

PHILOTARSIDAE (PSOCOPTERA) OF NEW GUINEA¹By I. W. B. Thornton² and C. N. Smithers³

Abstract: Fourteen species of philotarsids are described from the island of New Guinea, (5 of *Haplophallus*, 6 of *Aaroniella*, 2 of *Zelandopsocus* and 1 of *Austropsocus*) and 1 (of *Haplophallus*) from New Ireland. The New Ireland species and 3 of the New Guinea species belong to the *bundoorensis* species group of *Haplophallus* which is represented predominantly in Australia and New Caledonia; the 2 other species of *Haplophallus* belong to the widespread *orientalis* group of the genus. Two of the *Aaroniella* species belong to a section of the genus that is widely distributed over the Neotropical Region and the Pacific, and occurs also in Madagascar, while the other 4 form a small group of their own and possess character combinations intermediate between those of *Aaroniella* and the *bundoorensis* group of *Haplophallus*. Only 3 representatives of the *Austropsocus*—*Zelandopsocus* line of the family (which is richly represented in New Caledonia, and occurs also in New Zealand) are known from New Guinea; all are unusual in various respects and do not have very close affinities with the other species of this line.

Although some 53 species of Psocoptera have been recorded from the island of New Guinea (McLachlan 1866; Enderlein 1903, 1904; Ribaga 1908; Lee & Thornton 1967; Thornton & Wong 1968; Smithers & Thornton 1973, 1974a, 1975b) no members of the family Philotarsidae have yet been recorded from it.

The island is important zoogeographically not only because of its size and wide range of ecological conditions, but also because it may be an important faunal source area for Micronesia and the Melanesian island arcs. One of us has already studied the psocopteran fauna of Micronesia (Thornton, Lee & Chui 1972); we have also studied the Psocoptera of Norfolk Island (Smithers & Thornton 1974b) and Lord Howe Island (Smithers & Thornton 1975a), and the Philotarsidae of New Caledonia (Thornton & Smithers 1974) and New Zealand (Thornton, Wong & Smithers 1977). We are, therefore, in a position to relate the philotarsid fauna of New Guinea with that of Micronesia and some of the islands of the Melanesian Arcs.

We collected for a total of 34 man-days in the eastern 1/2 of the island and have also been able to study Bishop Museum collections from both the Papua-New Guinea and Indonesian parts of the island (FIG. 1). The term New Guinea is used here in a geographical, not a political sense, referring to the whole island. As a result of our studies 14 species of Philotarsidae have been discovered from the island, and 1 related species from the island of New Ireland was found in the Bishop Museum collection. These are described below, and the New Guinea philotarsid fauna is discussed in relation to that of Norfolk and Lord Howe Islands, New Caledonia, New Zealand, and Micronesia.

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FIG. 1. Map of New Guinea, New Ireland and New Britain, showing sites at which philotarsids recorded in this paper were collected. The 500 m contour is shown.

Unless otherwise stated, the collections were made by the authors. The place of deposition of types and paratype material is indicated thus: BISHOP (Bishop Museum, Honolulu); AM (Australian Museum, Sydney).

The abbreviations used in this paper follow those used by Thornton & Smithers, 1974. The ratio between interocular distance and eye diameter is that of Pearman (Ball 1943), and wing veins are named according to Badonnel (1951) except that "rs" is preferred to "r".

KEY TO THE PHILOTARSIDAE OF THE ISLAND OF NEW GUINEA

- | | | |
|--------|---|---|
| 1. | Hind wing veins setose; claw with preapical tooth..... | 2 |
| | Hind wing veins bare; claw without preapical tooth..... | 12 |
| 2(1). | Vein cu_2 in fore wing bare | 3 |
| | Vein cu_2 fore wing setose..... | 6 |
| 3(2). | Vein cu_1 in hind wing bare; fore wing not decidedly wider subapically..... | 4 |
| | Vein cu_1 in hind wing setose; fore wing decidedly wider subapically..... | 5 |
| 4(3). | Basal flagellar segment distinctly lighter than other flagellar segments..... | |
| | Aaroniella antennata , n. sp. | |
| | All flagellar segments with the same coloration..... | Aaroniella pedunculata , n. sp. |
| 5(3). | Apical fore wing veins bearing single rank of setae; dorsal valve of ♀ gonapophyses rectangular | Haplophallus oblongatus , n. sp. |
| | Apical fore wing veins bearing 2 ranks of setae; dorsal valve of ♀ gonapophyses smoothly rounded apically | Haplophallus separatus , n. sp. |
| 6(2). | Setae on basal fore wing veins sited on dark spots..... | 7 |
| | Setae on basal fore wing veins not sited on dark spots | 8 |
| 7(6). | Vein cu_1 of hind wing bare; phallosome with rod-like sclerites..... | Aaroniella sigma , n. sp. |
| | Vein cu_1 of hind wing setose; phallosome sclerites consisting of a pair of linear serrations | Aaroniella pseudosigma , n. sp. |

- 8(6). Apical fore wing veins bearing 2 ranks of setae.....**Haplophallus setosus**, n. sp.
 Apical fore wing veins bearing 1 rank of setae.....9
- 9(8). ♀ subgenital plate with apical insertion bare, or phallosome without internal sclerites.....10
 ♀ subgenital plate with apical lobe bearing marginal setae, or phallosome with linear sclerotised
 serrations internally11
- 10(9). Fore wing with large squarish brown patch on membrane, extending from origin of vein
*cu*₁ to *rs-m* junction**Aaroniella alticola**, n. sp.
 Fore wing membrane hyaline in region from origin of vein *cu*₁ to *rs-m* junction.....
**Haplophallus elongatus**, n. sp.
- 11(9). Legs long, tibia length more than 1 mm; basal tarsal segment with widely spaced but large
 ctenidia; known only from brachypterous ♀.....**Haplophallus kaindiensis**, n. sp.
 Legs normal, tibia length less than 0.9 mm; basal tarsal segment with ctenidia very small,
 barely recognizable as such; known only from ♂.....**Aaroniella sigmoides**, n. sp.
- 12(1). Fore wing long, parallel-sided, strap-like, majority of wing membrane pigmented; vertex
 very sharply angled in side view.....**Zelandopsocus stenopterus**, n. sp.
 Fore wing not as above, pigment on wing membrane confined to pterostigma; vertex
 rounded in side view.....13
- 13(12). Pterostigma completely filled with dark brown pigment.....**Austropsocus perforatus**, n. sp.
 Pterostigma with light brown pigment in distal 1/2, hyaline in basal 1/2.....
**Zelandopsocus novoguineensis**, n. sp.

SYSTEMATICS

GENUS *Aaroniella* Mockford, 1951

The 14 described species presently assigned to *Aaroniella* are from North America (1), botanical gardens in Europe (1), Oriental Region (1), Madagascar (2), Micronesia (2), Lord Howe Island (1), New Zealand (3, 1 also occurring in Australia and Tasmania), Australia (1), Cuba and Jamaica (1) and the Galapagos Archipelago (1). There are another 12 species which are probably assignable to the genus, all of which are from Central and South America and areas bordering the Pacific (Thornton, Wong & Smithers 1977). We did not find any species of *Aaroniella* on New Caledonia or on Norfolk Island.

Two of the 6 new species described below, *Aa. pedunculata* and *Aa. antennata*, clearly belong to *Aaroniella* as presently defined and exemplified by the type-species, *Aa. maculosa* (Aaron), although the apical sclerite of the subgenital plate of *Aa. antennata* bears a pair of setae, whereas it is bare in *Aa. maculosa*.

The female genitalia of *Aa. sigma*, n. sp. and *Aa. alticola*, n. sp. conform with those of the type-species, but whereas *Aa. sigma* possesses the typical dark spots at the bases of the setae of the fore wing veins, at least in the basal 1/2 of the wing, it lacks the typical white bands at the apex of the flagellar segments. In contrast, *Aa. alticola* possesses the typical flagellar pigment pattern but lacks the dark spots at the bases of the fore wing vein setae. No females of *Aa. pseudosigma*, n. sp. or *Aa. sigmoides*, n. sp. have been collected, but the male characters are very similar to those of *sigma*; no dark spots were discernible at the bases of the fore wing veins of *Aa. sigmoides*. All 4 species, *Aa. alticola*, *Aa. sigma*, *Aa. pseudosigma* and *Aa. sigmoides*, differ from the type-species of *Aaroniella*, and from all other species so far described under that genus, in having vein *cu*₂ of the fore wing setose.

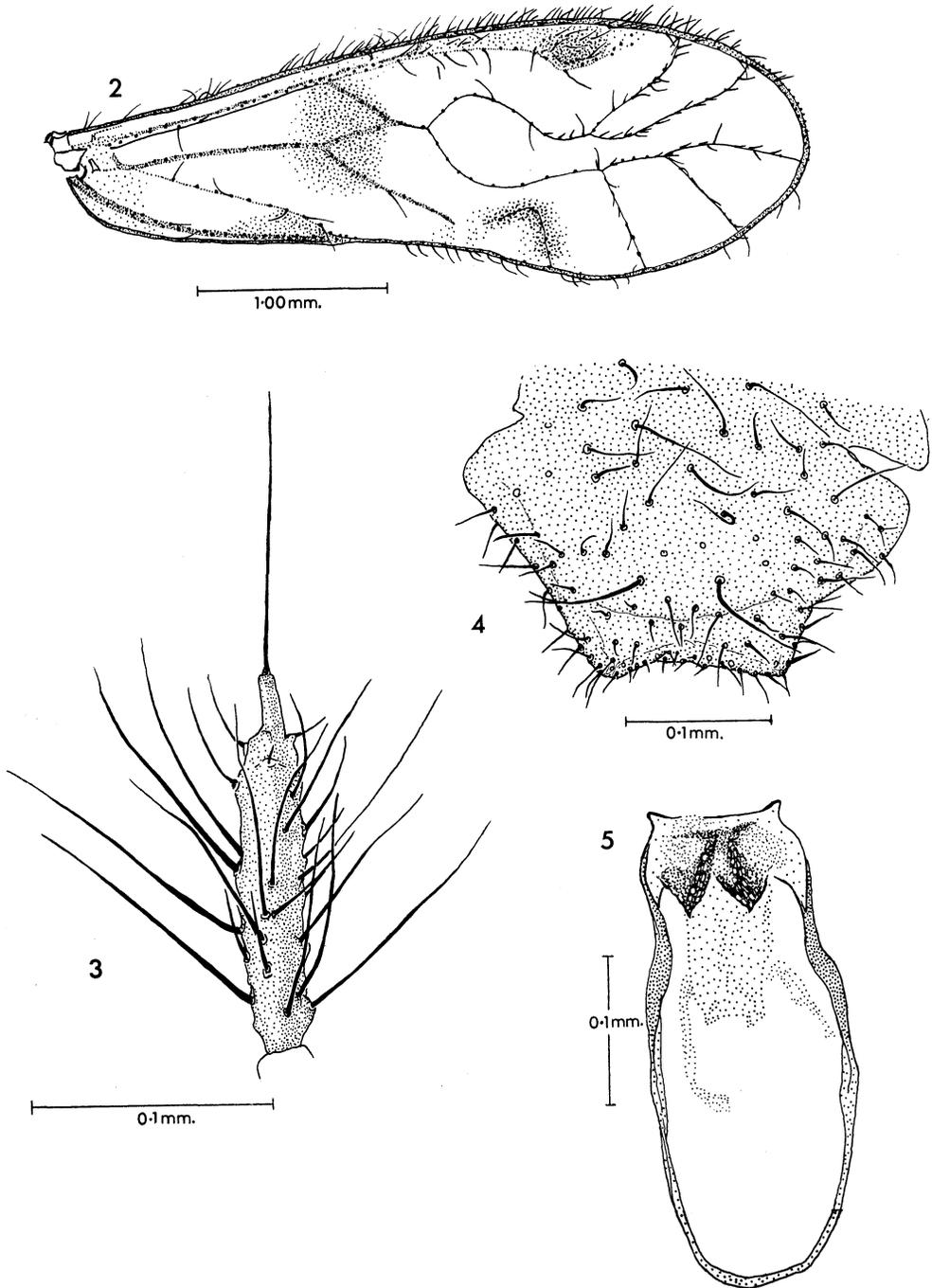


FIG. 2-5. *Aaroniella alticola*, n. sp., ♂: 2, fore wing; 3, apical segment of antenna; 4, hypandrium; 5, phallosome.

Aaroniella alticola Thornton & Smithers, new species FIG. 2-8

♂. *Coloration* (after ca 3 years in alcohol). Head buff with the following brown: usual patches on vertex and mesial to orbits, triangular patch anterior to ocellar protuberance, clypeus, labrum, and posterior edge of gena. Antenna brown, flagellar segments with paler apices. Maxillary palps brown. Eyes black, ocelli clear with black centripetal borders. Thoracic nota brown, cream median line includes scutella. Pleura and legs brown; femora slightly paler than rest of legs. Fore wing (FIG. 2) very pale translucent brown with brown clouds along posterior margin of anal cell, at distal end of vein $m + cu$, at vertex of pterostigma, and along margin of areola postica. Hind wing pale translucent brown, darker along posterior margin of anal cell. Abdomen very dark brown mottled with gray. *Morphology*. B = 2.50 mm. I.O.: D = 3.00. $f_1 = 0.43$ mm. $f_2 = 0.31$ mm. $f_1:f_2 = 1.39$. Apical segment of antenna attenuated, with 1 apical seta (FIG. 3). F = 0.47 mm. T = 0.90 mm. $t_1 = 0.36$ mm. $t_2 = 0.05$ mm. $t_3 = 0.08$ mm. $rt = 7.2:1:1.6$. $ct = 15$. Claw with preapical tooth. In fore wing, vein cu_2 setose (9 setae), veins with setae in single rank except r and an . Fw = 3.85 mm. Hw = 2.80 mm. Setae on hind wing veins: r_1-2 , $rs-0$, $r_{2+3}-1$, $r_{4+5}-8$, $m-2$, cu_1-0 . Epiproct setose, rounded apically, paraproct with a circular field of 27 trichobothria. Hypandrium (FIG. 4) angular apically, incised basally, bearing a pair of very long setae. Phallosome (FIG. 5).

♀. *Coloration* (after ca 3 years in alcohol). Head pattern as ♂ but more distinct, and brown area anterior to ocellar protuberance wider. Pale patches at apices of flagellar segments more distinct. Thorax dorsally cream, dark brown laterally and at bases of setae. Thoracic pleura and legs dark brown. Wings brown (FIG. 6). Abdomen light brown, setal bases dark brown with lighter halos, apical sclerites dark brown. *Morphology*. B = 2.30 mm. I.O.: D = 4.00. Ocelli normal, as ♂. $f_1 = 0.31$ mm. $f_2 = 0.11$ mm. $f_1:f_2 = 2.82$. Apical segment of antenna attenuated, with 1 apical seta. Antennae of type with fewer than usual flagellar segments; paratype normal. F = 0.54 mm. T = 0.78 mm. $t_1 = 0.20$ mm. $t_2 = 0.05$ mm. $t_3 = 0.08$ mm. $rt = 4.0:1:1.6$. $ct = 0$. Claw with preapical tooth. Fore wing brachypterous (FIG. 6), vein cu_2 with setae. Fw = 0.35 mm. Hw = 0.27 mm. Hind wing veins not discernible. Epiproct semicircular, setose. Paraproct lacking trichobothria. Subgenital plate (FIG. 7) apically tripartite and bare. Gonapophyses (FIG. 8): outer valve rounded posteriorly with 3 long stout setae; ventral valve narrow without recurrent setae apically; dorsal valve with honeycomb sculpturing, apically and slightly raised field of minute spines.

Holotype ♂ (AM), PNG: New Guinea (NE): Piundeaunde, Mt Wilhelm, 3500 m, 28.VIII.1970; allotype ♀ (AM), same data as holotype; paratypes: 1 ♂, 1 ♀, same data as holotype (BISHOP); 1 ♂, Mt Wilhelm, Lake Aunde, 3500 m, 1.VI.1955, J. L. Gressitt (BISHOP).

Haplophallus stigmatus, n. sp., in which the female is macropterous, and the pigment pattern of the fore wing is somewhat similar to that of the male *Aa. alticola*, occurs in New Ireland (see comments under that species). The subgenital plate of *Aa. alticola*, having a bare apical sclerite, is typical of *Aaroniella*, as are the female gonapophyses, and this species, together with *Aa. sigma*, n. sp., falls between *Aaroniella* and *Haplophallus* as presently defined. The phallosomes of both these species, together with those of *Aa. pseudosigma*, n. sp., *Aa. pedunculata*, n. sp. and *Aa. sigmoides*, n. sp., are unusual in apparently lacking separate outer parameres.

Aaroniella antennata Thornton & Smithers, new species FIG. 9-14

♀. *Coloration* (after ca 3 years in alcohol). Head generally cream, patterned in front with brown and dark brown marks (FIG. 9); genae cream; maxillary palps pale cream basally, shading to dark brown apical segment; eyes black. Antennae with scape, pedicel and 1st flagellar segment light brown, re-

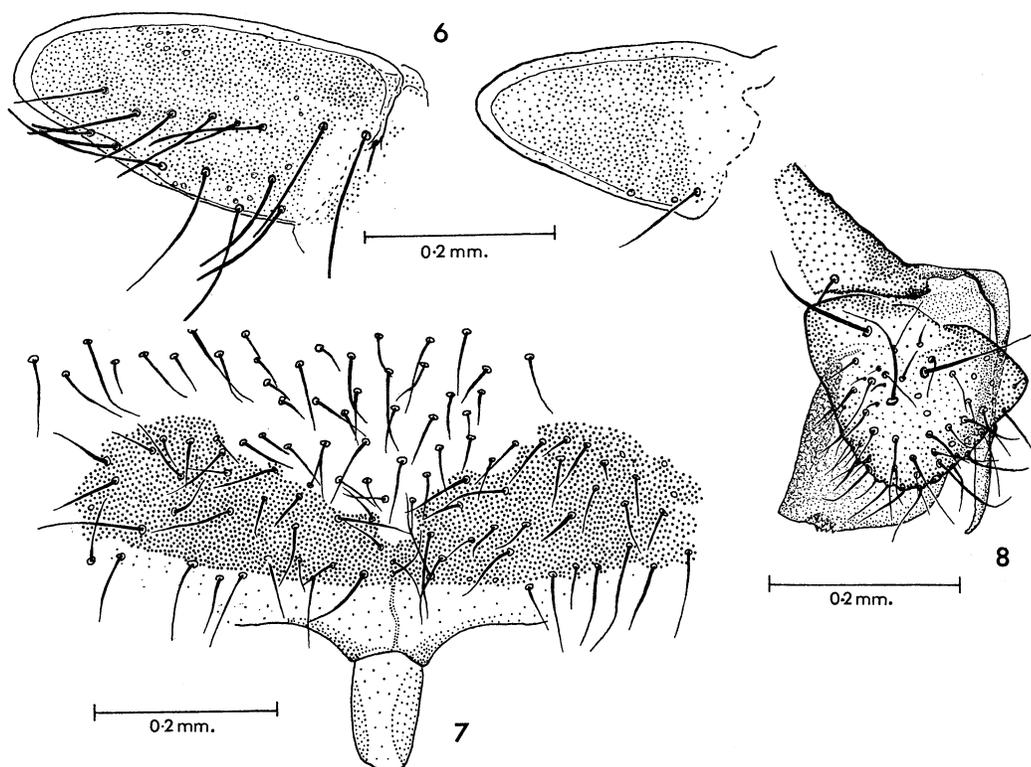


FIG. 6-8. *Aaroniella alticola*, n. sp., ♀: 6, fore wing, hind wing; 7, subgenital plate; 8, gonapophyses.

mainder of flagellum dark brown, all flagellar segments except apical one ringed with white apically. Thoracic nota brown, antedorsum of mesothorax darker, scutella cream; pleura brown, a dark brown line across cervicum runs along thorax above coxae. Legs with coxa brown, trochanter and femur pale buff, femur light brown over apical 1/4, tibia pale buff, a brown band subapically, tarsi dark brown. Fore wing (FIG. 10) patterned with brown, setae of basal veins sited on small brown spots. Hind wing hyaline. Abdomen very dark brown dorsally, laterally a wide cream and narrow dark brown longitudinal band, ventrally gray. *Morphology*. B = 2.60 mm. I.O.: D = 4.50. $f_1 = 0.40$ mm. $f_2 = 0.21$ mm. $f_1:f_2 = 1.90$. Antennal apex attenuated, with single apical seta (FIG. 11). F = 0.57 mm. T = 1.06 mm. $t_1 = 0.31$ mm. $t_2 = 0.06$ mm. $t_3 = 0.07$ mm. $rt = 5.17:1:1.17$. $ct = 15$. Claw with preapical tooth. Fw = 2.90 mm, vein cu_2 bare, fore wing not clearly wider subapically. Hw = 2.19 mm, setae on hind wing veins: r_1-10 , $rs-2$, $r_{2+3}-5$, $r_{4+5}-12$, cu_1-0 . Epiproct (FIG. 12) with sclerotised bar bearing 4 long setae posteriorly, paraproct with field of 17 trichobothria and 2 setae not in rosette sockets. Subgenital plate (FIG. 13) apically tripartite, apical insertion bearing 2 stout setae, fine microspines between these on posterior edge of sclerite. Gonapophyses (FIG. 14).

♂. Unknown.

Holotype ♀ (AM), PNG: New Guinea (NE): Gauka, S. of Minj, 1700 m, 27.VIII. 1970; paratype, 1 ♀, same data as holotype (BISHOP).

This species, collected at only one locality, is a typical member of the genus in fore

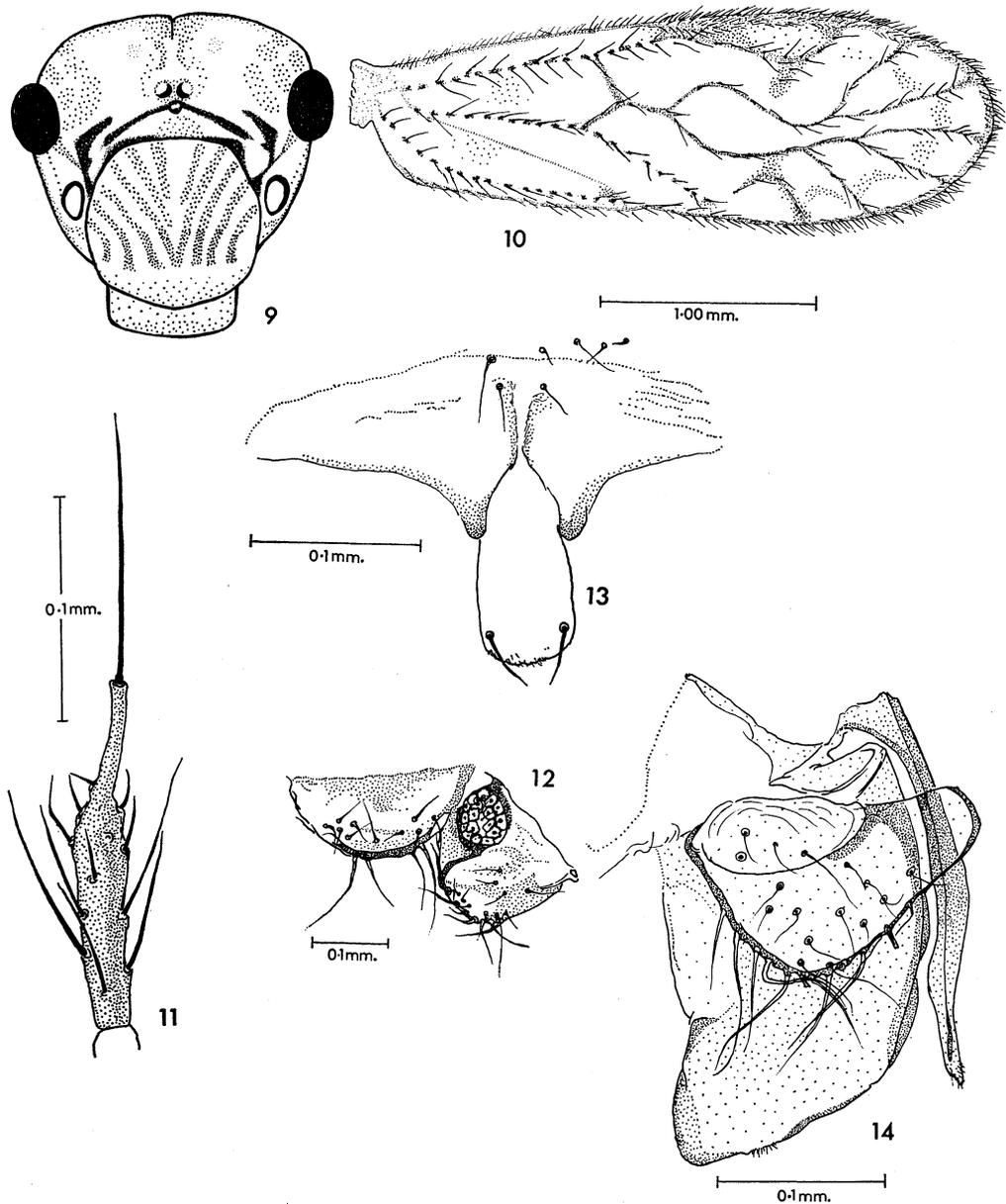


FIG. 9-14. *Aaroniella antennata*, n. sp., ♀: 9, head viewed from front (not to scale); 10, fore wing; 11, apical segment of antenna; 12, epiproct, paraproct; 13, subgenital plate; 14, gonapophyses.

wing shape and pigmentation, antennal structure and pigmentation, and structure of female gonapophyses and subgenital plate. It can be distinguished from all other known species of the genus except *Aa. galapagensis* Thornton & Woo, 1972 (Galapagos Is.) and

Aa. trukensis Thornton, Lee & Chui, 1972 (Truk), by the presence of a single pair of setae on the apical sclerite of the subgenital plate. *Aa. antennata* may be distinguished from both these species by the unusual antennal pigmentation (which has a light basal portion, with the 10 apical segments of the flagellum dark), and pattern of pigmentation of the fore wings (with clouds in apical cells).

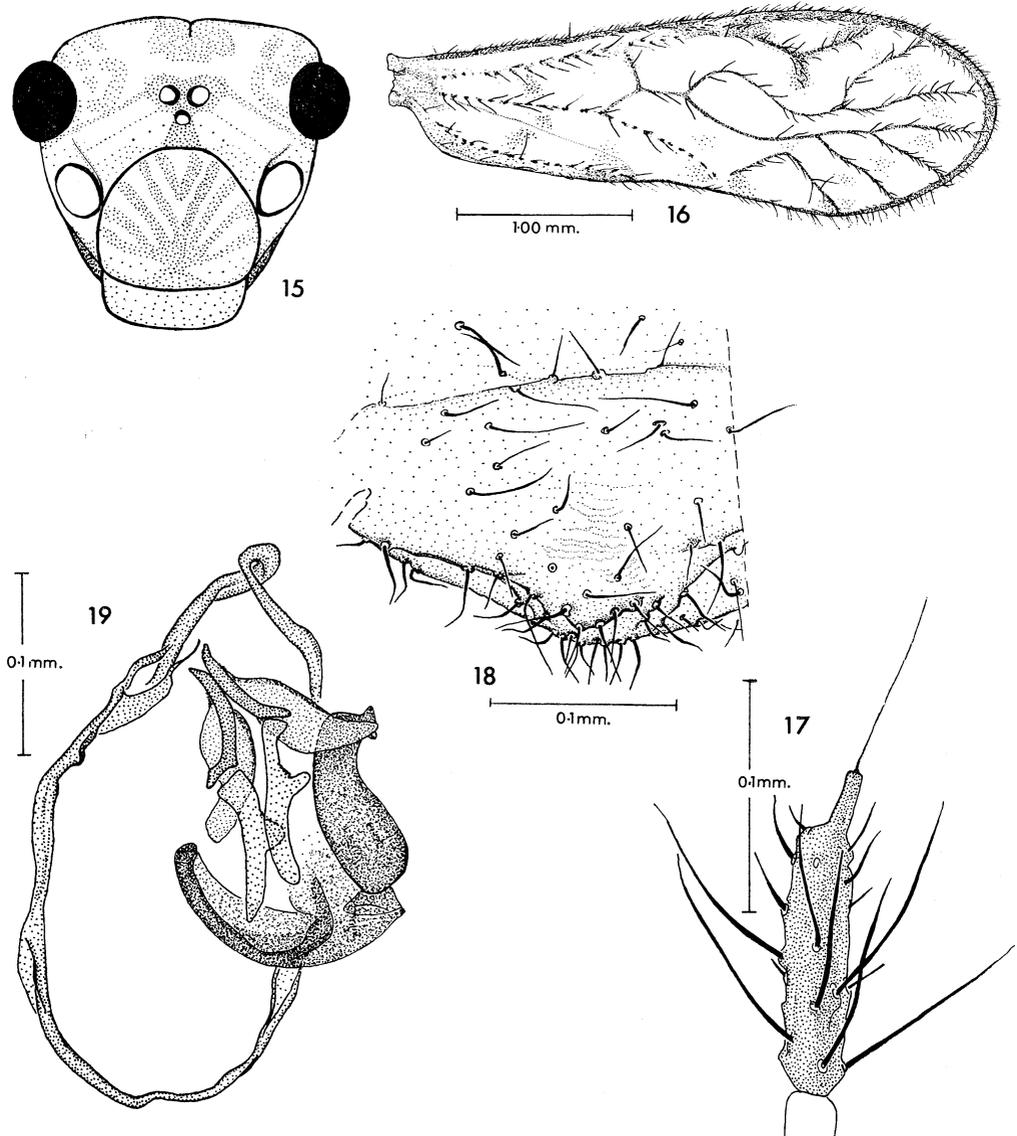


FIG. 15-19. *Aaroniella pedunculata*, n. sp., ♂: 15, head viewed from front (not to scale); 16, fore wing; 17, apical segment of antenna (from paratype); 18, hypandrium; 19, phallosome.

Aa. antennata differs from *Aa. pedunculata*, which is known only from the male, in head pattern and in having the basal flagellar segment markedly lighter than the rest of the flagellum. The 2 species are very similar in fore wing pattern and shape.

***Aaroniella pedunculata* Thornton & Smithers, new species** FIG. 15-19

♂. *Coloration* (after ca 3 years in alcohol). Head generally buff with brown markings as in FIG. 15; no darker brown stripes on frons; gena cream, lined with brown anterior to orbit and along posterior margin. Antenna gray-brown with wide white apical bands on flagellar segments. Maxillary palps gray-brown. Labrum buff. Thorax dorsally brown, a median cream band, scutella cream. Thoracic pleura brown. Legs brown. Fore wing (FIG. 16) patterned with brown patches, basal veins colorless except round bases of setae. Abdomen granulated gray-brown. *Morphology*. B = 2.20 mm. I.O.: D = 3.80. $f_1 = 0.45$ mm. $f_2 = 0.30$ mm. $f_1:f_2 = 1.50$. Apical segment of antenna attenuated but apex offset (FIG. 17) bearing 1 very slender seta. F = 0.65 mm. T = 1.14 mm. $t_1 = 0.37$ mm. $t_2 = 0.05$ mm. $t_3 = 0.07$ mm. $rt = 7.40:1:1.40$. $ct = 14$. Claw with preapical tooth. Fw = 3.30 mm. Fore wing not very much wider subapically, vein cu_2 bare, a short row of setae extending from apex of pterostigma. Hw = 2.55 mm. Setae on hind wing veins: r_1-18 , $rs-4$, $r_{2+3}-7$, $r_{4+5}-20$, $m-19$, cu_1-0 . Epiproct simple, setose. Paraproct with circular field of 23 trichobothria and 1 seta not in rosette socket. Hypandrium (FIG. 18) heavily setose apically, with lateral incisions. Phallosome (FIG. 19) distorted in preparation, evidently without external parameres, with 4 pairs of internal sclerites.

♀. Unknown.

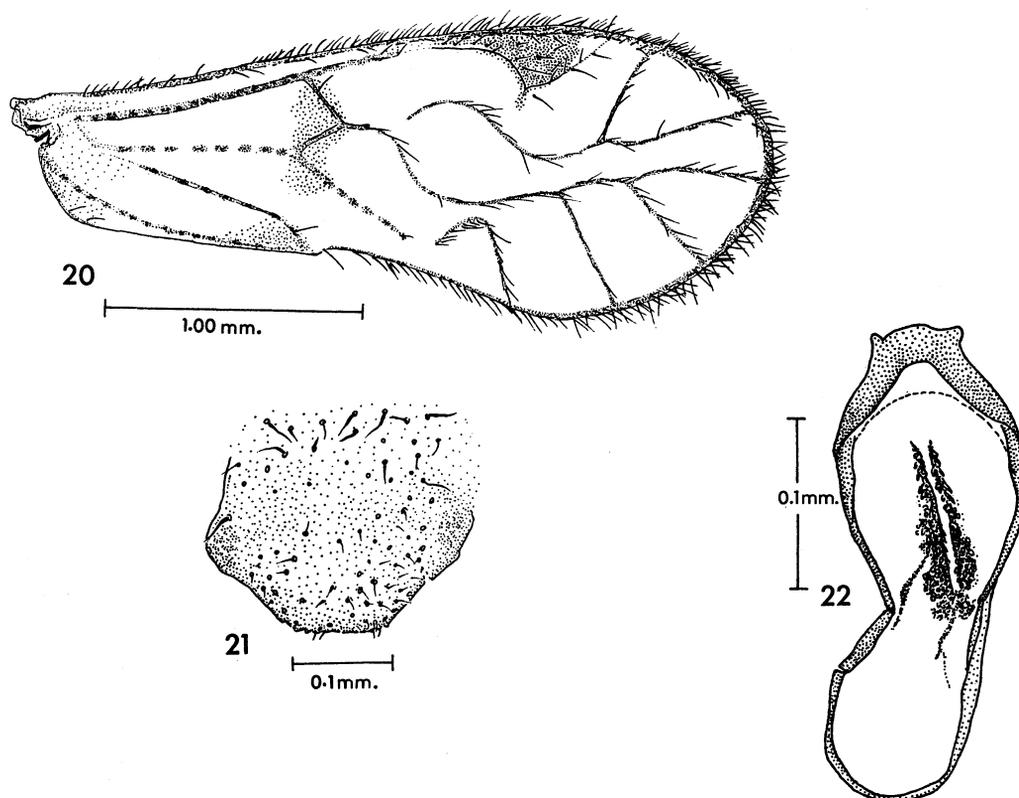


FIG. 20-22. *Aaroniella pseudosigma*, n. sp., ♂: 20, fore wing; 21, hypandrium; 22, phallosome.

Holotype ♂ (AM): PNG: New Guinea (NE): Mt Wilhelm, 3000 m, 27.VIII.1970. Paratypes: 1 ♂, same data as holotype (AM); 1 ♂, IRIAN: New Guinea (NW): Wisselmeren, Okaitadi, 1800 m, 7.VIII.1955, J. L. Gressitt (BISHOP).

In fore wing shape and pattern, *Aa. pedunculata* is very similar to *Aa. antennata*, of which only ♀♀ are known. However, in head pattern and in antennal coloration the 2 species are quite distinct; the flagellar segments of *Aa. pedunculata* are the same color, whereas the basal flagellar segment of *Aa. antennata* is distinctly lighter than the remainder of the flagellum.

In both *Aa. pedunculata* and *Aa. antennata*, it is only the basal veins of the fore wing that have setae sited on dark spots. This condition also occurs in *Aa. basipunctata*, Thornton, Wong & Smithers, 1977 (New Zealand), and the 2 New Guinea new species *Aa. sigma* and *Aa. pseudosigma* described in this paper. The New Zealand species is clearly separable by the distinct wide brown marginal band of the fore wing, and in both *Aa. sigma* and

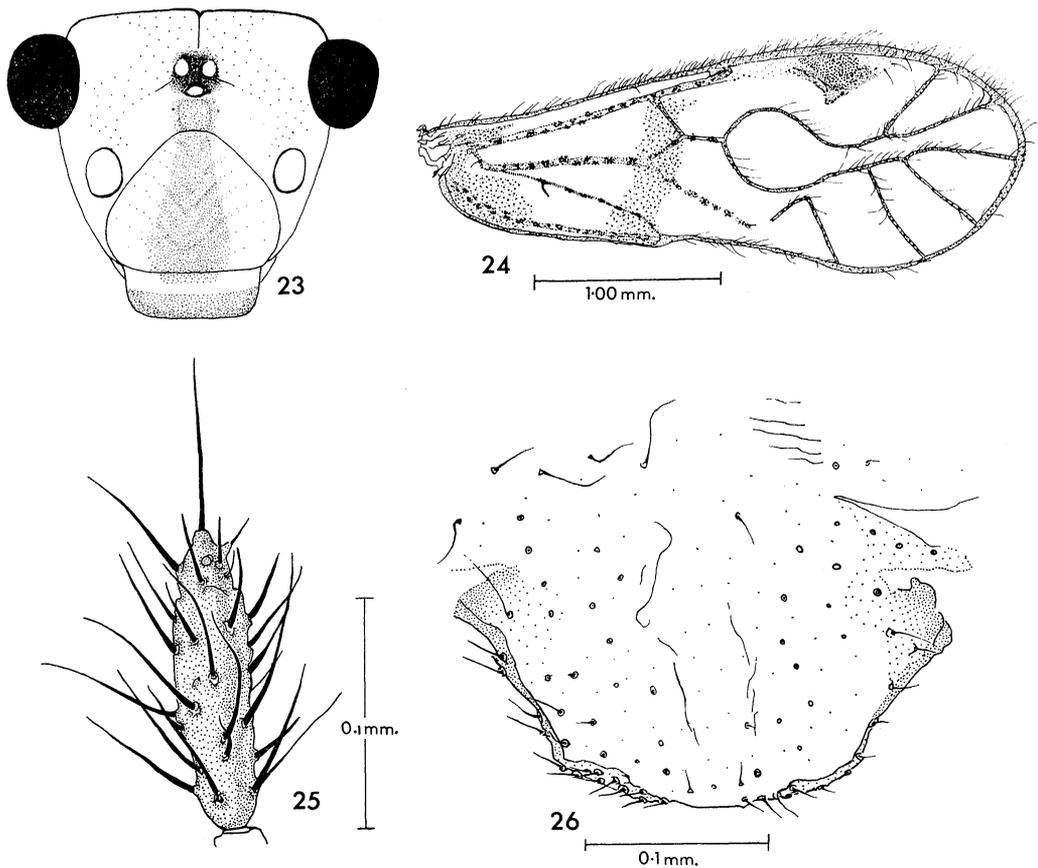


FIG. 23-26. *Aaroniella sigma*, n. sp., ♂: 23, head viewed from front (not to scale); 24, fore wing; 25, apical segment of antenna; 26, hypandrium.

Aa. pseudosigma vein cu_2 in the fore wing is setose, whereas this vein is bare in typical species of *Aaroniella*, including both *Aa. pedunculata* and *Aa. antennata*. It is possible, although not probable, that *Aa. pedunculata* is the male of *Aa. antennata*, with marked sexual dimorphism in color pattern. Marked sexual differences in head pattern and antennal pattern are not known in other species of philotarsids.

***Aaroniella pseudosigma* Thornton & Smithers, new species** FIG. 20–22

♂. *Coloration* (after ca 8 years in alcohol). Head pattern as that of *Aa. sigma* except genal markings not discernible. Thorax and legs as *Aa. sigma* but no longitudinal cream bands on pleura. Fore wing (FIG. 20) and hind wing pigmented much as in *Aa. sigma*. Abdomen mottled gray-brown. *Morphology*. B = 2.10 mm. I.O.: D = 2.50. $f_1 = 0.48$ mm. $f_2 = 0.30$ mm. $f_1:f_2 = 1.60$. Apical segment of antenna not available. Pearman's organ present. F = 0.55 mm. T = 1.00 mm. $t_1 = 0.37$ mm. $t_2 = 0.05$ mm. $t_3 = 0.07$ mm. $rt = 7.4:1:1.4$. $ct = 16$. Claw with preapical tooth. Fw = 2.80 mm, vein cu_2 with 7 setae, a fairly long, distinct spur-vein at vertex of pterostigma. Hw = 2.19 mm. Setae on hind wing veins: r_1-9 , $rs-2$, $r_{2+3}-2$, $r_{4+5}-21$, $m-21$, cu_1-3 . Epiproct subrectangular, setose apically. Paraproct with a circular field of 13 trichobothria and 1 seta not in a rosette socket. Hyandrium (FIG. 21) simple, setose. Phallosome (FIG. 22) similar to that of *Aa. sigma* but with a prong at each posterior corner instead of serrations; pair of penis sclerites roughly serrated but not S-shaped.

♀. Unknown.

Holotype ♂ (BISHOP 10,449), IRIAN: New Guinea (NW): Wisselmeren, Okaitadi, 1500 m, 8.VIII.1955, J. L. Gressitt.

This specimen, taken from the mountains of West Irian, is very similar in coloration to *Aa. sigma*, which occurs in the mountains of eastern New Guinea. It differs in having a distinct spur vein at the vertex of the pterostigma (in both wings), and in possessing a prong rather than serrations at each posterior corner of the phallosome. The penial bulb sclerites, although somewhat similar in structure to those of *Aa. sigma*, are shorter and straighter. The species is unusual in having vein cu_2 in the fore wing and vein cu_1 in the hind wing both setose. *Aa. pseudosigma*, *Aa. sigmoides* and *Aa. sigma* have many features in common, *Aa. sigmoides*, from Biak Island, being the most distinct of the 3.

***Aaroniella sigma* Thornton & Smithers, new species** FIG. 23–31

♂. *Coloration* (after ca 3 years in alcohol). Head generally buff, patterned in front with brown and dark brown marks as in FIG. 23; ocellar protuberance black, a wide dark brown band from this down middle of clypeus; labrum dark brown; genae brown posteriorly; maxillary palps brown, apical segment dark brown; antenna with scape light brown, remainder brown; eyes black. Thoracic nota dark brown, scutella cream, sutures between mesothoracic nota cream. Thoracic pleura brown; above coxae are longitudinal cream, brown, and cream bands. Legs: coxa brown; trochanter and femur pale buff; tibia pale buff, brown apically; tarsal segments brown. Fore wing (FIG. 24) with setae of basal veins sited on brown spots, a transverse brown band, and a brown mark in pterostigma. Hind wing hyaline, a fine brown cloud in angle of anal cell. Abdomen with mottled gray-brown granulations. *Morphology*. B = 2.30 mm. I.O.: D = 2.50. Prominent long black setae on vertex (not shown in diagram). Flagellum of holotype incomplete, Mt Kaindi paratype ♂ with only 10 flagellar segments, apical segment conical apically but not attenuated, with a single stout long apical seta (FIG. 25). Mt Kaindi paratype ♂. $f_1 = 0.40$ mm. $f_2 = 0.30$ mm. $f_1:f_2 = 1.33$. Thorax waxy dorsally. F = 0.58 mm. T = 1.05 mm. $t_1 = 0.38$ mm. $t_2 = 0.05$ mm. $t_3 = 0.08$ mm. $rt = 7.60:1:1.60$. $ct = 19$. Claw with preapical tooth. Fw = 3.10 mm. Fore wing clearly wider subapically, vein cu_2 with 7 setae, pterostigma with sharply angled vertex, areola postica

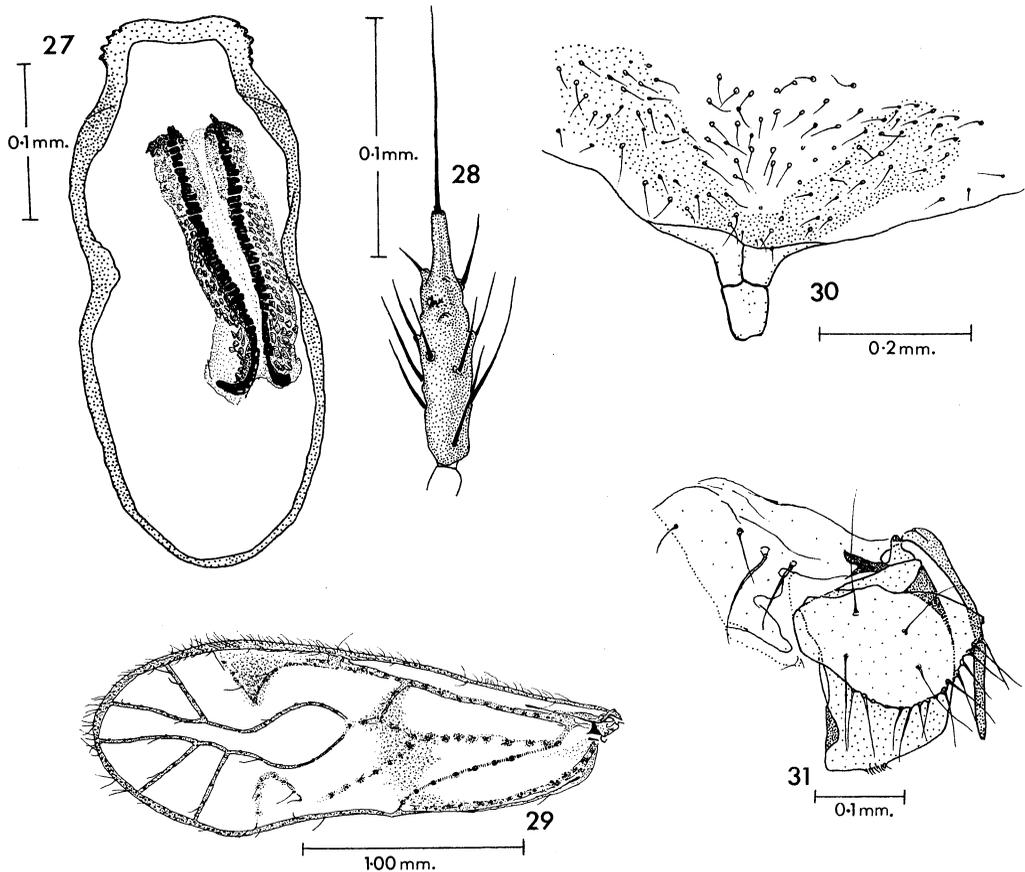


FIG. 27-31. *Aroniella sigma*, n. sp., ♂: 27, phallosome. ♀: 28, apical segment of antenna; 29, fore wing; 30, subgenital plate; 31, gonapophyses.

fairly high. Hw = 2.26 mm. Setae on hind wing veins: r_1 —10, rs —0, r_{2+3} —0, r_{4+5} —15, m —21, cu_1 —2. Epiproct simple, setose; paraproct with a hemispherical field of 34 trichobothria. Hypandrium (FIG. 26) with lateral incisions, apical margin bare centrally, setose at sides. Phallosome (FIG. 27) with a narrow 'waist', apically angular, the angles serrated, a pair of large twisted S-shaped sclerites within frame.

♀. *Coloration* (after ca 3 years in alcohol). As ♂. *Morphology*. B = 2.20 mm. I.O.: D = 3.80. f_1 = 0.25 mm. f_2 = 0.18 mm. $f_1:f_2$ = 1.39 (from Okapa paratype). Apical segment of antenna attenuated, with 1 apical seta (FIG. 28). F = 0.51 mm. T = 0.96 mm. t_1 = 0.33 mm. t_2 = 0.05 mm. t_3 = 0.07 mm. rt = 6.60: 1: 1.40. ct = 17. Claw with preapical tooth. Fw—2.15 mm, vein cu_2 with 7 setae, morphology of fore wing (FIG. 29) as ♂. Hw = 1.86 mm. Hind wing vein setae: r_1 —9, rs —0, r_{2+3} —0, r_{4+5} —14, m —11, cu_1 —0. Epiproct setose apically. Paraproct with circular field of 19 trichobothria. Subgenital plate (FIG. 30) tripartite apically, apical sclerites bare. Gonapophyses (FIG. 31): ventral valve elongate; dorsal valve subrectangular, a low minutely setose prominence on apical margin; outer valve with rounded apical margin, bearing long setae.

Holotype ♂ (AM), PNG: New Guinea (NE): Mt Kaindi, 2400 m, 6.IX.1970; allotype ♀ (AM), Haviland Lookout, Kassem Pass, 23.VIII.1970; paratypes: 1 ♂, same data as

holotype (AM); 1 ♂, Wau, 1500 m, 5.IX.1970, ex. *Araucaria cunninghami* (BISHOP); 1 ♀, Eastern Highlands, Okapa, 1800 m, 31.XI.1964, R. Hornabrook (BISHOP).

The fore wing of *Aa. sigma* is not *Aaroniella*-like in shape, and vein cu_2 is setose, as it is in some Australian, New Zealand and New Caledonian species of *Haplophallus*; moreover, the antennal segments lack the white apical rings typical of *Aaroniella*. However, the

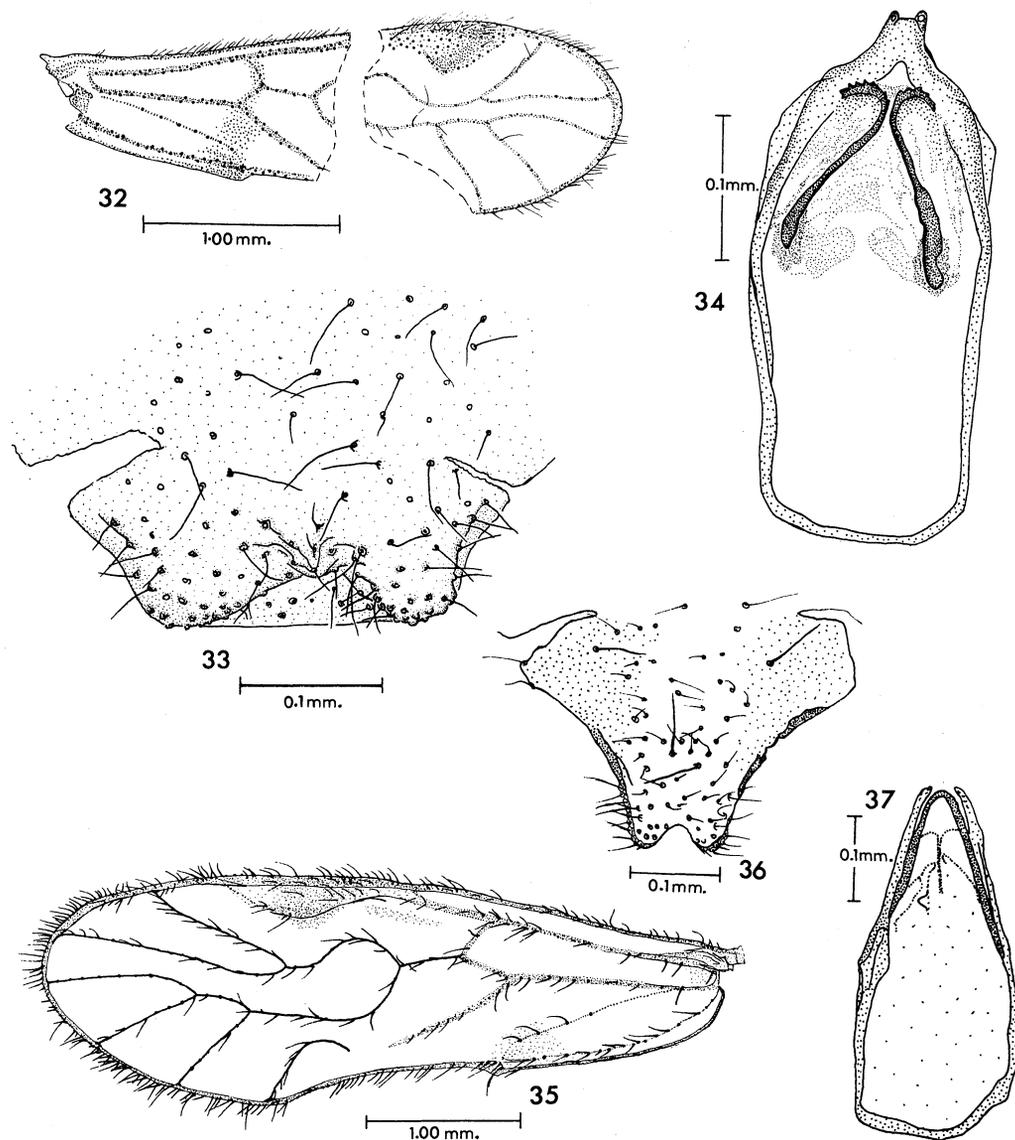


FIG. 32-37. *Aaroniella sigmoides*, n. sp., ♂: 32, fore wing (damaged); 33, hypandrium; 34, phallosome. *Haplophallus elongatus*, n. sp., ♂: 35, fore wing; 36, hypandrium; 37, phallosome.

female subgenital plate and gonapophyses structure are quite typical of the genus, the apical sclerite of the subgenital plate being devoid of setae, and the phallosome contains a pair of serrate S-shaped sclerites. Phallosome sclerites are as yet unknown in *Haplophallus*. On balance, we have assigned *sigma* to *Aaroniella* for the present.

Aaroniella sigmoides Thornton & Smithers, new species FIG. 32-34

♂. *Coloration* (after ca 11 years in alcohol). Color pattern of head, thorax and abdomen not discernible apart from wings. Fore wing (FIG. 32, damaged) with transverse brown band and pterostigma pigment similar to that of *Aa. sigma*, but setae on basal veins not sited on darker spots. Hind wing hyaline apart from a brown cloud in apical angle of anal cell. *Morphology*. B = 2.00 mm. I.O.: D = 2.50, but eyes possibly distorted. Antennae lost. F = 0.63 mm. T = 0.77 mm. $t_1 = 0.17$ mm. $t_2 = 0.05$ mm. $t_3 = 0.07$ mm. $rt = 3.40:1:1.40$. $ct = 9$ (very small). Claw with preapical tooth. Fw = 2.77 mm (approx.). Fore wing vein cu_2 with 7 setae, other basal veins with setae in 2 ranks. Hw = 1.95 mm. Hind wing setae r_1-15 , $rs-0$, $r_{2+3}-0$, $r_{4+5}-20$, $m-19$, cu_1-0 . Epiproct subrectangular, setose posteriorly. Paraproct with a circular field of 26 trichobothria and 1 seta not in rosette socket. Hypandrium (puckered in preparation) simple, setose, with lateral incisions (FIG. 33). Phallosome (FIG. 34) with blunt beak having a small peg at each corner; within frame a pair of J-shaped sclerites, toothed around curve of J.

♀. Unknown.

Holotype ♂ (BISHOP 10,450), IRIAN: New Guinea (NW): SE Biak I, 1.VII.1962, J. L. Gressitt & J. Sedlacek (BISHOP).

This damaged specimen is superficially very similar to *A. sigma*, taken from the eastern side of the island, but differs in details of fore wing vein pigmentation and ciliation, as well as in phallosome shape and structure of penis bulb sclerites.

GENUS **Haplophallus** Thornton, 1959

Up to the present, 16 described species have been placed in *Haplophallus*. Of these, 5 are so similar to the type-species, *H. orientalis*, from the Oriental Region, that they would be included in even the narrowest definition of the genus. They are *H. fenestristigma* (Enderlein 1931) (Seychelles), *H. fuscistigma* Thornton, Lee & Chui, 1972, and *H. boninensis* Thornton, Lee & Chui, 1972, (Micronesia), *H. maculatus* (Tillyard 1923) (New Zealand) and *H. basilewsky* (Smithers 1960) (Tanzania).

In addition, 3 species, *H. trepticus* Thornton & Smithers, 1974 (New Caledonia) *H. emmus* Smithers & Thornton, 1974 (Norfolk Island) and *H. tandus* Smithers & Thornton, 1975a (Lord Howe Island) differ from the genotype only in characters of the female genitalia. A 3rd group of 7 species differs from the genotype not only in characters of the male and female genitalia, but also in structure of the antennal apex and ciliation of the fore and hind wings. The group includes 4 species from New Caledonia: *H. acraeus* Thornton & Smithers, 1974, *H. decorus* Thornton & Smithers, 1974, *H. novitas* Thornton & Smithers, 1974 and *H. virgatus* Thornton & Smithers, 1974; 2 from Australia: *H. bundoorensis* New, 1971 and *H. capitulatus* Smithers, 1972; and 1 from New Zealand and Tasmania: *H. guttatus* (Tillyard, 1923). The placing of this *bundoorensis* group of species in *Haplophallus* is provisional.

Of the 6 new species described below, 1, *H. oblongatus*, clearly falls into the *orientalis* group, and another, *H. separatus*, differs only in details of female genitalia. The remaining 4 new species, *H. elongatus*, *H. stigmatus*, *H. kaindiensis* and *H. setosus*, possess characters that are in accord with those of the *bundoorensis* group of species, thus forming a considerable group of 11 species, distributed mainly in New Guinea, Australia and New Caledonia, that is distinct from the widely distributed *orientalis* group of 11 species.

Haplophallus elongatus Thornton & Smithers, new species FIG. 35-37

♂. *Coloration* (after ca 3 years in alcohol). Color pattern of head as in *H. setosus*, except head markings generally less dark; median vertex mark normal, consisting of a group of closely adjacent dark patches; no small dark brown marks on vertex dorsally near eyes. Fore wing (FIG. 35). *Morphology*. B = 2.60 mm. I.O.: D = 3.50. $f_1 = 0.50$ mm. $f_2 = 0.35$ mm. $f_1 : f_2 = 1.43$. Apical segment of antenna elongated, with 1 apical seta. Flagellum not postulate as in *H. setosus*. Legs missing. Fore wing veins with apical setae in single rank, vein cu_2 with 4 setae. Fw = 4.55 mm. Hw = 3.35 mm. Hind wing vein setae: r_1-0 , $rs-0$, $r_{2+3}-0$, $r_{4+5}-19$, $m-16$, cu_1-0 . Epiproct rounded apically, setose over apical 1/3. Paraproct with an oval field of 41 trichobothria and 2 setae not in rosette sockets, rim of field sclerotised. Hypandrium (FIG. 36)

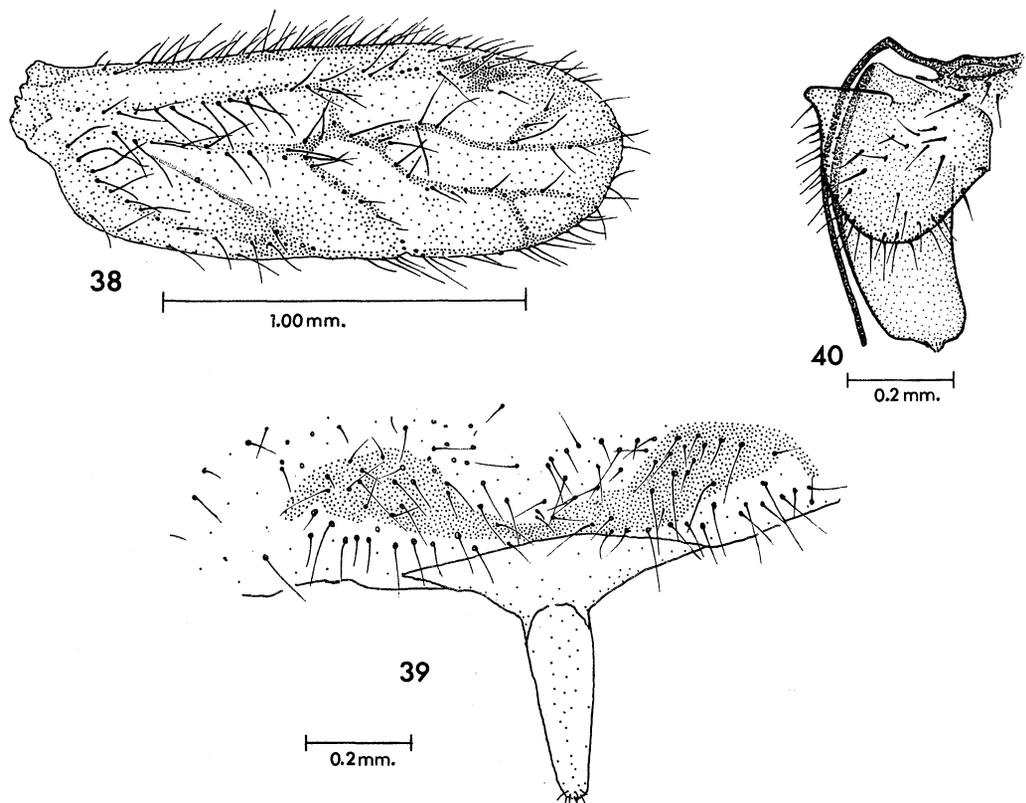


FIG. 38-40. *Haplophallus kaindiensis*, n. sp., ♀: 38, fore wing; 39, subgenital plate; 40, gonapophyses.

fairly long and narrow apically, setose, bilobed, incised laterally at base. Phallosome (FIG. 37) simple, without internal sclerites.

♀. Unknown.

Holotype ♂ (AM), PNG: New Guinea (NE): Mt Wilhelm, 2700 m, 25.VIII.1970.

This species is very similar, in head and fore wing pattern, to *H. setosus*. It differs, however, in the following respects: setae on basal flagellar segment about $2 \times$ width of segment (at least $5 \times$ in *H. setosus*); in fore wing apical veins with setae in 1 rank (2 ranks in *H. setosus*); hypandrium long, narrow apically, length about $3 \times$ width at apex (about $2 \times$ in *H. setosus*), distinctly bilobed (appears almost truncate in *H. setosus*).

Haplophallus kaindiensis Thornton & Smithers, new species FIG. 38-40

♀. *Coloration* (after ca 3 years in alcohol). Head generally buff, bristles pale; a dark brown patch over median epicranial suture, marking adjacent to orbit very light brown; brown cloud over ocellar protuberance and from there forward as a triangle to clypeus; genae buff; clypeus brown with dark brown striae; labrum dark brown. Antenna with scape, pedicel, and 1st flagellar segment buff, rest of flagellum dark brown; very narrow pale band at apex of each segment. Maxillary palps buff, except apical segment dark brown. Thorax dorsally buff, notal margins brown; a broad brown band along pleura above coxae. Legs buff except tarsi dark brown; tibia of prothoracic and mesothoracic legs brown apically. Fore wing (FIG. 38): veins brown in apical 2/3, setae not sited on distinct brown spots; a dark brown mark within pterostigma and a brown cloud in apical angle of anal cell. Hind wing hyaline apart from brown cloud in angle of anal cell. Abdomen cream with gray-brown granulations. *Morphology*. B = 2.90 mm. I.O.: D = 3.50. $f_1 = 0.38$ mm. $f_2 = 0.27$ mm. $f_1:f_2 = 1.41$. Antennal apex attenuated, with 1 apical seta. F = 0.72 mm. T = 1.22 mm. $t_1 = 0.36$ mm. $t_2 = 0.07$ mm. $t_3 = 0.10$ mm. $rt = 5.14:1:1.43$. $ct = 9$, and 4 setae without ctenidia. Claw with preapical tooth. Fw = 1.45 mm, brachypterous, vein cu_2 with 2 setae, with 2 and 4 setae in paratype wings. Hw = 1.18 mm. Setae on hind wing veins: r_1-1 , $rs-0$, $r_{2+3}-0$, $r_{4+5}-0$, $m-2$, cu_1-0 . Epiproct setose apically; paraproct with circular field of 34 trichobothria. Subgenital plate (FIG. 39) with bare subapical sclerite and long narrow apical sclerite bearing 6 small apical setae. Gonapophyses (FIG. 40): ventral valve narrow, sclerotised; dorsal valve subrectangular with apical prominence bearing minute spines; outer valve rounded on apical margin, setose.

♂. Unknown.

Holotype ♀ (AM), PNG: New Guinea (NE): Mt Kaindi, 2400 m, 6.IX.70; paratype 1 ♀, same data as holotype (AM).

Known only from high on Mt Kaindi, this brachypterous species is difficult to place. Although the antenna is *Aaroniella*-like in both coloration and structure, the subgenital plate is atypical, as is the shape of the dorsal valve of the female gonapophyses. In subgenital plate structure *H. kaindiensis* resembles 3 species of *Haplophallus* (*H. emmus* from Norfolk Island, *H. tandus* from Lord Howe Island and *H. trepticus* from New Caledonia, Fiji, Tonga and Samoa), although in these species the antennal apex is not attenuated, vein cu_2 in the fore wing is bare, and vein cu_1 in the hind wing is setose, conditions which are the opposite of those obtaining in *H. kaindiensis*. We have placed this species in *Haplophallus* provisionally. The discovery of fully-winged specimens, particularly males, may lead to a reassessment in placement of this species.

Haplophallus oblongatus Thornton & Smithers, new species FIG. 41-47

♀. *Coloration* (after ca 3 years in alcohol). Head pattern as in FIG. 41 and 42. Head cream with

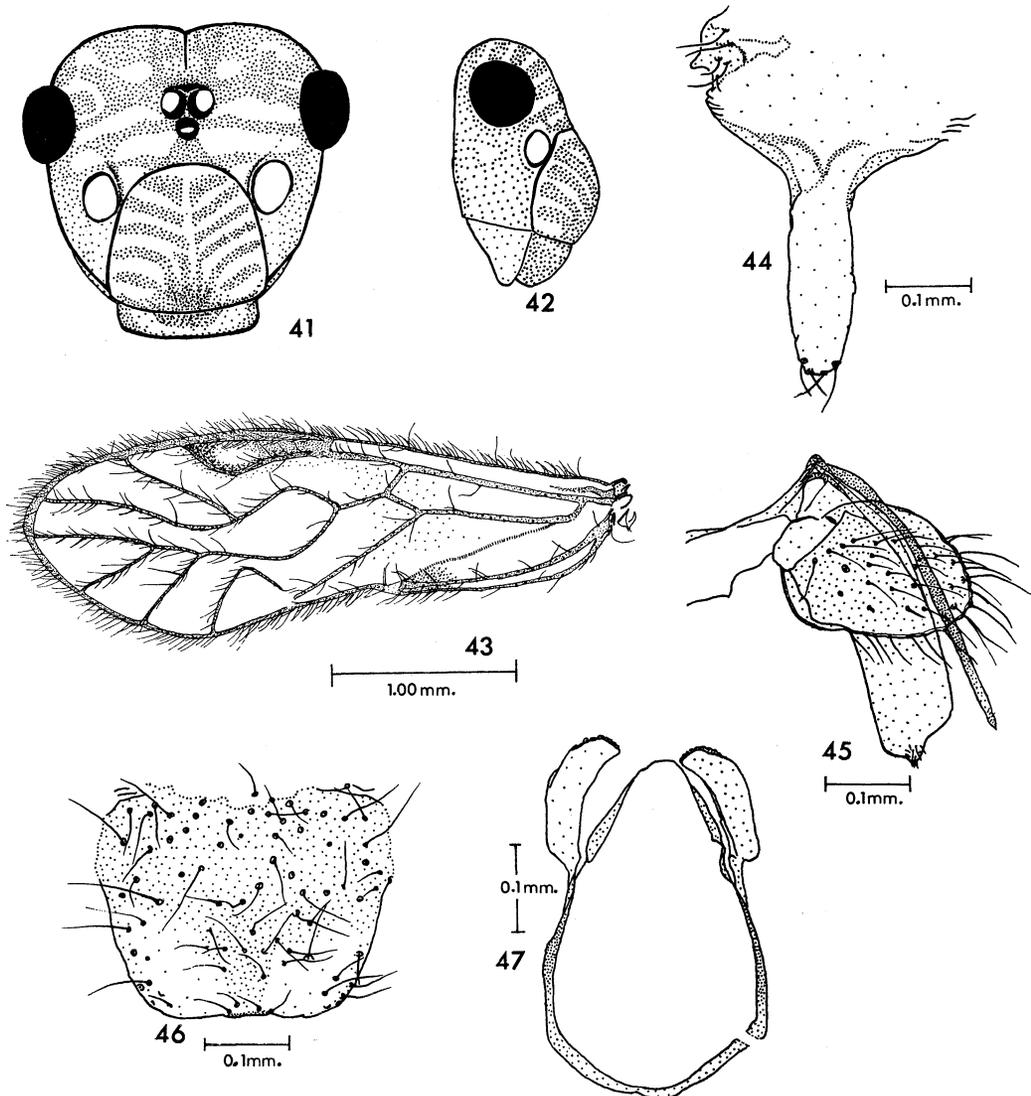


FIG. 41-47. *Haplophallus oblongatus*, n. sp., ♀: 41, head viewed from front (not to scale); 42, head viewed from side (not to scale); 43, fore wing; 44, subgenital plate; 45, gonapophyses. ♂: 46, hypandrium; 47, phallosome.

prominent dark brown striped pattern. Antennae brown, flagellar segments without light apices. Maxillary palps dark brown, eyes black, ocellar protuberance black, ocelli pale. Thoracic tergites including scutella brown, pleura brown. Legs: coxa brown; trochanter very pale buff; femur brown with narrow pale buff band halfway and at apex; tibia brown, a broad pale buff band a short distance from base; tarsal segments dark brown. Fore wing (FIG. 43) hyaline with an extremely faint diffuse transverse band, brown pigment within edge of pterostigma and a small brown cloud at apex of anal cell. Hind wing hyaline apart from brown cloud in anterior 1/2 of costal cell. Abdomen with dark gray-brown granulations. *Morphology.* B = 2.30 mm. I.O.: D = 3.60. $f_1 = 0.37$ mm. $f_2 = 0.21$ mm. $f_1:f_2 = 1.76$. Apical segment of antenna

not available. $F = 0.61$ mm. $T = 0.86$ mm. $t_1 = 0.26$ mm. $t_2 = 0.05$ mm. $t_3 = 0.07$ mm. $rt = 5.20:1:1.40$. $ct = 17$. Claw with preapical tooth. In fore wing vein cu_2 bare, other veins with setae in more than 1 rank even in apical 1/3 of wing. $Fw = 3.20$ mm. $Hw = 2.20$ mm. Hind wing vein setae: r_1-13 , $rs-0$, $r_{2+3}-0$, $r_{4+5}-18$, $m-15$, cu_1-10 . Epiproct squarish. Paraproct with a circular field of 21 trichobothria and 1 seta not in rosette socket. Subgenital plate (FIG. 44) without separate apical sclerites, apical lobe bearing 4 small setae apically. Gonapophyses (FIG. 45): ventral valve sclerotised basally, fleshy apically and bearing minute recurrent spines; dorsal valve basally swollen, elongate-rectangular apically, with a prominence on apical margin bearing minute spines; outer valve oval, setose.

♂. *Coloration* (after ca 8 years in alcohol). As ♀. *Morphology*. $B = 2.00$ mm. I.O.: D = 1.80. Antenna missing. $F = 0.60$ mm. $T = 1.20$ mm. $t_1 = 0.33$ mm. $t_2 = 0.06$ mm. $t_3 = 0.09$ mm. $rt = 5.50:1:1.50$. $ct = 17$. Claw with preapical tooth. $Fw = 4.41$ mm. Fore wing vein setae as ♀, vein cu_2 bare. $Hw = 3.20$ mm. Hind wing vein setae: r_1-14 , $rs-0$, $r_{2+3}-0$, $r_{4+5}-32$, $m-36$, cu_1-14 . Epiproct subtriangular. Paraproct with a circular field of 29 trichobothria and 1 seta not in rosette socket. Hypandrium (FIG. 46) simple, squarish, setose. Phallosome (FIG. 47) without internal sclerites.

Holotype ♀ (AM), PNG: New Guinea (NE): Wau, McAdam Park, 1300 m, 7.IX.1970, shrubs along water race; allotype ♂ (BISHOP 10,451A), Mt Wilhelm, above Keglsugl, 3000 m, 4.VII.1955, J. L. Gressitt; paratypes: 2 ♀♀, same data as holotype (BISHOP); 1 ♂, 1 ♀, same data as allotype (AM).

OTHER SPECIMENS EXAMINED: PNG: New Guinea (NE): ♀, Daulo Pass, Asaro-Chimbu Divide, 2500 m, 12.VI.1955, Gressitt (BISHOP); New Britain: ♀, Nakanai Mts, Gisiluve, 1050 m, 25.VII.1956, E. J. Ford, Jr. (BISHOP); New Ireland: ♀, Schleintz Mts, Lelet Plateau, X.1959, W. W. Brandt (BISHOP).

This widespread species is very similar in fore wing pattern to *H. separatus*, but can be easily distinguished from it by head pattern and pigmentation pattern of the legs, as well as by details of genitalic structure. Moreover, in *H. oblongatus*, the setae on the apical fore wing veins are sited in more than 1 rank, whereas in *H. separatus* almost all the fore wing veins have setae sited in single rank. *H. setosus* also has the setae in 2 ranks on the apical veins of the fore wing, and, like *H. oblongatus*, the membrane pigment of the fore wing is confined to the pterostigma. The 2 latter species are clearly separable, however, on ciliation of vein cu_2 in the fore wing (setae present in *H. setosus*, absent in *H. oblongatus*) and on hypandrial structure. The hypandrium of *H. oblongatus* is squarish, without lateral incisions, as in *H. orientalis* and its allies; that of *H. setosus* is trapezoid, with lateral incisions, as in *H. bundoorensis* and its allies.

Both *H. oblongatus* and *H. separatus* may be included in the *orientalis* group of species, in which vein cu_2 in the fore wing is bare, and the antennal apex is of normal structure. This group stands in contrast to the *bundoorensis* group of species, including several from New Guinea, the members of which have vein cu_2 in the fore wing setose, and the antennal apex attenuated and bearing 1 apical seta.

Haplophallus separatus Thornton & Smithers, new species

FIG. 48-56

♀. *Coloration* (after ca 4 years in alcohol). Head, cream, patterned with brown as in FIG. 48 and 49. Eyes black, ocelli with black centripetal borders. Maxillary palps brown, apical segment darker. Antenna brown, flagellar segments without pale apices. Thoracic nota brown, scutella and borders of sutures cream, pleura brown. Legs: coxa brown; trochanter pale buff; femur very pale buff with 2 broad

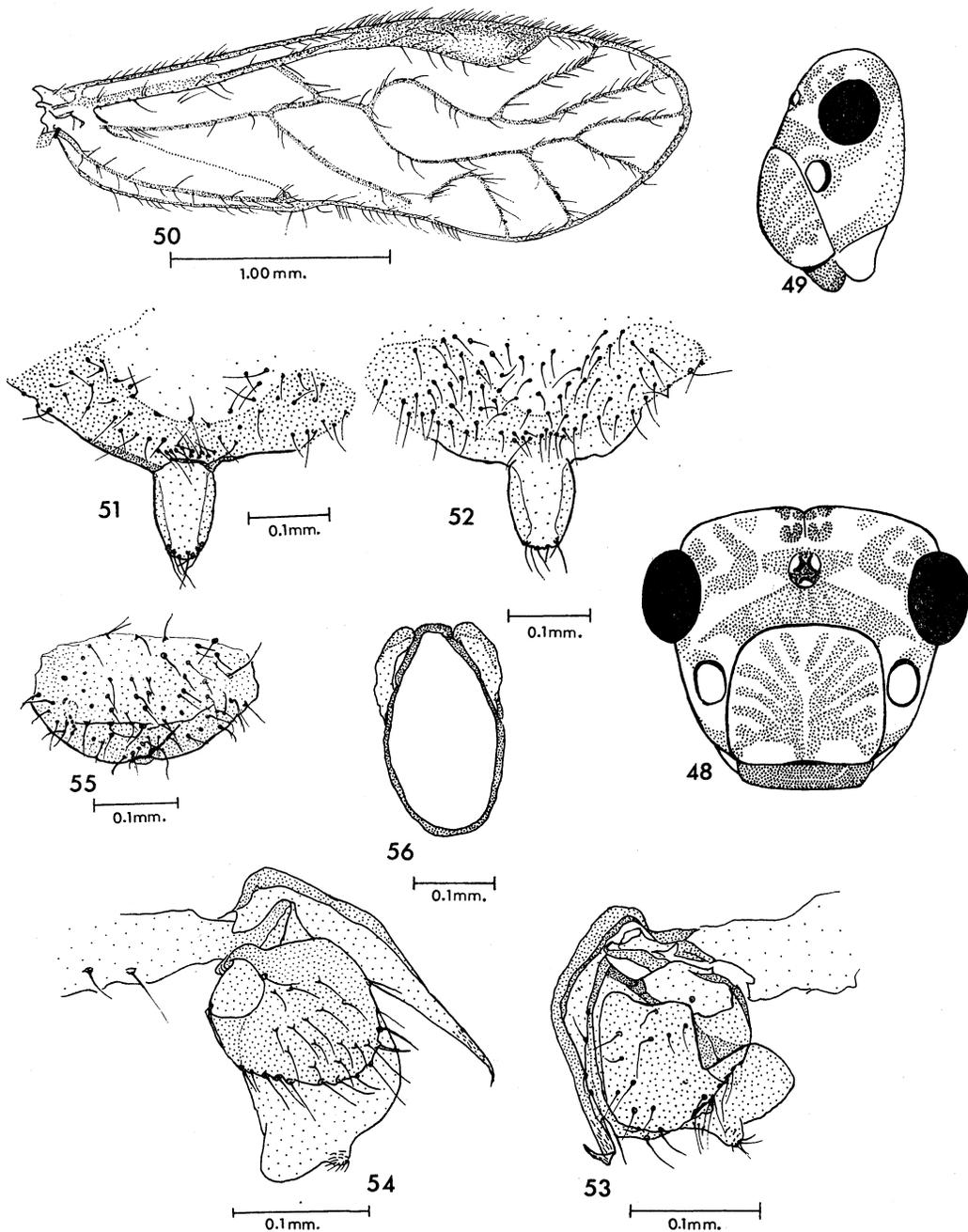


FIG. 48-56. *Haplophallus separatus*, n. sp., ♀: 48, head viewed from front (not to scale); 49, head viewed from side (not to scale); 50, fore wing; 51, subgenital plate (holotype); 52, subgenital plate (paratype); 53, gonapophyses (holotype); 54, gonapophyses (paratype). ♂: 55, hypandrium; 56, phallosome.

brown bands; tibia and tarsal segments brown. Fore wing (FIG. 50) pigment confined to pterostigma. Hind wing hyaline. Abdomen cream, mottled with brown. *Morphology*. B = 2.00 mm. I.O.: D = 3.50. $f_1 = 0.40$ mm. $f_2 = 0.35$ mm. $f_1:f_2 = 1.14$. Apical segment of antenna moderately attenuated, with 2 subapical setae. F = 0.55 mm. T = 0.78 mm. $t_1 = 0.24$ mm. $t_2 = 0.06$ mm. $t_3 = 0.08$ mm. $rt = 4.00$: 1:1.33. $ct = 14$. Claw with preapical tooth. Fw = 2.88 mm. In fore wing, vein cu_2 bare; all veins except r_1 have setae in single rank. Hw = 2.10 mm. Hind wing vein setae: r_1-13 , $rs-0$, $r_{2+3}-0$, $r_{4+5}-20$, $m-22$, cu_1-11 . Epiproct squarish, setose. Paraproct with a field of 19 trichobothria and 1 seta not in rosette socket, margin of field sclerotised. Subgenital plate (FIG. 51, holotype, somewhat folded, FIG. 52, Gauka paratype) apical sclerite with 8 setae (6 in paratype) along apical margin. Gonapophyses (FIG. 53, holotype, dorsal valve folded, FIG. 54, Gauka paratype): ventral valve with minute recurrent spines on apex; dorsal valve with subapical prominence beset with minute spinelets; outer valve large, circular, setose.

♂. *Coloration* (after ca 8 years in alcohol). As ♀, but abdomen cream. *Morphology*. B = 2.20 mm. I.O.: D = 0.90. $f_1 = 0.42$ mm. $f_2 = 0.34$ mm. $f_1:f_2 = 1.24$. Apical segment of antenna moderately attenuated, with 2 subapical setae. F = 0.42 mm. T = 0.85 mm. $t_1 = 0.27$ mm. $t_2 = 0.06$ mm. $t_3 = 0.07$ mm. $rt = 4.50$: 1:1.17. $ct = 13$. Claw with preapical tooth. Fw = 2.00 mm. In fore wing vein cu_2 bare; all veins except r_1 have setae in single rank. Hw = 2.28 mm. Hind wing vein setae: r_1-14 , $rs-0$, $r_{2+3}-0$, $r_{4+5}-25$, $m-25$, cu_1-5 . Epiproct rounded, sclerotised and setose on posterior margin. Paraproct with a field of 25 trichobothria and 2 setae not in rosette sockets, margin of field sclerotised. Hypandrium (FIG. 55) simple, rounded, setose. Phallosome (FIG. 56) without internal sclerites.

Holotype ♀ (AM), PNG: New Guinea (NE): Kundiawa, 24.VIII.1970; allotype ♂ (BISHOP 10,452A), New Guinea (SE): Mendi, Southern Highlands, 1600 m, 2.III.1965, light trap, J. Wolstenholme; paratypes: 1 ♀, same data as holotype (BISHOP); 2 ♂♂, same data as allotype (AM); New Guinea (NE): 1 ♀, Gauka, S of Minj, 27.VIII.1970 (AM); 1 ♀, Mt Wilhelm, 2750 m, 25.VIII.1970 (AM); New Guinea (SE): 1 ♂, Southern Highlands, Mendi, 1660 m, 13.X.1958, light trap, T. C. Maa (BISHOP); 5 ♂♂, Southern Highlands, Mendi, 1525 m, VI.1965, light trap, J. Wolstenholme (BISHOP).

On fore wing pattern *H. separatus* may easily be confused with *H. oblongatus*, with which it is sympatric on Mt Wilhelm. The 2 species may easily be distinguished, however, on pattern of pigmentation of the head and legs, as well as other characters (see under *H. oblongatus*).

Haplophallus setosus Thornton & Smithers, new species

FIG. 57-60

♂. *Coloration* (after ca 3 years in alcohol). Head with ground color cream, patterned as in FIG. 57, median vertex mark consisting of dark brown pigment surrounding lighter areas, giving a reticulate appearance. Eyes black, ocellar protuberance black. Antenna brown, flagellar segments without paler apices. Maxillary palp very pale brown, except subapical segment light brown and apical segment dark brown. Thorax: nota brown, scutella cream, sutures bordered cream; pleura brown. Legs: coxa brown; trochanter and femur pale buff; tibia pale buff, brown apically; tarsal segments brown. Fore wing (FIG. 58) hyaline, apart from brown pigment in pterostigma and in extreme apical angle of anal cell. Hind wing hyaline. Abdomen cream with blackish brown granulations. *Morphology*. B = 2.90 mm. I.O.: D = 2.80. $f_1 = 0.84$ mm. $f_2 = 0.57$ mm. $f_1:f_2 = 1.47$. Apex of antenna not available, flagellum with pustulate appearance—bases of setae raised from flagellum surface. F = 0.72 mm. T = 1.75 mm. $t_1 = 0.45$ mm. $t_2 = 0.07$ mm. $t_3 = 0.09$ mm. $rt = 6.43$: 1:1.29. $ct = 19$. Claw with preapical tooth. Pearson's organ with rasp and mirror. Fw = 4.40 mm. In fore wing vein cu_2 with 16 setae, all other veins with setae sited in 2 ranks. Hw = 3.10 mm. Hind wing vein setae: r_1-9 , $rs-4$, $r_{2+3}-7$, $r_{4+5}-31$, $m-35$, cu_1-0 . Epiproct subtriangular. Paraproct with a circular field of 37 trichobothria and 2 setae not in rosette sockets, margin of field sclerotized. Hypandrium (FIG. 59) angular apically, margin beset with

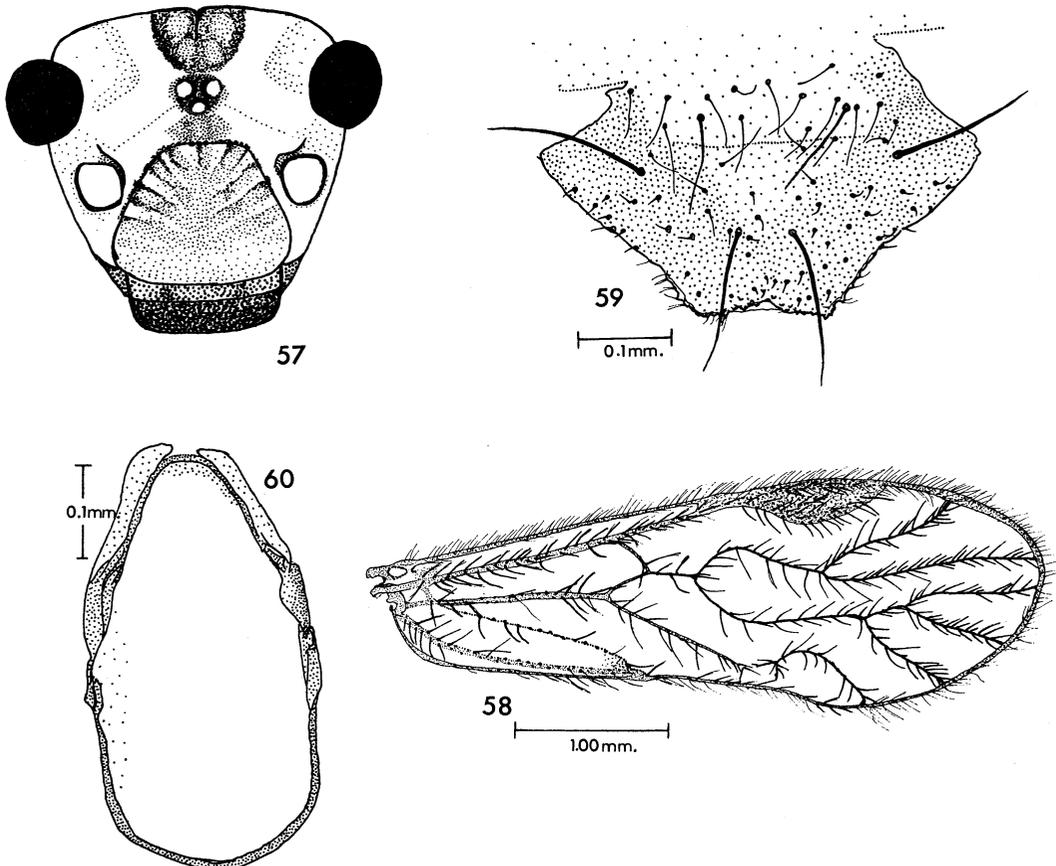


FIG. 57-60. *Haplophallus setosus*, n. sp., ♂: 57, head viewed from front (not to scale); 58, fore wing; 59, hyandrium; 60, phallosome.

fine setae having large bosses, 6 very long setae (4 of them stout) on surface of hyandrium, hyandrium incised laterally. Phallosome (FIG. 60) simple, lacking internal sclerites.

♀. Unknown.

Holotype ♂ (AM), PNG: New Guinea (NE): Mt Kaindi, 2400 m, 6.IX.1970; paratype, IRIAN: New Guinea (NW): 1 ♂, Swart Valley W ridge, 1800-2000 m, 19.XI.1958, J. L. Gressitt (BISHOP).

Like *Aa. sigma*, *Aa. pseudosigma*, *Aa. sigmoides*, *Aa. alticola*, *H. kaindiensis*, *H. elongatus* and *H. stigmatus*, this species has vein cu_2 in the fore wing setose. *H. setosus* is separable from these species by fore wing pigmentation, the pigment of the membrane being entirely confined to the pterostigma, and also by the 2 ranks of setae on the apical veins of the fore wing.

Superficially very like *H. elongatus*, *H. setosus* may be distinguished by a number of characters on microscopic examination (see remarks under *H. elongatus*).

Haplophallus stigmatus Thornton & Smithers, new species FIG. 61-63

♀. *Coloration* (after ca 10 years in alcohol). Head pattern not discernible. Antennae brown, segments without white apices. Eyes black. Thorax brown, scutella colorless. Legs: coxa, trochanter, and femur colorless; tibia light brown; tarsal segments light brown. Fore wing (FIG. 61) with discrete patch of brown in middle of wing and brown pigment over basal 1/2 of pterostigma, areola postica unpigmented. Color of abdomen not discernible. *Morphology*. B = 2.70 mm. I.O.: D = 3.00. $f_1 = 0.40$ mm. $f_2 = 0.25$ mm. $f_1:f_2 = 1.60$. Apical segment of antenna not available. F = 0.70 mm. T = 1.13 mm. $t_1 = 0.35$ mm. $t_2 = 0.06$ mm. $t_3 = 0.10$ mm. $rt = 5.50:1:1.67$. $ct = 13$. Claw with preapical tooth. Fw = 2.63 mm. Vein cu_2 of fore wing with 10 setae, veins in apical 1/2 of wing with setae in 1 rank. Hw = 2.15 mm. Hind wing vein setae: r_1-2 , $rs-0$, $r_{2+3}-0$, $r_{4+5}-7$, $m-5$, cu_1-0 . Epiproct rounded, margin heavily setose. Paraproct with a circular field of 23 trichobothria and 1 seta not in rosette socket. Subgenital plate (FIG. 62) tripartite apically, apical sclerite fairly long, with 7 small apical setae. Gonapophyses (FIG. 63): ventral valve narrow, sclerotised; dorsal valve subrectangular, with prominence on apical margin bearing fine spines; outer valve setose, subtriangular.

♂. Unknown.

Holotype ♀ (AM), PNG: New Ireland: Lemkamin, 21.IV.1962, mercury light, Noona Dan Expedition 61/2.

H. stigmatus is similar to 4 species from New Caledonia (*H. acraeus*, *H. decorus*, *H. novitas* and *H. virgatus*) and 2 from Australia (*H. bundoorensis* and *H. capitulatus*) in ciliation of vein cu_2 in the fore wing, and also structure of subgenital plate and shape of gonapophyses (except *H. acraeus* and *H. capitulatus* which are known only from males). It is clearly distinguishable from all of these on fore wing pattern.

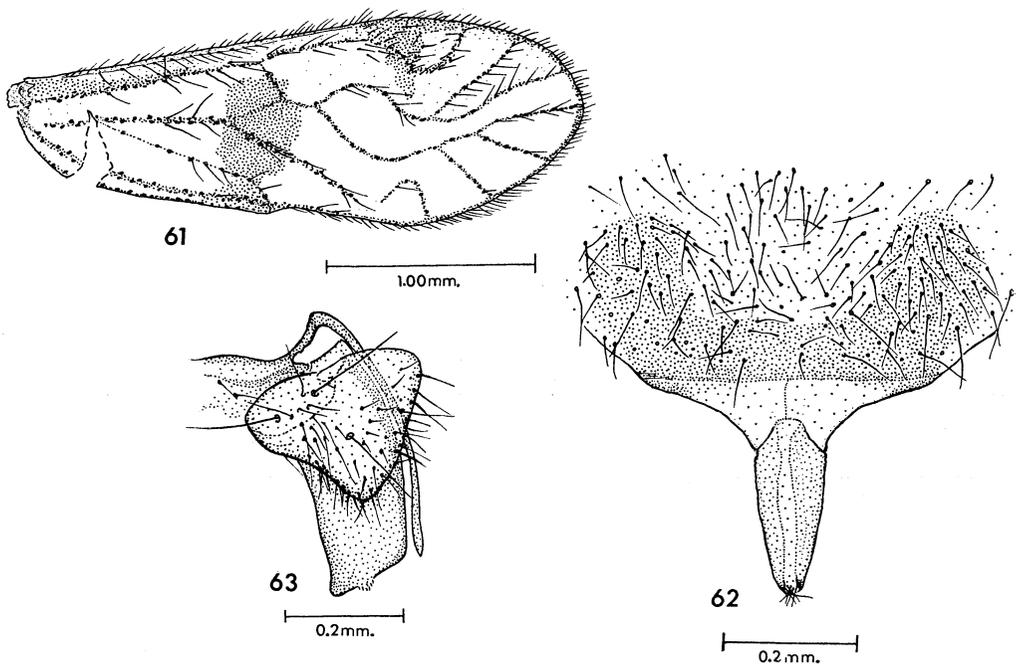


FIG. 61-63. *Haplophallus stigmatus*, n. sp., ♀: 61, fore wing; 62, subgenital plate; 63, gonapophyses.

This species is similar in fore wing pattern to the male of *Aa. alticola*, but in *H. stigmatus* the patch in the middle of the wing is more discrete, and the pterostigma mark is more sharply confined to the basal 1/2 of the pterostigma. The 2 species differ in subgenital plate structure and in antennal pigmentation.

GENUS *Zelandopsocus* Tillyard, 1923

The type-species, *Zelandopsocus formosellus* Tillyard, 1923, lacks a preapical tooth on the claw, has vein cu_2 in the fore wing bare, all hind wing veins bare, female epiproct with a dorsal setose flap, a subgenital plate bearing 4 apical setae, the dorsal valve of the female gonapophyses with a distinct subapical spine that does not project beyond the apex of the valve, a complex, 5-lobed hypandrium with the middle lobe mushroom-shaped, and penis sclerites (rods and spinous sacs) within the phallosome. The females of 2 other New Zealand species, *Z. tectus* Thornton, Wong & Smithers, 1977 and *Z. kuscheli* Thornton, Wong & Smithers, 1977, conform to the characters of *Z. formosellus* except that there are only 2 apical setae on the subgenital plate of *Z. kuscheli*. Males of *Z. tectus* have not been collected; males of *Z. kuscheli* conform to the male characters of *Z. formosellus*.

In New Caledonia we discovered a further 27 species assignable to *Zelandopsocus* (Thornton & Smithers 1974) and we have recently proposed an additional diagnosis for this genus (Thornton, Wong & Smithers 1977).

Both the New Guinea species described here under this genus are somewhat unusual. The male of *Z. novoguineensis*, n. sp. has sclerites within the phallosome that are unusual when compared to those of the 23 described species of which males are known, in that there are evidently no spinous sac-like sclerites; in the female the dorsal valve of the gonapophyses bears a long subapical spine, projecting well beyond the apex of the valve. No male of *Z. stenopterus*, n. sp. has been collected; the female, like *Z. novoguineensis*, possesses a long dorsal valve spine, and the shape of the outer valve is oval, whereas the 26 described species of which females are known possess a hatchet-shaped outer valve. *Z. stenopterus* is also highly unusual in 2 other respects: the fore wing is long and strap-like, and the head is very sharply angled at the vertex as seen in side view, features that are not known in any other philotarsid. The species is regarded as a highly aberrant philotarsid of the *Zelandopsocus-Austropsocus* line.

Zelandopsocus novoguineensis Thornton & Smithers, new species

FIG. 64-71

♂. *Coloration* (after ca 19 years in alcohol). Details not discernible but head generally dark brown except frons pale each side of median stirrup mark. Eyes black, ocelli with black centripetal borders. Thorax and abdomen generally mid-brown, 2 apical tarsal segments darker. Fore wing (FIG. 64) veins brown, a small brown patch within apex of pterostigma. Hind wing hyaline. *Morphology*. B = 2.00 mm. I.O.: D = 2.00. Head waxy. Antennae missing. F = 0.74 mm. T = 1.25 mm. $t_1 = 0.35$ mm. $t_2 = 0.06$ mm. $t_3 = 0.08$ mm. $rt = 5.83:1:1.33$. $ct = 13$. Claw without preapical tooth. Fw = 3.10 mm. In fore wing, rs and m meet at a point, pterostigma smoothly curved posteriorly, areola postica with acute apical angle, vein cu_2 bare. Hw = 2.47 mm. Hind wing veins bare. Epiproct (FIG. 65 from paratype) semicircular, a posterior rugose ridge. Paraproct with circular field of 20 trichobothria, border of field sclerotised on 1 side. Ninth tergite with posterior edge (FIG. 66) serrated adjacent to anterior border of

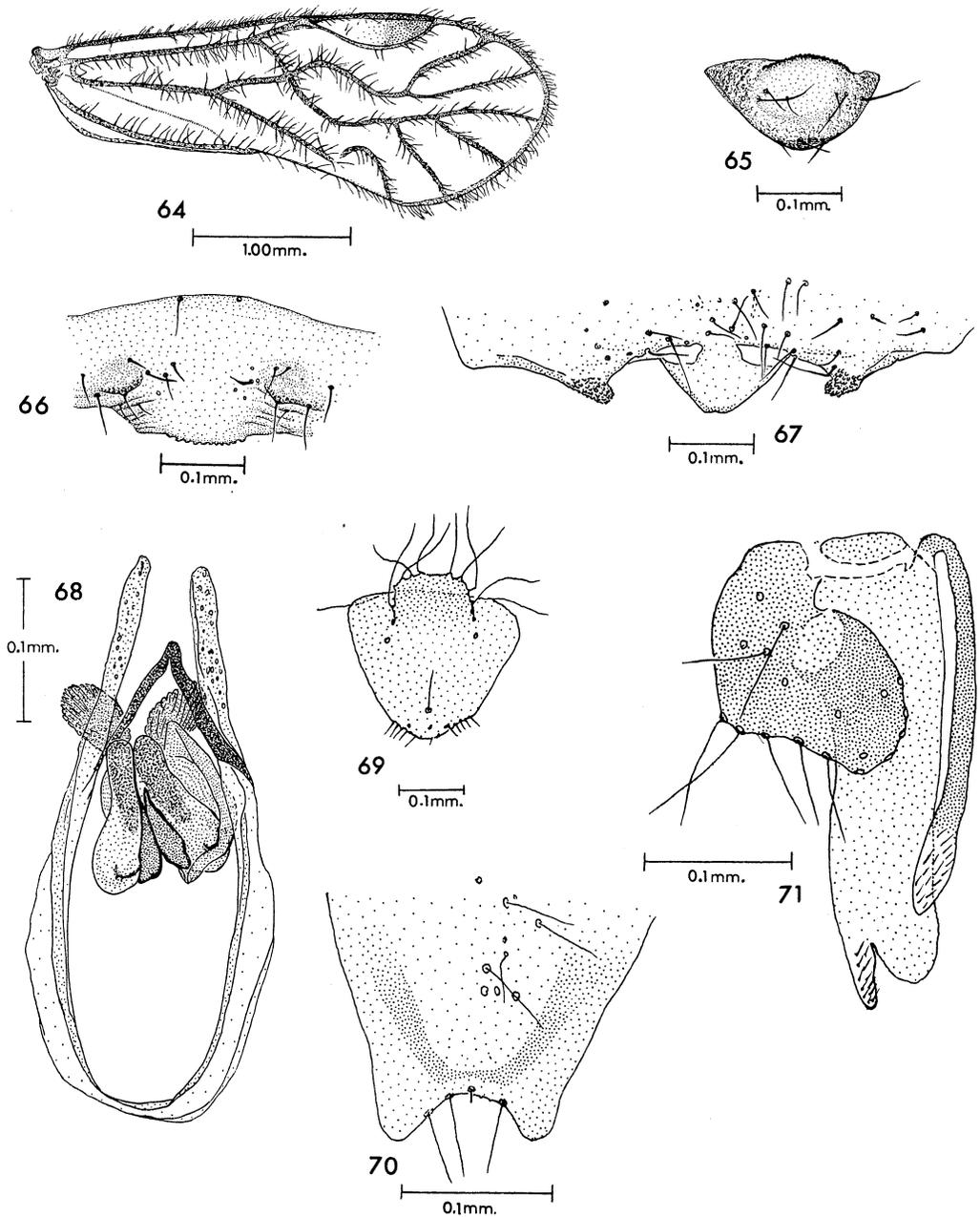


FIG. 64-71. *Zelandopsocus novoguineensis*, n. sp., ♂: 64, fore wing; 65, epiproct (from paratype); 66, 9th abdominal tergite; 67, hypandrium; 68, phallosome. ♀: 69, epiproct; 70, subgenital plate; 71, gonapophyses.

epiproct, and with a pair of lateral raised areas with sclerotised posterior margins. Hypandrium (FIG. 67) with median lobe somewhat mushroom-shaped, a pair of lateral serrated apophyses. Phallosome (FIG. 68) with several pairs of internal sclerites.

♀. *Coloration* (after ca 19 years in alcohol). As ♂, pterostigma spot rather smaller and somewhat more discrete. *Morphology*. B = 2.30 mm. I.O.: D = 3.50. Head waxy. Antennae missing. Hind legs missing, no preapical tooth on claw of other legs. Fw = 3.05 mm. Venation of fore wing as ♂. Hw = 2.46 mm, hind wing veins bare. Epiproct (FIG. 69) with distinct pattern of setae and a dorsal setose flap. Paraproct with field of 16 trichobothria without sclerotised field border. Subgenital plate (FIG. 70) bilobed, a sclerotised bar subapically, 4 or 5 setae between lobes. Gonapophyses (FIG. 71): ventral valve with recurrent setae apically; dorsal valve with subapical spine longer than lobe; outer valve hatchet-shaped, setose.

Holotype ♂ (BISHOP 10,453), IRIAN: New Guinea (NW): Wisselmeren, Enarotali, 1900 m, 19.VIII.1955, J. L. Gressitt; allotype ♀ (BISHOP 10,453A), Wisselmeren, Itouda, Kamo Valley, 1500 m, 13.VIII.1955, Gressitt; paratypes: PNG: New Guinea (NE): 1 ♂, 1 ♀, NE Adelbert Mts, Wanuma, light trap, 800–1000 m, 25.X.1958, Gressitt (AM).

OTHER SPECIMENS. PNG: New Guinea (SE): ♂ (abdomen missing), Bisianumu, E of Port Moresby, 500 m, 24.IX.1958, Gressitt (BISHOP).

The 3 specimens from eastern New Guinea lack the pterostigma spot which is present in the 2 specimens from West Irian. The genitalia of both sexes, however, conform to those of the holotype and allotype. The species is evidently widely distributed over the island.

Z. novoguineensis is a typical member of *Zelandopsocus* in having more than a pair of apical setae on the subgenital plate and a dorsal setose flap on the female epiproct, and in the shape of the median hypandrial lobe. It is unusual in the armature of the penis bulb, the 2 apical sclerites recalling those occurring in *Bryopsocus townsendi* (Smithers, 1969) from New Zealand. The distinctness of the median hypandrial sclerite and the structure of the lateral pegs of the hypandrium are similar to the condition in *Austropsocus perforatus*, n. sp. described below, which is also a very widespread species. The subapical spine of the dorsal valve is similar to that of New Caledonian species of *Austropsocus* in extending beyond the subapical lobe and *novoguineensis* must be regarded as a species having some attributes of both genera.

***Zelandopsocus stenopterus* Thornton & Smithers, new species** FIG. 72–77

♀. *Coloration* (after ca 10 years in alcohol). Head generally brown, paler just anterior to ocelli, antennae and maxillary palps light brown, eyes black, ocelli clear with black centripetal borders. Thoracic terga and pleura dark brown. Legs: coxa dark brown basally, very pale buff apically; trochanter very pale buff; femur light brown; tibia and basal tarsal segment very pale buff, apical 2 tarsal segments dark brown. Fore wing (FIG. 72) patterned with dark brown, veins brown. Hind wing (FIG. 73) brown apically, hyaline basally. Abdomen mid-brown. *Morphology*. B = 2.80 mm. I.O.: D = 7.50. Vertex of head very sharply angled (FIG. 74), only median epicranial suture discernible, head aleutaceous. Apical segment of maxillary palp broad, somewhat hatchet-shaped. $f_1 = 1.15$ mm. $f_2 = 0.40$ mm. $f_1 : f_2 = 2.88$, antennal apex somewhat attenuated, with 2 apical setae. F = 1.11 mm. T = 1.21 mm. $t_1 = 0.35$ mm. $t_2 = 0.07$ mm. $t_3 = 0.10$ mm. $rt = 5.00 : 1 : 1.40$. $ct = 6$ (4 setae without ctenidia). Claw without preapical tooth. Fw = 3.30 mm. Fore wing strap-like, not broader subapically; areola postica small, rounded; *rs* and *m* meet at a point, *rs* very short; vein cu_2 bare, other veins with 2 ranks of

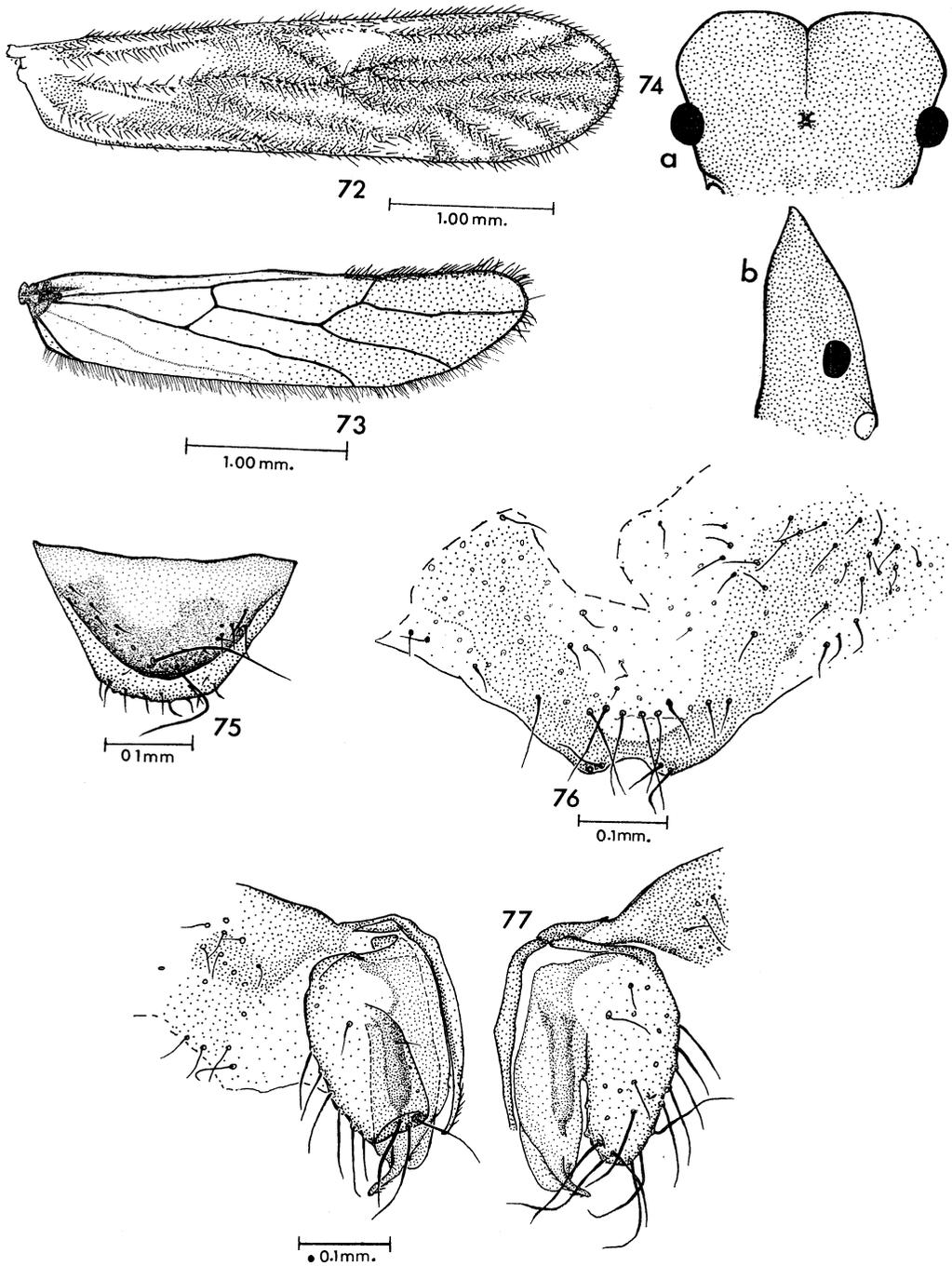


FIG. 72-77. *Zelandopsocus stenopterus*, n. sp., ♀: 72, fore wing; 73, hind wing; 74, vertex of head from front (a), from side (b), (not to scale); 75, epiproct; 76, subgenital plate; 77, gonapophyses.

setae sited alternately. Hw = 3.04 mm. Hind wing veins bare. Epiproct (FIG. 75) with dorsal flap bearing 2 very long setae. Paraproct with circular field of 13 trichobothria surrounding an area devoid of rosette sockets. Subgenital plate (FIG. 76) incipiently bilobed apically, 2 setae on each lobe. Gonapophyses (FIG. 77): ventral valve narrow, with recurrent fine setae apically; dorsal valve with curved subapical spine bearing recurrent fine setae, spine extending beyond apex of valve; outer valve oval, elongate, with long setae, particularly round margin.

♂. Unknown.

Holotype ♀ (AM), PNG: New Guinea (SE): Central District, Woitape, above 2000 m, 28.X.1963, D. K. McAlpine.

Z. stenopterus has a very unusual head, with sharply angled vertex, and a squat, truncate apical segment of the maxillary palp. The fore and hind wing shape, and the proportions of the fore wing veins, are also unlike any other philotarsid. However, the ciliation of the wings, presence of 3 tarsal segments, and the structure of the female genitalia lead us to place this unusual species in *Zelandopsocus*, of which it is a highly aberrant member.

GENUS *Austropsocus* Smithers, 1962

A total of 17 described species have been assigned to *Austropsocus*. Three groups of species are distinguishable: the *insularis* group (4 species) confined to the New Zealand subregion (Gressitt 1961) and Macquarie Island; the *apicipunctatus* group (3 species) confined to New Zealand proper; and the *productus* group (8 species) which is well represented in New Caledonia, with 1 species from New Zealand and Australia. Two New Zealand species are provisionally placed in *Austropsocus* and are not assignable to any of the above groups of species (Thornton, Wong & Smithers 1977).

The single species from New Guinea, *Au. perforatus*, n. sp., described below, has a highly unusual complex hypandrium, quite unlike that of any philotarsid of which the males have been described. However, the female characters of *Au. perforatus* are decidedly those of *Austropsocus* rather than *Zelandopsocus*, and are most similar to the *productus* group of *Austropsocus*.

Austropsocus perforatus Thornton & Smithers, new species

FIG. 78-84

♂. *Coloration* (after ca 3 years in alcohol). Head cream with following exceptions: usual markings on vertex dark brown, merging; anterior to ocellar protuberance a very dark brown spot, a little darker than protuberance, meets clypeus which is wholly very dark brown with some black striae visible. Labrum dark brown, tip of apical segment of maxillary palp dark brown. Antenna with scape and pedicel brown, 4 basal flagellar segments very dark brown, almost black, remaining flagellar segments gradually lighter until apical segment pale brown. Eyes black, ocellar protuberance black. Thorax dark brown, almost black. Legs: cream, except apex of basal tarsal segment and 2 apical tarsal segments brown. Fore wing (FIG. 78) hyaline, except veins brown and pterostigma filled with very dark brown pigment. Hind wing hyaline, apical 1/3 of costa brown. Abdomen with dark gray-brown granulations, apical sclerites very dark brown. *Morphology*. B = 2.50 mm. I.O.: D = 1.50. $f_1 = 1.15$ mm. $f_2 = 1.00$ mm. $f_1:f_2 = 1.15$. Flagellum postulate. Head waxy. Length of antennal setae $4 \times$ thickness of basal flagellar segment; length of antenna almost $2 \times$ length of insect; antennal apex attenuated, bearing 2 fine setae subapically. Thoracic sclerites waxy. F = 0.89 mm. T = 1.34 mm. $t_1 = 0.43$ mm. $t_2 = 0.08$ mm. $t_3 = 0.08$ mm. $rt = 5.38:1:1.00$. $ct = 18$. Claw without preapical tooth. Fw = 2.73 mm. Vein cu_2 of fore wing bare,

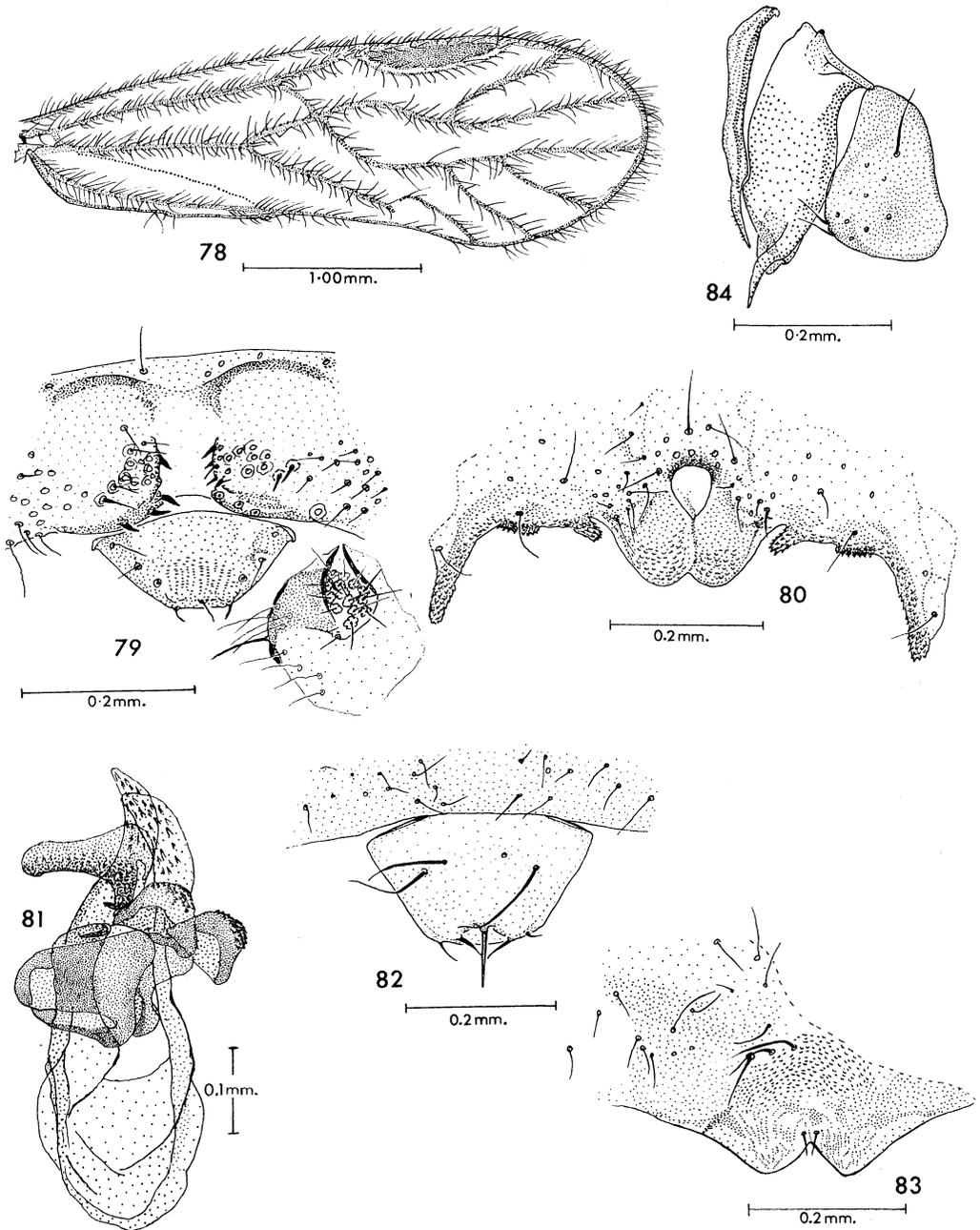


FIG. 78-84. *Austropsocus perforatus*, n. sp., ♂: 78, fore wing; 79, 9th tergite, epiproct, paraproct (from paratype); 80, hypandrium; 81, phallosome. ♀: 82, epiproct; 83, subgenital plate; 84, gonapophyses.

other veins with 2 or more rows of closely packed long setae. Hw = 2.15 mm. Hind wing veins bare. Abdominal 9th tergite (FIG. 79 from Mt Kaindi paratype) with median groove, and lateral domes bearing thick stout spines. Epiproct (FIG. 79) trapezoid, a large rugose field apically, 9 symmetrically placed setae. Paraproct (FIG. 79) with an angular field of 13–15 trichobothria, margin of field sclerotised. Hypandrium (FIG. 80) complex, with a subapical aperture bounded anteriorly by a sclerotised ridge and posteriorly by a bilobed rugose structure; posterior margin lateral to this rugose with a mesial peg, a more lateral low prominence, and extremely laterally a long sclerotised ridge bearing short stout spines. Phallosome (FIG. 81) with curved spinous outer parameres, a pair of trapezoid spinous sclerites, and at least 2 other pairs of large sclerites.

♀. *Coloration* (after ca 3 years in alcohol). As ♂. *Morphology*. B = 2.70 mm. I.O.: D = 2.50. $f_1 = 1.05$ mm. $f_2 = 0.89$ mm. $f_1 : f_2 = 1.18$. Apical segment of antenna as ♂, length of antennal setae no more than $2 \times$ width of basal flagellar segment and standing at 45° to axis of segments. Head waxy. Hind legs missing. Fw = 3.59 mm. Veins of fore wing as of ♂, vein cu_2 bare. Hw = 2.80 mm, veins bare. Epiproct (FIG. 82) trapezoid, with stout apical seta and without obvious rugose field, 8 other symmetrically arranged setae. Abdominal 9th tergite with large tine extremely laterally at each side. Paraproct with semicircular field of 16 trichobothria, margin of field not sclerotised, a setose area with 1 stout sharp seta. Subgenital plate (FIG. 83) apically bilobed, with a pair of very fine setae just anterior to median margin. Gonapophyses (FIG. 84, outer valve displaced): ventral valve fairly broad with recurrent setae on apical 5th of valve; dorsal valve with curved subapical spine extending well beyond apex of valve; outer valve sparsely setose.

Holotype ♂ (AM), PNG: New Guinea (NE): Jimmi-Wahgi Divide, 2000 m, 30.VIII.1970; allotype ♀ (AM), same data as holotype; paratypes: 2 ♀♀, 2 ♂♂, same data as holotype (AM); ♂♀, Mt Kaindi, 2400 m, 6.IX.1970 (BISHOP).

OTHER SPECIMENS: PNG: New Guinea (NE): 1 ♀, 2 ♂♂, Karimui, S of Goroka, 1000 m, 3–5.VI.1961, J. L. Gressitt (BISHOP); 2 ♂♂, 3 ♀♀, Mt Wilhelm, above Keglsugl, 3000 m, 4.VII.1955, Gressitt (BISHOP); ♀, Kundiawa, 24.VIII.1970 (AM); ♀, Kassem Pass, 1.IX.1970 (AM); ♀ Morobe District, Lake Trist, malaise trap, 1820 m, 21–26.XI.1966, G. A. Samuelson (BISHOP); ♂, Wau, Big Wau Creek, 1300 m, XI.1965, P. Shanahan (BISHOP); ♀, Morobe District, Mt Missim, malaise trap, 1600 m, 1.V.1966, J. L. & M. Gressitt (BISHOP); New Guinea (SE): 1 ♂, Southern Highlands, Dimifa, SE of Mt Giluwe, 2200 m, 10.IX.1958, Gressitt (BISHOP). IRIAN: New Guinea (NW): ♂, Wiselmeren, Okaitadi, 1800 m, 7.VIII.1955, Gressitt (BISHOP); ♀, Swart Valley, W side, 1400–2000 m, 10.XI.1958, Gressitt (BISHOP); ♀, Swart Valley, Karabaka, 1400 m, 21.XI.1958, Gressitt (BISHOP).

This common and widespread species, provisionally allocated to *Austropsocus* on the grounds of lack of hind wing vein setae, lack of preapical tooth on the claw, lack of dorsal setose flap on the female epiproct, and structure of subgenital plate and gonapophyses, is nevertheless highly unusual in hypandrium and in the armature of the phallosome. The 7 New Caledonian species of *Austropsocus* are similar to *Au. perforatus* in having a long subapical spine on the dorsal valve of female gonapophyses.

DISCUSSION

The philotarsid faunas of Australia, the Solomon Islands and the New Hebrides are

TABLE 1. Distribution of 80 philotarsid species of 5 genera in New Guinea, the New Caledonian subregion (including the Loyalty Is, Lord Howe I and Norfolk I), the New Zealand subregion (including islands of the N.Z. Plateau) and Macquarie I, and Micronesia.

	NEW GUINEA	NEW CALEDONIAN SUBREGION	NEW ZEALAND SUBREGION AND MACQUARIE I	MICRONESIA	TOTAL
<i>Aaroniella</i>	6	1	3	2	12
<i>Haplophallus</i>	5	7	2	2	16
	11	8	5	4	28
<i>Zelandopsocus</i>	2	27	3	0	32
<i>Austropsocus</i>	1	7	10	0	18
<i>Bryopsocus</i>	0	0	2	0	2
	3	34	15	0	52
Total	14	42	20	4	80

yet to be fully studied, and comments about the possible course of evolution of this family in the western Pacific must clearly await the examination of these faunas.

From the data available at present, however, it seems clear that the *Austropsocus-Zelandopsocus* line of the family is not as well represented in New Guinea as it is in the New Caledonian and New Zealand areas (TABLE 1). About 21% of the New Guinea philotarsid fauna is of the *Austropsocus-Zelandopsocus* line, compared to 81% of that of the New Caledonian subregion and 75% of that of the New Zealand subregion. Of the 52 well-studied species of this line, 34 (65%) occur in the New Caledonian subregion, 15 (29%) in the New Zealand subregion, and only 3 (6%) in New Guinea. None occurs in Micronesia. Although this distribution may suggest that the line moved into New Guinea from the southeast rather than spread from New Guinea along the Melanesian Arcs, it must be remembered that the 3 representatives discovered in New Guinea are all unusual and may have a relatively long history on the island.

Of the 11 New Guinea (and 1 New Ireland) representatives of the *Aaroniella-Haplophallus* line of the family, 2 species, *Aa. antennata* and *Aa. pedunculata* show similarities to a group of 14 species of *Aaroniella* having representatives in the Neotropical Region (4), Samoa (1), New Zealand (3, 1 also occurring in Australia), Australia (1), Lord Howe Island (1), Micronesia (2) and Madagascar (2). The 4 remaining New Guinea species of *Aaroniella* form a group of their own, and possess character combinations intermediate between those of *Aaroniella* and the *bundoorensis* group of *Haplophallus*, in which vein cu_2 of the fore wing is setose. Three of the New Guinea species of *Haplophallus* (and the 1 known only from New Ireland) belong to the *bundoorensis* group, which is represented predominantly in Australia and New Caledonia, while the other 2 clearly belong to another section of *Haplophallus*, the *orientalis* group, which has representatives in Africa, the Indian Ocean, the Oriental Region, Micronesia, New Zealand, the New Caledonian subregion, Fiji, Tonga and Samoa.

Thus, so far as the *Aaroniella-Haplophallus* line of the family is concerned, New Guinea appears to have representatives of several species groups, and the importance of New

Guinea as a possible source area for the *Haplophallus* group of species having vein cu_2 of the fore wing setose (the *bundoorensis* group) may perhaps become clear when the Australian fauna has been carefully studied.

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