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The Psocoptera (Insecta) Of Lord Howe Island

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Figures 1-54

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SUMMARY

This paper presents the first records of Psocoptera from Lord Howe Island.

Of the nine species included eight are new and *Caecilius quercus* Edwards is known from Tasmania.

INTRODUCTION

Nothing has been recorded on the Psocoptera of Lord Howe Island. Collecting at intervals since 1969 has yielded material of nine species of which eight are new and are described in this paper. The known species is recorded from Australia.

Discussion of the zoogeography of the Psocoptera of Lord Howe Island will be deferred until extensive material in collections from Australia, New Caledonia and other relevant areas has been worked.

Note: The IO/D ratio for species of Philotarsidae is measured by Pearman's method in order to allow comparison with other species in that family; in the remaining species Badonnel's method is used.

LIST OF SPECIES OF PSOCOPTERA FROM LORD HOWE ISLAND

Family **Lepidopsocidae**

- Echmepteryx (Loxopholia) howensis* sp. n.
Echmepteryx (sens. lat.) anomala sp. n.

Family **Caeciliidae**

- Caecilius quercus* Edwards

Family **Pseudocaeciliidae**

- Pseudoscottiella fasciata* sp. n.
Pseudoscottiella hollowayi sp. n.

Family **Elipsocidae**

- Pentacladus marmoratus* sp. n.
Spilopsocus parvus sp. n.

Family **Philotarsidae**

- Aaroniella howensis* sp. n.
Haplophallus tandus sp. n.

SYSTEMATIC ACCOUNT

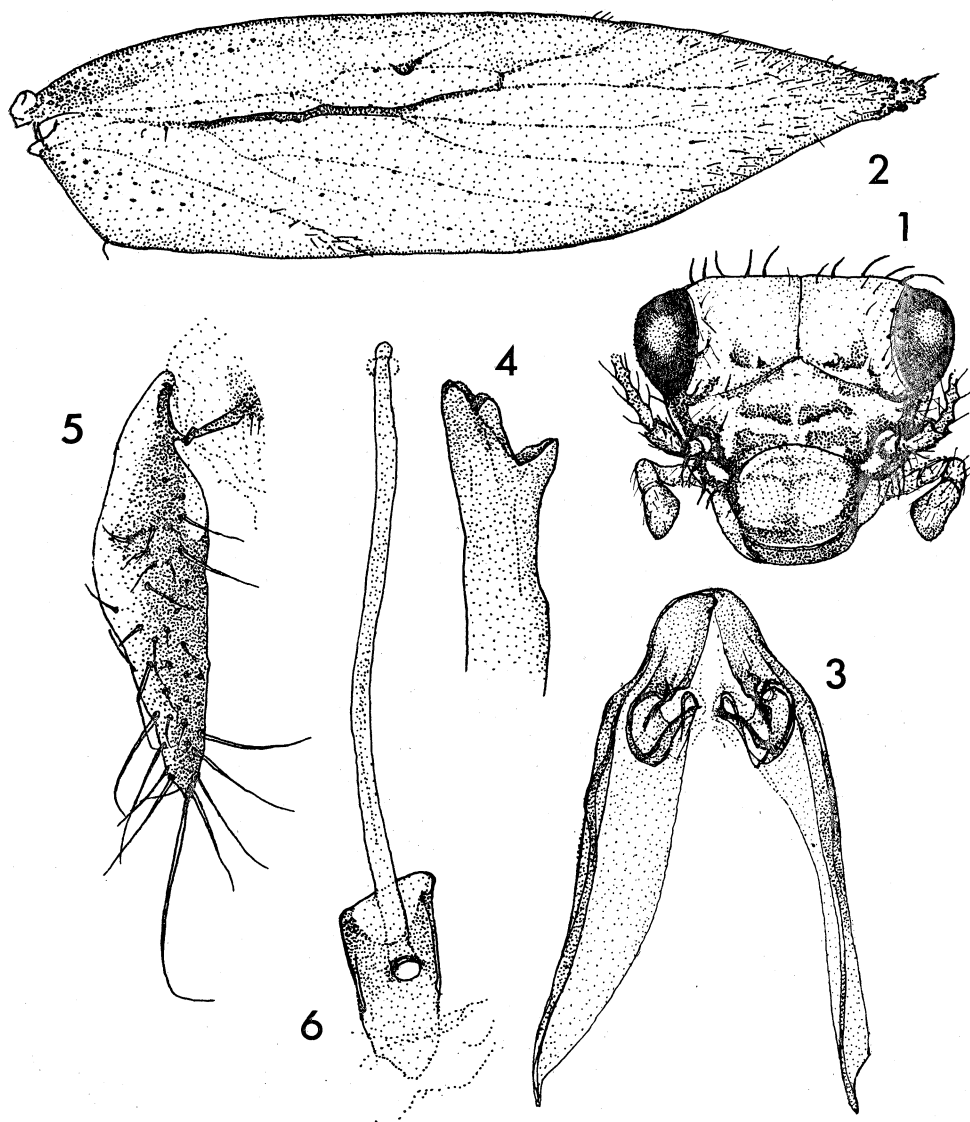
Family **Lepidopsocidae*****Echmepteryx (Loxopholia) howensis* sp. n.**

MALE

Coloration (in alcohol). Head pale buff with brown markings (fig. 1). Genae pale buff with an anterior brown stripe from eye to antenna base, a broader posterior stripe from eye to mandible. Antennae very pale brown. Eyes black. Ocelli absent, the position usually occupied indicated by a narrow dark brown circle. Maxillary palps pale buff, the distal segment only a little darker than others. Thorax pale buff with a longitudinal, dorso-lateral brown stripe. Femora pale buff; tibiae similar but with two brown bands; basal tarsal segment brown in basal sixth, remainder of tarsus pale. Fore wings (fig. 2) hyaline with veins pale except for *m*, *rs + m*, and *rs* as far as $r_1 - rs$ crossvein which are pale brown; the effect is thus of a hyaline wing with an incomplete longitudinal strengthening rod in the basal half of the wing. Abdomen pale with occasional lateral, segmentally arranged brown spots; terminal structures dark.

Morphology. Length of body: 2.9 mm. Vertex fairly sharp with a small notch at median epicranial suture. Eyes not quite reaching level of vertex. Ocelli absent. Lacinia as in female (fig. 4). Antennal segments short and fairly broad; f_1 four-fifths wide as long. Measurements of hind leg: F: 0.7 mm; T: 1.2 mm; t_1 : 0.518 mm; t_2 : 0.098 mm; t_3 : 0.098 mm; rt: 5.2 : 1 : 1. Fore wings (fig. 2) with front and hind margins almost parallel for basal two-thirds,

then curving to meet at wing apex. Fore wing length: 2.4 mm; fore wing width: 0.68 mm. Basal section of *sc* absent, distal section indistinct. Veins *m*, *m + rs*, and *rs* as far as *r - rs* crossvein strongly developed; remaining veins somewhat evanescent; *rs* before joining *m* very faint. Scales of fore wing asymmetrical. Hind wing length: 2.08 mm; hind wing width: 0.48 mm. Epiproct simple, semicircular, setose. Paraproct with seven setae arising from rosette bases. Hypandrium mostly very well sclerotized, simple, a lightly sclerotized area occurs in the middle adjacent to the hind margin giving the impression that the hind margin is notched when seen under low power (x 10); strongly setose. Phallosome (fig. 3).



Figures 1-6.—*Echmepteryx (Loxopholia) howensis* sp. n. 1. ♂, head; 2. ♂, forewing; 3. ♂, phallosome; 4. ♀, lacinia; 5. ♀, gonapophyses; 6. ♀, entrance to spermatheca.

FEMALE

Coloration (in alcohol). As in male.

Morphology. Length of body: 2.9 mm. Lacinia (fig. 4). Measurements of hind leg as in male. Wing measurements as in male. Gonapophyses well sclerotized (fig. 5). Entrance to spermatheca (fig. 6). Paraproct as in male but with six setae arising from rosette bases.

MATERIAL EXAMINED

Lord Howe Island: 3 ♂ (including holotype), 1 ♀ (allotype), Transit Hill, 29.xi.1969; 1 ♂, Transit Hill, 23.ii.1971; 2 ♂, 1 ♀, "Blue Lagoon", 23.ii.1971; 8 ♂, 6 ♀, Lagoon Road, 28.xi.1969; 1 ♂, 1 ♀, Transit Hill Road, 27.xi.1969 (C. N. Smithers); 1 ♂, 1 ♀, Boat Harbour, 1.iii.1974 (G. A. Holloway).

Holotype, allotype and paratypes in the Australian Museum.

DISCUSSION

Echmepteryx howensis clearly belongs to the subgenus *Loxopholia* on venational features. It can be recognized from other species in that group by its distinctive facial pattern.

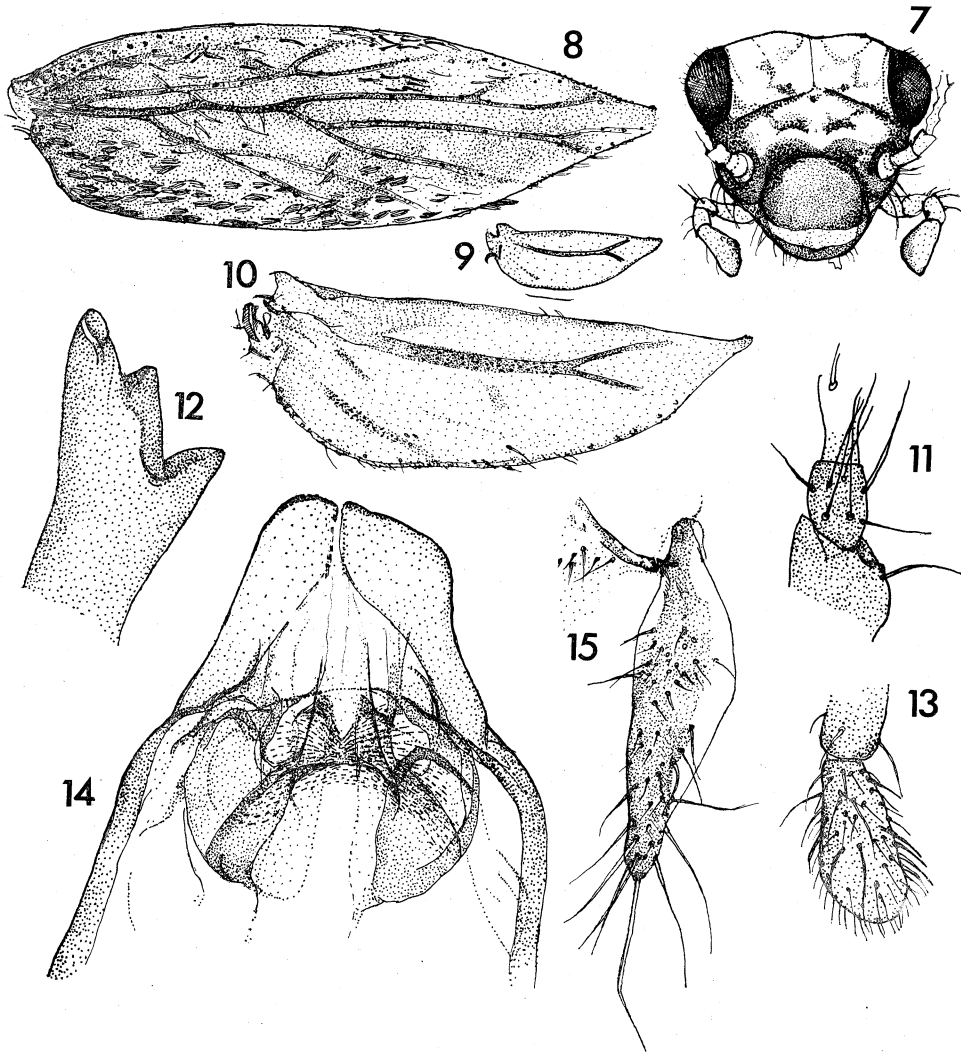
***Echmepteryx anomala* sp. n.**

MALE

Coloration (in alcohol). Head pale buff, marked in various shades of brown (fig. 7). Labrum brown. Antennae pale brown. Maxillary palps coloured as head, fourth segment a little darker than others. Positions usually occupied by ocelli indicated by black spots. Eyes black. Thorax pale buff with lateral brown stripe. Fore wings (fig. 8) hyaline, tinged with pale brown, veins mostly brown. Hind wings (fig. 9 and fig. 10) reduced, hyaline. Legs pale with two transverse brown bands on tibiae and with short section at base of first tarsal segment brown. Abdomen pale with dark brown patches on paraprocts and epiproct; these spots are conspicuous against pale background of the apex of the abdomen.

Morphology. Length of body: 2.8 mm. Median epicranial suture very distinct although concolorous with vertex. Vertex fairly sharp. First flagellar segment (fig. 11). Antennae with at least 32 segments. Flagellar segments relatively long except first, which is short; fifth flagellar segment about 3.7 times long as wide. Eyes fairly large but not quite reaching level of vertex. Ocelli absent. Lacinia (fig. 12). Maxillary palp with apical segment rounded (fig. 13), broadened towards distal end. Measurements of hind leg: F: 0.658 mm; T: 1.092 mm; t_1 : 0.420 mm; t_2 : 0.084 mm; t_3 : 0.084 mm; rt: 5:1:1. Tarsal claws with one strong preapical tooth and only traces of other preapical teeth. Fore wing length: 1.8 mm. Fore wings short (fig. 8), pointed, thickened and hardened in texture so that they are somewhat elytriform. Vein *sc* curving to meet *r* before origin of distal section of *sc* but weakly developed for most of its length. Vein *rs* fused with *m* for a length; *m*, *rs* + *m* and free distal section of *rs* before bifurcation strongly developed; $r_1 - rs$ crossvein sometimes faint or absent. Veins bearing long easily detached setae; membrane bearing mostly asymmetrical scales. Hind wing length: 0.48 mm. Hind wing (fig. 9) (same scale as fore wing, and fig. 10 (enlarged) reduced to a small pointed membranous flap.

Veins reduced to a longitudinal fork ($r + m?$) and a very faint vein near wing base in posterior part of wing ($cu_1?$). Veins and margin with fairly strong setae. Epiproct simple. Hypandrium simple. Phallosome (fig. 14). Paraproct with a large posterior spine, setose, with six setae with rosette bases, adjacent to which arises a strong seta as long as the posterior spine.



Figures 7-15.—*Echmepteryx (s.l.) anomala* sp. n. 7. ♂, head; 8. ♂, forewing; 9. ♂, hindwing (scale as forewing); 10. ♂, hindwing (enlarged); 11. ♂, first flagellar segment; 12. ♂, lacinia; 13. ♂, maxillary palp; 14. ♂, apex of phallosome; 15. ♀, gonapophyses.

FEMALE

Coloration (in alcohol). As in male.

Morphology. Length of body: 2.8 mm. General morphology as in male. Antennae with more than thirty-two segments. Lacinia as in male. Measurements of hind leg: F: 0.74 mm; T: 1.19 mm; t_1 : 0.46 mm; t_2 : 0.09 mm; t_3 : 0.09 mm; rt: 5:1:1. Fore and hind wings as in male. Fore wing length: 2.0 mm. Hind wing length: 0.48 mm. Epiproct simple, sparsely setose. Paraproct as in male. Gonapophyses (fig. 15).

MATERIAL EXAMINED

Lord Howe Island: 1 ♂ (holotype), 2 ♀ (including allotype), Transit Hill Road, 27.xi.1969; 1 ♀, "Blue Lagoon", 23.vii.1971 (C. N. Smithers).

Holotype, allotype and paratypes in the Australian Museum.

DISCUSSION

Echmepteryx anomala is placed in the genus *Echmepteryx* Aaron with some reservation. The presence of scales clearly places it in either the Lepidopsocinae or Perientominae but the latter is excluded owing to the number of antennal segments exceeding twenty-four. Vein *rs* is forked in the fore wing, a characteristic of the tribe Lepidopsocini in which are included *Echmepteryx* Aaron, *Lepidopsocus* Enderlein and *Cyptophania* Banks. *E. anomala* has a 3-branched media in the fore wing (*Cyptophania* has a 2-branched media). Veins *rs* and r_1 are joined by a crossvein whereas in *Lepidopsocus* these veins are fused for a length. *E. anomala* does not conform to the characters of *Echmepteryx*, however, in lacking ocelli, in having long flagellar segments (a feature of the Perientominae) and in having strongly reduced hind wings. It is considered best to retain *E. anomala* in *Echmepteryx* until the species groups in the Lepidopsocinae have been more closely studied.

Roesler (1944) has provided a key to the subgenera of *Echmepteryx* but it is not possible to assign *E. anomala* to any of these as the key is based partly on hind wing venation; this is too reduced in *E. anomala* to be of value. The species is, therefore, assigned to *Echmepteryx* sens. lat.

Family Caeciliidae

Caecilius quercus Edwards

MATERIAL EXAMINED

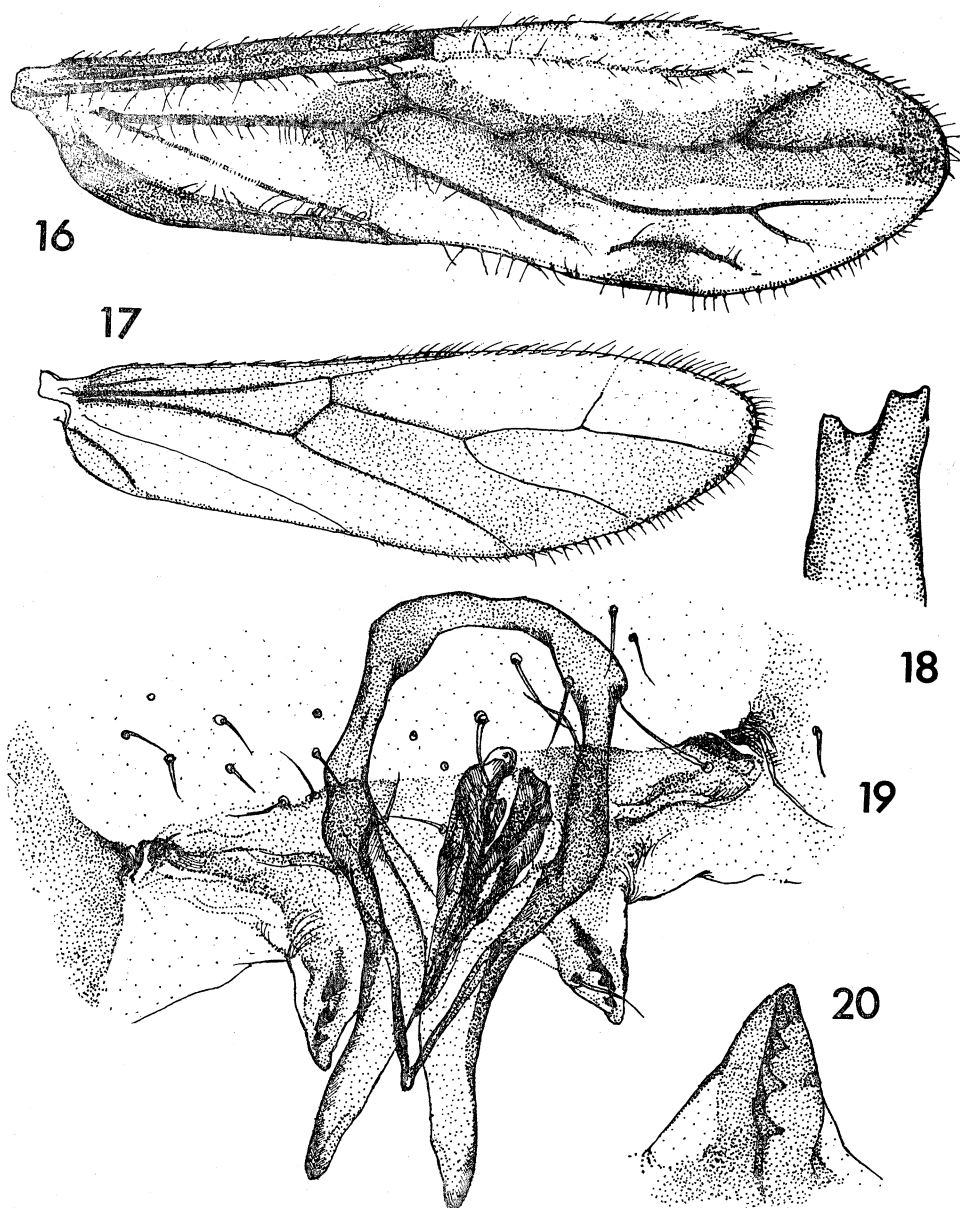
Lord Howe Island: 1 ♂, 4 ♀, Transit Hill Road, 27-29.xi.1969 (C. N. Smithers).

C. quercus is known from Tasmania.

Family Pseudocaeciliidae
Pseudoscottiella fasciata sp. n.

MALE

Coloration (in alcohol). Head pale brown with frons and a narrow area around ocellar triangle very pale. Labrum, maxillary palps and antennae as pale as frons. Eyes black. Ocelli bordered with black adjacent to each other. Seen from the side, thorax pale brown in upper half, very pale in lower, the junction



Figures 16-20.—*Pseudoscottiella fasciata* sp. n. 16. ♂, forewing; 17. ♂, hind wing; 18. ♂, lacinia; 19. ♂, hypandrium and phallosome; 20. ♂, posterior apophysis of hypandrium.

between the two areas marked by an irregular, much broken, dark brown band; thorax dorsally pale brown with a very pale median stripe. Fore and hind wings (fig. 16 and fig. 17) hyaline marked with brown. Abdomen pale except for a large, irregular black mark on each side near hind end.

Morphology. Length of body: 1.7 mm. Median epicranial suture distinct only on dark area of vertex; elsewhere indistinct. Vertex fairly flat. Postclypeus fairly flat. Lengths of flagellar segments: f_1 : 0.49 mm; f_2 : 0.25 mm. Eyes small. IO/D: 2.0; PO: 0.57. Lacinia (fig. 18). Measurements of hind leg: F: 0.434 mm; T: 0.826 mm; t_1 : 0.210 mm; t_2 : 0.084 mm; rt: 2.5:1; ct: 12, 0. Fore wing length: 2.4 mm; fore wing width: 0.68 mm. Fore wing (fig. 16) fairly narrow, pterostigma long and narrow; stigmaphysis very inconspicuous. Veins *rs* and *m* fused for a length, *rs* long before bifurcation; *m* 2-branched, *m* long and curved before bifurcation; cu_1 straight before areola postica. In hind wing $r_2 + r_3$ evanescent in distal half. Hind wing length: 1.8 mm; hind wing width: 0.52 mm. Epiproct simple, a small group of setae across distal area and a large sub-basal seta near each side. Paraprocts with a field of twelve setae with rosette bases. Phallosome and hypandrium (fig. 19); posterior apophyses with stout conical projections (fig. 20).

MATERIAL EXAMINED

Lord Howe Island: 1 ♂, (holotype), "Blue Lagoon", 23.ii.1971; 1 ♂, Lagoon Road, 28.xi.1969 (C. N. Smithers).

Holotype and paratype in the Australian Museum.

DISCUSSION

Pseudoscottiella fasciata can be distinguished from other species of the genus by its wing pattern. It is somewhat similar to the Micronesian species *Ps. pseudornatus* Thornton et al., *circularis* Thornton et al., and *ornatus* Thornton et al., but clear differences in extent of wing markings are apparent; the hypandrium and phallosome are also characteristic.

***Pseudoscottiella hollowayi* sp. n.**

MALE

Coloration (in alcohol). As in *Pseudoscottiella fasciata*. Fore and hind wings (fig. 21 and fig. 22).

Morphology. Length of body not measurable owing to collapsed state of the abdomen. Eyes small, just reaching level of vertex. IO/D: 2.0; PO: 0.75. Measurements of hind leg: F: 0.686 mm; T: 1.106 mm; t_1 : 0.266 mm; t_2 : 0.126 mm; rt: 2.1:1; ct: 10, 0. Fore wing length: 3.3 mm; fore wing width: 0.88 mm. Fore wing long and narrow; veins *rs* and *m* fused for a long length. Pterostigma long and narrow; a few setae on *membrane* in distal part of cell R_3 . Hind wing length: 2.6 mm; vein $r_2 + r_3$ hardly visible; *rs* and *m* fused for a long length. Hypandrium (fig. 23) very lightly sclerotized, the posterior lobes each bearing four conical protuberances (fig. 24). Phallosome (fig. 25).

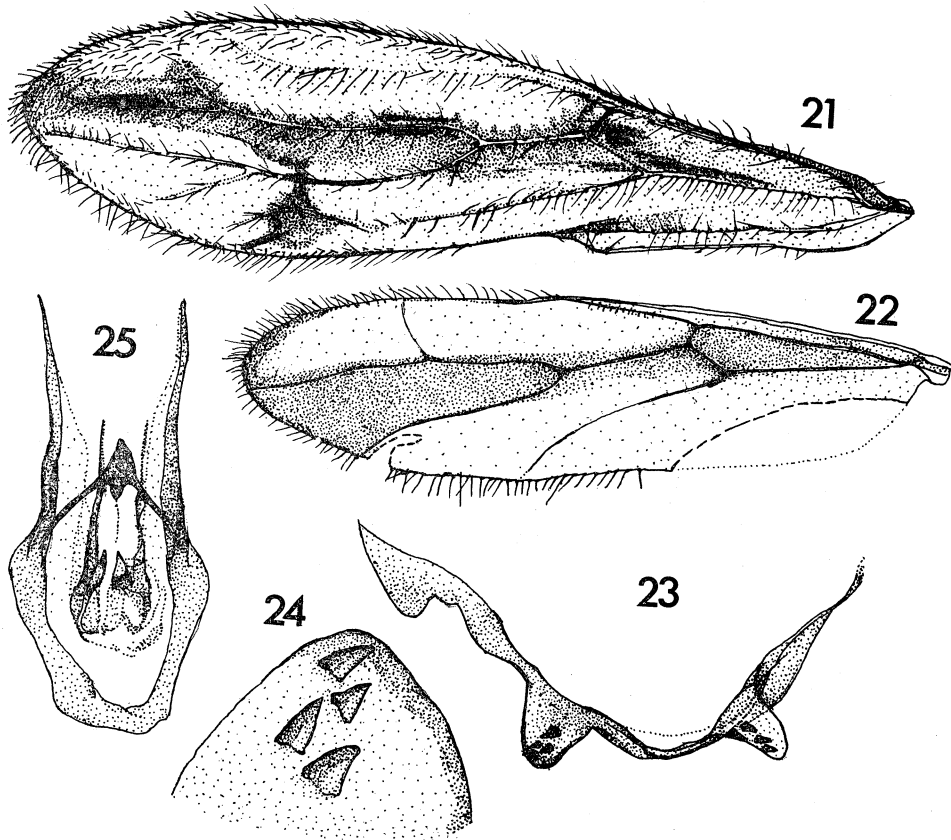
MATERIAL EXAMINED

Lord Howe Island: 1 ♂ (holotype), Mount Gower, 9.x.1971 (G. A. Holloway).

Holotype in the Australian Museum.

DISCUSSION

Pseudoscottiella hollowayi has a superficial resemblance to *Ps. fasciata* but differs considerably in size, being much larger, and in having setae on the membrane in the distal part of cell R_3 . Other differences are to be found in the extent of wing pattern, the hypandrium and phallosome.



Figures 21–25.—*Pseudoscottiella hollowayi* sp. n. 21. ♂, forewing; 22. ♂, hind wing; 23. ♂, hypandrium; 24. ♂, posterior lobe of hypandrium; 25. ♂, phallosome.

Family Elipsocidae

Pentacladus marmoratus sp. n.

MALE

Coloration (in alcohol). Head pale buff with faint suggestion of a darker area adjacent to compound eyes and median epicranial suture. Thorax, abdomen and legs pale. Fore wings (fig. 26) hyaline marked in very pale brown. Eyes black. Ocelli margined in black along adjacent borders.

Morphology. Length of body: 2.3 mm. Median epicranial suture discernible but very faint. Vertex smoothly rounded with scattered fairly stout setae. Frons deep, setose as vertex. Postclypeus not very bulbous, setose but setae finer than on vertex. Antennae long and fine, nearly twice as long as fore wings. Lengths of flagellar segments: f_1 : 0.89 mm; f_2 : 0.39 mm. Eyes large, hemispherical, reaching level of vertex. IO/D: 1.6; PO: 1.0. Anterior ocellus much smaller than lateral ocelli. Lacinia (fig. 27). Thorax with fairly stout, scattered setae on dorsal surface. Femora in distal half with setae on upper surface and laterally in addition to the row of small evenly spaced, ventral setae. Measurements of the hind leg: F: 0.817 mm; T: 1.400 mm; t_1 : 0.490 mm; t_2 : 0.070 mm; t_3 : 0.084 mm; rt: 7 : 1 : 1.2; ct: 24, 1, 0. Fore wing length: 2.92 mm; fore wing width: 1.08 mm. Veins *rs* and *m* meeting in a point or connected by an extremely short crossvein; the tall, apically pointed areola postica connected to *m* by a short crossvein; *m* four-branched. Marginal setae minute and sparse, arising from membrane near margin. Hind wing length: 2.08 mm; hind wing width: 0.64 mm. Vein *rs* straight from separation from *m* to bifurcation; *rs* and *m* fused for a fairly long length; cu_1 recurved near margin; a few minute marginal setae between r_{2+3} and r_{4+5} . Epiproct simple, with setae near margin, a little more heavily sclerotized near base than in distal three-quarters. Paraproct with an ovoid trichobothrial field (fig. 28) with a large seta adjacent to it in addition to other setae. Hypandrium (fig. 29) posteriorly upturned with a curved lobe on each side. Phallosome (fig. 30).

FEMALE

Coloration (in alcohol). As in male but wing pattern a little darker.

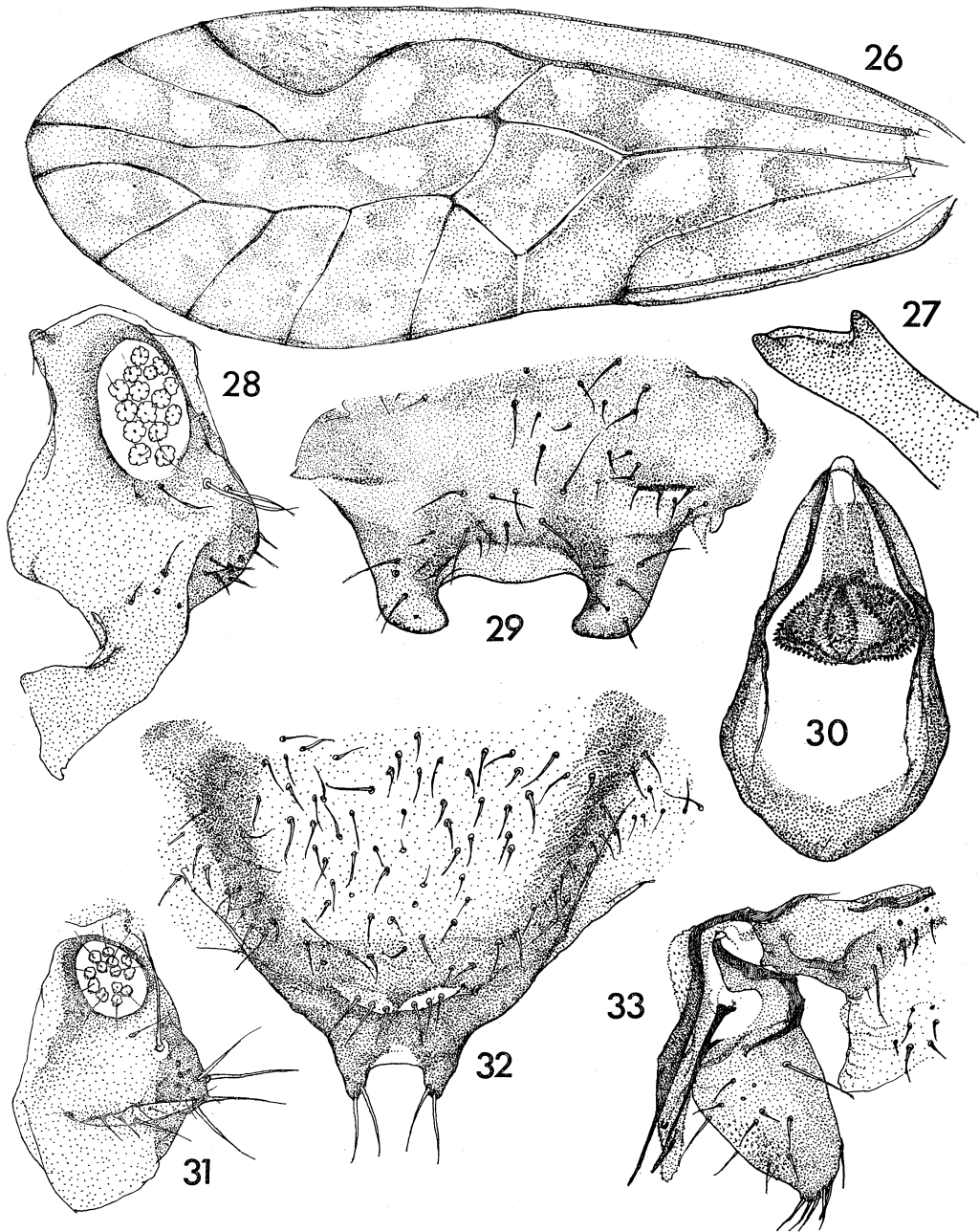
Morphology. Length of body: 2.9 mm. General morphology as in male. Eyes large, antennae nearly twice as long as fore wings. IO/D: 1.6; PO: 1.0. Measurements of hind leg: F: 0.84 mm; T: 1.52 mm; t_1 : 0.546 mm; t_2 : 0.070 mm; t_3 : 0.098 mm; rt: 7.8 : 1 : 1.4; ct: 24, 1, 0. Fore wing length: 3.10 mm; fore wing width: 1.12 mm. Venation and setae as in male. Hind wing length: 2.20 mm; hind wing width: 0.72 mm. Venation as in male. Paraproct (fig. 31) with circular field of trichobothria, large adjacent seta and long setae on posterior margin. Subgenital plate (fig. 32). Gonapophyses (fig. 33).

MATERIAL EXAMINED

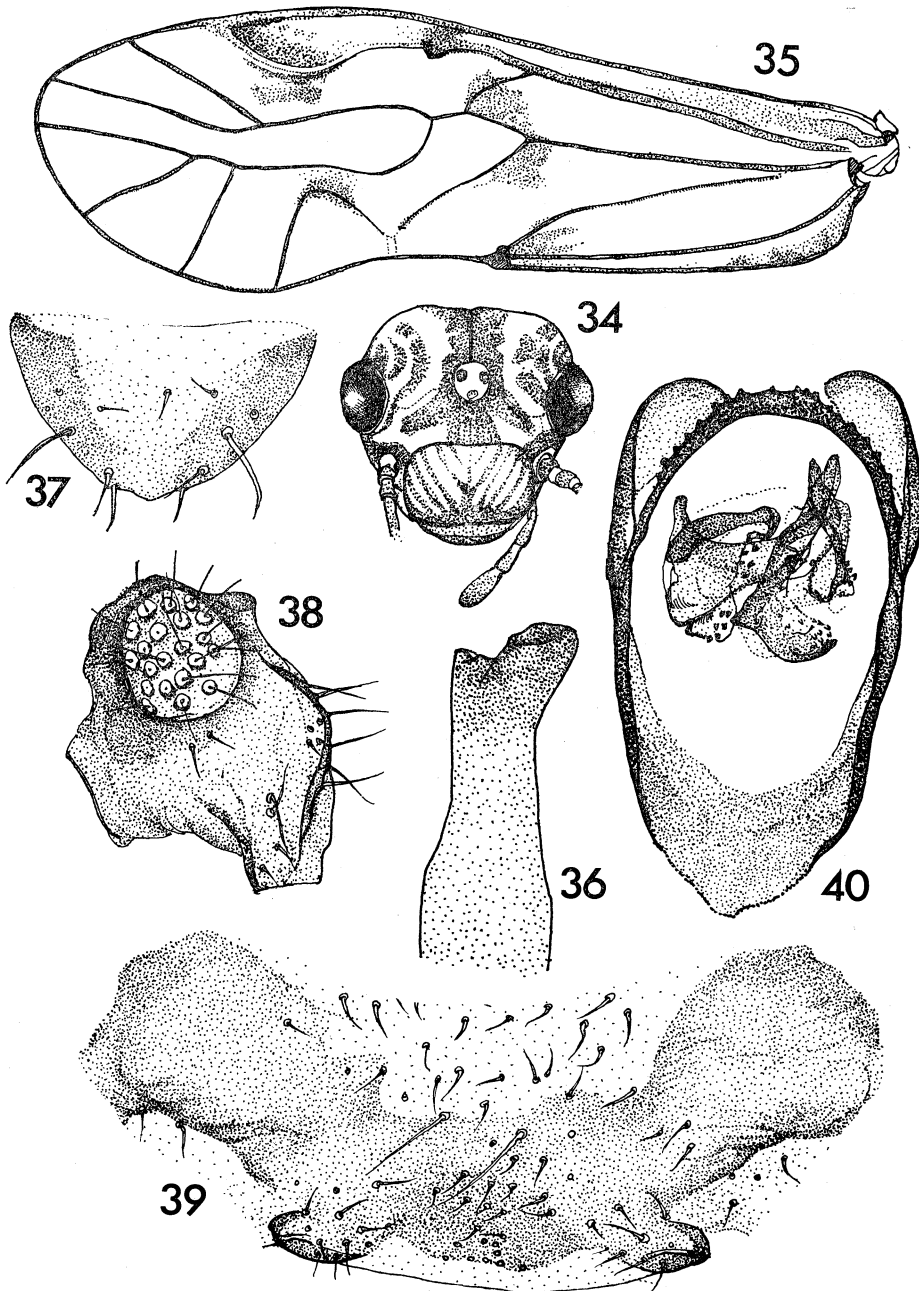
Lord Howe Island: 1 ♂ (holotype), 1 ♀ (allotype), 1 nymph, Lagoon Road, 28.xi.1969 (C. N. Smithers). Holotype and allotype in the Australian Museum.

DISCUSSION

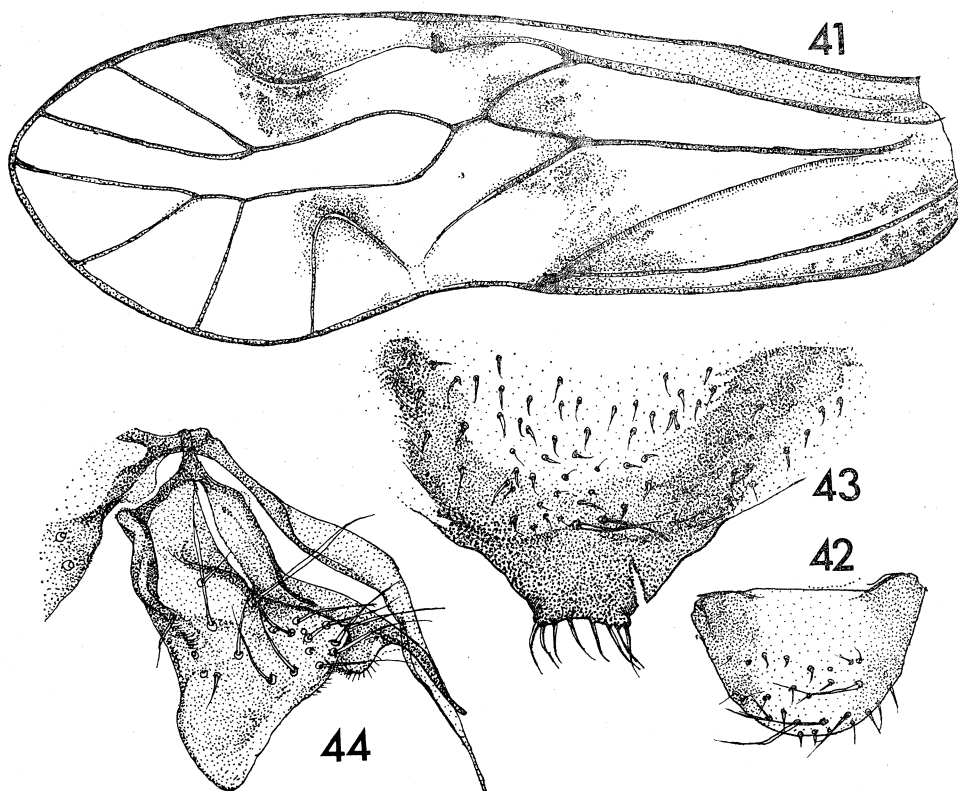
Pentacladus marmoratus differs conspicuously from *P. eucalypti* Enderlein, the only other member of the genus, in wing pattern and is easily distinguished on this feature alone.



Figures 26-33.—*Pentacladus marmoratus* sp. n. 26. ♂, forewing; 27. ♂, lacinia; 28. ♂, paraproct; 29. ♂, hypandrium; 30. ♂, phallosome; 31. ♀, paraproct; 32. ♀, subgenital plate; 33. ♀, gonapophyses.



Figures 34–44 (above and on opposite page).—*Spilopsocus parvus* sp. n. 34. ♂, head; 35. ♂, fore wing; 36. ♂, lacinia; 37. ♂, epiproct; 38. ♂, paraproct; 39. ♂, hypandrium; 40. ♂, phallosome; 41. ♀, fore wing; 42. ♀, epiproct; 43. ♀, subgenital plate; 44. ♀, gonapophyses.



Spilopsocus parvus sp. n.

MALE

Coloration (in alcohol). Head pale buff with brown markings (fig. 34). Median epicranial suture dark brown. Postclypeus with anteriorly converging stripes. Labrum brown. Genae pale except for brown area immediately below compound eye. Antennae with scape, pedicel and basal two-thirds of first flagellar segment brown, remainder of flagellum dark brown. Eyes purplish. Area around ocelli pale buff but ocelli with purplish backing. Maxillary palps brown. Dorsal lobes of mesothorax brown, pale adjacent to sutures; antedorsum brown, partly divided in the middle by a longitudinal pale stripe and pale near sutures. Legs pale brown except for distal parts of tibia and tarsi which are darker. Fore wings (fig. 35) hyaline marked with brown. Abdomen pale with incomplete, irregular segmental bands of brown.

Morphology. Length of body: 1.7 mm. Median epicranial suture distinct, anterior arms evanescent. Vertex gently rounded, glabrous. Lengths of flagellar segments: f_1 : 0.546 mm; f_2 : 0.322 mm. Antennae a little longer than fore wings. Eyes fairly large, not reaching level of vertex. IO/D: 1.80; PO: 0.71. Lacinia (fig. 36). Measurements of hind leg: F: 0.448 mm; T: 0.896 mm;

t_1 : 0.266 mm; t_2 : 0.042 mm; t_3 : 0.070 mm; rt : 6.3 : 1 : 1.2; ct : 14, 1, 0. Tibia broadens a little in distal quarter, which corresponds to the darker sections of the tibia. Fore wing length: 2.24 mm; fore wing width: 0.76 mm. Fore wing marginal setae very small and fine; bifurcation of rs basad of origin of m_3 ; areola postica tall and smoothly arched. Hind wing with cu_1 strongly recurved near wing margin. A few fine, short setae on margin between $r_2 +_3$ and $r_4 +_5$. Epiproct (fig. 37) almost semicircular, a little more heavily sclerotized laterally than mesially, sparsely setose. Paraproct (fig. 38) with an almost circular trichobothrial field and a strongly sclerotized, arched dorsal ridge. Hypandrium (fig. 39) with almost straight hind margin and a small lateral lobe on each side. Phallosome (fig. 40).

FEMALE

Coloration (in alcohol). Similar to male but wing pattern a little more extensive (fig. 41).

Morphology. Length of body: 2.0 mm. General morphology as in male. Antennae more slender and eyes smaller, antennae shorter than fore wing. Length of flagellar segments: f_1 : 0.420 mm; f_2 : 0.266 mm. IO/D: 2.3; PO: 0.83. Measurements of hind leg: F: 0.434 mm; T: 0.910 mm; t_1 : 0.252 mm; t_2 : 0.042 mm; t_3 : 0.070 mm; rt : 6.0 : 1 : 1.6; ct : 14, 1, 0. Tibiae distally broadened as in male. Fore wing length: 2.36 mm; fore wing width: 0.84 mm. Wing characteristics as in male but rs bifurcation nearly opposite origin of m_3 . Hind wing length: 1.92 mm; hind wing width: 0.64 mm. Epiproct (fig. 42). Subgenital plate (fig. 43) with a poorly developed median posterior lobe, the posterior margin of which bears eight setae; preapical row of setae reduced to two strong setae near midline. Gonapophyses (fig. 41).

MATERIAL EXAMINED

Lord Howe Island: 3 ♂ (including holotype), 1 ♀ (allotype), Lagoon Road, 28.xi.1969; 2 ♂, Transit Hill, 23.ii.1971; 2 ♀, Transit Hill Road, 27-29.xi.1969 (C. N. Smithers); 1 ♀, Ned's Beach, 22.ii.1971 (D. K. McAlpine).

Holotype, allotype and paratypes in the Australian Museum.

DISCUSSION

Spilopsocus parvus can be distinguished from other members of the genus (other than *S. stigmaticus* (Tillyard) from New Zealand) by its wing pattern. Although clearly closely related to *S. stigmaticus* it is much smaller and differs in details of the form of the complex sclerifications of the penial bulb in the male and in the form of the gonapophyses in the female.

Family Philotarsidae

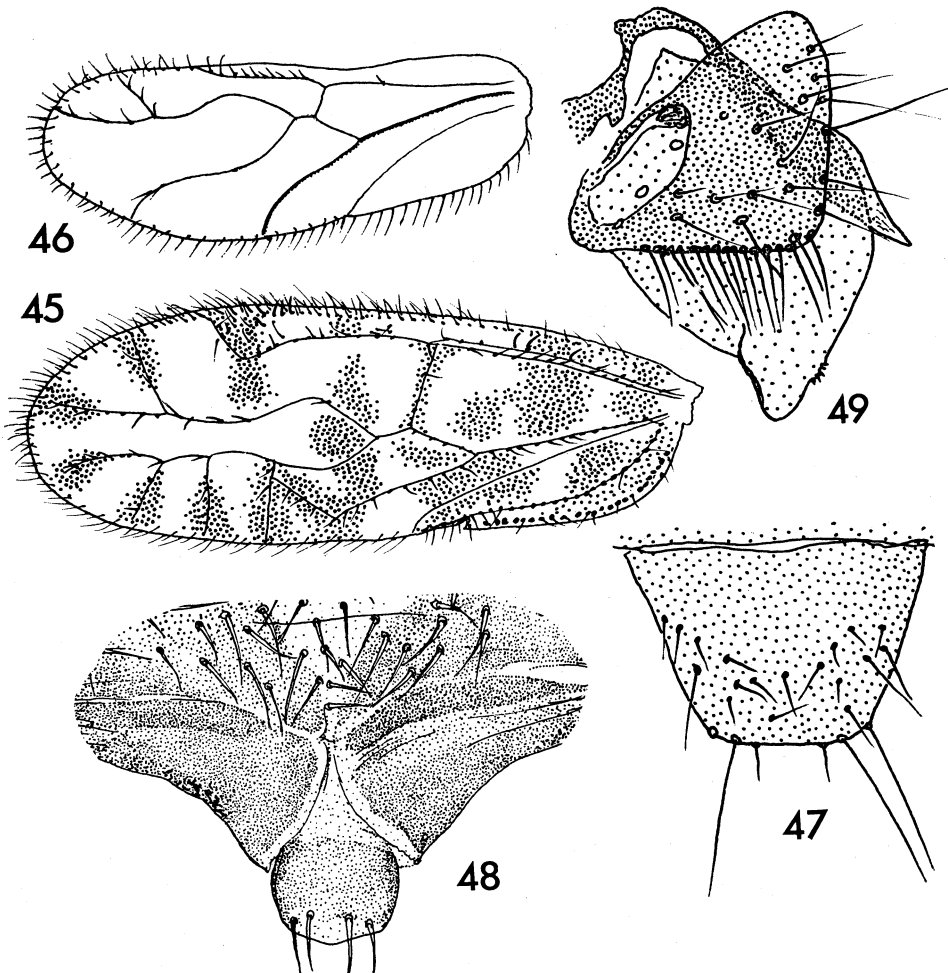
Aaroniella howensis sp. n.

FEMALE

Coloration (after 18 years on pin, then softening and removal into alcohol): Cuticle generally transparent. Brown pigment clearly visible on vertex (usual pattern), medial stirrup-mark on frons, and clypeal striae on middle third of clypeus. Apical segment of maxillary palp brown; antennae brown, segments with distinct pale apices. Mesothoracic antedorsum brown with pale median line,

dorsal lobes brown except at edges of sclerites. Metathoracic terga pale. Thoracic pleura and legs pale except apices of tibia brown, tarsal segments brown. Fore wing (fig. 45) with distinct dark brown markings, setae not sited on brown spots. Hind wing (fig. 46) hyaline, vein cu_1 dark brown. Abdomen pale.

Morphology. Length of body: 2.45 mm; IO/D (Pearman): 6.2:1. Antennae broken, but f_1 : 0.29 mm; f_2 : 0.12 mm; f_1 : f_2 = 2.42:1. Measurements of hind leg: F: 0.55 mm; T: 0.84 mm; t_1 : 0.12 mm; t_2 : 0.06 mm; t_3 : 0.06 mm; rt : 2:1:1; t_1 unusually short; ct : 0; claw with a very small preapical tooth. Fore wing length: 2.40 mm. Areola postica connected to vein m by a crossvein in both wings, basal section of rs very long and unusually transverse, vein cu_2 bare; fore wing smoothly rounded, evidence of incipient brachyptery in conformation of apical veins but wings extend well beyond abdomen, evidently held almost horizontally in repose. Hind wing length: 2.02 mm. Setae on veins r_1 : 11; rs : 0; $r_2 + r_3$: 3;



Figures 45-49.—*Aaroniella howensis* sp. n. 45. ♀, fore wing; 46. ♀, hind wing; 47. ♀, epiproct; 48. ♀, subgenital plate; 49. ♀, gonapophyses.

r_4+r_5 : 3; m : 2; cu_1 : 1. Epiproct (fig. 47) squarish, paraproct with a field of 14 trichobothria and one seta not in rosette socket. Subgenital plate (fig. 48) with a pair of very long setae basally, apically tripartite, apical lobe bearing 4 marginal setae; gonapophyses (fig. 49); ventral valve with fleshy apical lobe; dorsal valve bluntly pointed, no prominent subapical spine but a subapical spiny area; outer valve subtriangular, heavily setose.

MATERIAL EXAMINED

Lord Howe Island: 1 ♀ (holotype), 5.xii.1955 (S. J. Paramonov and Z. Liepa).

Holotype in the Australian National Insect Collection.

DISCUSSION

This species is unusual in several respects, but is placed in *Aaroniella* Mockford since it agrees with the type species *A. maculosa* (Aaron) in the following characters: antennal segments with white apices, fore wings smoothly rounded, vein cu_2 in fore wing bare, outer valve of gonapophyses triangular, ventral valve with fleshy apical lobe, subgenital plate apically tripartite. It differs from the type species, and agrees with *A. rawlingsi* Smithers (New Zealand), *A. pallida* New (Australia), and *A. trukensis* Thornton et al., and *A. gressitti* Thornton et al. (Micronesia) in that the apical sclerite of the subgenital plate is not bare, but carries 4 marginal setae. This character is common to southern hemisphere species of the genus. *A. galapagensis* Thornton and Woo (Galapagos), like *A. howensis*, does not have the fore wing setae sited on dark spots, but the dorsal valve shape is unusual for *Aaroniella*. If *A. howensis* is a typical member of the south Pacific section of the genus, one can predict that if and when a male is found, the phallosome will be found to lack distinct separate internal sclerites.

The pattern of pigmentation of the fore wings is quite distinctive, as is the remarkable connection of the areola postica with the media. With but a single specimen, it is impossible to say whether this latter character is a feature of the species, or variable with incipient brachyptery.

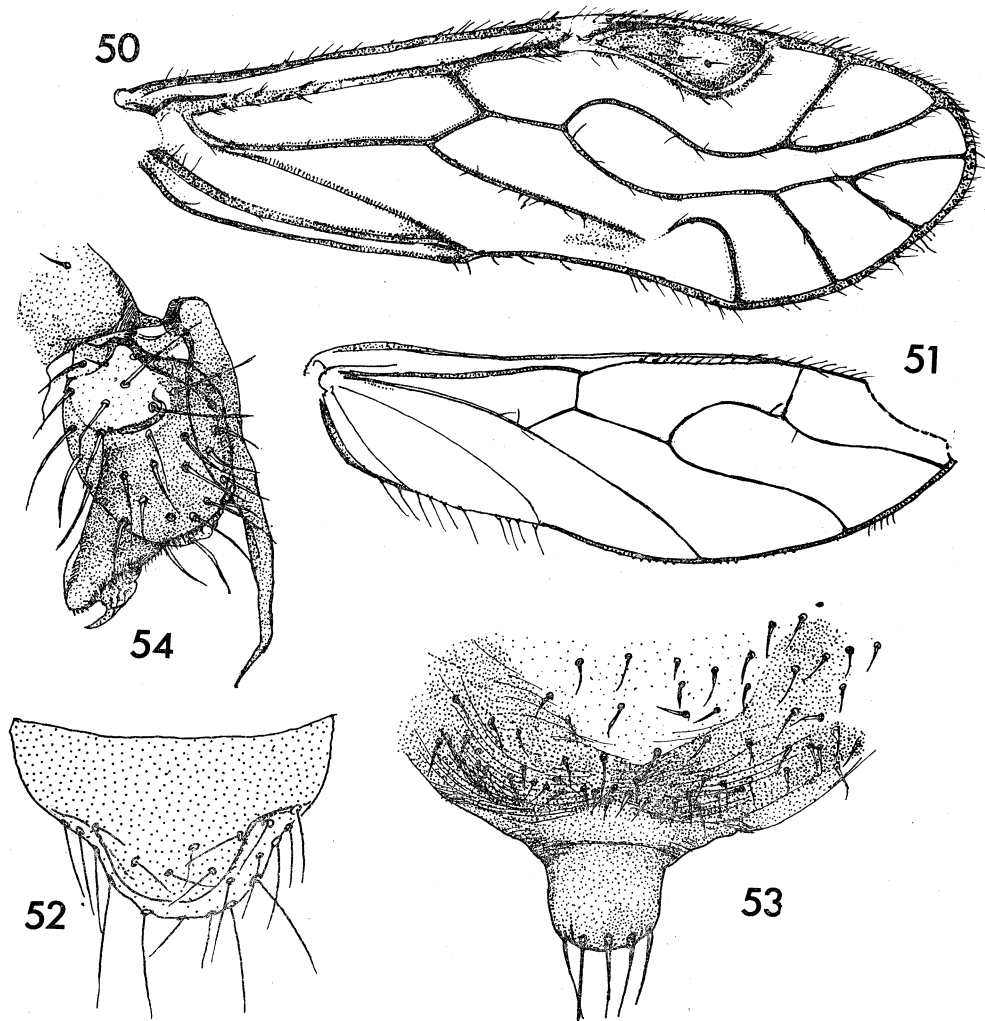
Species of *Aaroniella* have not been found on Norfolk Island nor on New Caledonia.

Haplophallus tandus sp. n.

FEMALE

Coloration. Head cream, usual markings on vertex brown. Frons with a pair of dark brown bars on each side of a rounded brown median mark. Gena cream, with a small brown patch at anterior corner. Clypeus with striae evident posteriorly, anterior third with a pair of large rounded cream areas separated almost to anterior edge by a brown mark. Eyes black, ocelli pale, ringed with black. Legs: coxa brown, femur cream with 2 brown bands (pro- and mesothoracic legs) or one (hind leg), tibia cream with three brown bands, one near each end and one midway, tarsi brown. Fore wing (fig. 50), no cloudiness in apical cells, pterostigma "windowed". Hind wing (fig. 51) with faint fuscous area in cell R_1 . Thoracic terga brown, cream along the sutures, a cream mid-line. Abdomen with wide grey-brown granulated annulations dorsally, narrower ventrally.

Morphology. Length of body: 2.50 mm. IO/D (Pearman): 3.0:1. Median epicranial suture distinct. Length of flagellar segments: f_1 : 0.24 mm; f_2 : 0.15 mm; f_1 : f_2 = 1.60. Hind leg measurements: F: 0.33 mm; T: 0.68 mm; t_1 : 0.19 mm; t_2 : 0.04 mm; t_3 : 0.04 mm; rt: 4.75:1:1; ct: 13. Fore wing length: 2.35 mm. Hind wing length: 1.85 mm. Setae on hind wing veins: r_1 : 7; rs : 0; r_2+3 : 0; r_4+5 : 11; m : 9; cu_1 : 3. Epiproct (fig. 52) rounded apically, with scattered setae. Epiproct evidently with a setose flap much as in species of *Zealandopsocus* Tillyard. Paraproct simple with circular field of 15 trichobothria, and 2 not in rosette sockets. Subgenital plate (fig. 53) with a distinct apical lobe bearing 5 marginal setae and a distinct bare subapical sclerite. Gonapophyses (fig. 54) dorsal valve with curved pointed subapical spine bearing a group of short, fine, setae subapically; outer valve oval, with long setae.



Figures 50-54.—*Haplophallus tandus* sp. n. 50. ♀, fore wing; 51. ♀, hind wing; 52. ♀, epiproct; 53. ♀, subgenital plate; 54. ♀, gonapophyses.

MATERIAL EXAMINED

Lord Howe Island: 1 ♀ (holotype), Transit Hill Road, 29.xi.1969 (C. N. Smithers).

Holotype in the Australian Museum.

DISCUSSION

Haplophallus tandus is similar to *H. emmus* Smithers and Thornton (Norfolk Island) and *H. trepticus* Thornton and Smithers (New Caledonia) in having vein cu_1 in the hind wing setose and vein cu_2 in the fore wing bare, the subgenital plate apical lobe distinctly marked off from the rest of the plate with a single bare subapical sclerite, and in the general shape of the dorsal valve of the female gonapophyses. The three species form a small group related to the widespread *orientalis* group of six species which has representatives in New Zealand, Micronesia, the Oriental Region, Seychelles and Africa.

The head pattern of *H. tandus* distinguishes it from *H. emmus* and *H. trepticus*, neither of which possess the two pairs of dark brown bars antero-lateral to the ocelli. *H. trepticus* has the large pale semicircular areas on the anterior of the clypeus, but also has a fairly wide median area posteriorly that is devoid of striae; the clypeus of *H. tandus* like that of *H. emmus*, lacks the pale median area. *H. emmus* also lacks the large pale circular areas anteriorly. In *H. trepticus* the ocellar area is bounded by a distinct thin brown line of pigment; this is absent from *H. tandus* and *H. emmus*. In fore wing pattern also, *H. tandus* is a mosaic of parts of the patterns of *H. emmus* and *H. trepticus*. Like *H. emmus* the apical cells are hyaline, and like *H. trepticus* the pterostigma is windowed hyaline. The subgenital plate of *H. tandus* is very similar to that of *H. trepticus*, whereas the gonapophyses are more similar to those of *H. emmus*. The outer valve is oval, not circular, and the dorsal valve subapical spine is curved and sharply pointed, rather than blunt. The setose flap of the female epiproct is unusual in species of *Haplophallus*, being found also in *H. emmus*. This character is a feature of *Zelandopsocus* species; the character appears outside *Zelandopsocus* also in New Zealand species of *Aaroniella*.

TABLE 1

Comparison of eight characters in three species of *Haplophallus*

	<i>trepticus</i> (N.C.)	<i>emmus</i> (N.I.)	<i>tandus</i> (L.H.I.)
1. 2 prs dark brown transverse bars antero-lateral to ocelli	absent	absent	present
2. Ocellar area brown boundary ..	present	absent	absent
3. Clypeus posterior median cream area	present	absent	absent
4. Clypeus anterior large cream areas circular	present	absent	present
5. Pterostigma pattern	windowed	not	windowed
6. Dorsal valve subapical spine ..	blunt	pointed	pointed
7. Outer valve	round	oval	oval
8. Subgenital plate apical lobe setae	3-5	2	5

Of the eight characters considered in Table 1, two are shared by all three species. *H. tandus* and *H. trepticus* have two characters in common; *H. emmus* and *H. trepticus* have three in common. Six of the characters are shared by *H. tandus* and *H. emmus*. It seems likely that both the Lord Howe and Norfolk species have evolved from the New Caledonian *H. trepticus*, and possibly through a single daughter species.

ACKNOWLEDGEMENTS

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REFERENCE

Roesler, R., 1944. Die Gattungen der Copeognathen. *Stettin. ent. Ztg.*, 105: 117-166.

ERRATA

RECORDS OF THE AUSTRALIAN MUSEUM VOL. 29 NO. 16 PSOCOPTERA OF LORD HOWE ISLAND

- Page 453 Bottom. Vol. 29 not Vol. 28
- Page 459 Line 2. *Pseudoscottiella fasciata* not *faiscata*
- Page 471 Para. 1. Of the eight characters considered in Table 1, *H. tandus* and *H. trepticus* have 3 characters in common; *H. emmus* and *H. trepticus* have one in common. Four of the characters are shared by *H. tandus* and *H. emmus*. It seems likely that both the Lord Howe and Norfolk species have evolved from the New Caledonian *H. trepticus*, and possibly through a single daughter species.