

Omicrini from Sulawesi Utara, Indonesia (Coleoptera : Hydrophilidae : Sphaeridiinae)*

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Abstract

A series of terrestrial Omicrini collected in Sulawesi during the Project Wallace expedition was studied. The recorded species belong to *Omicrogiton* d'Orchymont, *Paromicrus* Scott, *Aculomicrus* Smetana, *Noteropagus* d'Orchymont and to a new genus, *Stanmalcolmia*, for a new species: *S. sulawesensis*. Five new species of *Paromicrus* are described: *P. bicarinatus*, *P. flexus*, *P. punctulatus*, *P. scutulatus*, and *P. wallacei*. *Paromicrus bryanti* d'Orchymont, *P. championi* d'Orchymont and *P. scotti* d'Orchymont are redescribed; a key is given to the examined *Paromicrus*. A list of the known species of *Paromicrus* is given. *Aculomicrus* is new for the Oriental region, and *A. brendelli*, sp. nov. is described; a key to the known species of *Aculomicrus* is given. *Aculomicrus* is likely to be another example of trans-Pacific distribution and a discussion on its zoogeography is provided. The aedeagi and female ectodermal genitalia are figured for each species when they are available. The aedeagus of *A. pusio* Smetana, from Puerto Rico, is figured for the first time.

Introduction

Omicrini Smetana, 1975, are minute terrestrial Sphaeridiinae widespread in the tropical regions of the world. They live mostly among decaying matter (e.g. dead leaves and moist litter) and are best collected by sifting, particularly with Winkler-Moczarsky electors (Bameul 1992). Twelve genera are known (Hansen 1991), including one recently described (Bameul 1991), but the tribe has many still unknown taxa, including genera. They are relatively rare in museum collections since they are not well collected by 'traditional' entomological methods.

A very interesting short series of Omicrini, the first to be recorded from the island, has been collected in Sulawesi Utara, Indonesia, by the entomologists of the Project Wallace Expedition (January-December 1985), a joint project of The Royal Entomological Society of London and the Indonesian Institute of Sciences (Knight 1988). The material was collected in tropical rain forest and often at high altitude. Some specimens were collected in Malaise traps.

The Omicrini studied below are the first known from Sulawesi, and this paper must be considered only as a first contribution to the knowledge of the Omicrini of this island. The specimens studied belong to the genera *Omicrogiton* d'Orchymont, 1919, *Paromicrus* Scott, 1913, *Aculomicrus* Smetana, 1990, *Noteropagus* d'Orchymont, 1919, and to a new genus. Five new species of *Paromicrus* have been discovered and are described, and the opportunity is taken to redescribe two previously little-known Indonesian *Paromicrus*. One new species of *Aculomicrus* is also described and its discovery is of considerable importance since this genus was known previously from only three species from Central and South America. Some remarks are given about the taxonomy of the encountered taxa and some morphological details are also given about two known Neotropical *Aculomicrus*.

Some remarks are given at the end of this study about the trans-Pacific distribution of *Aculomicrus*, illustrated with examples from other groups of invertebrates.

Materials and Methods

The material examined in this study is deposited in the following collections:

- BMNH Department of Entomology, The Natural History Museum, London;
 CNC Canadian National Collections of Insects, Biosystematics Research Institute, Agriculture Canada, Ottawa;
 DEI Deutsches Entomologisches Institut, Eberswalde-Finow.

The following unusual abbreviations are used in the text: (!) indicates, in distribution lists, specimens seen by the author; (ex.) abbreviation of the Latin 'exemplar', indicating a specimen not sexed.

Specimens were relaxed in hot water. Their abdomens were carefully removed in water and dissected with fine needles. The aedeagi were examined on microscope slides in glycerol and drawn with a drawing apparatus mounted on a compound microscope. A permanent mount was made of each aedeagus in DMHF water-soluble resin on a plastic card, which was then placed under the specimen on the pin (Bameul 1990).

Female genitalia were examined following Carayon (1969). The abdomen is removed from the specimen with a fine needle, and put into a 5% KOH solution at the bottom of a glass tube. One or two drops of a saturated 0.7% solution of chlorazol black E dye (C. I. Nr. 30235) in 70% ethanol are then added to KOH and the liquid is carefully warmed for 3–5 min to 80–90°C. The abdomen is dissected in a dish in the warm solution. Female genitalia, stained dark blue, are then examined on a slide in a 0.88 M aqueous propanediol-1,2 solution isotonic to KOH solution, in the same way as the aedeagi.

The wings were gently dissected in water and unfolded in a warm solution of Amann's lactophenol. They were examined on microscope slides in lactophenol and drawn as above. They were mounted in DMHF on a plastic card under the specimens. The systematisation of the wing venation follows Malcolm (1981).

Genus *Omicrogiton* d'Orchymont

Omicrogiton d'Orchymont, 1919: 121–2.

Type species: *Omicrogiton insularis* d'Orchymont, 1919, by monotypy.

Omicrogiton insularis d'Orchymont

(Figs 1–3)

Omicrogiton insularis d'Orchymont, 1919: 122–3.

Material Examined

Sulawesi Utara: 1♀, Gng. Ambang F. R., nr Kotamobagu, lower montane forest, 1200 m, leaf litter, 18.i.1985; 3 ex., same locality, rotting figs, 24.iii.1985; 1 ex., Dumoga-Bone Natl Pk, lowland forest edge c. 200 m, banana leaf litter, Jan. 1985; 1 ex., same locality, lowland forest, 200–300 m, rotten wood, July 1985, Project Wallace Expedition (BMNH).

Male Genitalia

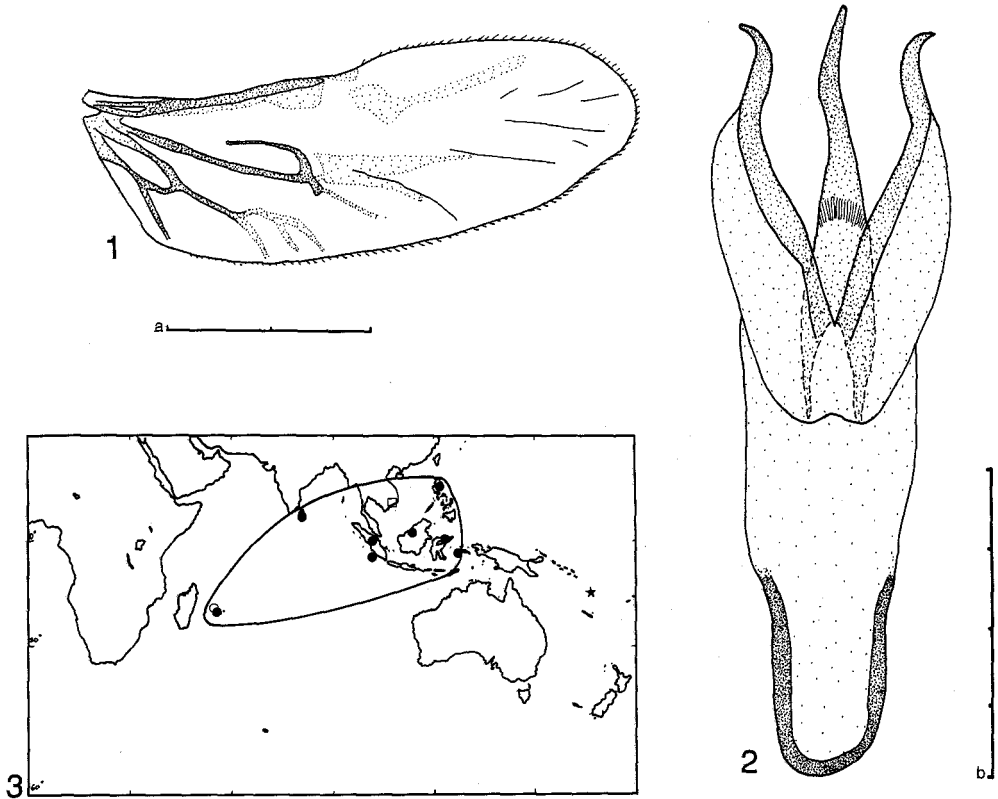
As in Fig. 2.

Distribution (Fig. 3)

Engano Island, south-west of Sumatra (d'Orchymont 1919); Luçon Island: Imugan (Philippines); Sumatra (d'Orchymont 1932); Buru Island, east of Sulawesi, Indonesia; Sarawak; Sri Lanka (d'Orchymont 1926) (!); Borneo (!); Mascarene Islands: La Réunion (Bameul 1986). New for Sulawesi. *O. insularis* is probably widespread in Indonesia and around the Indian Ocean.

Comments

The five specimens of *O. insularis* are somewhat smaller than specimens previously known from Sri Lanka and La Réunion; however, their aedeagi and external characters are similar.



Figs 1-3. *Omicrogiton* spp. *O. insularis* d'Orchymont: 1, wing; 2, aedeagus; 3, distribution map of *Omicrogiton* spp., ● and line, *O. insularis* d'Orchymont; ○, *O. gomyi* Bameul; □, *O. coomani* Balfour-Browne; ★, *O. cheesmanae* Balfour-Browne. Scale a, 1 mm; scale b, 0.1 mm.

The wing of an *Omicrogiton* (Fig. 1) is represented here for the first time. The venation is not reduced and the wing seems functional with veins Ra, M-Cu loop and V1, V2 and V3 vestigial. There is no jugal vein nor jugal lobe. This type of venation is quite similar to the venation in *Oreomicrus* Malcolm, 1980.

Genus *Paromicrus* Scott

Paromicrus Scott, 1913: 206-7.

Type species: *Paromicrus carinatus* Scott, 1913, by original designation.

Comments

The genus is well characterised (Scott 1913; Malcolm 1980, 1981; Hansen 1990, 1991) and can be identified with the keys by d'Orchymont (1919, 1928), Malcolm (1980, 1981) and Hansen (1990, 1991).

Malcolm (1981) believed the character of elytral margins explanate throughout their length to be generic, but some undescribed species do not present this character state (Hansen, personal communication, and personal observations). Female ectodermal genitalia of *Paromicrus* (Figs 10-13) appear to have a coil-shaped spermathecal duct: this character could be generic. The aedeagus (Figs 4-9) is trilobed, without a joint between distal lobes and phallobase. The wings (Fig. 35) have a cuneus cell open to margin, M-Cu loop vestigial, with veins Ra and M, and vestigial M2, M3, V2 and V3, and the jugal lobe absent.

Key to Examined Species of *Paromicrus*

1. Mesosternal apophysis with a longitudinal median single or geminate carina (Figs 22–26) ... 2
 Mesosternal apophysis with a transverse carina (Figs 27–29) 6
2. Mesosternal apophysis divided with a longitudinal central median carina throughout its length (Fig. 22); surface of pronotum strongly microreticulate on sides (Fig. 14); aedeagus with phallobase lanceolate at its base (Fig. 4); 1.525 mm (Sulawesi) *P. scutulatus*, sp. nov.
 Mesosternal apophysis divided with 2 geminate v- or u-shaped transverse median carinae (Figs 23–26); surface of pronotum not strongly microreticulate on sides (Figs 15–18); aedeagus without a lanceolate piece at the phallobase (Figs 5–7) 3
3. Mesosternal apophysis transverse (Fig. 23); pronotum with a small patch of large points near edges (Fig. 15); aedeagus as in Fig. 5; female ectodermal genitalia as in Fig. 10; 1.675 mm (Sulawesi) *P. bicarinatus*, sp. nov.
 Mesosternal apophysis longitudinal or as long as broad (Figs 24–26); pronotum without a distinct patch of large points near edges 4
4. Pronotum shining, smooth, without microsculpture (Fig. 16); mesosternal apophysis with a carina splitting into 2 branches forward, feebly elevated in lateral view (Fig. 24); aedeagus with concave parameres and with a circular gonopore (Fig. 6); female ectodermal genitalia with a reniform spermatheca (Fig. 11); 1.45 mm (Sulawesi) *P. wallacei*, sp. nov.
 Pronotum with a microsculpture (Figs 17–18); mesosternal apophysis with a median posterior elevation distinctly elevated in side view (Figs 25–26) 5
5. Pronotum with on each side a series of 5 large points to form a curve convex forward, its surface dull, densely and evenly micropunctate (Fig. 18); first (sutural) elytral interstria with 1 supernumerary row of small points in the scutellar region, doubling the interstitial row; mesosternal apophysis longitudinal, its sharp triangular elevation not higher than the level of the apophysis in side view (Fig. 26); female ectodermal genitalia with a large spherical spermatheca (Fig. 12); 1.70 mm (Sulawesi) *P. flexus*, sp. nov.
 Pronotum without a series of points on each side, only with large sparse points, its surface shining, not micropunctate but very finely wrinkled (Fig. 17); first elytral interstria without supernumerary row in the scutellar region; mesosternal apophysis as long as broad, with a distinct sharp triangular elevation, higher than the base of the apophysis in side view (Fig. 25); aedeagus with convex parameres and a rectangular gonopore (Fig. 7); 1.60 mm (Sulawesi) *P. punctulatus*, sp. nov.
6. Hind tibiae dilated (Fig. 32); mesosternal apophysis crossed before the middle by a fine transverse carina (Figs 28–29); surface of pronotum densely and very finely microstriolate and micropunctate (Figs 20–21); elytral interstriae with a secondary row of points about $\frac{1}{2}$ to $\frac{1}{3}$ the diameter of the main points (Fig. 34) 7
 Hind tibiae cylindrical, not dilated (Fig. 31); mesosternal apophysis crossed at the middle by a fine transverse sinuous carina (Fig. 27); surface of pronotum without microstriole, only densely micropunctate; elytral interstriae with a secondary row of small points about $\frac{1}{4}$ the diameter of the main points (Fig. 33); aedeagus with reduced tegmen, the median lobe truncate apically (Fig. 9); female ectodermal genitalia as in Fig. 13; 1.25–1.32 mm (Sumatra, Sulawesi) *P. scotti* d'Orchymont
7. Explanate sides of elytra gradually larger in posterior half; microstriolae of pronotum denser (Fig. 20); aedeagus with tegmen not reduced (Fig. 8); 1.325 mm (Sarawak)
 *P. championi* d'Orchymont
 Explanate sides of elytra evenly and finely explanate throughout their length; microstriolae of pronotum sparser (Fig. 21); 1.45 mm (Sarawak) *P. bryanti* d'Orchymont

The genus has been artificially and tentatively divided here into two groups on the basis of morphological differences of the mesosternal apophysis:

Group A, species with the mesosternal apophysis with a longitudinal bar, v- or u-shaped structure;

Group B, species with the mesosternal apophysis with a transverse bar.

Group A

Paromicrus scutulatus, sp. nov.

(Figs 4, 14, 22)

Material Examined

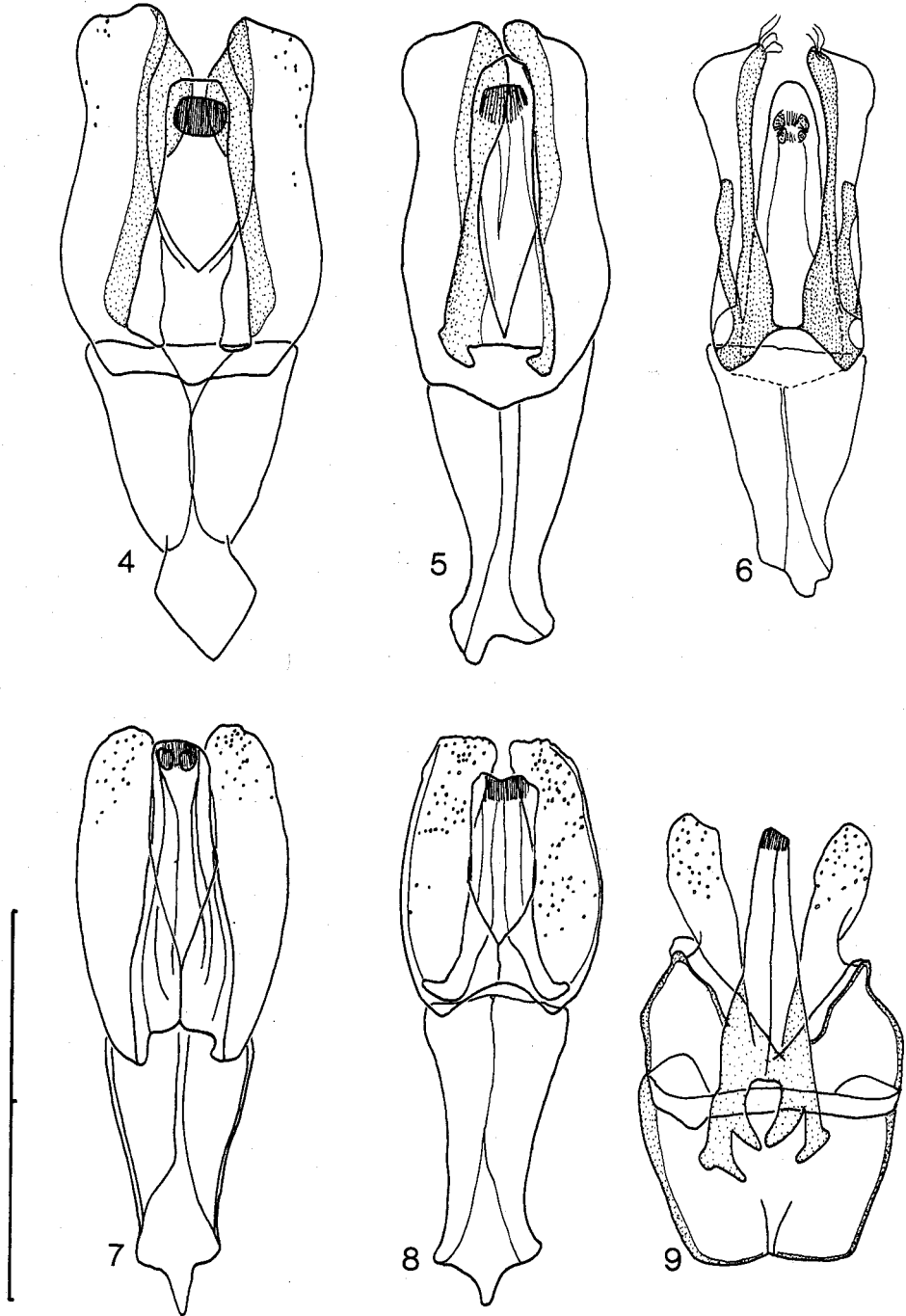
Holotype. ♂, Sulawesi Utara, Gng. Ambang F. R., nr Kotamobagu, Gng. Muajat summit area, c. 1780 m, leaf litter, 16.x.1985, Project Wallace Expedition (BMNH).

Paratype. 1♂, Sulawesi Utara, Gng. Ambang F. R., nr Kotamobagu, lower montane forest, 1200-1400 m, rotten log, 23-24.iii.1985, Project Wallace Expedition (BMNH).

Description

Male

Length: 1.525 mm; width: 1.025 mm. Oval, convex, ferrugineous, shining.



Figs 4-9. *Paromicrus* spp., aedeagi: 4, *P. scutulatus*, sp. nov.; 5, *P. bicarinatus*, sp. nov.; 6, *P. wallacei*, sp. nov.; 7, *P. punctulatus*, sp. nov.; 8, *P. championi* d'Orchymont, holotype; 9, *P. scotti* d'Orchymont, paratype. Scale, 0.2 mm.

Head. Ferruginous with labrum testaceous, with 2 angular emarginations; clypeus truncate, clypeus and frons shining, very finely and sparsely micropunctate, with very minute points; antennae yellow.

Pronotum. Ferruginous, shining, punctate, points medium sized and well impressed, separated by 2–3 × their diameter, smaller on disc; surface very finely wrinkled, microsculpture mainly visible under low-angled light, distinctly microreticulate on sides; sides (Fig. 14) not regularly rounded, finely and evenly margined.

Elytra. Ferruginous, shining, with 10 parallel rows of large shallow points finer on sutural first 2 rows, separated from each other by less than $\frac{1}{4}$ of their own diameter; points of last row huge, about 1.5 × larger than discal points; interstriae convex, convexity making points appear larger and shallower, interstriae flat with 1 secondary row of minute but well visible points of about half the diameter of main points; sutural stria obsolete; surface smooth, shining; sides evenly margined and finely explanate.

Underside. Orange to ferruginous, microreticulate; genae and gula microreticulate; labial palpi with long yellow hair-like setae. Prosternum microreticulate, diamond-shaped, strongly elevated anteriorly, with short median tooth on hind edge. Mesosternal apophysis larger than long, margined anteriorly, with central median carina dividing plate throughout its length (Fig. 22) elevated in lateral view. Metasternum evenly microreticulate, except pentagonal median shelf which is smooth and shining with scattered badly impressed medium points; metasternum with median posterior longitudinal impression throughout half of length. Legs smooth, with femora not covered by setae, finely punctate; hind tibiae nearly cylindrical, not distinctly enlarged. Abdomen microreticulate and covered by dense short yellow setae. Wings present.

Male genitalia. As in Fig. 4, with the median lobe truncate apically, distinctly shorter than parameres, parameres dilated at base and at top, phallobase as long as parameres, diamond-shaped at its base.

Female

Unknown.

Etymology

The name is from the Latin 'scutulatus', diamond-shaped, in reference to the shape of the proximal part of the phallobase of the aedeagus.

Paromicrus bicarinatus, sp. nov.

(Figs 5, 10, 15, 23, 30, 33)

Material Examined

Holotype. ♂, Sulawesi Utara, Dumoga-Bone Natl Pk, 'Clarke' camp, lower montane forest, 1140 m, leaf litter, Oct. 1985, Project Wallace Expedition (BMNH).

Paratypes. 1♂, 1♀, Sulawesi Utara, Gng. Ambang F. R., nr Kotamobagu, lower montane forest, c. 1400 m, leaf litter, Jan. 1985, Project Wallace Expedition (BMNH).

Description

Male

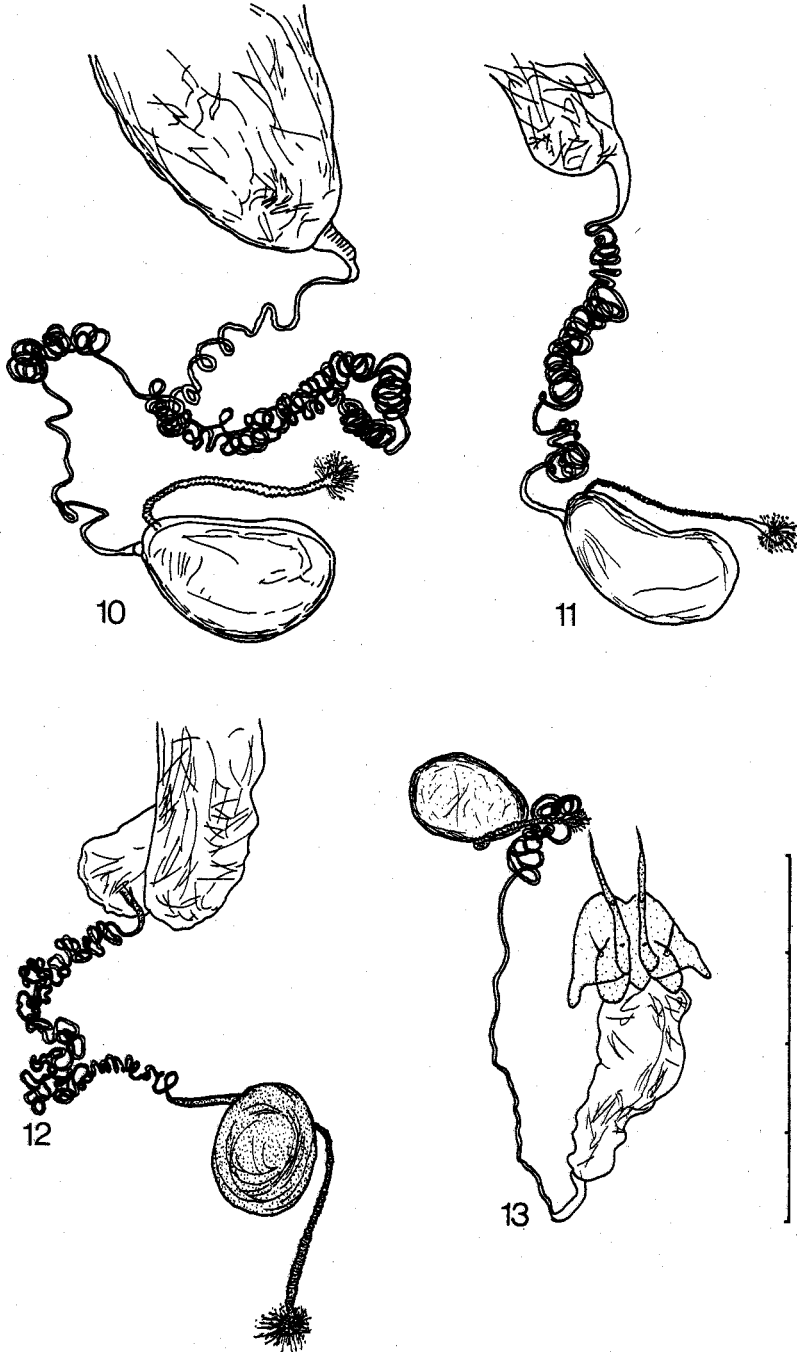
Length: 1.675 mm; width: 1.075 mm. Broadly oval, convex, orange to ferruginous, shining.

Head. Ferruginous with labrum orange, with 2 emarginations; clypeus truncate, orange, dull, microreticulate, with very fine meshes; frons smooth, with surface very finely and sparsely micropunctate; antennae yellow with darker club.

Pronotum. Ferruginous, shining, with the surface very finely and sparsely micropunctate, with points more sparse than on frons, with little patch of larger points near

edges; sides (Fig. 15) not regularly rounded, finely margined, the margins broadening in front half.

Elytra. Ferruginous, shining, with 10 parallel rows of large and shallow points separated from each other by $\frac{1}{4}$ of their own diameter; interstriae flat with 1 secondary row of minute but well visible points of about $\frac{1}{4}$ the diameter of main points (Fig. 33);



Figs 10-13. *Paromicrus* spp., female ectodermal genitalia: 10, *P. bicarinatus*, sp. nov.; 11, *P. wallacei*, sp. nov.; 12, *P. flexus*, sp. nov.; 13, *P. scotti* d'Orchymont. Scale, 0.4 mm.

first (sutural) interstria with 1 supernumerary row of small points in scutellar region, doubling interstitial row; sutural stria present in apical quarter, very fine; surface smooth, shining; sides explanate, mainly in hind quarter.

Underside. Orange to ferrugineous, microreticulate; genae and gula microreticulate; labial palpi with long yellow hair-like setae. Prosternum microreticulate, diamond-shaped, strongly elevated anteriorly, with short median tooth on hind edge. Mesosternal apophysis transverse, margined anterolaterally, with 2 nearly parallel median carinae, forming V-shaped structure in ventral aspect (Fig. 23), and short elevated carina in lateral view. Metasternum microreticulate, with pentagonal median shelf covered by short scattered setae, and with a median posterior oval-like area without setae, shining. Legs with femora smooth, not covered by setae nor microsculpture; hind tibiae nearly cylindrical, not distinctly enlarged (Fig. 30). Abdomen covered by dense short yellow setae. Wings present but reduced.

Male genitalia. As in Fig. 5, with median lobe shorter than parameres; parameres asymmetrical, concave near their middle; phallobase cup-shaped.

Female

Ectodermal genitalia. As in Fig. 10, with very long coil-shaped spermathecal duct, duct of spermathecal gland as long as spermatheca ($L = 104 \mu\text{m}$), spermatheca bean-shaped ($L = 100 \mu\text{m}$; $l = 61 \mu\text{m}$).

Etymology

The name means that this new species bears two carinae on its mesosternal apophysis.

Paromicrus wallacei, sp. nov.

(Figs 6, 11, 16, 24, 35)

Material Examined

Holotype. ♂, Sulawesi Utara, Gng. Ambang F. R., nr Kotamobagu, 1300 m, rotten log, 17.ii.1985, Project Wallace Expedition (BMNH).

Paratypes. 1♀, Sulawesi Utara, Gng. Ambang F. R., nr Kotamobagu, Gng. Muajat summit area, c. 1780 m, leaf litter, 16.ix.1985; 1♂, 3 ex., Dumoga-Bone Natl Pk, G. Mogogonipa summit, 1008 m, leaf litter, Sept. 1985; 1 ex., Dumoga-Bone Natl Pk, lowland forest, 200–300 m, leaf litter, Sept. 1985; all from Project Wallace Expedition (BMNH).

Description

Male

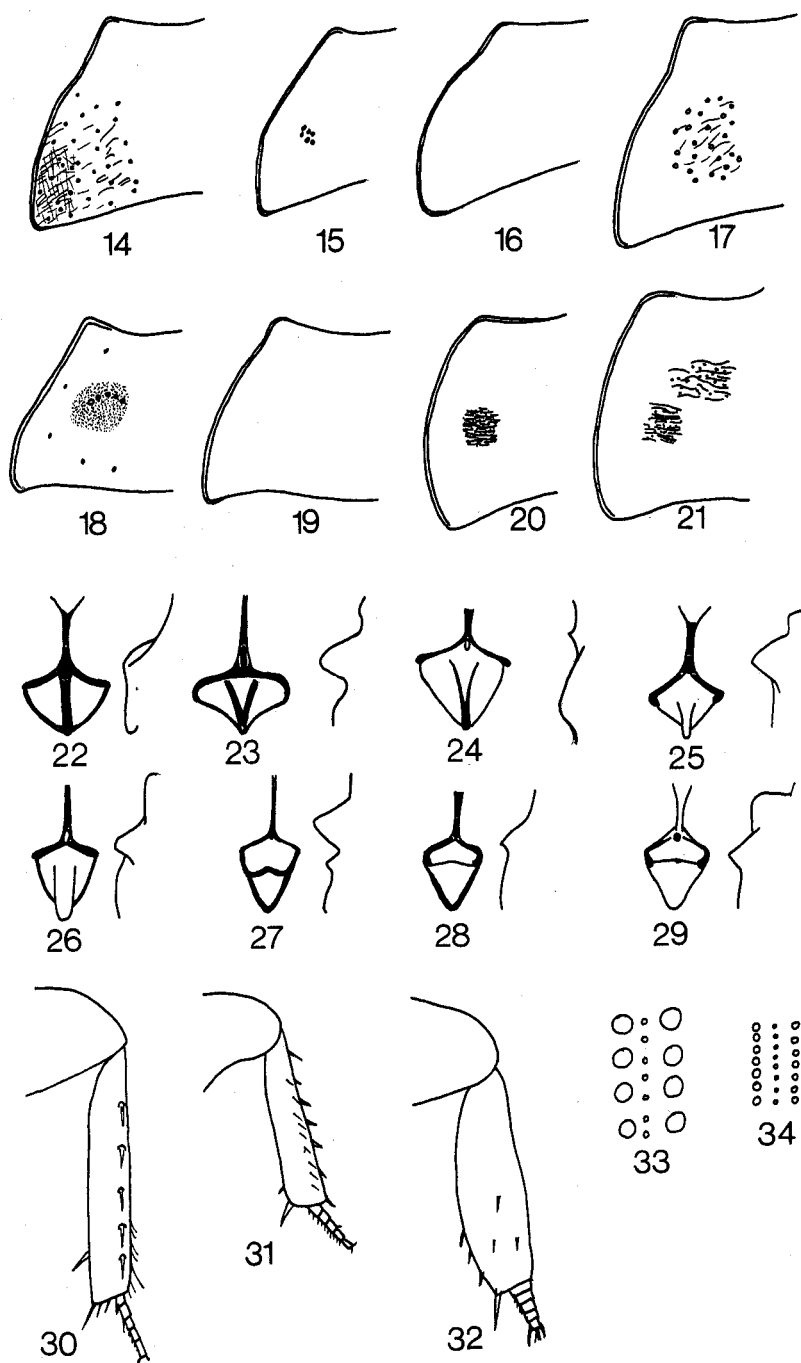
Length: 1.45 mm; width: 0.80 mm. Oval, convex, ferrugineous, shining.

Head. Ferrugineous with labrum testaceous, with 2 angular emarginations; clypeus truncate, clypeus and frons ferrugineous, shining, very finely and sparsely micropunctate, with very minute points; antennae yellow.

Pronotum. Ferrugineous, shining, as on head; sides (Fig. 16) regularly rounded, finely and evenly margined.

Elytra. Ferrugineous, shining, with 10 parallel rows of large shallow points finer on rows 1 and 2, separated from each other by less than $\frac{1}{4}$ of their own diameter; points of last row huge, about $2 \times$ larger than discal points; interstriae flat with 1 secondary row of minute but clearly visible points of about $\frac{1}{4}$ the diameter of main points; sutural stria obsolete; surface smooth, shining; sides evenly margined and almost not explanate.

Underside. Orange to ferrugineous, microreticulate; genae and gula microreticulate; labial palpi with long yellow hair-like setae. Prosternum microreticulate, diamond-shaped, strongly elevated anteriorly, with short median tooth on hind edge. Mesosternal apophysis longitudinal, margined anteriorly, with a central median posterior carina splitting into 2 branches forward (Fig. 24) only feebly elevated in lateral view. Metasternum evenly micro-



Figs 14-34. *Paromicrus* spp., side of the pronotum: 14, *P. scutulatus*, sp. nov.; 15, *P. bicarinatus*, sp. nov.; 16, *P. wallacei*, sp. nov.; 17, *P. punctulatus*, sp. nov.; 18, *P. flexus*, sp. nov.; 19, *P. scotti* d'Orchymont; 20, *P. championi* d'Orchymont; 21, *P. bryanti* d'Orchymont. *Paromicrus* spp., mesosternal apophysis; left, sternal view; right, profile view: 22, *P. scutulatus*, sp. nov.; 23, *P. bicarinatus*, sp. nov.; 24, *P. wallacei*, sp. nov.; 25, *P. punctulatus*, sp. nov.; 26, *P. flexus*, sp. nov.; 27, *P. scotti* d'Orchymont; 28, *P. championi* d'Orchymont; 29, *P. bryanti* d'Orchymont. *Paromicrus* spp., hind tibiae and tarsi: 30, *P. bicarinatus*, sp. nov.; 31, *P. flexus*, sp. nov.; 32, *P. championi* d'Orchymont. *Paromicrus* spp., elytral punctation: 33, *P. bicarinatus*, sp. nov.; 34, *P. championi* d'Orchymont.

reticulate, except pentagonal median shelf smooth, very finely and sparsely micropunctate, shining, and covered by short scattered setae beneath, with short median posterior notch. Legs smooth, shining, very finely micropunctate, femora glabrous; hind tibiae nearly cylindrical, not distinctly enlarged. Abdomen covered by dense short yellow setae. Wings present (Fig. 35).

Male genitalia. As in Fig. 6, with median lobe rounded apically, sides converging regularly from base to apex; parameres dilated in apical region, with tuft of short setae apically and sclerotised process along internal edge, this divided in basal half.

Female

Ectodermal genitalia. As in Fig. 11, with long coil-shaped spermathecal duct, attached to bursa copulatrix by a horn-like process; spermatheca reniform ($L = 93 \mu\text{m}$; $l = 45 \mu\text{m}$), duct of spermathecal gland nearly as long as spermatheca ($L = 79.5 \mu\text{m}$).

Etymology

This new *Paromicrus* is named after the great naturalist Alfred Russel Wallace and the Project Wallace Expedition.

Paromicrus flexus, sp. nov.

(Figs 12, 18, 26, 31)

Material Examined

Holotype. ♀, Sulawesi Utara, Dumoga-Bone Natl Pk, 'Edwards' camp, lowland forest, 664 m, Malaise trap, 26.iv-7.vi.1985, Project Wallace Expedition (BMNH).

Description

Female

Length: 1.70 mm; width: 1.10 mm. Broadly oval, convex, ferrugineous to darkly ferrugineous, shining.

Head. Ferrugineous with labrum orange, with 2 angular anterior emarginations on labrum; clypeus truncate, orange, dull, strongly micropunctate, with points very fine and dense; frons darkened, with median paler spot, with surface strongly and evenly micropunctate; antennae yellow with darker club.

Pronotum. Ferrugineous, dull, with surface strongly and evenly micropunctate, with very fine and dense micropunctuation mostly visible at *c.* $\times 160$, and a secondary punctuation with very sparse large points about 4 to 5 \times larger than background micropunctuation, on each side with series of 5 large and well-impressed points to form convex curve forward; sides (Fig. 18) not regularly rounded, finely and evenly margined.

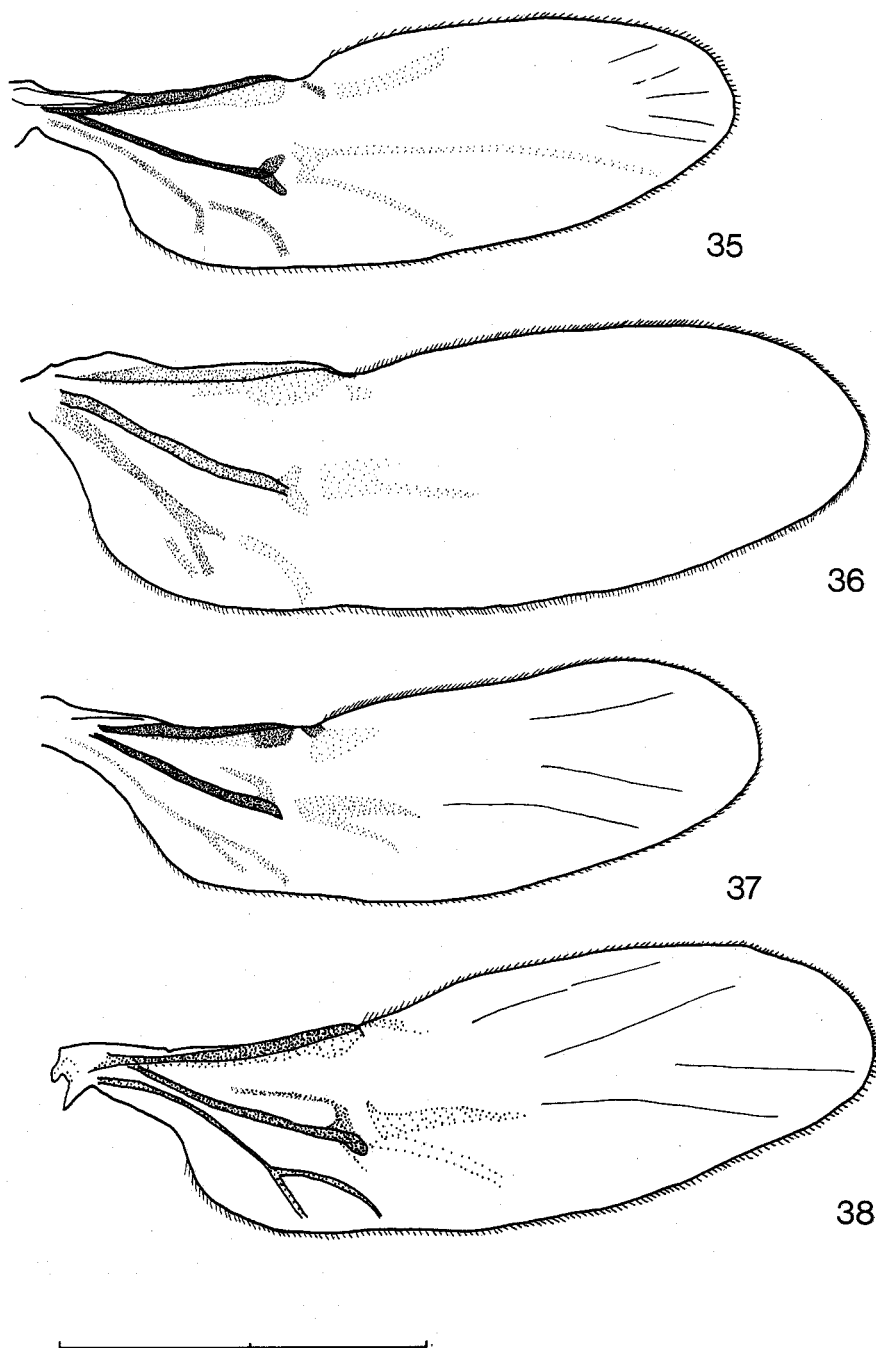
Elytra. Ferrugineous, shining, with 10 parallel rows of shallow points widening progressively from suture to sides and separated from each other by $\frac{1}{4}$ of their own diameter; interstriae flat with 1 secondary row of minute but clearly visible points of about $\frac{1}{4}$ the diameter of main points; first (sutural) interstria with 1 surnumerary row of small points in scutellar region, doubling interstitial row; sutural stria present in last quarter of length, very fine; surface smooth, shining; sides explanate, mainly in hind quarter.

Underside. Orange to ferrugineous, microreticulate; genae and gula microreticulate; labial palpi with long yellow hair-like setae. Prosternum microreticulate, diamond-shaped, strongly elevated anteriorly, with short median tooth on hind edge. Mesosternal apophysis longitudinal, margined anteriorly, with median posterior elevation (Fig. 26), forming short elevated carina in lateral view. Metasternum evenly microreticulate, including pentagonal median shelf covered by short scattered setae, with small median posterior oval depression. Legs microreticulate, with femora glabrous; hind tibiae nearly cylindrical, not distinctly enlarged (Fig. 31). Abdomen covered by dense short yellow setae. Wings present.

Female ectodermal genitalia. As in Fig. 12, with large rounded spermatheca ($L = 66 \mu\text{m}$; $l = 52 \mu\text{m}$), long spermathecal duct coil-shaped throughout length, and a long spermathecal gland duct ($L = 98 \mu\text{m}$).

Male

Unknown.



Figs 35-38. Wings of: 35, *Paromicrus wallacei*, sp. nov.; 36, *Stannalcolmia sulawesiensis*, gen. nov., sp. nov.; 37, *Aculomicrus pusio* Smetana; 38, *A. brendelli*, sp. nov. Scale, 1 mm.

Etymology

The name is derived from the Latin 'flexus', curve, in reference to the curved short line of points on each side of the pronotum.

Paromicrus punctulatus, sp. nov.

(Figs 7, 17, 25)

Material Examined

Holotype. ♂, Sulawesi Utara, Gng. Ambang F. R., nr Kotamobagu, lower montane forest, 1400-1600 m, rotten log, 23-24.iii.1985, Project Wallace Expedition (BMNH).

*Description**Male*

Length: 1.60 mm; width: 1.025 mm. Broadly oval, convex, ferrugineous to darkly ferrugineous, dull.

Head. Ferrugineous with labrum orange, with 2 angular emarginations; clypeus truncate, orange, dull, strongly microreticulate; frons densely micropunctate, points of two sizes: main points very fine, separated by 2 to 3 × their diameter; the background micropunctuation dense, with points microscopic, about 5 × finer than main points, mainly visible at ×80; antennae yellow.

Pronotum. Ferrugineous, shining, punctate, points medium sized and well impressed, separated by 2 to 3 × their diameter; surface very finely wrinkled, microsculpture mainly visible under low-angled light; sides (Fig. 17) not regularly rounded, finely and evenly margined.

Elytra. Ferrugineous, shining, with 10 parallel rows of large shallow points finer on first two sutural rows, separated from each other by less than $\frac{1}{4}$ of their own diameter; points of last row huge, about 1.5 × larger than discal points; interstriae flat with 1 secondary row of minute but well visible points of about $\frac{1}{4}$ the diameter of main points; sutural stria obsolete; surface smooth, shining; sides subparallel from humeral region to last quarter of their length, evenly margined and almost not explanate.

Underside. Orange to ferrugineous, microreticulate; genae and gula microreticulate; labial palpi with long yellow hair-like setae. Prosternum microreticulate, diamond-shaped, strongly elevated anteriorly, with short median tooth on hind edge. Mesosternal apophysis transverse, margined anteriorly, with median posterior elevation (Fig. 25), forming short elevated carina in lateral view. Metasternum evenly microreticulate, except pentagonal median shelf smooth and shining with scattered badly impressed medium points, with median posterior longitudinal impression throughout half of length. Legs smooth, with femora not covered by setae, finely punctate; hind tibiae nearly cylindrical, not distinctly enlarged. Abdomen microreticulate and covered by dense short yellow setae. Wings present.

Male genitalia. As in Fig. 7, with median lobe truncated apically, dilated in proximal half, parameres regularly rounded, phallobase shorter than parameres.

Female

Unknown.

Etymology

The name is derived from the Latin 'punctulatus', covered by small points.

Group B*Paromicrus scotti* d'Orchymont

(Figs 9, 13, 19, 27)

Paromicrus scotti d'Orchymont, 1919: 128-9.*Material Examined*

Paratypes. 1♂, 1♀, Sumatra, Engano Island, labelled 'Engano, Malaconni, Modigliani, VI. 1891'/'Coll. Deuts. Ent. Mus.'/'a. d'orchymont det. [underlined], *Paromicrus Scotti*, Orch. Co-types [underlined] (2)/'Coll. DEI, Eberswalde' [yellow label] (DEI).

Additional material. 2♀, Sulawesi Utara, Dumoga-Bone Natl Pk, lowland forest c. 200 m, logs and trunks, Jan. 1985; 1♀, same locality, lowland forest 200-300 m, fallen tree, Oct. 1985; 1♂, same locality, Plot A, c. 200 m, lowland forest, under bark, Nov. 1985; all from Project Wallace Expedition (BMNH).

*Redescription**Male*

Length: 1.25-1.32 mm; width: 0.75-0.90 mm. Oval, convex, ferrugineous, shining.

Head. Ferrugineous with labrum testaceous, with 2 angular emarginations; clypeus truncate, orange, dull, strongly micropunctate, with points very fine and dense; frons ferrugineous, with surface strongly and evenly micropunctate; antennae yellow.

Pronotum. Ferrugineous, dull, with surface strongly and evenly micropunctate, with very fine and dense micropunctuation mostly visible at c. $\times 80$, the points separated by 1 to 2 \times their diameter; sides (Fig. 19) regularly rounded, finely and evenly margined.

Elytra. Ferrugineous, shining, with 10 parallel rows of large shallow points finer on sutural area, and separated from each other by $\frac{1}{4}$ of their own diameter; interstriae flat with 1 secondary row of minute but well visible points of about $\frac{1}{4}$ the diameter of main points; sutural stria obsolete, consisting of short longitudinal depression in apical region; surface smooth, shining; sides evenly explanate.

Underside. Orange to ferrugineous, microreticulate; genae and gula microreticulate; labial palpi with long yellow hair-like setae. Prosternum microreticulate, diamond-shaped, strongly elevated anteriorly, with short median tooth on hind edge. Mesosternal apophysis longitudinal, margined anterolaterally, crossed in middle by fine transversal sinuous carina (Fig. 27), with short triangular-shaped elevated carina in lateral view. Metasternum evenly microreticulate, except pentagonal median shelf smooth, shining and covered by long scattered setae beneath, with median posterior oval depression. Legs smooth, shining, femora not covered by setae; hind tibiae nearly cylindrical, not distinctly enlarged. Abdomen covered by dense short yellow setae. Wings present.

Male genitalia. As in Fig. 9, showing a peculiar shape, with characteristic reduced and lobed parameres, median lobe truncate apically and phallobase reduced.

Female

Ectodermal genitalia. As in Fig. 13, with large oval spermatheca ($L = 135 \mu\text{m}$; $l = 95 \mu\text{m}$), and very long spermathecal duct coil-shaped only in distal fifth part; duct of spermathecal gland: $L = 125 \mu\text{m}$. The genitalia of *P. scotti* are figured here for the first time.

Distribution

Sumatra: Engano Island; Sulawesi. *P. scotti* is new for Sulawesi.

Paromicrus bryanti d'Orchymont

(Figs 21, 29)

Paromicrus bryanti d'Orchymont, 1925a: 161-2.

Material Examined

Holotype. ♀, Sarawak, labelled: 'Mt. Matang, W. Sarawak. [yellow line], G. E. Bryant., 2.1914'/'G. Bryant Coll., 1919-147'/'Type' [round label red-circled]/'A. d'Orchym. det., Paromicrus Bryanti sp.n.' [in handwriting]/'TYPE' [in handwriting]/'♀' (BMNH).

*Redescription**Female*

Length: 1.45 mm; width: 0.95 mm. Oval-oblong, convex, ferrugineous, shining.

Head. Ferrugineous with labrum testaceous, with 2 angular emarginations; clypeus truncate, orange, dull, strongly and very finely micropunctate and microstriolate, striolae dense and points microscopic; frons ferrugineous, with surface strongly and finely microstriolate and micropunctate like on clypeus; antennae yellow.

Pronotum. Ferrugineous, dull, with surface strongly and very finely microstriolate and micropunctate, striolae long, transverse, with microscopic punctures sitting between striolae; sides (Fig. 21) regularly rounded, finely and evenly margined.

Elytra. Ferrugineous, shining, with 10 parallel rows of medium sized shallow points finer on sutural area, and separated from each other by $\frac{1}{4}$ of their own diameter; interstriae flat with 1 secondary row of minute but well visible points of about half the diameter of main points; first (sutural) interstria with 1 supernumerary row of small points in scutellar region, doubling the interstitial row; sutural stria obsolete, consisting of short longitudinal depression in apical region; surface smooth, shining; sides finely explanate throughout length.

Underside. Orange to ferrugineous, microreticulate; genae and gula microreticulate; labial palpi with long yellow hair-like setae. Prosternum microreticulate, diamond-shaped, strongly elevated anteriorly, with short median tooth on hind edge. Mesosternal apophysis longitudinal, badge-shaped, finely margined anteriorly, crossed before middle by fine transversal carina (Fig. 29), with short triangular-shaped elevated carina in lateral view. Metasternum evenly microreticulate, except pentagonal median shelf smooth, very finely and sparsely micropunctate, shining, with some scattered setae beneath, with median posterior oval depression. Legs smooth, shining, finely microreticulate, meshes long, femora not covered by setae; hind tibiae dilated, distinctly enlarged. Abdomen covered by dense short yellow setae. Wings present.

Male

Unknown.

Distribution

P. bryanti is known only from Sarawak. See the comments following the description of *P. championi*.

Paromicrus championi d'Orchymont

(Figs 8, 20, 28, 34)

Paromicrus Championi d'Orchymont, 1925a: 162-3.

Material Examined

Holotype. ♂, Sarawak, labelled: 'Mt. Matang, W. Sarawak [yellow line], G. E. Bryant., 16-30.1.14'/'G. Bryant Coll., 1919-147'/'Type' [round red-circled]/'A. d'Orchymont det., Paromicrus Championi d'Orchymont' [in handwriting]/'TYPE' [in handwriting]/'♂' (BMNH).

*Redescription**Male*

Length: 1.325 mm; width: 0.85 mm. Oval-oblong, convex, ferrugineous, shining.

Head. Ferruginous with labrum testaceous, with 2 angular emarginations; clypeus truncate, orange, dull, strongly and very finely micropunctate and microstriolate, striolae dense and points microscopic; frons ferruginous, with surface strongly and finely microstriolate and micropunctate like on clypeus; antennae yellow.

Pronotum. Ferruginous, dull, with surface strongly and very finely microstriolate and micropunctate, striolae shortened, transverse, with microscopic punctures sitting between short striolae; sides (Fig. 20) regularly rounded, finely and evenly margined.

Elytra. Ferruginous, shining, with 10 parallel rows of medium sized shallow points, separated from each other by $\frac{1}{4}$ of their own diameter; first and second striae with points obsolete in posterior half; interstriae flat with 1 secondary row of minute but well visible points of about $\frac{1}{3}$ the diameter of main points (Fig. 34); first (sutural) interstria with 1 supernumerary row of small points in scutellar region, doubling interstitial row; sutural stria obsolete, consisting of short longitudinal depression in apical region; surface smooth, shining; sides finely explanate, explanation progressively larger in posterior half.

Underside. Orange to ferruginous, microreticulate; genae and gula microreticulate; labial palpi with long yellow hair-like setae. Prosternum microreticulate, diamond-shaped, strongly elevated anteriorly, with short median tooth on hind edge. Mesosternal apophysis longitudinal, badge-shaped, finely margined anteriorly, crossed before middle by fine transversal carina (Fig. 28), with short triangular-shaped feebly elevated carina in lateral view. Metasternum evenly microreticulate, except the pentagonal median shelf strongly elevated in its posterior half with nearly vertical edges, its surface smooth, shining, very finely and sparsely micropunctate, with some scattered setae beneath, with median posterior oval depression. Legs smooth, shining, finely microreticulate, meshes long, femora not covered by setae; hind tibiae dilated, distinctly enlarged (Fig. 32). Abdomen covered by dense short yellow setae. Wings present.

Male genitalia. As in Fig. 8, with median lobe shorter than parameres, truncated and concave apically, parameres regularly rounded at sides, phallobase longer than parameres.

Female

Unknown.

Distribution

P. championi is only known from Sarawak.

Comments

P. bryanti d'Orchymont and *P. championi* d'Orchymont are very similar, and since they are known from only a single female of the first and larger species and a single male of the second and smaller species taken in the same locality, it could be that they belong to the same species. They are nearly identical in the shapes of their mesosternal apophysis and have comparable dilated hind tibiae, both of which are considered to be specific characters. However, the density and length of the microstriolae covering their pronotum are different, the striolae being sparser in *P. bryanti*, and the lateral explanation of the elytra appears more developed in *P. championi*. These last differences may be only a consequence of individual variation or sexual dimorphism, but since we lack new material from Sarawak, it is wiser to keep the two taxa separated.

List of the Known Species of *Paromicrus* Scott

- | | |
|---|--------------------|
| 1. <i>P. affinis</i> d'Orchymont, 1919 | Japan |
| 2. <i>P. annandalei</i> d'Orchymont, 1919 | India, Abor count. |
| 3. <i>P. atomus</i> Scott, 1913 | Seychelles |
| 4. <i>P. bicarinatus</i> Bameul, 1993 | Sulawesi |
| 5. <i>P. bryanti</i> d'Orchymont, 1925a | West Sarawak |
| 6. <i>P. carinatus</i> Scott, 1913 | Seychelles |

- | | | |
|-----|---|---------------------|
| 7. | <i>P. carolinae</i> d'Orchymont, 1919 | Engano I. |
| 8. | <i>P. championi</i> d'Orchymont, 1925a | Sarawak |
| 9. | <i>P. flexus</i> Bameul, 1993 | Sulawesi |
| 10. | <i>P. punctulatus</i> Bameul, 1993 | Sulawesi |
| 11. | <i>P. scotti</i> d'Orchymont, 1919 | Engano I., Sulawesi |
| | 'var'. <i>denseseriatum</i> d'Orchymont, 1925b* | Borneo |
| 12. | <i>P. scutulatus</i> Bameul, 1993 | Sulawesi |
| 13. | <i>P. thomasseti</i> Scott, 1913 | Seychelles |
| 14. | <i>P. wallacei</i> Bameul, 1993 | Sulawesi |

*The taxonomic status of *P. scotti* 'var.' *denseseriatum* d'Orchymont is not yet fixed.

Genus *Stanmalcolmia*, gen. nov.

Type species: *Stanmalcolmia sulawesiensis*, sp. nov., by present designation.

Description

Form strongly convex in side view. Head pentagonal, transverse, with maximum width at top of eyes; antennal bases visible from above; eyes small, appearing to sit on angular lateral prominences of head; Y-suture obsolete; mentum only slightly broader than long; antennae (Fig. 42) 9-segmented (6+3), intermediate segments minute, club elongate oval, compact; ligula and labial palpi with hair-like dense yellow setae; maxillary palpi with second segment dilated, third segment shorter than fourth; fourth segment slender, pointed at tip; head incapable of retraction within prothorax, rotation downward possible so head might be hardly visible from above. Prosternum (Fig. 43) extremely short in front of procoxae, reduced to a narrow vertical bar; mid-prosternum raised as a flat triangular plate; antennal excavations indistinctly defined, antennal clubs when retracted fitted against vertical face of prosternum in front of procoxae. No pro- or mesosternal devices to lock or orient segments. Mesosternum (Fig. 44) posteromedially finely carinate and with a very short and small laminate projection in front of mesocoxae, without pentagonal apophysis; mesocoxae contiguous. Metasternum (Fig. 44) projecting between mesocoxae; metepisterna not narrowed; metasternal grooves, ridges and femoral lines absent; midmetasternum triangular, moderately raised. Elytra with rows of punctures, striate, without sutural stria; epipleura strongly developed throughout. Tarsi 5-segmented (5-5-5), bearing sparse short setae beneath; first hind tarsomere as long as second, both of similar diameter; last tarsomere as long as 2nd, 3rd and 4th tarsomere together; profemoral bases angulate at point of trochanteral attachment. Abdomen with 5 visible sternites; first sternite longitudinally carinate. Aedeagus (Fig. 39) of trilobed type, without joint between distal lobes and phallobase. Female ectodermal genitalia (Fig. 41) with long coil-shaped spermathecal duct, without sclerotised part in bursa copulatrix. Wings (Fig. 36) with venation extremely reduced, Ra and M only present, M-Cu loop absent, with only beginning of cubital vein, and vestigial M3, V2 and V3, jugal lobe and jugal vein absent.

Habitat

Terrestrial, living among decaying organic debris (see under the description of the type species).

Comments

Stanmalcolmia is classified among the Omicrini on the basis of its head being strongly explanate laterally, depressed and abruptly narrowed in front of the eyes, and its mandibles very small, reduced to a membraneous apex. In the keys of Malcolm (1981) and Hansen (1991), *Stanmalcolmia* is difficult to classify. In its highly convex body, the prosternum reduced to a narrow vertical bar, the 9-segmented antennae, the contiguous mesocoxae and very convex elytral interstriae, it is reminiscent of *Litrosurus* d'Orchymont, 1925b, a genus known only from a single species, *L. insolitus* d'Orchymont, 1925b, described from Borneo. However, *Litrosurus* has a pentagonal mesosternal apophysis while the mesosternum

of *Stanmalcolmia* has a short posteromedian carina with a short lamina extending between the mesocoxae. This character is shared with *Heteryon* Sharp, 1882, from Mexico, *Omicrogiton* d'Orchymont, 1919, from the Oriental region, and *Oreomicrus* Malcolm, 1980, described from Borneo, in which the drawing of the underside (Malcolm 1980) is similar to that of *Stanmalcolmia sulawesiensis*: their meso- and metasternum and their legs are identical in shape. The convex discal interstriae of *S. sulawesiensis* are more or less reminiscent of the six discal elytral carinae of *O. explanatus* Malcolm, 1980.

Stanmalcolmia differs from *Heteryon* Sharp in its 9-segmented antennae (8-segmented in *Heteryon*), the prosternum with a triangular median apophysis (carinate in *Heteryon*), and the carinate first abdominal sternum.

Stanmalcolmia differs from *Omicrogiton* d'Orchymont in the prosternum with a triangular median apophysis (tectiform in *Omicrogiton*), the wing venation and form (the cubito-anal veins are well developed in *Omicrogiton*), and the first carinate abdominal sternum.

The genus differs from *Oreomicrus* Malcolm in its 9-segmented antennae (8-segmented in *Oreomicrus*), the prosternum with a triangular median apophysis (without median apophysis in *Oreomicrus*), the wing venation and form (the cubito-anal and the M4 veins are well developed in *Oreomicrus*) and the carinate first abdominal sternum (not carinate in *Oreomicrus*).

If one uses only the mesosternum character in Malcolm's key (1981), *Stanmalcolmia* appears to be close to the apparently very distinct *Paromicrus* Scott, 1913. While the mesosternum of *Paromicrus*, with a more or less triangular apophysis, is very different from the mesosternum of *Stanmalcolmia*, the two genera share some characters. Both genera have similar shaped wings and reduced venation in the cubito-anal region. The aedeagus of *S. sulawesiensis* has a similarly shaped median lobe, parameres and phallobase to *Paromicrus scotti* d'Orchymont, 1919. The long coil-shaped spermathecal duct of *Paromicrus* species is also present in the female genitalia of *S. sulawesiensis*.

My tentative cladistic analysis of the known genera of Omicrini with HENNIG86 V.1.5 software (Farris 1988) shows that *Stanmalcolmia* is likely to be related to both *Litrosurus* and *Paromicrus* rather than to any other genera. However, the relationships between the genera of Omicrini are not fully known and need further examination to identify the real affinities of *Stanmalcolmia*.

Stanmalcolmia keys to *Litrosurus* in Hansen (1991).

Etymology

The new genus is dedicated to the American entomologist, Stanley E. Malcolm, whose excellent works in the 1980s were a new start for research on the taxonomy and phylogeny of Sphaeridiinae and Omicrini. Gender: feminine.

Stanmalcolmia sulawesiensis, sp. nov.

(Figs 36, 39-44)

Material Examined

Holotype. ♂, Sulawesi Utara, Dumoga-Bone Natl Pk, Wein camp, Gunung Poniki, old log, 21-26.x.1985, Project Wallace Expedition (BMNH).

Paratype. 1♀, same data as holotype (BMNH).

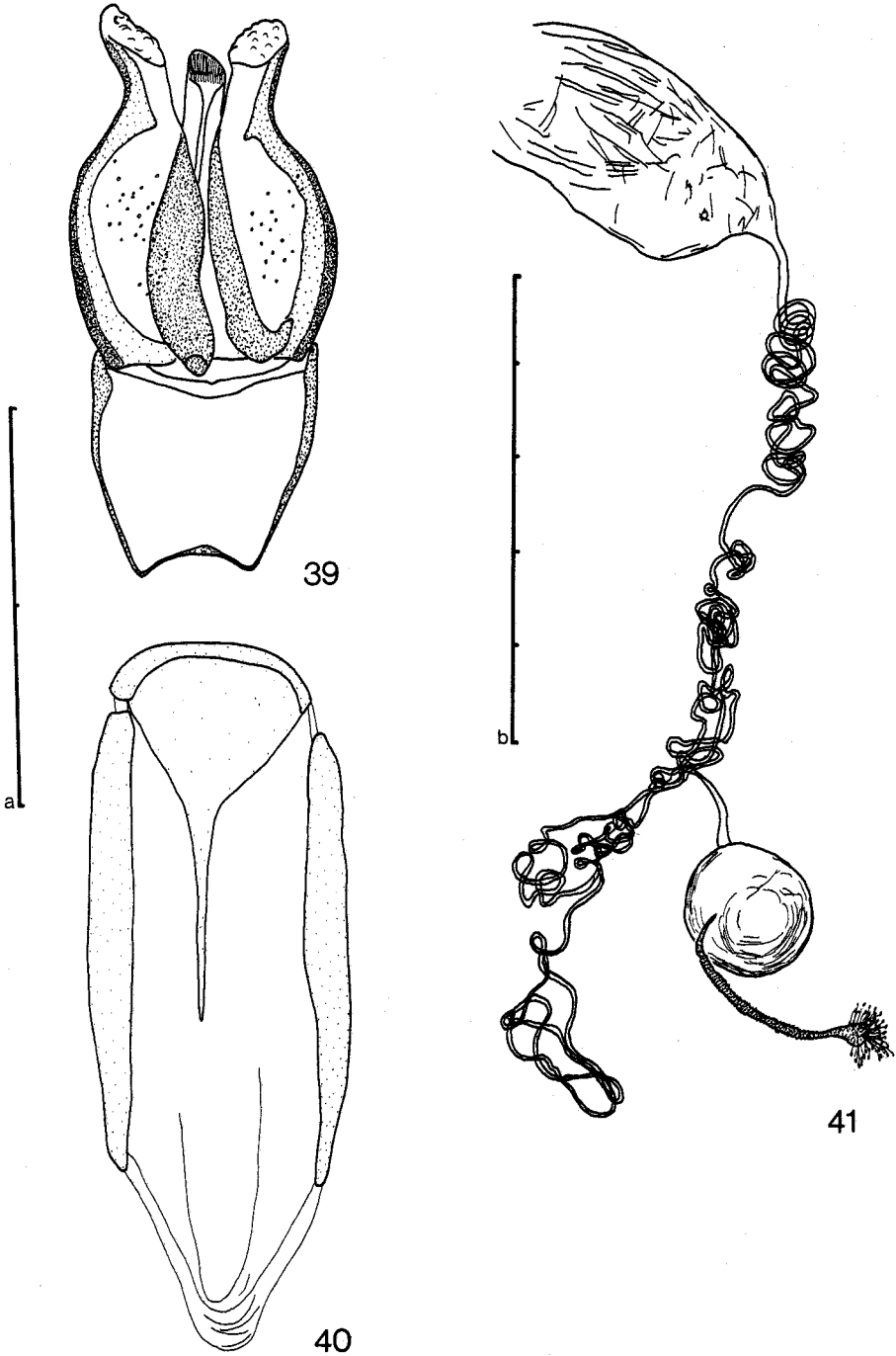
Description

Male

Length: 1.875 mm; width: 1.10 mm. Oval, highly and regularly convex, darkly ferruginous, dull.

Head. Ferruginous, dull, microreticulate; clypeus densely microreticulate, meshes lengthened on lateral areas of clypeus; frons finely and densely microstriolate. Labial and maxillary palpi and antennae testaceous.

Pronotum. Very convex, transverse, its greatest width before its base; ferrugineous, punctate, points of medium size and shallow separated by half their own diameter on posterior half of length and smaller, separated by half their diameter on front half; edges finely and regularly margined anterolaterally.



Figs 39–41. *Stanmalcolmia sulawesiensis*, gen. nov., sp. nov.: 39, aedeagus; 40, 9th sternite; 41, female ectodermal genitalia. Scale *a*, 0.2 mm; scale *b*, 0.5 mm.

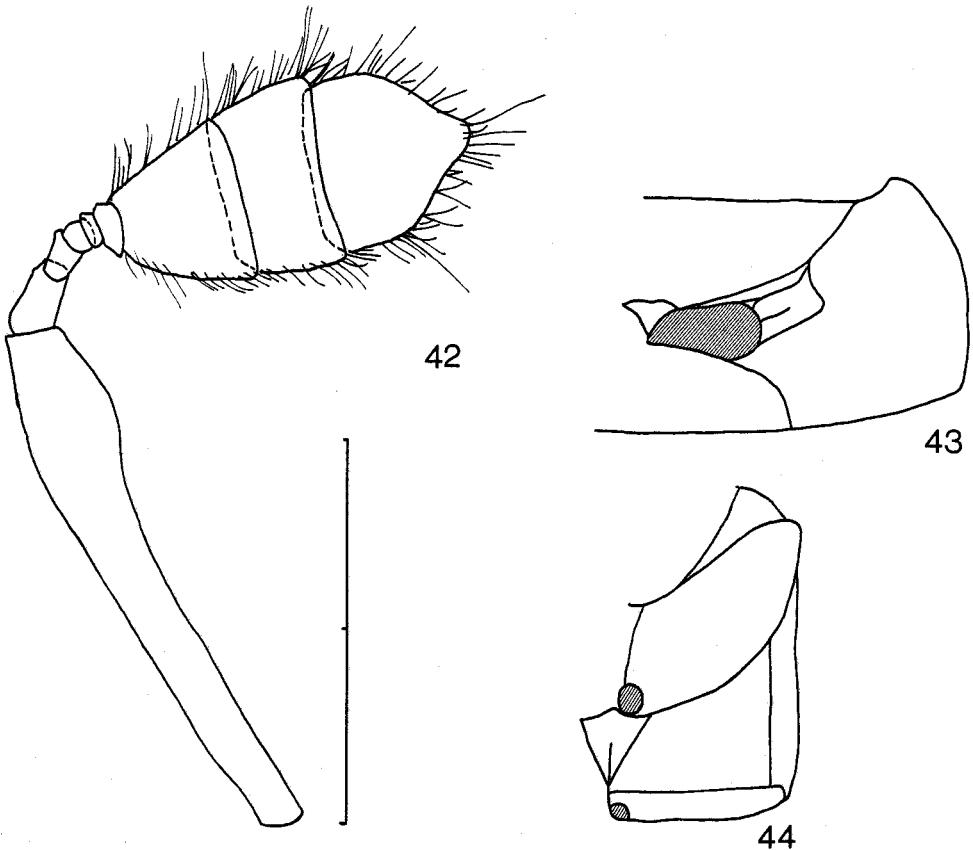
Elytra. Ferrugineous, very convex, their largest point near base, strongly and evenly punctate on sutural and discal regions, points fine, nearly contiguous, the elytral surface appearing rough, except between 8th striae and edges, that have 4 rows of points, interstriae smooth; sutural and discal areas with 7 striae, with row of small points at bottom, virtually merged with background punctation; interstriae 1-8 strongly convex, other lateral interstriae nearly flat; sutural striae absent; edges explanate, mainly in posterior half.

Underside. Ferrugineous, dull, microreticulate. Metasternum microreticulate, except median smooth triangular plate; its posteromedian half depressed, with longitudinal line along half its length. Femora shining, smooth, very finely and very sparsely micropunctate. Tibiae narrowly cylindrical, slender, longer than femora, darker than underside. Tarsomere with short sparse yellow setae beneath. Abdomen testaceous covered by fine dense yellow setae. Wings present.

Male genitalia. As in Fig. 39, with median lobe shorter than parameres and truncate apically, parameres projecting outwards in the apical region and strongly convex laterally, phallobase shorter than parameres.

Female

No visible sexual dimorphism; ectodermal genitalia (Fig. 41) with extremely long coil-shaped spermathecal duct, spermatheca nearly spherical ($L = 144 \mu\text{m}$; $l = 135 \mu\text{m}$); duct of spermathecal gland: $L = 240 \mu\text{m}$.



Figs 42-44. *Stanmalcolmia sulawesiensis*, gen. nov., sp. nov.: 42, antenna; 43, prosternum; 44, meso- and metasternum. Scale, 0.2 mm.

Habitat

S. sulawesiensis having been collected in an 'old log', probably lives in decayed wood.

Etymology

The name indicates the geographical origin of this new species.

Genus *Aculomicrus* Smetana

Aculomicrus Smetana, 1990: 64 (*nec* Smetana, 1975: 175–6, unavailable name without type species designation).

Type species: *Aculomicrus minimus* Smetana, 1975, by subsequent designation (Smetana 1990).

Aculomicrus brendelli, sp. nov.

(Figs 38, 45–47, 53–59)

Material Examined

Holotype. ♂, Sulawesi Utara, Dumoga-Bone Natl Pk, lowland forest, c. 200 m, Malaise trap, Mar. 1985, Project Wallace Expedition (BMNH).

Paratypes. 7 ex., same locality as holotype, with different catching conditions: 3 ex., Flight interception trap 2, Plot A, c. 200 m, lowland forest, 24.ii.1985; 1 ex., lowland forest edge, c. 200 m, Malaise trap, 9–16.iii.1985; 1 ex., same data, June 1985; 1 ex., same data, Sept. 1985; 1 ex., same data, Nov. 1985; all from Project Wallace Expedition (BMNH).

*Description**Male*

Length: 1.675 mm; width: 1.025 mm. Oval, regularly and highly convex, ferrugineous, dull, very finely and evenly micropunctate and microstriate.

Head. Ferrugineous, pentagonal, with maximum width at top of eyes, abruptly narrowed in front of eyes and regularly beyond to base. Labrum testaceous. Clypeus margined, nearly vertical, ferrugineous, with very fine microsculpture; sides with rectangular lateral prominences under antennal bases, finely margined in front and laterally, strongly depressed before eyes on sides; base of antennae visible from above; frontoclypeal suture obsolete. Front dull, distinctly micropunctate and microstriate. Eyes small, situated at top of lateral angles of head. Labial palpi and ligula covered by long hair-like setae. Maxillary palpi as long as antennae, testaceous, with second segment strongly dilated, nearly globular, third segment shorter than fourth, fourth segment elongate oval, symmetrical, with tip pointed. Antennae (Fig. 55) 9-segmented (6 + 3), testaceous; first segment longer than second to sixth; 2nd, 4th, 5th and 6th segments minute; club oval, not darkened, compact, with short yellow setae longer at tip.

Pronotum. Ferrugineous, dull, very convex, transverse, very finely micropunctate and distinctly microstriate (Fig. 54); edges very finely but distinctly margined, lateral margins distinctly rounded, front angles obtuse, hind angles nearly 90°; scutellum ferrugineous, rather large, smooth, forming an equilateral triangle, very finely micropunctate.

Elytra. Ferrugineous, dull, highly convex, their widest point near base; main punctation formed by about 20 rows of points parallel to suture, not parallel to margins, obsolete in scutellar region, with rows best organised in the humeral region; surface very dull, very finely microstriate and micropunctate, the microstriation finer than on pronotum (Fig. 54); lateral margins bordered, not explanate.

Underside. Ferrugineous, dull, microreticulate. Prosternum (Fig. 56) very short in front of procoxae, reduced to narrow vertical band, elevated in middle to form a tectiform triangular apophysis; antennal cavities barely defined, consisting of an oval depression, not

reaching lateral margins of pronotum; procoxae almost contiguous. Mesosternum (Fig. 57) dull, microreticulate; mesosternal elevation arrow-like, pentagonal and distinctly margined anterolaterally with median longitudinal carina. Metasternum (Fig. 57) extended by flat apophysis between mesocoxae, central area slightly elevated, more strongly elevated in posterior lateral area, without metasternal lines or ridges, without setae. Epipleura strongly developed at base, gradually narrowed to half their width at level of the first visible abdominal sternite and from there about evenly wide posteriorly. Abdomen with 5 visible sternites, with fine yellow setae, first sternite with a longitudinal carina. Legs ferruginous; femora with fine yellow setae; profemoral bases angulate at point of trochanteral attachment; tibiae cylindrical, with short distal spines; tarsi 5-segmented (5-5-5), covered by short yellow setae beneath; first segment as long as second. Wings (Fig. 38) well developed, venation with Ra, M-Cu, M-Cu loop, A1, A2, basal cell absent, jugal vein and jugal lobe absent.

Male genitalia. As in Figs 45 and 46, with median lobe distinctly shorter than parameres; parameres asymmetrical, truncate, bearing short yellow setae apically, left paramere concave laterally at top; basal piece distinctly longer than parameres.

Female

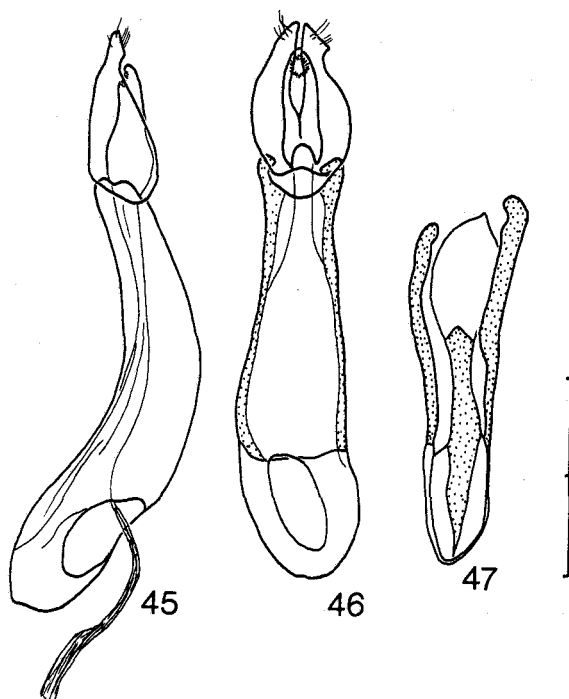
Ectodermal genitalia. As in Fig. 53, with pyriform spermatheca ($L = 98 \mu\text{m}$; $l = 70 \mu\text{m}$), spermathecal duct short ($L = 95 \mu\text{m}$), duct of spermathecal gland ($L = 102 \mu\text{m}$) nearly as long as spermathecal duct.

Comments

The discovery of an *Aculomicrus* Smetana in Sulawesi is particularly interesting because this genus had been known from only three species described from the Nearctic region: *A. pusio* Smetana, 1975, from Puerto Rico, *A. minimus* Smetana, 1975, from Central America, and *A. testudo* Smetana 1975, from Colombia. This observation is reminiscent of the recent discovery of an *Omicrus* Sharp, 1879, in the Afrotropical region when this genus was known only from Central and South America and the Pacific region (Bameul 1993). Thanks to Dr A. Smetana, I have been able to compare the specimens of the new species with some paratypes of both *A. pusio* and *A. minimus* preserved in the CNC. There are no differences in generic characters between these American species and *A. brendelli*: the general forms of their pro-, meso- and metasterna are similar, and the form and venation of the wings (Figs 37 and 38) is identical, this last character being demonstrably of generic level among the Sphaeridiinae (Malcolm 1981; Hansen 1990).

Only the aedeagus of *A. minimus* had been described (Smetana 1975), but one of the paratypes of *A. pusio* examined, considered as 'apparently female' in its description, proved in fact to be a male: its aedeagus (Figs 48-50) is figured here for the first time. The aedeagi of the Neotropical *A. minimus* and *A. pusio* are very similar to each other, differing in the form of the phallobase in ventral view; they both share peculiar characteristic parameres with horn-like lobes in the apical regions, the lobes of *A. pusio* bearing spines in side view (Fig. 50). *A. brendelli* has completely different parameres and median lobe: its parameres (Fig. 46) are shorter than those of *A. pusio* and *A. minimus*, asymmetrical and with distal setae. However, *A. brendelli* seems to have a type of phallobase (Fig. 45) comparable with that of *A. pusio* (Fig. 48), concave in side view in both species and with a similar basal opening. The differences shown by *A. brendelli*, i.e. the lack of elytral emarginations and the different distal parts of the aedeagus, are almost certainly of species level, but the peculiar shape of its asymmetrical parameres, while *A. minimus* and *A. pusio* both share very similar aedeagi, suggests that *A. brendelli* could belong to a different subgenus or species-group from the three known American species.

The wing of *A. pusio* (Fig. 37) is figured here for the first time. The female ectodermal genitalia of *A. minimus* (Fig. 52) are also figured for the first time.



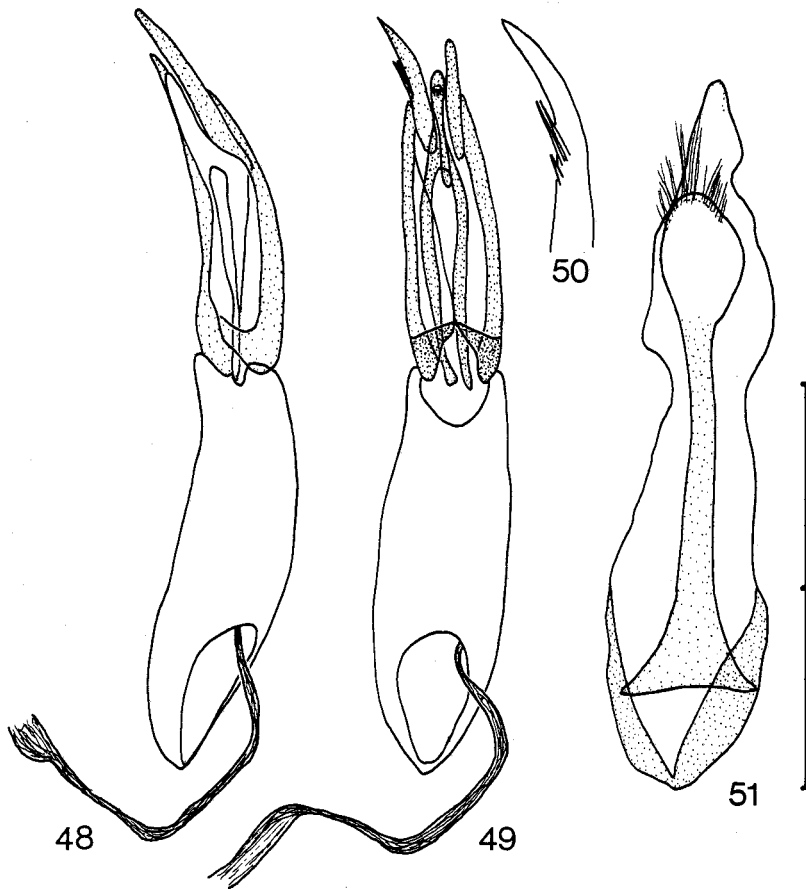
Figs 45–47. *Aculomicrus brendelli*, sp. nov.: 45, aedeagus, profile view; 46, aedeagus, sternal view; 47, 9th sternite. Scale, 0.2 mm.

Etymology

This new, interesting *Aculomicrus* is named after Martin Brendell, of the Department of Entomology, The Natural History Museum (London), one of the participants of the Project Wallace Expedition, who gave me the opportunity to study this material.

Key to the Known Species of *Aculomicrus* (Modified from Smetana 1975)

1. Head with fine but distinct microsculpture consisting of irregular waves 2
 Head, including clypeus, appearing smooth except for exceedingly fine microsculpture consisting of scattered rudimentary traces of waves 3
2. Head with waves of the microsculpture becoming gradually denser and transverse on clypeus. Pronotum and elytra with microsculpture indistinct, appearing smooth and shining on disk. Aedeagus as in Figs 48–50. Small species: 0.90–0.95 mm (Puerto Rico)
 *A. pusio* Smetana
 Head with waves of the microsculpture dense, as much on frons as on clypeus. Pronotum and elytra with microsculpture clearly visible, appearing dull on disc (Fig. 54). Aedeagus as in Figs 45–46. Female ectodermal genitalia as in Fig. 53. Larger species: c. 1.70 mm (Sulawesi)
 *A. brendelli*, sp. nov.
3. Last of three short oblique rows of coarse punctures on lateral portion of elytra not extended anteriorly, fading out very far from base of elytra. Female ectodermal genitalia as in Fig. 52. Small species: 0.75–0.80 mm (Central America) *A. minimus* Smetana
 Last of three short oblique rows of coarse punctures on lateral portion of elytra shifted forwards, fading out not far from base of elytra. Larger species: 1.10 mm
 *A. testudo* Smetana



Figs 48-51. *Aculomicrus pusio* Smetana: 48, aedeagus, profile view; 49, aedeagus, sternal view; 50, apex of the parameres; 51, 9th sternite. Scale, 0.2 mm.

Genus *Noteropagus* d'Orchymont

Noteropagus d'Orchymont, 1919: 132-4.

Type species: *Noteropagus politus* d'Orchymont, 1919, by original designation.

Noteropagus obliquus d'Orchymont

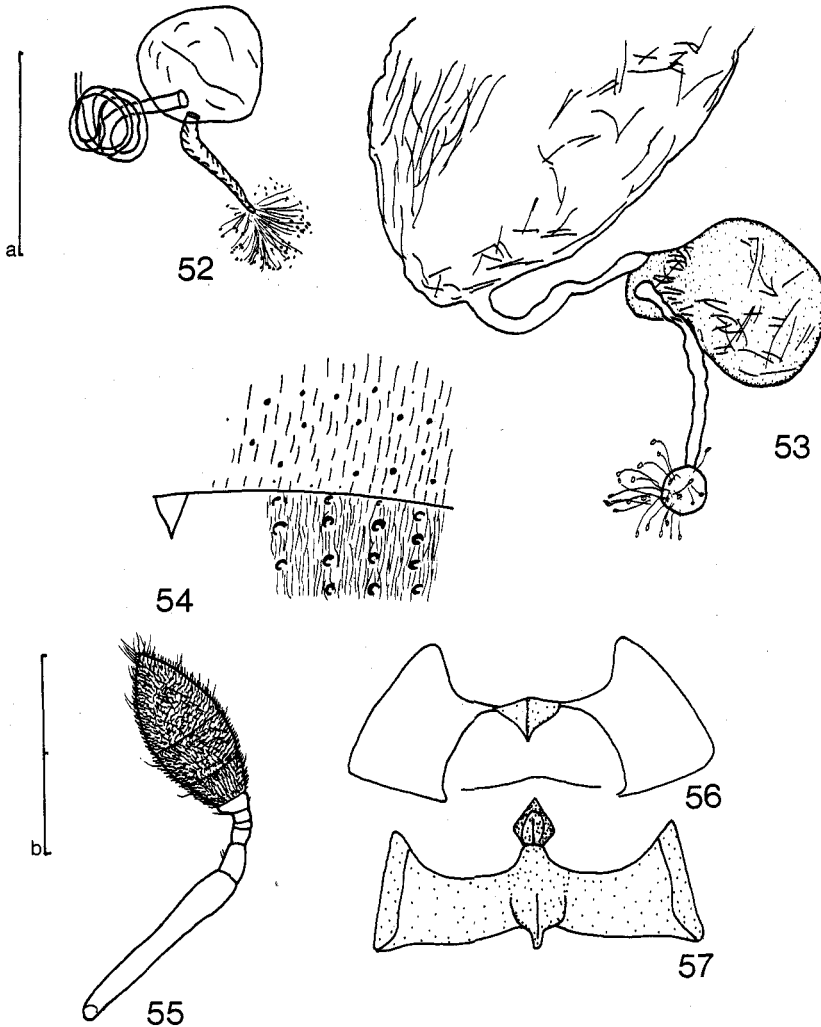
Noteropagus obliquus d'Orchymont, 1925b: 305.

Material Examined

Sulawesi Utara: 1♀, Dumoga-Bone Natl Pk, Plot A, c. 200 m, lowland forest, dead leaves, Mar. 1985, Project Wallace Expedition (BMNH).

Comments

N. obliquus d'Orchymont has been described from Penang Island, Indonesia. This single female from Sulawesi is attributed to this species since its external characters correspond to the identification data given by d'Orchymont (1932). However, this single specimen is in a poor state and the identification cannot be certain without comparison of male specimens from Sulawesi with the type specimens of *N. obliquus*.

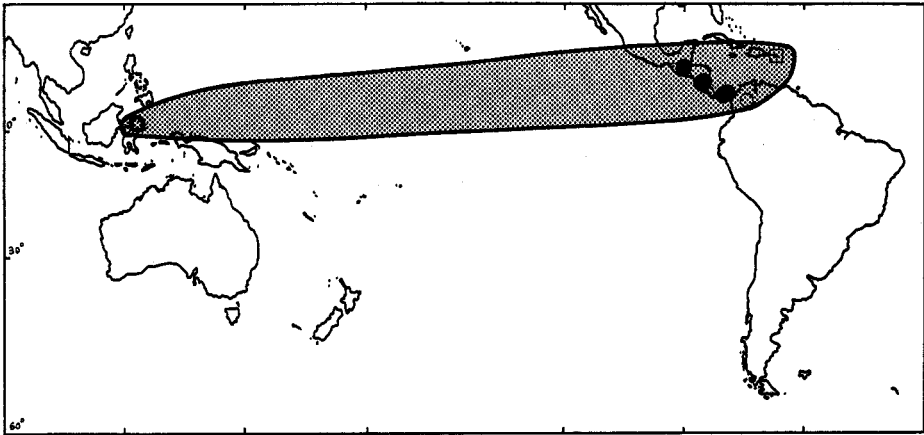


Figs 52-57. *Aculomicrus* spp., female ectodermal genitalia: 52, *A. minimus* Smetana; 53, *A. brendelli*, sp. nov. *A. brendelli*, sp. nov.: 54, detail of the pronotal and elytral sculpture; 55, antenna; 56, prosternum; 57, mesosternal apophysis and metasternum. Scale a, 0.1 mm; scale b, 0.2 mm.

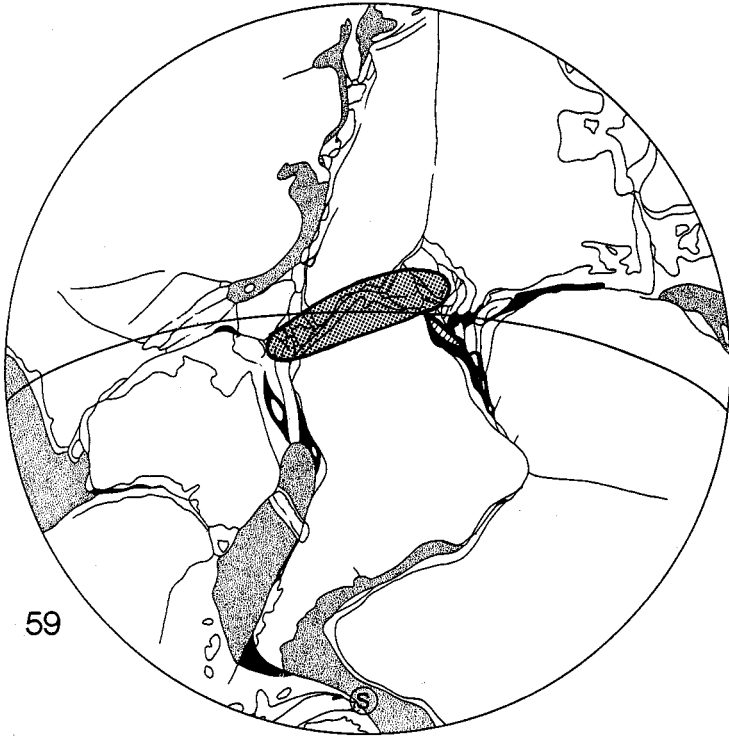
Comments about the Trans-Pacific Distribution of *Aculomicrus* Smetana

The discovery in Sulawesi of a new species of *Aculomicrus* Smetana, a genus previously known only from the Neotropical region (Fig. 58), poses once again the question of trans-Pacific distributions. Because *Aculomicrus* are certainly, like most Omicrini, strictly tropical insects, it is difficult to imagine their transport between Asia and America through the cold regions of the Bering Strait, or before the breakup of Pangaea, along South America, Antarctica, Australia, New Guinea, the Mollucas Archipelago and to Sulawesi. Moreover, in the latter hypothesis, one must postulate several extinctions in the Australian biogeographical region (although *Aculomicrus* may be present in this region, but not yet recorded due to the use of collecting methods unsuitable for Omicrini).

Trans-Pacific distributions were reported by Jeannel (1942) under the designation of 'centrifugal segregations on Inabresia'. The French coleopterist followed the reconstruction of Pangaea by Wegener (1937) who postulated the breakup of the Gondwana supercontinent into two main parts: the Paleantarctid and Inabresia, the former being a



58



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Figs 58, 59. *Aculomicrus* spp., geographical distribution. 58, contemporary trans-Pacific distribution: ●, *A. minimus* Smetana; ○, *A. testudo* Smetana; □, *A. pusio* Smetana; ⊙, *A. brendelli*, sp. nov. 59, projection of the known distribution of the genus on Pangaea *sensu* Shields (1979); S indicates the position of the South Pole (base map courtesy of L. Matile).

combination of South America, Africa, Madagascar, India and Malaysia. Banarescu (1990), in his recent review on the zoogeography of freshwater animals, has reported cases of 'inabresian' distributions among the infraorder Sularida of siluriform fishes, and the mutelacean mussels, Muelleriidae. Shields (1979) has reviewed many cases of trans-Pacific distributions of fossil and present-day flora and fauna. However, the concept of Inabresia is not admitted by contemporary authors operating with a reconstruction that shows that

Laurasia and Gondwana were separated by the Tethys Ocean (Dietz and Holden 1970; Owen 1983; Olivet *et al.* 1987).

Recently, in his major work on Keroplatidae (Diptera), Matile (1990) showed that among the 18 genera of Keroplatidae, 9 were distributed on both sides of the Pacific Ocean. The case of *Setostylus* Matile, 1990, is in this respect similar to that of *Aculomicrus*. In a completely different group of organisms, marine triclads, Sluys (1989) has reached the same conclusions as Matile, especially for the Uteroporidae: *Procerodella* Sluys, 1989 has two species in Japan [*P. japonica* (Kato, 1955) and *P. asahinai* (Kato, 1943)] and one known species in the Chonos Archipelago, Chile [*P. macrostoma* (Darwin, 1844)].

As argued by Matile, it is not possible to explain the trans-Pacific distribution of tropical invertebrates in the context of the contemporary global tectonic reconstruction. Other hypotheses are available for the former structure of Pangaea, the most interesting in this respect postulating that the Tethys Ocean was closed before the Jurassic and therefore, there have been relationships between Melanesia and South America (Humphries and Parenti 1986; Matile 1990). Two complementary hypotheses have been proposed: a hypothetical Pacifica continent that could have formed part of South America during its drift (Peruvian Pacifica and Magellanian Pacifica) (Nur and Ben-Avraham 1977; Melville 1981, 1982), and the hypothesis of a smaller Earth that would close the Pacific prior to the mid-Mesozoic, the Earth later expanding to its modern dimensions (Shields 1979, 1983). According to Sluys (1989), this is the best theoretical model to explain the trans-Pacific distributions of marine triclads.

These hypotheses of a closed Tethys are still much debated since the palaeotectonic reconstruction of the Pacific region is still poorly documented. The trans-Pacific distribution of *Aculomicrus* appears to be another argument in favour of former faunal exchanges between Melanesia and South America (Fig. 59). However, the geographic distribution of Omicrini is still very poorly known and conclusions are impossible with our present state of knowledge of the group.

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