Fig. 3); pronotum with 4 distinct carinae; prosternum depressed immediately in front of coxae (Fig. 7) **Pseudendestes** gen. n.

Each elytron with 9 puncture rows, at least anteriorly, and usually with 4 distinct carinae; supraantennal ridges more or less continuous with supraorbital ridges 8

8. Prosternum not depressed immediately in front of coxae; intercoxal process more or less flattened .. .. **Endestes** Pascoe

Prosternum depressed immediately in front of coxae; intercoxal process strongly convex 9

9. Pronotum usually with 2 paramedian carinae, sometimes indistinct or absent; elytral carinae often indistinct basally, that of interval 5 often joining that of 9 before apex; head usually with single median ridge between supraorbital ridges; Africa, Madagascar, Seychelles .. .. **Mecedanum** Erichson

Pronotum with 4 paramedian carinae, outer pair often interrupted or incomplete; elytral carinae always distinct basally, that of interval 5 ending free near apex, that of interval 7 shorter, sometimes ending at basal fourth; head with 2 ridges or tubercles between supraorbital ridges; East Indies and Australia **Munaria** Reitter

10. Tarsal segment 1 longer than 2; eyes emarginate anteriorly; antennae with loose, 3-segmented club; pronotum on each side with submarginal carina, so that lateral edge appears doubly margined; intercoxal process of prosternum moderately broad and abruptly declivous at apex; procoxal cavities narrowly closed or rarely narrowly open posteriorly; body elongate and subglabrous or clothed with short, fine hairs .. .. COLYDIINI

Tarsal segment 1 almost always shorter than or equal to 2; pronotum without double lateral margin; without other characters in combination .. .. Remainder of COLYDIINAE

Aprostoma Guérin-Méneville

Aprostoma Guérin-Méneville, 1839: 171. Type-species, by monotypy, *A. filum* Guérin-Méneville, 1839: 172.
Leptosomatium Kraatz, 1895: 154. Type-species, by monotypy, *L. laevifrons* Kraatz, 1895: 157 (= *Aprostoma auberti* Fairmaire).
Eumecidium Kolbe, 1898: 110. Type-species, by monotypy, *E. glabriceps* Kolbe, 1898: 110. Pope, 1955: 244.

Distribution

Africa, Madagascar, Ceylon.

Comments

This genus differs from other gempylodines in having a distinct antennal groove between the eye and genal ridge and in the structure of the intercoxal process of the prosternum, which is moderately broad and flat, extends below the procoxae, and is abruptly expanded behind the coxae. In these two respects, the genus is more like *Nematidium*, from which it differs in having emarginate eyes and concealed mandibular bases. The elytra are finely punctate and carinate only at the apices, while the antennae are flattened and gradually expanded towards the apex, but with the preapical segments longer than wide and bearing a longitudinal band of sensory hairs on each side (unlike *Mecedanum*). The elytral apices are rounded (unlike *Munaria* or *Gempylodes*). The tarsi in this genus are extremely long, with segment 1 alone often equal in length to the tibia. Both *A. glabriceps* (Kolbe) and *A. planifrons* Westwood have been collected in tunnels of Platypodidae (Schedl 1963).

Endestes Pascoe

Endestes Pascoe, 1863: 80, 91. Type-species, by monotypy, *E. incilis* Pascoe, 1863: 92, pl. 5, fig. 2.

Distribution

Central and South America, Africa.

Comments

This genus differs from *Mecedanum*, *Munaria*, and *Pseudendestes* in having the intercoxal process of the prosternum relatively flat and not preceded by a distinct depression. The antennae may be gradually expanded apically or bear an abrupt 2-segmented club. The Indian species *E. andrewesi* Grouvelle is transferred to *Pseudendestes* (see below).

Gempylodes Pascoe

Gempylodes Pascoe, 1863: 123, 132. Type-species, by monotypy, *G. macer* Pascoe, 1863: 133, pl. 8, fig. 2.
Mecedanops Reitter, 1878: 120. Type-species, by monotypy, *M. ornamentalis* Reitter, 1878: 121. New synonymy.

Distribution

Japan, Ceylon, southeast Asia, Moluccas.

Comments

In members of this genus the procoxae are apparently truly contiguous, meeting below the intercoxal process, which may be incomplete in the middle. The antennae are gradually expanded towards the apex with the subapical segments strongly transverse. The pronotum has 3 characteristic pits at the base, in addition to the median canal, and the tarsi are elongate, but not as long as in *Aprostoma*. The elytral apices are always distinctly excavate, and in both *G. lewisi* Sharp and *G. ornamentalis* each elytral apex is doubly notched. The type of *G. ornamentalis* has not been examined, but none of the characters given by Reitter would distinguish this from other *Gempylodes*. The Australian *G. tmetus* Olliff is transferred to *Munaria* (see below).

Mecedanum Erichson

Mecedanum Erichson, 1845: 274, note. Type-species, by subsequent monotypy, *M. erichsoni* Sharp, 1893: 257.

Distribution

Africa, Madagascar, Seychelles.

Comments

Erichson originally described this genus without an included species, and as a result the concept has been somewhat confused in the literature. Reitter (1878) considered it to be synonymous with *Aprostoma*. The genus is similar to *Munaria*, both being characterised by the sublaminate prosternal process, more or less continuous supraorbital and supraantennal ridges, and elytra with 9 puncture rows. The antennae in *Mecedanum* may have an abrupt, 3-segmented club or may be gradually expanded towards the apex with the preapical segments strongly transverse and bearing sensory hairs at the apices only. Unlike *Munaria*, there is never a trace of a second pair of pronotal carinae, and sometimes the first pair is indistinct. *Mecedanum antennatum* (Kraatz), *M. filum* (Hinton), and *M. sexualis* Pope have all been associated with platypodid beetles (Schedl 1963).

Munaria Reitter

Munaria Reitter, 1882: 55. Type-species, by monotypy, *M. ritsemae* Reitter, 1882: 56.

Distribution

East Indies, Australia.

Munaria ritsemae Reitter

Munaria ritsemae Reitter, 1882: 56. Type-locality: Solok, Sumatra. Type in RNHL (examined).

Comments

This species resembles a *Pseudendestes* in having 4 distinct carinae on the pronotum, but the continuous lateral ridges on the head and 9 elytral puncture rows are more reminiscent of *Mecedanum*. Reitter stated that the anterior coxae are contiguous, but in the type they are narrowly but distinctly separated. The antennae are gradually expanded apically, and the elytral apices are deeply excavate like those in *Gempylodes*. The mentum is triemarginate apically, which is also similar to the condition in *Mecedanum*.

Munaria tmetus (Olliff) comb. n.

Gempylodes tmetus Olliff, 1887: 81. Type-locality: Lord Howe Island. Type in AMS (examined).

Distribution

Lord Howe Is.; N.S.W.: Brooklana, Dorrigo, Richmond River; Qld: Brisbane, Bunya Mtns, Cunningham's Gap, Gadgarra, Imbil, Maryborough, Mt Glorious, Tamborine Mtn.

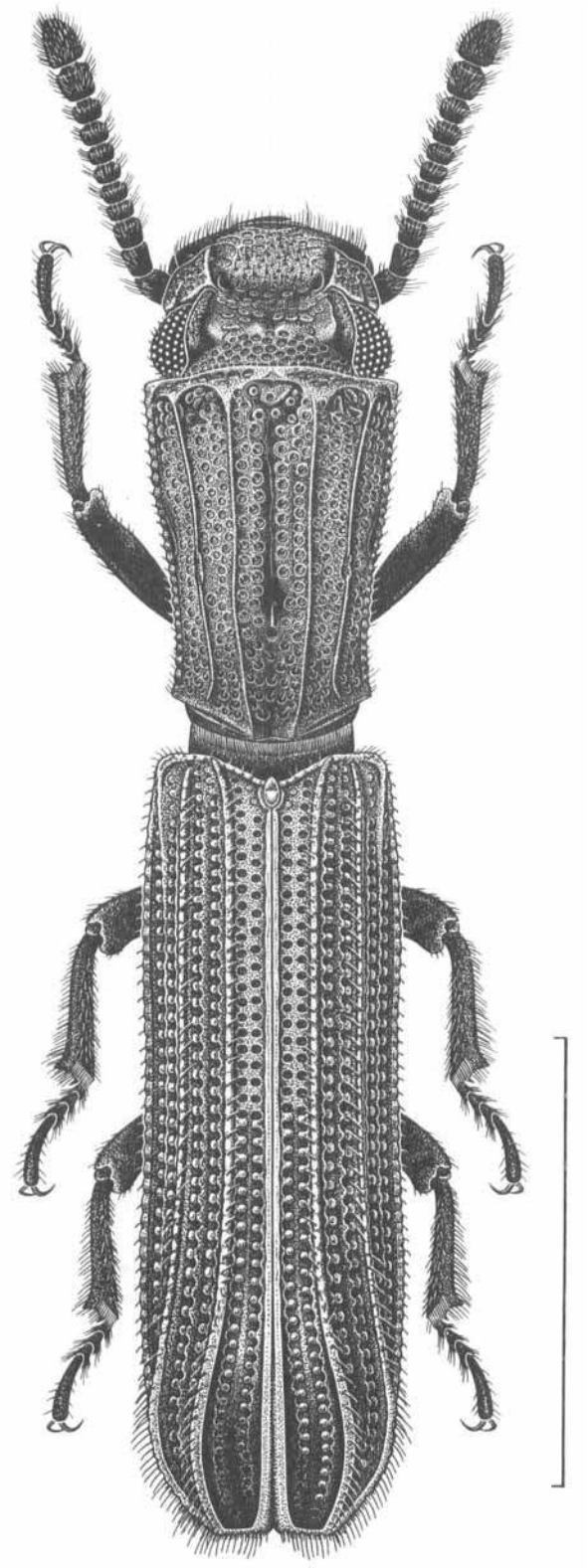


FIG. 1— *Pseudendestes australis*, adult (scale = 2.0 mm).

Comments

This species is very narrow and elongate, but has little else in common with species of *Gempylodes*. It is only doubtfully included in *Munaria* because of the combination of 4 pronotal carinae, 9 elytral puncture rows (at least anteriorly), gradually expanded antennal segments, and deeply excavated elytral apices. It also has two weak prominences on the vertex which are similar to those in *M. ritsemae*. The elytra, however, are unique for the group, in that puncture rows 6 and 7, along with the carina of interval 7, end at about the anterior fourth, and rows 5 and 8 become contiguous, until they fuse near the apex. There are also two characters which indicate a possible relationship with *Pseudendestes*. The mentum is biemarginate apically, so that a median process is formed, and there is a slight depression where the supraorbital and supraantennal ridges meet. It should also be noted that the outer pronotal carinae may be very indistinct and are never very long. Froggatt (1927) collected *M. tmetus* in a sassafras log infested with *Platypus australis* Chapuis. A specimen from Imbil, Queensland, bears the label "predatory on Platypus".

Pseudendestes gen. n.

Elongate, subcylindrical; vestiture of scattered, erect hairs, with patches of fine, dense pile, widespread or localised. Clypeus broad, truncate, or slightly emarginate; labrum strongly transverse, lightly sclerotised, partly or entirely concealed beneath clypeus. Frons with pair of anterolateral, subtriangular, supraantennal ridges, which are separated from supraorbital ridges by a pair of narrow, oblique furrows (Figs 1-3); pair of impressions just mesad of supraantennal ridges. Mesal part of vertex simple, without ridges or tubercles. Eyes prominent, vertical, anteriorly emarginate, coarsely faceted, and setose. Antennae 11-segmented, with abrupt 2- or 3-segmented club, or with indistinct club composed of 5 or 6 segments. Genal ridges strongly developed, but not forming antennal grooves in front of eyes. Mandibles with single, blunt, apical tooth. Maxillary and labial palps with last segment elongate and subtruncate. Mentum deeply biemarginate apically, with median longitudinal ridge.

Pronotum slightly to much longer than wide; sides slightly to strongly diverging anteriorly; lateral edges serrulate or concealed by dense pile; anterior angles not or slightly produced; posterior angles more or less acute. Disc with 2 pairs of longitudinal carinae and median pit or groove; inner carinae complete, joined anteriorly; outer carinae incomplete anteriorly and posteriorly; base constricted just behind posterior angles. Scutellum elongate and more or less elliptical, with base usually projecting anteriorly.

Elytra more than 2 to more than 3 times as long as wide; sides subparallel or widened near apices, which are truncate or slightly emarginate. Each elytron with raised sutural edge, 3 more or less complete carinae, and distinct humeral callus. Outer carina meeting carina 2 just anterad of apex; carina 2 curved posteriorly, meeting inner carina at apex. Disc steeply sloping posteriorly forming declivity between apices of inner carinae. Areas between carinae containing rows of large, deep punctures, which may alternate with tubercles. Two puncture rows between suture and carina 1, two between carinae 1 and 2, two between carinae 2 and 3, and one between carina 3 and lateral edge. Epipleuron narrow, extending to middle of elytron only.

Prosternum in front of coxae at least 1.5 times as long as intercoxal process, which is impressed at base, narrow and sublaminate at middle, expanded and rounded at apex, finely, longitudinally grooved, and slightly convex, not extending ventrally to edges of coxae (Fig. 7). Procoxal cavities broadly closed posteriorly; notal projections meeting just above intercoxal process, not visible behind it, posteriorly lined with membrane. Mesosternum truncate anteriorly; mesocoxae separate by about half a coxal diameter; intercoxal process steeply sloping. Metasternum as long as or longer than wide, strongly convex, flattened in middle, with long median suture and transverse impression anterad of each metacoxa; metepisterna narrow, mostly concealed by elytral epipleura.

Hind wing with radial cell poorly developed or absent; subcubital fleck present; anal cell narrow. All tibiae with outer edge strongly produced forming apical, non-articulated tooth or spine; second small spine usually present near base of tarsus. Tarsal segment 1 slightly longer than 2.

Abdomen relatively short, 1.5 to 2 times as long as wide, not extending to elytral apices; last visible sternite without subapical groove, its edge lined with membrane. Aedeagus (Figs 8-11) relatively large, more than half as long as visible part of abdomen, narrowly elongate, with ventral tegmen; basal piece much longer than apical piece (fused parameres); median lobe lightly sclerotised with lateral struts.

Without external differences between sexes.

Type-species: *Pseudendestes australis* sp. n.

Distribution

India, New Guinea, Australia.

Comments

The species of *Pseudendestes* are easily distinguished by the reduced number of elytral puncture rows and the distinct furrow between the supraantennal and

supraorbital ridges. An undescribed form from Africa has a similar head structure, but has the normal number of elytral puncture rows. The Indian and Australian species are similar, but the Papuan *P. robertsi* sp. n. is much larger and broader, with an almost continuous clothing of fine pile on the dorsal surfaces. It is probable that other species remain to be discovered in the Indo-Australian area.

Key to species of *Pseudendestes*

1. Total length greater than 8 mm; ratio of elytral length to width less than 2.6; fine, dense pile covering all raised areas on dorsal surface (tubercles, carinae, ridges); pronotum widest at about middle, lateral edges covered with pile; antennae gradually expanded apically; New Guinea .. .. **P. robertsi** sp. n.
   Total length less than 6.5 mm; ratio of elytral length to width more than 3.0; fine, dense pile, if present, localised on pronotal apex and apices of elytral carinae; pronotum widest at apex, lateral edges serrulate; antennae with abrupt 2- or 3-segmented club .. 2
2. Antennal club 3-segmented; supraorbital ridges weakly developed; India .. .. **P. andrewesi** (Grouvelle)
   Antennal club 2-segmented; supraorbital ridges strongly developed; Australia .. .. **P. australis** sp. n.

Pseudendestes andrewesi (Grouvelle) comb. n.

Endestes andrewesi Grouvelle, 1908: 100. Type-locality: Ouchterlony Valley, Nilgiri Hills, India. Syntypes in BMNH and MNHN (probable syntype examined).

Comments

Although described as an *Endestes*, this species has the reduced elytral puncture rows and interrupted head ridges characteristic of *Pseudendestes*. It is similar to *P. australis* in most respects, but has a 3-segmented antennal club. Andrewes' specimens were collected under the bark of dead *Erythrina*.

Pseudendestes australis sp. n. (Figs 1, 6, 8, 9)

Types.—*Holotype*, QUEENSLAND: Kuranda, 8.ii.1969, J. G. Brooks (ANIC No. 78). *Paratypes*: QUEENSLAND: 1, Atherton region, 27.xii.1961-15.i.1962, H. Demarz (FMT); 1, Black Mtn Rd, 6 km N of Kuranda, 8.xii.1970, No. 4743, A. & M. Walford-Huggins (AWH); 2, Eubenangee, ix.1949, J. G. Brooks (ANIC, BMNH); 2, Eubenangee, vi.1950, J. G. Brooks (ANIC); 2, Gadgarra, 2.iii.1933, ex spurwood (DPIQ); 5, Gadgarra, 21.viii.1934, ex spurwood (DPIQ, QMB); 1, Innisfail, 28.ix-12.xii.1961, H. Demarz (FMT); 1, Kuranda, 8.ii.1969, J. G. Brooks (ANIC); 1, 1 mi N of Kuranda, 1200 ft, 23.iv.1969, I.F.B. Common and M. S. Upton (ANIC); 1, Millaa Millaa, F. H. Taylor (ANIC); 1, Mt Lewis Rd, via Julatten, ix.1971, A. Walford-Huggins (AWH); 1, Mt Spec, 3.8 mi NW of Paluma, 10.ii.1971, J. G. Brooks (ANIC); 1, *ca* 20 km up Whitfield Rd, Track No. 3, 14.xii.1970, at light, J. G. Brooks (ANIC).

Adult (Fig. 1)

Length 4.6-6.0 mm. Pronotum and elytra combined about 4.5 times as long as greatest width. Reddish brown to black; patches of fine pile very localised and often abraded, so that surface is more or less shiny; pile occurring mainly at anterior edge of inner pronotal carinae and posterior parts of inner elytral carinae. Antennae (Fig. 6) with abrupt 2-segmented club; dense, short hairs on club segments only. Clypeus slightly emarginate anteriorly; labrum always exposed. Pronotum 1.5 times as long as wide, widest at apex; sides evenly diverging; anterior angles laterally produced and acute; lateral edges serrulate. Disc slightly convex, coarsely punctate; inner carinae diverging from base to apex; outer carinae more or less parallel to inner ones, but slightly undulate; elongate pit located at posterior two-fifths, connected to narrow median groove, which extends posteriorly for short distance and anteriorly almost to edge. Scutellum only slightly produced anteriorly. Elytra 3.2 times as long as wide and 2.2 times as long as pronotum; sides subparallel; apices slightly emarginate. Elytral tubercles weakly developed, barely indicated anteriorly, with a few on anterior portions of carinae; carinae not as expanded posteriorly or as raised as in *P. robertsi*. Prosternum in front of coxae 1.75 times as long as intercoxal process. Metasternum 1.25 times as long as wide; median suture 0.4 times as long as median length of sternum; disc coarsely and densely punctate laterally, more finely and sparsely so mesally. Abdomen 1.85 times as long as wide, tuberculate. Aedeagus 0.9 times as long as abdomen; tegmen (Fig. 8) 8 times as long as wide; basal piece 2.3 times as long as apical piece; median lobe as in Fig. 9.

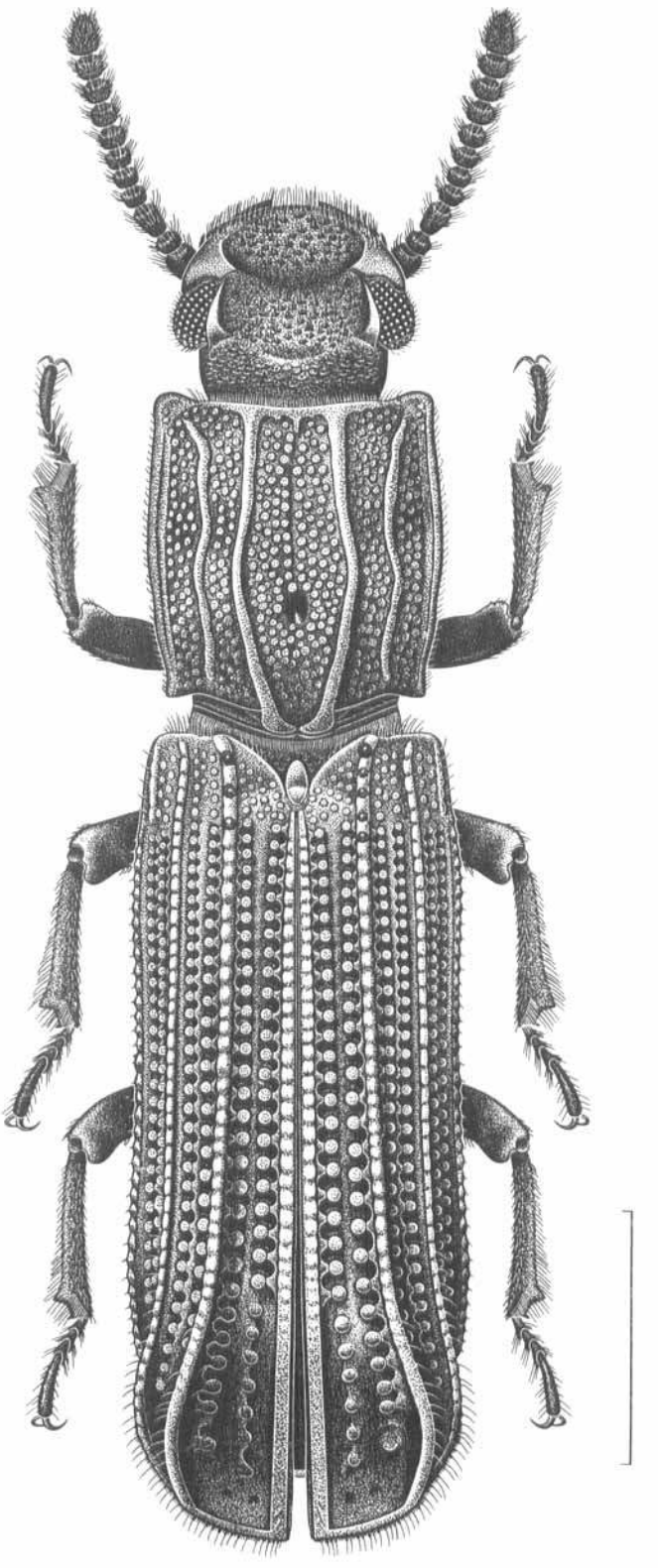


FIG. 2—*Pseudendestes robertsi*, adult (scale = 2.0 mm).

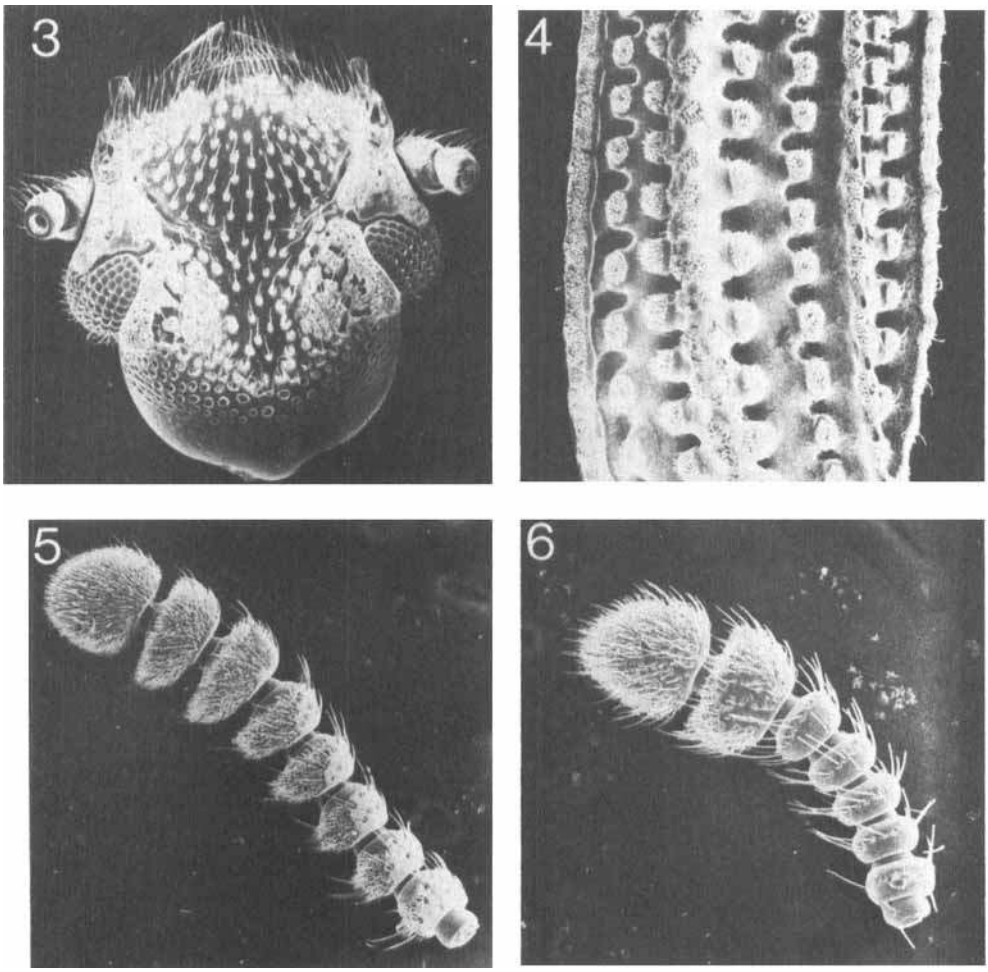
Pseudendestes robertsi sp. n. (Figs 2-5, 7, 10-16)

Types.—*Holotype*, PAPUA NEW GUINEA: Stony Logging Area, near Bulolo, Morobe Prov., viii.1977, ex *Endiandra* sp., H. Roberts (ANIC No. 77). *Paratypes*: PAPUA NEW GUINEA: 8, same data as holotype (ANIC, FICB); 1, same locality, 10.vii.1976, ex *Endiandra* sp., H. Roberts (BMNH); 9, same locality, ii.1978, ex *Xanthophyllum* sp., H. Roberts (ANIC, FICB, QMB); 14, same locality, host tree, and collector, with following dates: 19.ii, 21.ii, 22.ii, 25.ii, 26.ii, 1.iii, 2.iii, 5.iii, 6.iii, 7.iii.1978 (ANIC, BMNH, BPBM, MCZ, QMB, USNM).

Larval material (not types).—PAPUA NEW GUINEA: Stony Logging Area, near Bulolo, Morobe Prov., ii.1978; same locality, viii.1977, ex *Endiandra* sp. (ANIC, FICB).

Adult (Fig. 2)

Length 8.5-9.6 mm. Pronotum and elytra combined 3.5 times as long as greatest width. Blackish; patches of fine pile covering much of dorsal surface, so that it appears dull and grayish or yellowish; pile occurring on first 8 antennal segments, supraantennal and supraorbital ridges, genal ridge, mentum, bases of setae on frons and clypeus, anterior and lateral edges of pronotum, pronotal tubercles and carinae, scutellum, lateral and sutural edges of elytra, elytral tubercles and carinae (Fig. 4), parts of undersurface, and tibiae. Antennae (Fig. 5) with indistinct 5- or 6-segmented club, all segments bearing numerous short hairs and long, forked setae (in addition to pile). Clypeus truncate anteriorly; labrum sometimes concealed. Pronotum 1.2 times as long as wide, widest at anterior third; sides very weakly rounded; anterior angles anteriorly produced and rounded; lateral edges apparently even, fine sculpturing being concealed by pile.



FIGS **3-6**—*Pseudendestes* spp., scanning electron micrographs of adults: **(3-5)** *P. robertsi*: **(3)** head, dorsal view (26 x); **(4)** section of right elytron, behind middle (40 x); **(5)** antenna, last 8 segments (41 x); **(6)** *P. australis*, antenna, last 7 segments (63 x).

Disc slightly convex, coarsely tuberculate; inner carinae diverging to about middle, then converging, very slightly undulate; outer carinae more or less parallel but strongly undulate; median rounded pit located at posterior two-fifths; lateral portions of disc even, forming pair of longitudinal troughs between tuberculate area and raised lateral edges. Scutellum strongly produced anteriorly. Elytra 2.5 times as long as wide and 2.25 times as long as pronotum; sides subparallel anteriorly, slightly expanded apically by divergence of carinae 2, which obscure lateral edges at that point; apices subtruncate. Elytral carinae distinctly tuberculate; tubercles on inner carinae especially large and acute; inner carinae diverging at apical fourth and then slightly converging to apical ninth, where they curve and join apex; carinae 2 more or less parallel to inner pair, diverging and then converging to meet inner pair near apex; outer carinae subparallel, meeting carinae 2 at posterior eighth; inner carinae in lateral view distinctly elevated at their widest point and sloping just before apex. Elytral punctures alternating with tubercles, which form slight bridges over punctures. Prosternum in front of coxae 1.5 times as long as intercoxal process. Metasternum as long as wide; median suture 0.6 times as long as median length of sternum; disc tuberculate anterolaterally, punctate posteromesally, impunctate on either side of transverse impressions. Abdomen 1.7 times as long as wide, all segments covered with pilose tubercles. Aedeagus 0.6 times as long as abdomen; tegmen (Fig. 11) 6 times as long as wide; basal piece 4 times as long as apical piece; median lobe as in Fig. 10.

Mature larva (Fig. 12)

Length 11-14 mm. Subcylindrical, slightly curved (in preservative), very lightly sclerotised, except for tips of urogomphi and parts of head and mouthparts. Head subglobular, 0.75 times as long as wide, clothed with long and short setae, mostly laterally and anteriorly. Clypeus 0.33 times as wide at base as head width and 0.36 times as long as wide, abruptly joined to frons with sides subparallel, only slightly converging apically; disc evenly sclerotised, without membranous anterior part, bearing 3 pairs of longer setae and several shorter ones. Labrum subovate, 0.5 times as long as wide at base, apex slightly produced and somewhat angulate; disc lightly sclerotised at anterior fourth, with 4 pairs of longer setae, 1 pair of shorter ones, and 3 pairs of short, stout setae along lateral edges, the anterior of which are associated with sclerotised bar; apex with patch of minute hairs at middle. Epipharynx (Fig. 15) with apical brush of short hairs, 2 broad, curved, dense bands of longer setae surrounding median area of sparser, shorter setae, 4 sensilla at anterior fourth, 2 just in front of middle, and 2 at posterior fourth; large, elongate brush of setae at base of epipharynx, in between anterior edges of cibarial membranes, each of which bears about 30 oblique plates, obscured posteriorly by fine hairs. Tormae well developed, meeting at midline, with sclerotised bar attached to middle of each and extending posteriorly to base of cibarial plate. Ocelli absent. Posterior edge of head with very slight median emargination. Epicranial stem very short; frontal arms lyriform and complete, although somewhat obscured at apex. Antennal ridges slightly sclerotised, not concealing antennal insertions. Antennae 0.16 times as long as head width; ratio of segment lengths 1.0: 2.0: 2.6; segment 1 strongly transverse, 2 about as long as wide, 3 about 2.5 times as long as wide; sensorium conical, slightly inclined lateroventrally, and 0.25 times as long as segment 3. Hypostomal ridges strongly sclerotised, especially posterolaterally, where they give rise to traces of hypostomal rods; ventral epicranial ridges absent. Mandibles (Figs 13, 14) asymmetrical, each with broad base, fairly weak incisor lobe, and 2 rounded apical teeth perpendicular to plane of movement; right incisor lobe serrate proximad of apical teeth; molar areas extensive, left broadly convex, right concave, both with numerous transverse ridges; left mola with patch of coarse hairs at distal end; both mandibles bearing rows of microspines dorsally and numerous tubercles ventrally. Maxilla with well developed, subtriangular cardo; mala broadly rounded and setose, with a row of setae extending along inner edge; inner apical angle without distinct uncus; dorsal surface with brush of hairs (Fig. 16) at base near palpifer; ratio of palp segments 1.0: 1.6: 2.0, apical segment twice as long as wide and subconical; articulating area elongate-oval, membranous. Mentum 0.75 times as long as wide, free almost to base; prementum 0.5 times as long as wide, with 3 long setae near apex; ligula very short and broad, less than half as long as labial palp, which consists of single, elongate, subconical segment; hypopharynx densely clothed with hairs; sclerome consisting of broadly triangular bar attached to pair of anterior and posterior arms. Submentum and gula not separated by suture, together 1.5 times as long as greatest width.

Prothorax 0.7 times as long as wide and 1.2 times as long as meso- or metathorax; tergum with long and short setae, mostly around edges. Meso- and metathorax 0.5 times as long as wide and equal in length; terga clothed with transverse, posteromesal field of short, stout setae, with a few longer setae laterally. Procoxae separated by 2.5 times coxal diameter, meso- and metacoxae by 3 times coxal diameter. Legs about 0.9 times as long as thoracic width; ratio of leg segments 7: 3: 3: 2: 1; legs clothed with moderately fine setae; tarsungulus with 2 setae. Thoracic spiracle 0.15 times as long as thoracic width, elongate-oval, vertically oriented, with pair of very small, dorsal, air tubes.

Abdomen 2.7 times as long as thorax; segments 1 to 7 about equal in length; segment 8 0.7 times as long as 7; segment 9 short, 0.3 times as long as 7. Abdominal terga 1-7 each with transverse field of dense, short setae, with 2 longer setae at each end; terga 2-7 with transverse row of asperities in centre of setal field; accumulation of residue and debris usually present on these terga, suggesting glandular secretion. Abdominal spiracles smaller and more rounded than those on thorax, with air tubes posterodorsally oriented. Tergum 9 with well developed, strongly recurved urogomphi, which are acute and heavily sclerotised at apex and are separated by 1.6 times basal width of one; interurogomphal pit absent; sternite 9 strongly transverse, simple. Segment 10 strongly transverse, posteroventral.

Early instar larva

Differing from mature larva in having thoracic and abdominal terga slightly more heavily sclerotised and yellowish in colour, transverse rows of asperities on terga 2-7 better developed, and pleura of abdominal segments 1-7 produced laterally forming distinct processes beneath spiracles.

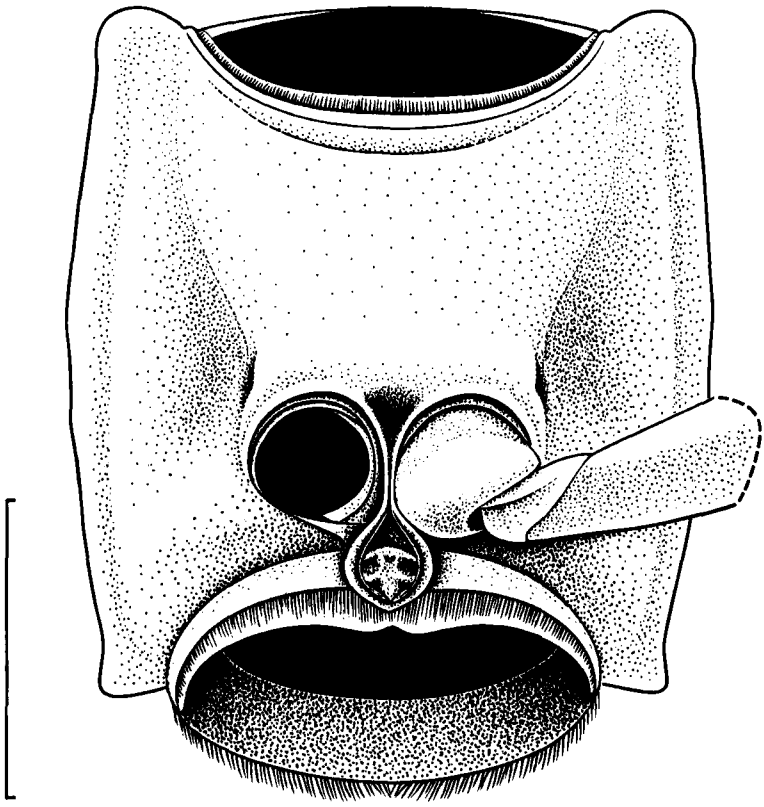


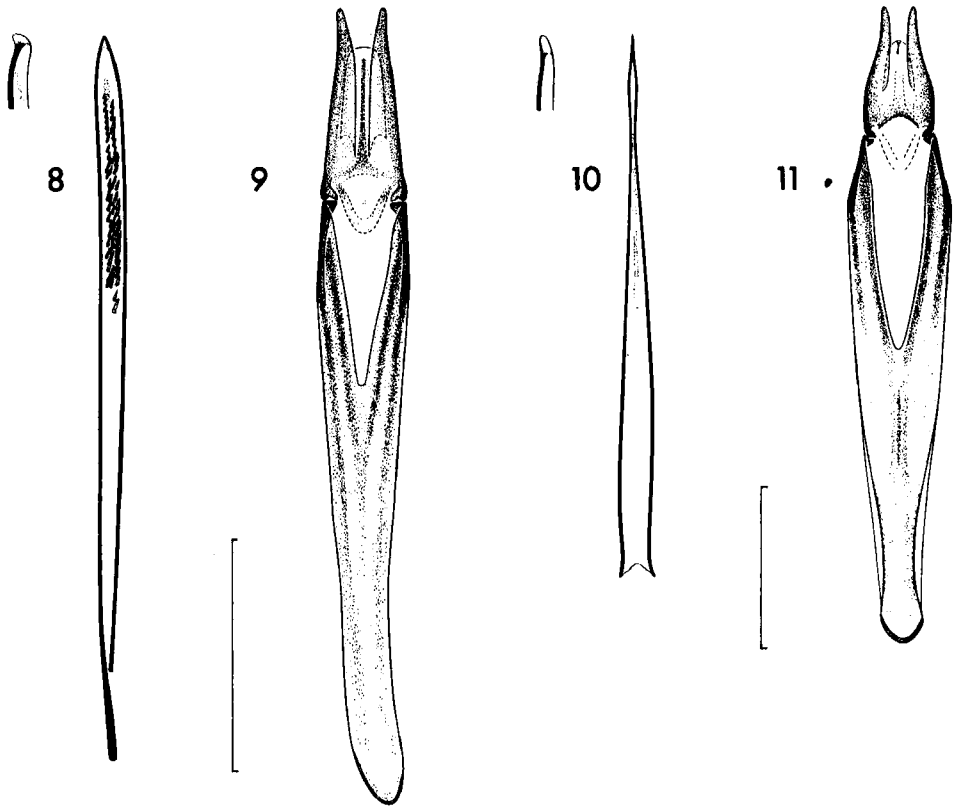
FIG. 7—*Pseudendestes robertsi*, adult prothorax, ventral view, with right leg and part of left leg removed (scale = 1.0 mm).

Pupa

All terga bearing dense fields of setae or hairs; transverse rows of asperities on abdominal terga 3-6; 2 conical processes on tergum 7 and sternum 7; recurved urogomphi on tergum 9.

Comments

The larva of *Pseudendestes robertsi* has at least two unique features not known in any described colydiid. These are the patch of coarse hairs at the distal end of the left mandibular mola and the brush of hairs on the dorsal surface of the mala near the base. It also differs from most colydiids in having no ocelli, very short hypostomal rods, well developed mandibular molae composed of fine, transverse ridges, 1-segmented labial palps, very short spiracular air tubes, a combination of dense setal patches and transverse rows of asperities on most thoracic and abdominal terga, and a shortened abdominal segment 9 bearing widely separated, strongly recurved urogomphi without a pit between them. In all of these respects it resembles the larva of *Nematidium filiforme* LeConte, which was described by Craighead (1920). I have examined Craighead's specimens (which are in very poor condition) and at least abdominal terga 6 and 7 bear asperities in addition to setal patches. *Nematidium* differs from *Pseudendestes* in having a moderately long epicranial stem, more or less V-shaped frontal arms, a longer and more parallel-sided head, and 2-segmented antennae, in addition to lacking the brushes of hairs on the left mola and dorsal malar surface. The described larvae of Colydiini [*Colydium elongatum* Fabricius and three species of *Aulonium* Erichson, see Craighead (1920), Nikitsky (1976) and Marshall (1978)] also have a well developed mandibular mola with fine, transverse ridges, but they have 2-segmented labial palps and a longer abdominal segment 9, which is at least slightly more heavily sclerotised. *Aulonium* also has a distinct interurogomphal pit, while



FIGS **8-11**—*Pseudendestes* spp., male genitalia: **(8, 9)** *P. australis* (scale = 0.5 mm): **(8)** median lobe, dorsal view; **(9)** tegmen, ventral view; **(10, 11)** *P. robertsi* (scale = 0.5 mm): **(10)** median lobe, dorsal view; **(11)** tegmen, ventral view.

Nikitsky's figure of *Colydium* Fabricius indicates at least a slight depression in that area. In most colydiid larvae, the mandibular mola is less well developed and often consists of 2 or 3 tooth-like processes. Five ocelli are usually present on each side of the head, in groups of 3 and 2, the hypostomal rods are often well developed, although never extending very far posteriorly, and the spiracles have longer accessory air tubes. The pit between the urogomphi varies considerably but appears to be present in many Synchitini and apparently in *Pycnomerus* Erichson, but not in *Penthelispa* Pascoe (Craighead 1920, Dajoz 1877, Hayashi 1972). Larvae of Bothriderinae have little in common with colydiine larvae and are discussed further in the next section.

According to H. Roberts *(in litt.)*, *Pseudendestes robertsi* has been found only in galleries of the platypodid beetle *Crossotarsus biconcavus* Schedl. They occur in

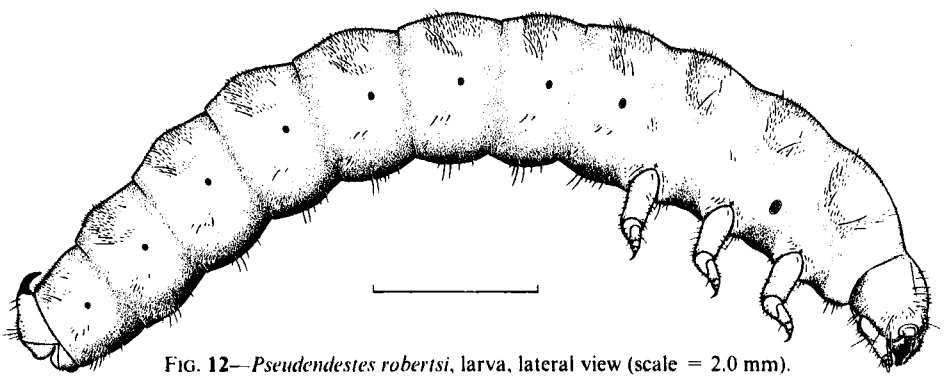


FIG. **12**—*Pseudendestes robertsi*, larva, lateral view (scale = 2.0 mm).

established galleries containing young tenerals, pupae, and last instar larvae of the platypodid. Further information on the biology is to be published elsewhere by Dr Roberts. The larval mouthparts of *Pseudendestes* have none of the adaptations which might be expected in a specialised predator; this suggests that the larvae are facultative predators which may feed on decayed wood and fungal hyphae as well.

Stematosoma Fairmaire

Stematosoma Fairmaire, 1899: 385. Type-species, by monotypy, *S. canaliculatum* Fairmaire, 1899: 385.

Distribution

Madagascar.

Comments

I have seen no specimens of *S. canaliculatum*, the only described species of the genus, but from the description it might be a species of *Mecedanum*, although the author compared it with *Aprostoma*. The preapical antennal segments are strongly transverse, and the elytra are coarsely punctate and carinate.

Notes on the constitution of the family Colydiidae

Over the years, the family Colydiidae has tended to be a "dumping ground" for various genera, both Clavicornia and Heteromera, which could not be conveniently placed elsewhere, and which possessed a few very general features, such as 4-segmented tarsi and clubbed antennae. The constitution of the family has changed considerably in the almost 50 years since the publication of Hetschko's catalogue (1930), and several changes are still called for. I will take this opportunity to review those changes which have been made and to suggest several more based primarily on the Australian fauna.

A major change in the constitution of the family occurred when Crowson (1955) transferred members of the Cerylonini, Murmidiinae, and Euxestinae to the clavicorn family Cerylonidae, while keeping the remaining colydiids in the Heteromera. Sen Gupta and Crowson (1973) incorporated the Anommatinae into their Cerylonidae, while Lawrence (1977) and Doyen and Lawrence (1979) removed several other genera to Othniidae and Tenebrionidae, respectively. The following is a list of genera which were included in the fascicle of *Coleopterorum Catalogus* on Colydiidae (Hetschko 1930), but have since been removed and placed in other families. The generic names are followed by their present placement (or placements) and pertinent references.

Eba Pascoe (= *Palorus* Mulsant) and *Pseudeba* Blackburn. Tenebrionidae, Tenebrioninae, Ulomini *(s. lat.)*. Halstead (1967).

Cryptozoon Schaufuss, *Paralyreus* Grouvelle, and *Tyrtaeus* Champion. Tenebrionidae, Hypophloeinae, Gnathidiini. Doyen and Lawrence (1979).

Archaeoglenes Broun. Tenebrionidae, Phrenapatinae, Archaeoglenini. Watt (1974).

Anchomma LeConte. Tenebrionidae, Tentyriinae, Stenosini. Doyen and Lawrence (1979).

Myrmechixenus Chevrolat (= *Myrmecoxenus* of authors). Tenebrionidae, Myrmechixenini. Doyen and Lawrence (1979).

Meryx Latreille. Merycidae. Crowson (1955). Zopheridae, Ulodinae. Doyen and Lawrence (1979).

Syncosmetus Sharp (= *Omogocis* Miyatake). Ciidae, Ciinae. Miyatake (1970).

Serrotibia Reitter (= *Paralindria* Olliff). Prostomidae. Heinze (1943), Crowson (1967). Othniidae, Trogocryptinae. Lawrence (1977).

Ocholissa Pascoe and *Anepsicus* Sharp. Othniidae, Trogocryptinae. Lawrence (1977).

Euxestus Wollaston, *Hypodacne* LeConte, *Pseudodacne* Crotch, *Cycloxenus* Arrow, and *Euxestoxenus* Arrow. Cerylonidae, Euxestinae. Crowson (1955), Sen Gupta and Crowson (1973).

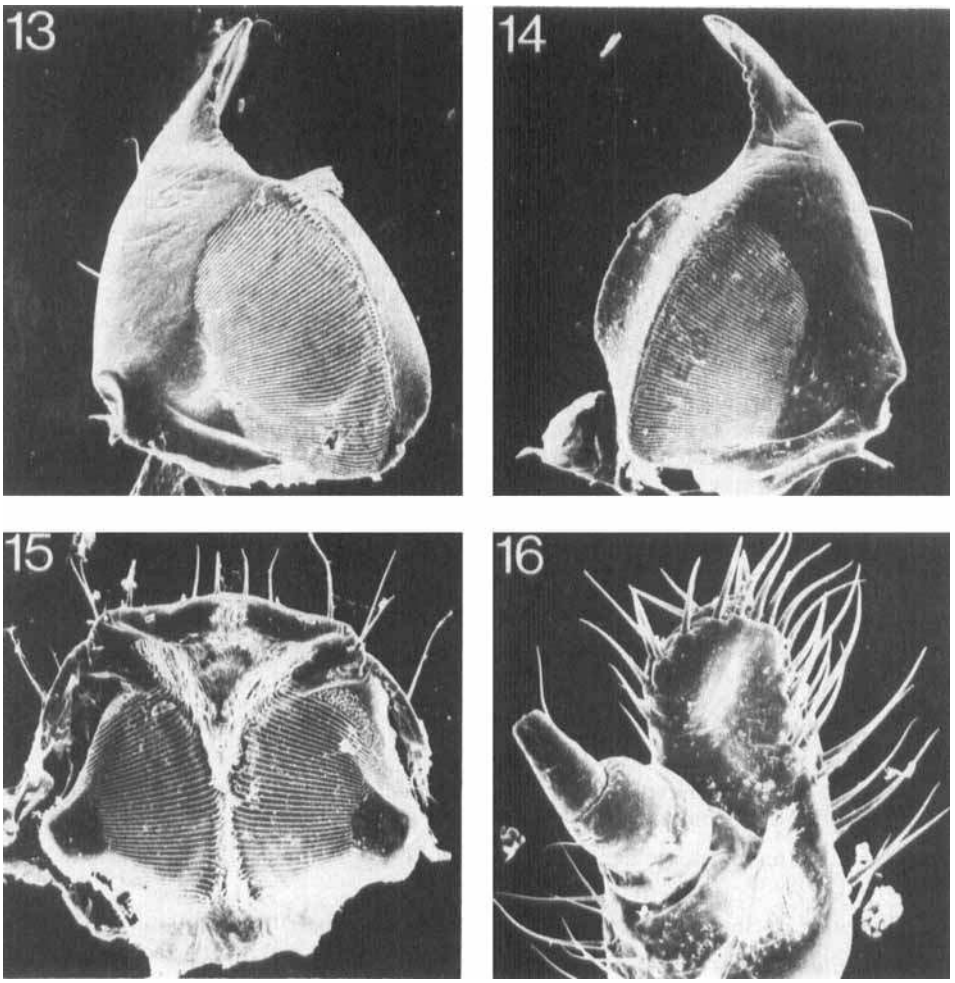
Pachyochthes Reitter (= *Hypodacne* LeConte). Cerylonidae, Euxestinae. Nikitsky and Belov (1979).

Abromus Reitter and *Anommatus* Wesmael. Cerylonidae, Anommatinae. Sen Gupta and Crowson (1973), Lawrence and Stephan (1975). Anommatidae. Dajoz (1977).

Metacerylon Grouvelle. Cerylonidae, Metaceryloninae. Sen Gupta and Crowson (1973), Lawrence and Stephan (1975).

Murmidius Leach, *Botrodus* Casey, and *Mychocerus* Erichson. Cerylonidae, Murmidiinae. Crowson (1955), Sen Gupta and Crowson (1973), Lawrence and Stephan (1975).

Cerylon Latreille, *Pseudocerylon* Grouvelle, *Cautomus* Sharp, *Ploeosoma* Wollaston, *Pachylon* Sharp, *Glyptolopus* Erichson, *Axiocerylon* Grouvelle, *Philothermus* Aube, *Lapethus* Casey, *Lytopeplus* Sharp, and *Thyroderus* Sharp. Cerylonidae, Ceryloninae. Sen Gupta and Crowson (1973), Lawrence and Stephan (1975).



FIGS **13-16** —*Pseudendestes robertsi*, scanning electron micrographs of larva: **(13)** left mandible, mesodorsal view (133 x); **(14)** right mandible, mesodorsal view (133 x); **(15)** epipharynx and cibarial plates, ventral view (133 x); **(16)** left maxilla, dorsal view (200 x).

Eupsilobius Casey (= *Eidoreus* Sharp). Endomychidae, Eupsilobiinae. Sen Gupta and Crowson (1973).

Thaumaphrastus Blaisdell (= *Thorictodes* Reitter). Dermestidae, Thorictinae. Anderson (1949), Crowson (1955).

Two other genera included by Hetschko which should be removed from the Colydiidae are *Aglenus* Erichson and *Derolathrus* Sharp. These are discussed below.

Aglenus brunneus (Gyllenhal) is recognised as a colydiid by almost all workers in the field, although it is placed in a separate tribe (Aglenini), along with *Cryptozoon* and *Ocholissa*, by Dajoz (1977). The species has been recorded from various parts of North America and Eurasia, as well as from Chile (Dajoz 1969), but it also occurs in southeastern Australia, where it has been collected in and around Melbourne (Sunshine, Fern Tree Gully, Bena, near Korumburra). It is often associated with manure or decaying vegetation, and may occur in cellars, stables, or granaries. As has been previously recognised, *Aglenus* resembles *Ocholissa* in many respects, and the male genitalia of the two are extremely similar, with the apical piece (combined parameres) bearing a pair of articulated lobes [digiti laterales of Spilman (1967)]. This type of aedeagus is not found in other Colydiidae, but is typical of the more advanced group of families including Salpingidae, Othniidae, Inopeplidae, Boridae, Pythidae, and Trictenotomidae. If one discounts the 4-4-4 tarsal formula, neither *Aglenus* nor *Ocholissa* differ significantly from *Prostominia* Reitter, *Szekessya* Kaszab, and other members of the othniid subfamily Trogocryptinae as defined by Lawrence (1977). Larvae of *Aglenus* collected in bat guano from Carter Cave, Carter County, Kentucky, were compared with various other larval Heteromera, and were found to share at least two characters with the salpingid group of families which are not found in Colydiidae: complex urogomphi, with an accessory mesal tooth at the base of each, and a pair of asperities at the base of sternum 9. *Aglenus* has a single pair of sternal asperities, as in the Salpingidae (*Sphaeriestes* LeConte, *Rhinosimus* Latreille, *Rabocerus* Mulsant, *Aegialites* Mannerheim, *Antarcticodomus* Brookes). *Prostominia* (Trogocryptinae) larvae and those of some Inopeplidae have 2 on each side, whereas other members of this group of families have several, which may form a continuous row. The *Aglenus* larva differs from most Salpingidae and resembles Trogocryptinae in having a well developed mandibular mola and lacking endocarinae beneath the frontal arms of the head. There is little doubt that members of the Salpingidae, Inopeplidae, and Othniidae are closely related, and perhaps all should be treated as a single family with *Aglenus* forming an independent subgroup. In any event, the genus is better placed among this group of families than in the Colydiidae.

Derolathrus includes two described species, *D. atomus* Sharp from Hawaii, and *D. sharpi* Grouvelle from Guadeloupe, but unnamed forms have been seen from various parts of the world, including Africa and Australia. The genus has been recognised as a member of the dermestoid family Jacobsoniidae by Crowson *(in litt.)* and Hamilton-Smith *(in litt.)* and was discussed under that family by Lawrence and Hlavac (1979). Adults of *Derolathrus atomus* fall within Crowson's definition of Jacobsoniidae (1955, 1959) and have functional spiracles on segment 8 which excludes them from Cucujiformia. Larvae collected under bark of *Acacia koa* Gray on Oahu, Hawaii, are similar to those of *Saphophagus* Sharp described by Crowson (1959), having a peculiar staphylinoid-like maxillary fringe and distinct abdominal segment 10.

Numerous species have been added to the Colydiidae since the publication of Hetschko's catalogue, and perhaps some of these will also have to be removed. Only two, both from Australia, will be dealt with here. *Larinotus umbilicatus* and *Neotrichus acanthacollis* were both described by Carter and Zeck in their monograph of the Australian Colydiidae (1937). *Larinotus umbilicatus* belongs to the trogossitid subfamily Egoliinae and was redescribed by Crowson (1970) as *Nebophilus hirsutus*. The genus *Nebophilus* Crowson is then a junior synonym of *Larinotus* Carter and Zeck (new synonymy). *Neotrichus acanthacollis* belongs to the bostrychid subfamily Lyctinae and was redescribed by Vrydagh (1958) as *Minthea armstrongi* (new synonymy). Other described species of *Neotrichus* Sharp, including the type-species, are true colydiids.

When the above genera are removed from the family, the Colydiidae are still composed of two very different groups, the Bothriderinae, including the tribes Bothriderini, Dastarcini, and Deretaphrini, and the Colydiinae, containing all remaining tribes. The three bothriderine tribes include most of those genera listed by Hetschko (1930), with a number of additions (Heinze 1943, Pope 1955, Pope 1961). Heinze (1943) removed the genera *Aplanetes* Sharp and *Phreatus* Pascoe, because of the concealed antennal insertions, and placed both in the Colydiinae. The New Zealand genus *Rhizonium* Sharp was retained in the Deretaphrini by Heinze, but it seems to have little in common with other members of the group. *Rhizonium* should be placed in Colydiidae *incertae sedis* and with further study may be removed from the family.

The position of the Bothriderinae is still open to question but is beyond the scope of the present study. There is some evidence, however, based on both larva and adult, which indicates that the group should constitute a distinct family, as suggested by Craighead (1920). The metendosternite of bothriderines usually has a relatively short and broad stalk, well developed laminae, and approximate anterior tendons; this is characteristic of Clavicornia, rather than Heteromera. The aedeagus is of the ring type, with dorsal parameres joined to a ventral median strut; this also is a clavicorn feature. In these and other respects, bothriderines resemble members of the tribe Metacerylonini, placed in Cerylonidae by Sen Gupta and Crowson (1973) and thought to be a link between the two groups by Heinze (1943). Larval characteristics of bothriderines indicating clavicorn affinities include the acute, hyaline prostheca (often called "retinaculum"), protracted ventral mouthparts, widely separated frontal arms (in *Deretaphrus* Newman, but not indicated in Craighead's description), falciform mala (in *Bothrideres* Erichson), and more or less terminal, circular abdominal 10.

The Colydiinae are presently divided into 12 tribes (Dajoz 1977) after the removal of *Myrmechixenus* and *Aglenus*: Colydiini, Nematidiini, Gempylodini, Pycnomerini, Acropini, Moneodini, Synchitini, Coxelini (including Megataphrini), Diodesmini, Langelandiini, Rhopalocerini, and Orthocerini (including Corticini and Rhagoderini). From the discussion above, it seems apparent that *Nematidium* is related to the Gempylodini and that both groups share a number of adult and larval characters with members of the Colydiini. The relationships among the other tribes are not well understood, nor are those between the Orthocerini and certain genera now included in the Zopheridae (Doyen and Lawrence 1979). It is hoped that more complete descriptions of properly associated larvae will help to clarify these. A final change in the Colydiinae involves the addition of three Australian genera which were described in the Tenebrionidae. Champion (1894) described the genus *Caanthus* with a single species from Tasmania. A number of undescribed species occur throughout eastern Australia. Carter (1919) described *Enhypnon* and *Mniophilus*, also from Tasmania, but the latter name, being a junior homonym, was replaced by *Mnionychus* Carter (1926). All three genera should be placed in the Colydiidae. In addition to having a 4-4-4 tarsal formula (which would not in itself be justification for the change), the procoxal cavities are internally open and the aedeagus is of the colydiid type. Externally the procoxal cavities are open in *Caanthus* and closed in *Enhypnon* and *Mnionychus*, and the metacoxae in all three are well separated, forming a truncate abdominal intercoxal process. Within the Colydiidae, all three genera would key out to Coxelini and resemble various coxeline genera, such as *Coxelus* Latreille and *Tarphius* Erichson. Larvae consistently associated with undescribed *Enhypnon* from Tasmania are also of the colydiid and not the tenebrionid type.

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