

AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Smithers, C. N., 1977. Psocoptera of Muogamarra Nature Reserve. *Records of the Australian Museum* 31(7): 251–306. [31 December 1977].

doi:10.3853/j.0067-1975.31.1977.215

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

Australian Museum science is freely accessible online at
www.australianmuseum.net.au/publications/
6 College Street, Sydney NSW 2010, Australia



THE PSOCOPTERA OF MUOGAMARRA NATURE RESERVE

by C. N. SMITHERS

The Australian Museum, Sydney

SUMMARY

In a preliminary study Psocoptera were periodically collected from eight habitats in Muogamarra Nature Reserve, near Sydney. Forty-three species were taken of which fifteen are described as new. Rainforest and *Casuarina* habitats yielded the greatest variety of species. Populations were highest in summer on *Casuarina* and showed little seasonal variation in rainforest; dry sclerophyll habitats, on the other hand, yielded greater populations in winter than summer. In each habitat one or two species were dominant. *Acacia floribunda* and *Eucalyptus* spp. were poorest in species and specimens.

INTRODUCTION

During the latter part of 1973 and through most of 1974 collections of Psocoptera were made at intervals from selected habitats in Muogamarra Nature Reserve. Psocoptera had not previously been recorded from the Reserve. The object of the work was to ascertain which species were present and to obtain some indication of any gross habitat preferences or seasonal fluctuations in numbers, if any, as a basis for planning future, more detailed, biological and ecological work. The basic information necessary for rational planning of such work has not been available for Australian species and very little appropriate work which might be applicable to Australian conditions has been done elsewhere.

This paper presents the results of a preliminary survey.

MUOGAMARRA NATURE RESERVE

Muogamarra Nature Reserve is an area of broken Hawkesbury sandstone country covering about 2,300 hectares situated near Cowan, 38 kilometres north of Sydney. It is bounded on the east by the Pacific Highway and on the west by the irregular shores of Berowra Water, a tributary of the Hawkesbury River.

In the north, the curving Hawkesbury River itself forms the boundary and in the south, residential areas adjoin the border of the Reserve.

Most of the Reserve carries vegetation cover of dry sclerophyll forest with some heathlike areas on flatter hilltops. The vegetation of the area has been described by Pidgeon (1938).

In altitude the land rises from virtually sea level to almost 200 metres.

LIST OF SPECIES OF PSOCOPTERA FROM MUOGAMARRA NATURE RESERVE

The following species have been taken from Muogamarra Nature Reserve during the present survey.

LEPIDOPSOCIDAE

Echmepteryx (Loxopholia) brunnea Smithers
Echmepteryx (Thylacopsis) picta sp.n.

CAECILIIDAE

Caecilius macrostigma Enderlein
Caecilius lineatus sp.n.
Caecilius pteridii sp.n.
Paracaecilius hylobius sp.n.
Enderleinella globiclypeus (Enderlein) comb. nov.
?Caeciliid gen. et sp.n.

STENOPSOCIDAE

Taeniostigma trickettae Smithers

ECTOPSOCIDAE

Ectopsocus californicus (Banks)
Ectopsocus punctatus Thornton and Wong
Ectopsocus perplexus sp.n.
Ectopsocus pteridii sp.n.
Ectopsocus parmatus sp.n.
Ectopsocus russulus sp.n.
Ectopsocus albiceps sp.n.

PERIPSOCIDAE

Peripsocus milleri (Tillyard)
Peripsocus maoricus (Tillyard)
Peripsocus tillyardi New
Peripsocus hamiltonae sp.n.
Peripsocus roseus sp.n.

PSEUDOCAECILIIDAE

Pseudocaecilius lachlani Enderlein
Heterocaecilius brunellus (Tillyard)
Lobocaecilius monicus Lee and Thornton
Pseudoscottiella tanei sp.n.

PHILOTARSIDAE

Aaroniella rawlingsi Smithers
Austropsocus viridis (Enderlein)
Austropsocus tibialis Thornton and New

Haplophallus ornatus Thornton and New
Haplophallus sinus Thornton and New
Haplophallus guttatus (Tillyard)

ELIPSOCIDAE

Spilopsocus ruidis Smithers
Paedomorpha gayi Smithers

PSOCIDAE

Blaste tillyardi Smithers
Blaste taylori New
Blaste (Lasiopsocus) michaelsoni (Enderlein)
Copostigma (Clematostigma) latimentula sp.n.
Copostigma (Clematostigma) paula sp.n.
Ptycta muogamarra sp.n.
Sigmatoneura formosa (Banks)
Trichadenotecnum enderleini (Roesler)

MYOPSOCIDAE

Phlotodes australis (Brauer)
Phlotodes furcatus (Smithers)

DESCRIPTIONS OF NEW SPECIES AND RECORDS OF PSOCOPTERA
 FROM MUOGAMARRA NATURE RESERVE

In the lists of material examined given below, collectors are indicated by initials as follows: C. N. Smithers (C.N.S.), Aletta S. Smithers (A.S.S.), Graeme F. Smithers (G.F.S.), Hartley G. Smithers (H.G.S.) and Robyn D. Brewer (R.D.B.).

Material is deposited in the Australian Museum (AM) and the Australian National Insect Collection (ANIC).

In the descriptions the following abbreviations are used: F (femur); T (tibia); t_1 , t_2 , t_3 (first, second and third tarsal segments); rt (ratio of tarsal segment lengths); ct (number of ctenidiobothria on tarsal segments); f_1 , f_2 (lengths of first and second flagellar segments); IO/D and PO (eye measurement ratios) are measured using the method of Badonnel, i.e. IO = distance across vertex between the eyes, D = eye diameter from front to back as seen from above, P = transverse width of eye seen from above (see Ball, 1943).

LEPIDOPSOCIDAE

Echmepteryx (Loxopholia) brunnea Smithers

Echmepteryx (Loxopholia) brunnea Smithers 1965. *J. ent. Soc. Qd* 4:75, figs. 11-16.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 2 ♀, I.xi. 1973 (C.N.S.); 1 ♀, 29.xi.1973 (C.N.S., G.F.S.); 1 ♀, 28.ii.1974 (C.N.S., A.S.S.); 1 ♀, 1 ♂, 22.iii.1974 (C.N.S., A.S.S.); 1 ♂, 23.v.1974 (C.N.S.); 1 nymph, 9.vii.1974 (C.N.S., R.D.B.); 1 ♂, 1 nymph, 18.vii.1974 (C.N.S., A.S.S.); 1 ♀, 1 nymph, 18.vii.1974 (C.N.S., A.S.S.); 1 ♀, 1 nymph, 19.ix.1974 (C.N.S.); 1 ♂, 1 nymph, 23.viii.1974 (C.N.S., A.S.S.) (AM).

Echmepteryx (Thylacopsis) picta sp. n.

MALE

COLORATION: (in alcohol). Head pale buff with a distinct brown pattern (fig. 1). Median epicranial suture dark brown, anterior arms pale brown. Labrum black in distal half, white in proximal half, the white area divided by a median black stripe running from the base of the labrum to the black distal area. Genae pale buff with a brown posterior, longitudinal patch which runs from just below the compound eye to the base of the mandible; a brown mark runs from compound eye to join the brown circle surrounding antenna base. Antennae brown. Eyes grey with brown markings. Ocelli each with a black pigmented area on the side nearest the junction of the median and anterior arms of the epicranial suture. Maxillary palps brown with the apex of the second and third segments white. Mesonotum brown. Legs all similarly coloured; femora pale brown on external face, becoming a little darker near distal end. Tibiae pale with two dark brown bands of width equal to the intervening paler parts of the tibiae; basal tarsal segment dark brown basally, pale in distal half, second and third segments brown. Fore wing membrane (fig. 2) grey with some hyaline, colourless areas. Veins various shades of grey-brown depending on development. Hind wing (fig. 3) hyaline, veins brown; abdomen pale with irregular, segmentally arranged, brown marks dorsally and lateroventrally.

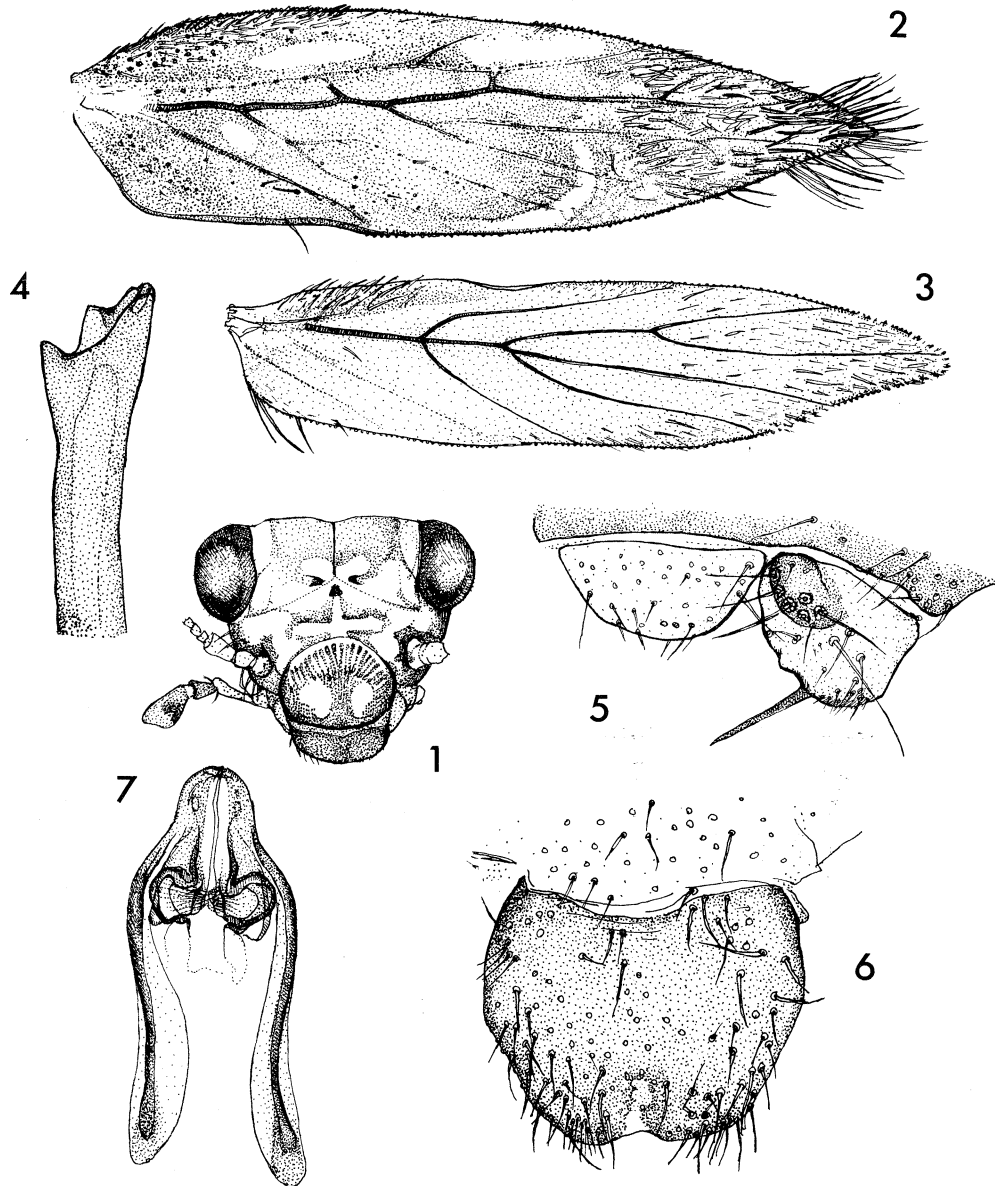
MORPHOLOGY: Length of body: 2.5 mm. Epicranial suture very distinct. Vertex fairly sharp, head flattened with postclypeus only slightly bulbous. Vertex with strongly developed setae, similar setae scattered over rest of head with a denser grouping between compound eye and antenna base. Antennae with at least 38 segments and at least 2.2 mm long. Lacinia (fig. 4). Measurements of hind leg: F: 0.70 mm; T: 1.15 mm; t_1 : 0.69 mm; t_2 : 0.11 mm; t_3 : 0.08 mm; rt: 6.3:1:0.73; fore wing length: 2.5 mm; fore wing width 0.72 mm. Fore wings almost parallel-sided for basal three-quarters, the anterior and posterior margins converging in distal quarter to the pointed apex. Veins poorly developed except for M + Cu₁, M, Rs + M and Rs which are more strongly developed. This gives the appearance of a well-developed, median, longitudinal supporting vein in the basal half of the wing. Fore wing clothed with mostly asymmetrical scales interspersed with well developed setae, the marginal setae near the wing apex bearing small sharp points along one side. Hind wing length: 2.24 mm; hind wing width: 0.52 mm. Hind wing (fig. 3) with margins converging to pointed apex in distal third. In left wing of holotype M₁ and M₂ arise independently, in right wing they arise from a very short common stem. Veins, except Sc, Cu₂ and IA well developed. Epiproct (fig. 5) lightly sclerotized, setose. Paraproct (fig. 5) a little more heavily sclerotized than epiproct and bearing six setae with rosette bases in addition to other scattered setae. Hypandrium (fig. 6) with posterior median emargination. Phallosome (fig. 7).

FEMALE: — Unknown.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂ (holotype), 18.vii.1974 (C.N.S., A.S.S.). (AM).

Holotype in the Australian Museum.

DISCUSSION: *Echmepteryx (Thylacopsis) picta* differs from *E. (T.) madagascariensis* (Kolbe) and *E. (T.) pallida* Smithers, the other Australian members of the subgenus *Thylacopsis* Enderlein, in its distinctive facial pattern. In *E. (T.) pallida* the head is pale with a sinuous, reddish brown band across the front of the head and in *E. (T.) madagascariensis* the head is pale with darker labrum and postclypeus.



FIGURES 1-7. — *Echmepteryx (Thylacopsis) picta* sp. n. 1. ♂ head, 2. ♂ forewing, 3. ♂ hindwing, 4. ♂ lacinia, 5. ♂ epiproct and paraproct, 6. ♂ hypandrium, 7. ♂ phallosome.

CAECILIIDAE

Caecilius macrostigma Enderlein

Caecilius macrostigma Enderlein 1903. *Ann. hist. - nat. Mus. hung.* 1:272, pl. VII, fig. 37.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀, 18.x.1973 (C.N.S., A.S.S.); 2 nymphs, 1.xi.1973 (C.N.S.); 1 nymph, 13.xii.1973 (C.N.S., A.S.S.); 1 ♂, 30.i.1974 (C.N.S., A.S.S.) (AM).

Caecilius lineatus sp. n.

FEMALE

COLORATION: (in alcohol). Head (fig. 8) pale brownish yellow with a brown rectangular patch on the frons between ocellar triangle and epistomial suture and a circular paler brown patch on the median epicranial suture about half way between ocellar tubercle and occipital region. In well pigmented specimens there is a faint suggestion of a median brown band through the postclypeus. Labrum and postclypeus a little paler than rest of head. Antennae with scape, pedicel and first two flagellar segments brown, more distal segments darker. Eyes black. Ocellar tubercle pale, ocelli black. Maxillary palps pale brownish yellow, the distal third of apical segment pale brown. Mesothoracic antedorsum brown with a pale median area; lateral lobes mostly brown with area adjacent to sutures pale. Fore wings (fig. 9) transparent, tinged with pale brown in posterior part of wing, very pale in cell R, basal part of cell R₁, costal cell and pterostigma. Cell IA brown. Veins brown except for R, Rs before Rs-M confluence and R₁ (hind margin of pterostigma) which are almost colourless; Cu_{1b} evanescent. Hind wing hyaline; veins pale brown. Legs pale brownish yellow except for slightly darker second tarsal segment and dark brown claws. Abdomen pale creamy yellow.

MORPHOLOGY: Length of body: 3.0 mm. Median epicranial suture very distinct, anterior arms less so but obvious, curved. Postclypeus very bulbous and prominent. Labrum with strongly developed antero-lateral styli. Lengths of flagellar segments: f₁: 0.62 mm; f₂: 0.47 mm; first flagellar segment not thickened, almost straight. Eyes fairly large, not reaching level of vertex. IO/D (Badonnel): 1.77; PO: 0.77. Ocelli small. Lacinia (fig. 10). Tibiae of uniform width. Mesothorax without precoxal suture. Measurements of hind legs: F: 0.5 mm; T: 0.87 mm; t₁: 0.2 mm; t₂: 0.12 mm; rt: 1.6:1; ct: 18, 0. Fore wing length: 3.4 mm; fore wing width 1.0 mm. Fore wings fairly elongate and narrow, length about 3.4 times width. Venation as illustrated (fig. 9). Cu₂ without setae. Hind wing length: 2.7 mm; hind wing width: 0.75 mm; length: width: 3.6:1. Epiproct and paraproct (fig. 11). Subgenital plate simple, setose. Gonapophyses (fig. 12). Glandular part of spermathecal duct fairly long.

MALE

COLORATION: (in alcohol). Head (fig. 13) as in female but the epicranial brown patch is usually not evident or only slightly so.

MORPHOLOGY: Length of body: 2.3 mm. Length of flagellar segments: f₁: 0.60 mm; f₂: 0.40 mm. Antennae thicker than in female. Eyes large, much larger than in female and reaching well above level of vertex. IO/D (Badonnel): 0.64; PO: 0.73. Ocelli larger than in female. Lacinia similar to that of female. Tibiae a little broader near tarsi but no sign of expansion along length. Measurements of hind leg: F: 0.52 mm; T: 0.94 mm; t₁: 0.25 mm; t₂: 0.14 mm; rt: 1.8:1, ct: 18, 0. Fore wing length: 3.2 mm; fore wing width: 1.1 mm. Fore wings similar to those of female but relatively a little broader. Hind wing

length: 2.6 mm; hind wing width: 0.75 mm. Epiproct and paraproct without papillar fields. Setae on hypandrium somewhat concentrated in areas on each side leaving the median part of the hind margin relatively free of setae. Phallosome (fig. 14).

MATERIAL EXAMINED: Muogammarra Nature Reserve, N.S.W. 1 ♀ (holotype), 1 ♂ (allotype), 20.vi.1974 (C.N.S., A.S.S.). Paratypes: 2 ♀, 18.x.1973 (C.N.S., A.S.S.); 1 ♂, 3 ♀, 1.xi.1973 (C.N.S.); 4 ♂, 12 ♀, 15.xi.1973 (C.N.S., A.S.S.); 1 ♂, 2 ♀, 29.xi.1973 (C.N.S., G.F.S.); 1 ♂, 2 ♀, 13.xii.1973 (C.N.S., A.S.S.); 5 ♂, 2 ♀, 16.i.1974 (C.N.S., H.G.S.); 1 ♀, 30.i.1974 (C.N.S., A.S.S.); 4 ♂, 28.ii.1974 (C.N.S., A.S.S.); 2 ♀, 22.iii.1974 (C.N.S., A.S.S.), 2 ♀, 4.iv.1974 (C.N.S., A.S.S.); 1 ♂, 2.v.1974 (C.N.S., A.S.S.); 1 ♂, 2 ♀, 20.vi.1974 (C.N.S., A.S.S.); 1 ♂, 18.vii.1974 (C.N.S., A.S.S.); 1 ♀, 19.ix.1974 (C.N.S.); 1 ♀, 3.x.1974 (C.N.S.); 1 ♀, 22.x.1974 (C.N.S.) (AM); 1 ♂, 2 ♀, 7.xi.1974 (C.N.S.) (ANIC).

Holotype and allotype in the Australian Museum; paratypes in the Australian Museum and the Australian National Insect Collection.

DISCUSSION: For comparison with other Australian species of *Caecilius Curtis* see key (p.259). Wing lengths of paratypes: ♂♂ : 3.2, 3.1, 2.9, 3.1 mm; ♀♀ : 3.4, 3.3, 3.1, 3.0 mm.

Caecilius pteridii sp.n.

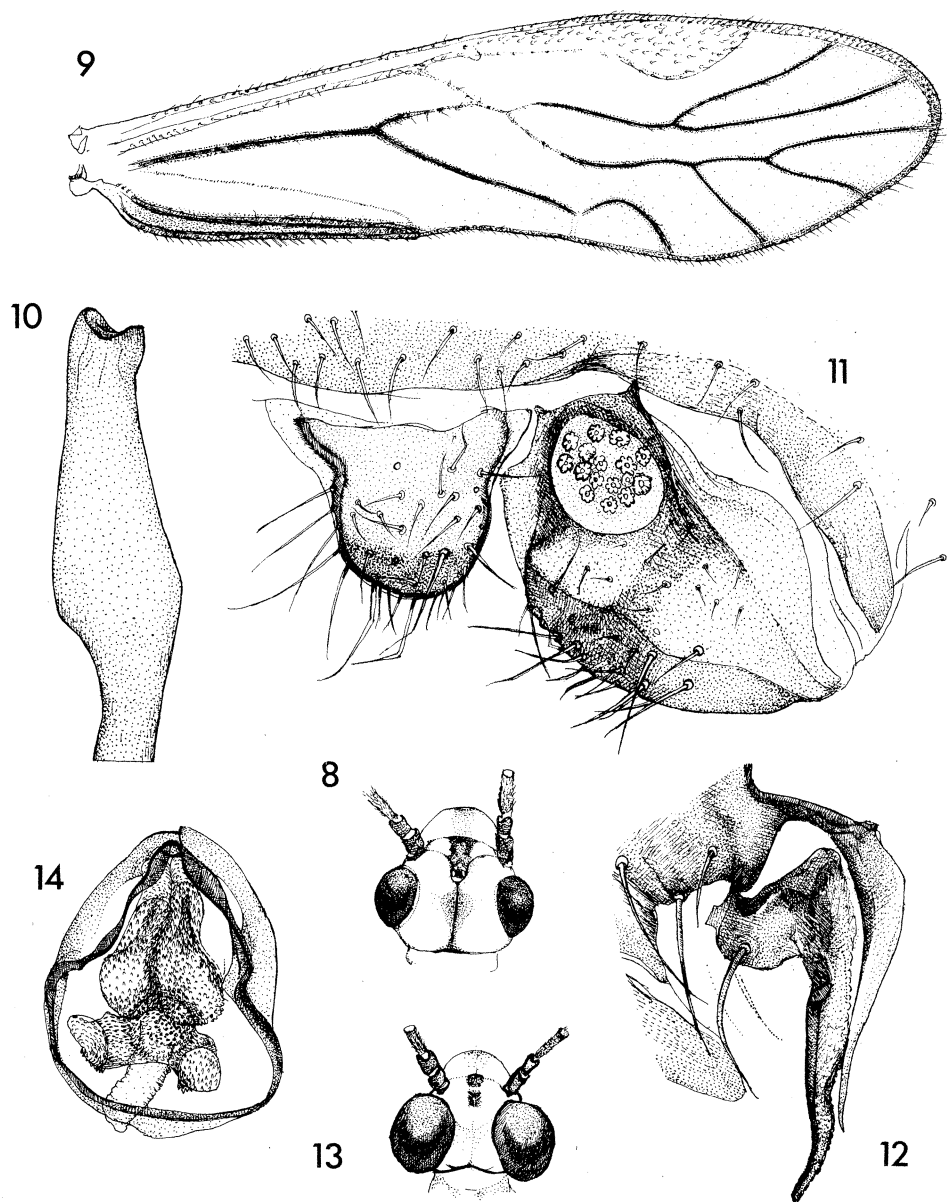
FEMALE

COLORATION: (in alcohol). Head (fig. 15) pale brownish yellow with a brown triangular mark anterior to ocellar triangle, a brown mark on either side of the median epicranial suture from ocellar triangle to back of head, a very dark brown spot behind each eye, between antenna base and eye and a very dark brown mark extending from the latter to the epistomial suture but not meeting the mark from the other side. Postclypeus a little darker than vertex. Labrum pale, a dark spot at anterior lateral corner. Neck and prothorax coloured as head with a lateral brown stripe. Antennae pale brown. Meso- and metanota pale brownish yellow, brown on each side of antedorsum and on each lateral lobe. Fore wing (fig. 16) almost uniformly tinged with very pale brown, cell IA darker, veins and pterostigma pale brown. Membrane bordering veins narrowly colourless. Hind wing faintly tinged with brown; veins pale. Legs pale brownish yellow; second tarsal segment little darker than first. Abdomen pale.

MORPHOLOGY: Length of body: 2.3 mm. Median epicranial suture distinct; anterior arms faint. Postclypeus strongly bulbous. Lengths of antennal segments: f_1 : 0.39 mm.; f_2 : 0.29 mm. Eyes fairly small. IO/D (Badonnel): 1.4, PO : 0.70. Ocelli small. Lacinia (fig. 17). Labrum without antero-lateral styli. Tibiae of uniform width, ctenidia and setae fewer towards basal end of tibia. Measurements of hind leg: F : 0.49 mm.; T : 0.84 mm.; t_1 : 0.27 mm.; t_2 : 0.13 mm.; rt : 2:1.; ct : 18, 0. Fore wing length: 2.5 mm.; fore wing width: 0.8 mm. Fore wing with fairly low areola postica, radial fork well basad of origin of M_3 . Cu_2 without setae. Hind wing length: 1.9 mm.; hind wing width: 0.6 mm. Cu_2 in hind wing very pale and fine. Epiproct simple, rhomboidal, setose (fig. 18). Paraproct without papillar area and with ovoid trichobothrial field of 12 setae with rosette bases (fig. 18). Subgenital plate with strong lateral apophyses. Glandular part of spermathecal duct fairly long. Gonapophyses (fig. 19).

MALE

COLORATION: (in alcohol). Head (fig. 20) as in female but vertex lacking the darker areas on either side of the median epicranial suture. Antennae brown, a little darker than in female.



FIGURES 8-14. — *Caecilius lineatus* sp. n. 8. ♀ head, 9. ♀ forewing, 10. ♀ lacinia 11. ♀ epiproct and paraproct, 12. ♀ gonapophyses, 13. ♂ head, 14. ♂ phallosome.

MORPHOLOGY: Length of body: 2.1 mm. Median epicranial suture distinct but less so than in female owing to paler colour. Antennae a little thicker than in female. Lengths of flagellar segments: f_1 : 0.48 mm.; f_2 : 0.40 mm. Eyes large, much larger than in female, reaching above level of vertex. IO/D (Badonnel): 0.60.; PO: 0.77. Labrum and lacinia as in female. Tibiae of fore and middle legs very slightly swollen in basal part on which ctenidia and seta are poorly developed. Measurements of hind leg: F: 0.56 mm.; T: 1.04 mm.; t_1 : 0.31 mm.; t_2 : 0.13 mm.; rt : 2.4:1.; ct : 20, 0. Fore wing length: 2.8 mm.; fore wing width: 1.0 mm.; venation and setae as in female. Hind wing length: 2.0 mm.; hind wing width: 0.65 mm. Cu_2 indistinct. Epiproct (fig. 22) without papillae; paraproct (fig. 21) with an area bearing well developed papillae. Hypandrium with middle of hind margin relatively clear of setae. Phallosome (fig. 23); spatulate apex of external parameres without pores.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀ (holotype), 1 ♂ (allotype), 23.v.1973 (C.N.S.). Paratypes: 1 ♂, 1 ♀, 15.xi.1973 (C.N.S., A.S.S.); 1 ♀, 29.xi.1973 (C.N.S., G.F.S.); 1 ♂, 23.xii.1973 (C.N.S., A.S.S.); 2 ♀, 18.iv.1974 (C.N.S.); 1 ♂, 2.v.1974 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 19.ix.1974 (C.N.S.); 1 ♂, 3.x.1974 (C.N.S.); 1 ♀, 22.x.1974 (C.N.S.) (AM); 1 ♂, 1 ♀, 7.xi.1974 (C.N.S.) (ANIC).

Holotype and allotype in the Australian Museum; paratypes in the Australian Museum and the Australian National Insect Collection.

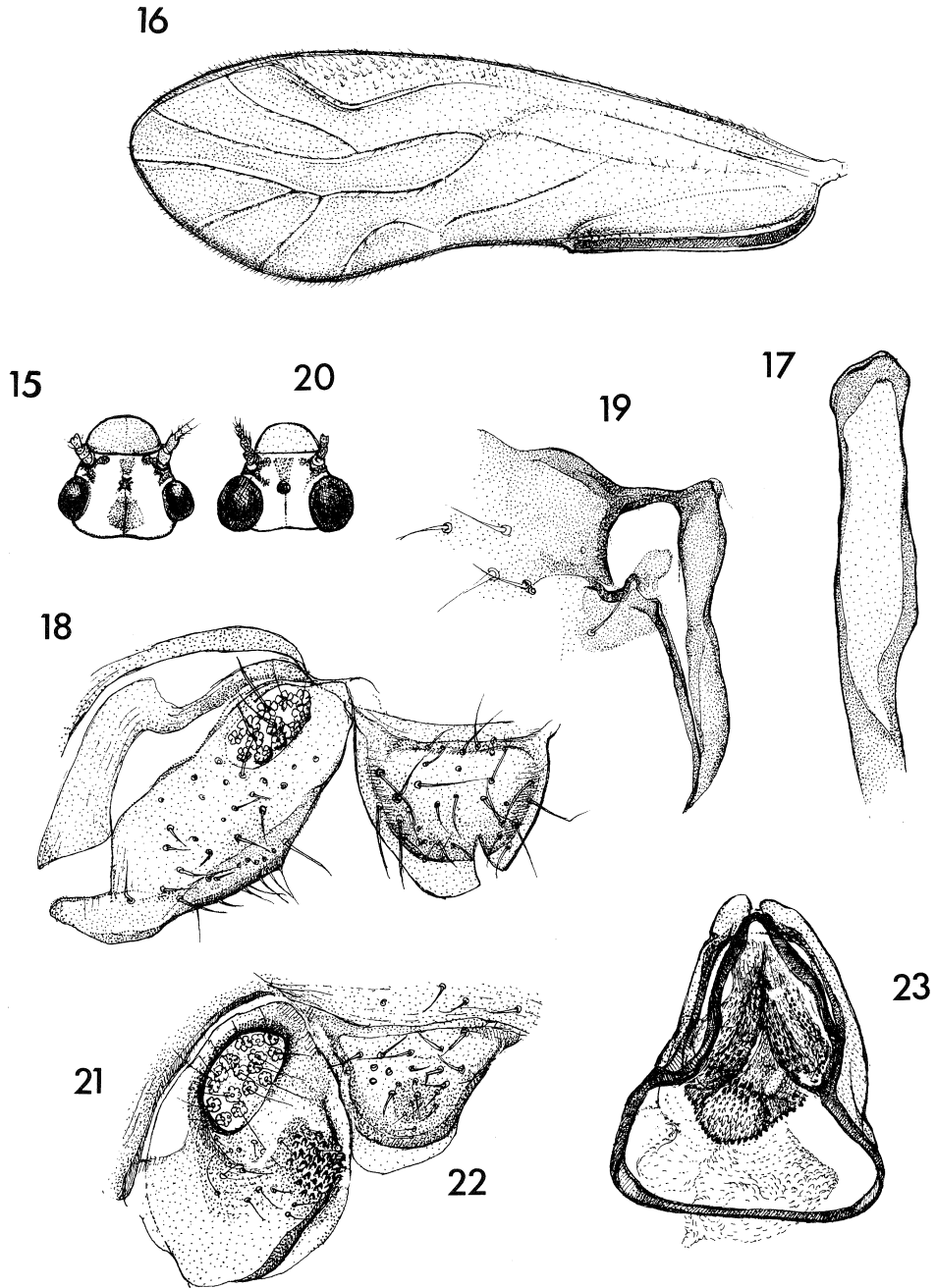
DISCUSSION: For comparison with other Australian species of *Caecilius* see key (p.259). Wing length of paratypes: ♀♀: 2.4, 2.4, 2.5 mm; ♂♂: 2.5, 2.3, 2.4 mm.

Caecilius is a large, worldwide, genus of at least 250 species of which only eight have so far been recorded from Australia although many more are present in collections. Badonnel (1955) grouped species on the basis of easily discernible characters into a series of groups and subgroups without implying relationships.

Mockford (1965, 1966, 1969) is in the process of regrouping the species using a range of morphological features which, it is hoped, will provide a better indication of relationships. This work is incomplete, however, and it would be unwise to attempt to fit the known Australian species into Mockford's system at present. For the present, therefore, key characters for distinguishing the Australian species only are given in a dichotomous key for all the known Australian species.

KEY TO AUSTRALIAN SPECIES OF *CAECILIUS* CURTIS

1. Fore wing pale, yellowish, sometimes cell IA darker than rest of membrane .. 2
Fore wing with blotched or clearcut pattern 5
2. Cell IA darker than rest of membrane 3
Cell IA not darker than rest of membrane *australis* Enderlein
3. A brown mark behind antenna base 4
No brown mark behind antenna base *lineatus* sp.n.
4. A dark mark between eye and epistomial suture *pteridii* sp.n.
No dark mark between eye and epistomial suture *quercus* Edwards
5. Fore wing pattern consisting of a longitudinal, irregular, median band 6
Fore wing irregularly blotched with various shades of brown (pterostigma with strongly developed posterior angle) 7



FIGURES 15-23. — *Caecilius pteridii* sp. n. 15. ♀ head, 16. ♀ forewing, 17. ♀ lacinia, 18. ♀ epiproct and paraproct, 19. ♀ gonapophyses, 20. ♂ head, 21. ♂ epiproct, 22. ♂ paraproct, 23. ♂ phallosome.

6. Dark median band of fore wing extending well into median cells with extension of colour along branches of media *flavicosta* Banks
 Dark median band of fore wing not extending along branches of media
 *morosus* Banks
7. ♂ IO/D : 0.90; PO : 1.0; ♀ IO/D : 2.3; PO : 0.86 *semifuscatus* (Tillyard)
 ♂ IO/D : 1.1; PO : 0.83; ♀ IO/D : 2.2; PO : 1.7 *macrostigma* Enderlein

Paracaecilius hylobius sp.n.

FEMALE

COLORATION: (in alcohol). A pale yellowish species with faint suggestion of a brown area across vertex and two broad brownish bands along dorsum of thorax. Antennae pale, slightly brownish from second flagellar segment. Eyes black. Ocellar tubercle pale with ocellar pigment reddish brown. Legs uniformly coloured as body. Fore wings (fig. 24) hyaline with faint suggestion of brown in membrane in distal half; cell IA pale brown. Veins colourless in basal half of wing, very pale brown in darker parts of distal half of wing.

MORPHOLOGY: Length of body: 2.0 mm. Median epicranial suture distinct, anterior arms poorly developed. Postclypeus bulbous. Labrum with strongly sclerotized inwardly curving lateral marginal rods (fig. 25). Lengths of flagellar segments: f_1 : 0.44 mm.; f_2 : 0.39 mm. First flagellar segment slightly curved. Eyes fairly large. IO/D (Badonnel): 1.1; PO : 0.75. Lacinia (fig. 26) with very narrow bifid apex. Mesothoracic precoxal suture present ventrally, evanescent dorsally. Tibiae without any suggestion of thickening. Measurements of hind leg: F: 0.49 mm.; T : 0.89 mm.; t_1 : 0.28 mm.; t_2 : 0.08 mm.; rt : 3.4:1.; ct : 19, 0. Femora fairly narrow. Fore wing length: 2.6 mm.; fore wing width: 0.9 mm. Fore wings fairly broad (fig. 24). Pterostigma with broadening but smoothly rounded hind margin. Subcosta evanescent, remnant straight. Stem of R_s before junction with M strongly curved, after separation from M slightly sinuous and shorter than R_{4+5} . Areola postica small. Veins setose except IA. Epiproct (fig. 27) and paraproct (fig. 27); setae with well-developed alveoli; tubercles absent. Subgenital plate with long, fine setae. Glandular part of spermathecal duct short, in two sections, the distal one of even width, the smaller proximal section narrowing towards the bulb of the spermatheca. Gonapophyses (fig. 28) of characteristic form, the dorsal valve broad basally, tapering distally with a dorsally sclerotized margin, otherwise membranous. No clear basal connection to ninth tergite.

MALE

COLORATION: (in alcohol). As female but without any indication of darkening on vertex but dorsal stripes on thorax a little darker.

MORPHOLOGY: Length of body: 2.2 mm. Epicranial suture indistinct. Lengths of flagellar segments: f_1 : 0.602 mm.; f_2 : 0.504 mm. Antennae hardly thicker than in female. Eyes very large, reaching above level of vertex, almost circular seen from above. IO/D : 0.36; PO : 0.91. Labrum and lacinia as in female. Tibiae not thickened, femora long and narrow. Measurements of hind leg: F : 0.56 mm.; T : 1.10 mm.; t_1 : 0.38 mm.; t_2 : 0.10 mm.; rt : 3.8:1; ct : 24, 0. Fore wing length: 3.2 mm.; fore wing width: 1.1 mm.; venation as in female. Hind wing length: 2.1 mm.; hind wing width: 0.7 mm. Epiproct (fig. 29). Paraproct (fig. 29). Phallosome (fig. 30) with very broad external parameres.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀ (holotype) 13.xii.1973 (C.N.S., A.S.S.); 1 ♂ (allotype), 23.v.1974 (C.N.S.). Paratypes 2 ♀, 15.xi.1973 (C.N.S., A.S.S.); 1 ♀, 29.xi.1973 (C.N.S., G.F.S.); 1 ♀, 4.iv.1974 (C.N.S., A.S.S.); 1 ♀, 7.xi.1974 (C.N.S.) (AM).

Holotype, allotype and paratypes in Australian Museum.

DISCUSSION: The genus *Paracaecilius* Badonnel has been recorded only from Africa and Madagascar; seven species are included, a key to six of which is given by Badonnel (1967). Later Badonnel, (1969) added the seventh (*P. wittei* (Bad.)). In the key given by Badonnel *P. hyllobius* runs to *P. cyanops* Badonnel, but differs from that species in having paler wings and larger eyes. In *P. cyanops* IO/D = 0.83. From *P. wittei* (Badonnel) it differs in lacking a bold wing pattern. Wing length of paratypes: ♂ : 3.2 mm; ♀ ♀ : 2.6, 2.9, 2.8 mm.

Paracaecilius hyllobius is the first species of the genus to be recorded from Australia.

***Enderleinella globiclypeus* (Enderlein) comb. nov.**

Caecilius globiclypeus Enderlein 1903. *Ann. hist.-nat. Mus. hung* 1:275.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀, 1.xi.1973 (C.N.S.); 1 ♂, 1 ♀, 15.xi.1973 (C.N.S., A.S.S.) (AM).

DISCUSSION: Enderlein (1903) described *Caecilius globiclypeus* but gave no information on female genitalia nor mouthparts.

The specimens from Muogamarra Nature Reserve agree well with Enderlein's description in colour and morphological features, e.g., excessively enlarged postclypeus, narrow pterostigma, short radial fork. These are features characteristic of species of *Enderleinella* Badonnel and dissection of the female from Muogamarra discloses that the gonapophyses were also of the broad membranous form characteristic of *Enderleinella* and not of the sclerotized, acuminate form found in *Caecilius*. *Caecilius globiclypeus* Enderlein should be placed in *Enderleinella*. The genus *Enderleinella* has been recorded so far from Europe and New Zealand, with one species from each area.

?Caeciliid gen. et. sp. n.

In addition to the identifiable caeciliid material one female was taken in which the genitalia are of peculiar form. The specimen undoubtedly represents an interesting undescribed genus but as only one specimen was taken and the genitalia preparations are unsatisfactory it is considered unwise to describe the species until more material is available. Repeated efforts to obtain more specimens from the same locality have so far failed.

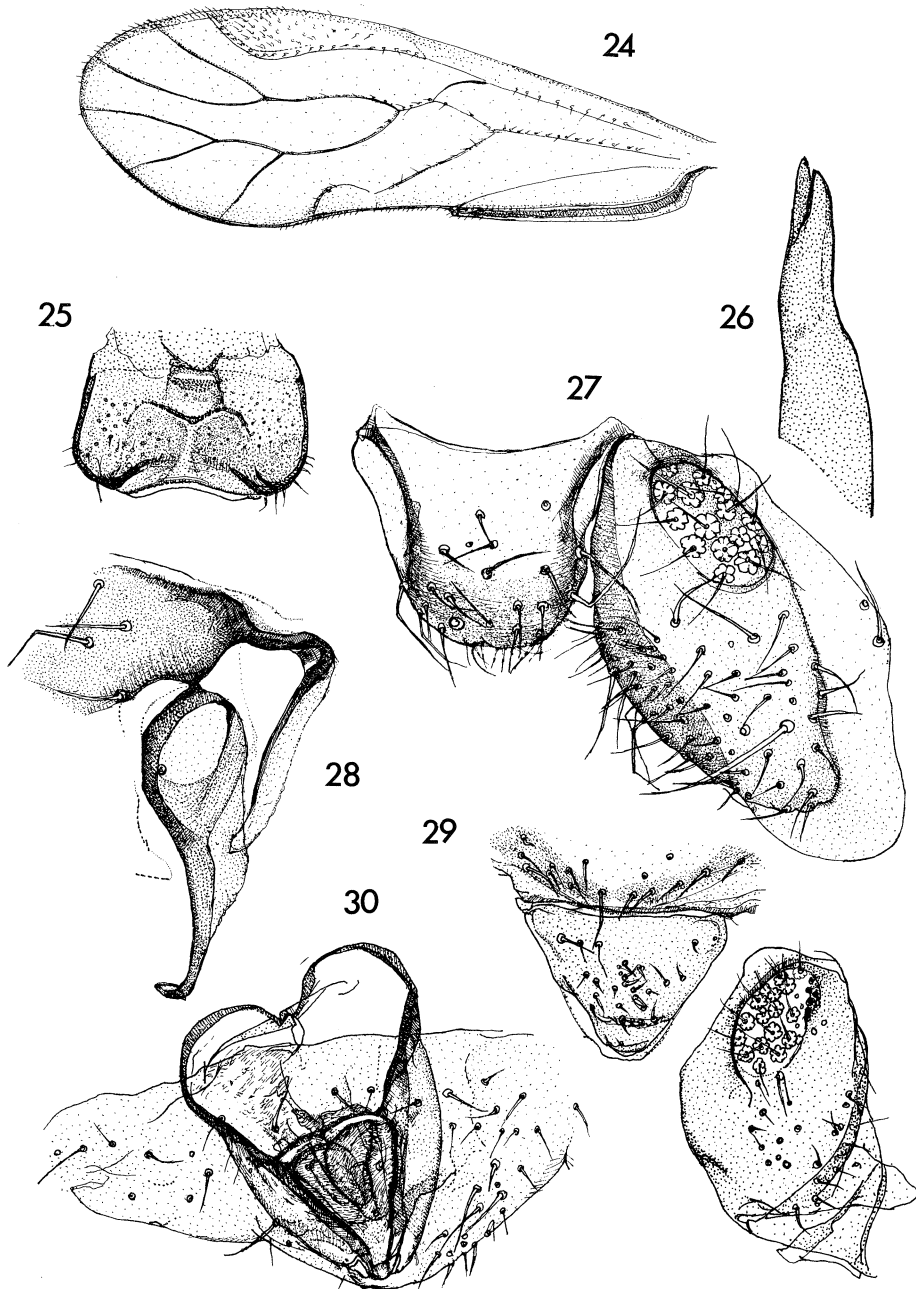
MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀, 23.v.1973 (C.N.S., A.S.S.) (AM).

STENOPSOCIDAE

***Taenostigma trickettae* Smithers**

Taenostigma trickettae Smithers 1974. *J. Aust. ent. Soc.* 13:211, figs. 1-12,17.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 1 ♀, 7 nymphs, 1.xi.1973, (C.N.S.); 1 ♀, 2 nymphs, 15.xi.1973 (C.N.S., A.S.S.); 1 ♀, 2 nymphs, 29.xi.1973



FIGURES. 24-30. — *Paracaecilius hylobius* sp. n. 24. ♀ forewing, 25. ♀ labrum, 26. ♀ lacinia, 27. ♀ epiproct and paraproct, 28. ♀ gonapophyses, 29. ♂ epiproct and paraproct, 30. ♂ phallosome.

(C.N.S., G.F.S.); 1 ♀, 13.xi.1973 (C.N.S., A.S.S.); 7 nymphs, 30.i.1974 (C.N.S., A.S.S.); 3 nymphs, 22.iii.1974 (C.N.S., A.S.S.); 4 nymphs, 4.iv.1974 (C.N.S., A.S.S.); 1 ♂, 18.iv.1974 (C.N.S.); 1 ♂, 1 ♀, 4 nymphs, 2.v.1974 (C.N.S., A.S.S.); 1 ♀, 3 nymphs, 23.v.1974 (C.N.S.); 1 ♂, 1 ♀, 4 nymphs, 20.vi.1974 (C.N.S., A.S.S.); 1 nymph, 9.vii.1974 (C.N.S.); 1 nymph, 18.vii.1974 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 1.viii.1974 (C.N.S., A.S.S.); 3 nymphs, 22.viii.1974 (C.N.S., A.S.S.); 1 ♂, 3 nymphs, 19.ix.1974 (C.N.S.); 1 ♀, 3 nymphs, 3.x.1974 (C.N.S.); 1 ♂, 22.x.1974 (C.N.S.); 7 nymphs, 7.xi.1974 (C.N.S.) (AM).

ECTOPSOCIDAE

Ectopsocus californicus (Banks)

Peripsocus californicus Banks 1903. *Jl N.Y. ent. Soc.* 11:237.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀, 18.x.1973 (C.N.S., A.S.S.); 10 ♀, 4 nymphs, 1.xi.1973 (C.N.S.); 2 ♀, 15.xi.1973 (C.N.S., A.S.S.); 1 ♂, 29.xi.1973 (C.N.S., G.F.S.); 1 ♀, 13.xii.1973 (C.N.S., A.S.S.); 1 ♂, 30.i.1974 (C.N.S., A.S.S.); 1 ♀, 28.ii.1974 (C.N.S., A.S.S.); 1 ♂, 4.iv.1974 (C.N.S., A.S.S.); 1 ♂, 23.v.1974 (C.N.S.); 1 ♂, 3 ♀, 1.viii.1974 (C.N.S., A.S.S.); 1 ♂, 22.viii.1974 (C.N.S., A.S.S.); 2 ♂, 1 nymph, 19.ix.1974 (C.N.S.) (AM).

Ectopsocus punctatus Thornton and Wong

Ectopsocus punctatus Thornton and Wong, 1968. *Pacif. Insects Monogr.* 19:137, figs. 291-296.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 7.xi.1974 (C.N.S.) (AM).

Ectopsocus perplexus sp. n.

MALE

COLORATION: (in alcohol). Head, palps, antennae, thorax and legs almost uniformly very pale brown, at most a little darker on vertex; abdomen pale with dark tubercular lobe, lateral patches and transverse comb showing up distinctly against pale background at end of abdomen. Fore wings (fig. 31) hyaline, very faintly tinged with brown; veins brown. Hind wings hyaline, almost colourless; veins pale brown.

MORPHOLOGY: Length of body: 1.7 mm. Head with scattered, well developed, erect setae. Epicranial suture indistinct. Lengths of flagellar segments: f_1 :0.21 mm.; f_2 :0.168 mm. Male antennae not greatly thicker than in female. Eyes fairly well developed, upper margin level with vertex, not greatly larger than in female. IO/D (Badonnel): 2.0; PO: 0.57. Anterior ocellus much smaller than lateral ocelli. Coxae and femora stout. Measurements of hind leg: F: 0.35 mm.; T: 0.62 mm.; t_1 :0.15 mm.; t_2 :0.07 mm.; rt: 2.2:1; ct: 12, 0. Fore wing length: 1.76 mm; fore wing width: 0.6 mm. Fore wings fairly narrow. Pterostigma a little wider distally than basally. Rs and M meet in a point, radial fork shorter than stem of Rs; margin with an occasional minute seta. Hind wing length: 1.36 mm.; hind wing width: 0.44 mm. Margin with a few minute setae between R_{2+3} and R_{4+5} . Rs-M crossvein fairly long. Epiproct simple, more heavily sclerotized distally than near base and bearing a few symmetrically arranged setae in distal half; hind margin rounded. Paraproct lightly sclerotized; trichobothrial field of eight setae. Sclerotizations of ninth tergite distinctive (fig. 32); posterior margin with "comb" and lateral margins sinuose, sclerotized in posterior half; dorsal plate bearing a median, posteriorly-directed, rugose lobe and a small, more truncate, rugose lobe anteriorly; laterally, margin of tergite with a small, sclerotized area the posterior margin of which carries a small "comb" of irregular teeth (fig. 32). Hypandrium (fig. 33). Phallosome (fig. 34).

FEMALE

COLORATION: (in alcohol). As in male.

MORPHOLOGY: Length of body: 1.7 mm. Lengths of flagellar segments: f_1 :0.224 mm.; f_2 :0.140 mm. IO/D (Badonnel): 2.0; PO: 0.57. No sexual dimorphism in antennal and eye characters but anterior ocellus equal to lateral ocelli in size in female. Measurements of hind leg: F: 0.32 mm.; T: 0.60 mm.; t_1 :0.17 mm.; t_2 :0.08 mm.; rt: 2:1; ct:13, 0. Fore wing length: 1.68 mm.; fore wing width: 0.56 mm. Fore wing venation and setae as in male. Hind wing length 1.4 mm.; hind wing width: 0.44 mm. Epiproct (fig. 35) well sclerotized, less so in middle area. Paraproct well sclerotized with a strongly sclerotized dorsal marginal band which extends, but is narrower, below trichobothrial field of nine setae; near its posterior end the marginal band bears a strong cone; a row of four widely-spaced setae lies below trichobothrial field and there is a short, strong seta in distal half. Subgenital plate (fig. 36). Gonapophyses (fig. 36).

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, (holotype), 1 ♀, (allotype), 18.x.1973 (C.N.S., A.S.S.). Paratypes: 1 ♂, 1 ♀, 18.x.1973 (C.N.S., A.S.S.); 2 ♀, 30.i.1974 (C.N.S., A.S.S.); 1 ♀, 13.xii.1973 (C.N.S., A.S.S.) (AM).

Holotype, allotype and paratypes in the Australian Museum.

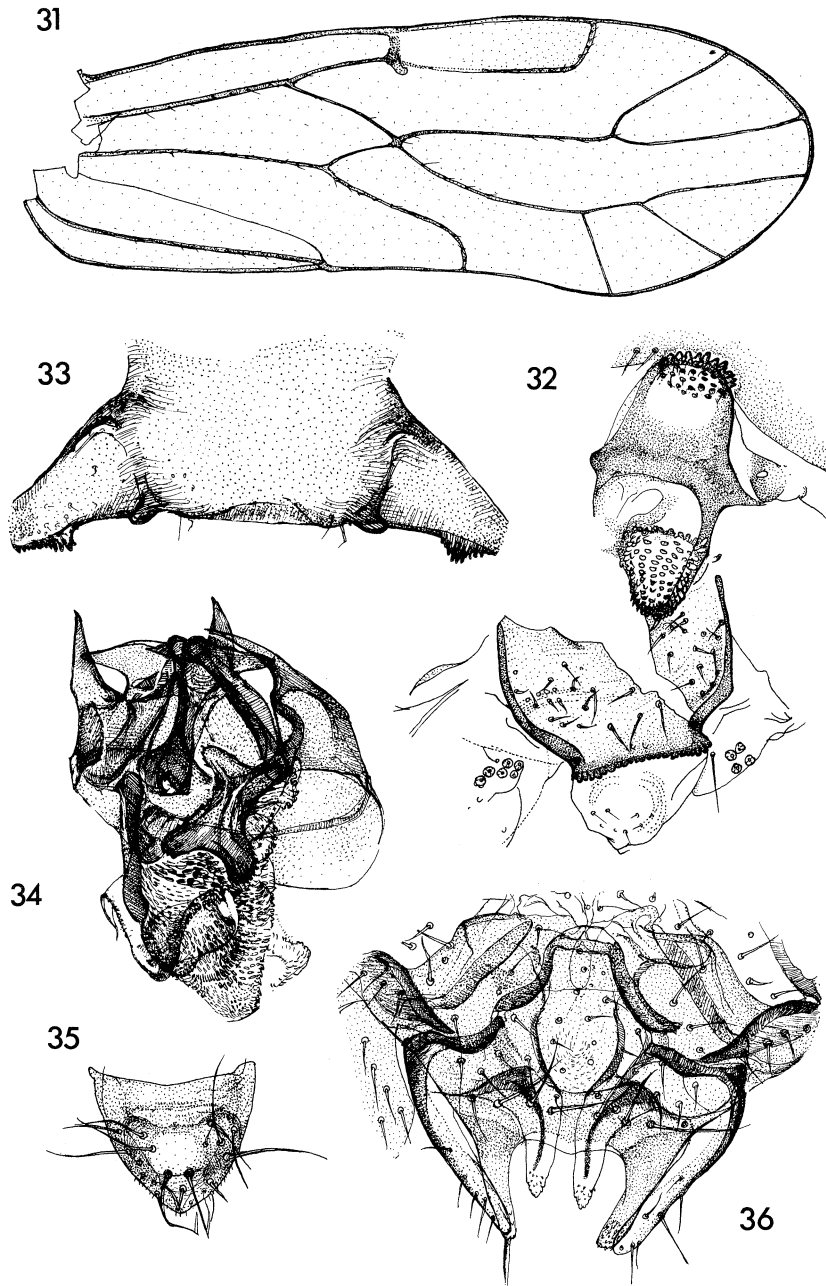
DISCUSSION: Thornton and Wong (1968) have grouped the species of *Ectopsocus* McLachlan of the Oriental and Pacific Regions into fourteen groups. *E. perplexus*, as it does not show any degree of sexual dimorphism, cannot be placed in the *ornatus*, *fullawayi*, *basalis*, *fenestratus*, *denervus*, *maindroni* nor *briggsi* groups. *E. perplexus* has the pterostigma broadened a little towards the distal end and the inner parameres of the male are fused; it is not, therefore, closely allied to the *perkinsi* group. The apical abdominal structures of the male preclude association with *E. digrogllossus* Thornton and Wong and *E. adelphos* Thornton and Wong and the *denotatus*, *titschacki* and *maindroni* groups have truncate lobes to the subgenital plate and those of the *cinctus* group are triangular. From species of the *hirsutus* group and from *E. pumilis* (Banks), *perplexus* differs in the distinctive form of the sclerifications of the apex of the male abdomen. It cannot, therefore, be placed with confidence in any of the species groups of Thornton and Wong (loc. cit.).

Ectopsocus pteridii sp. n.

MALE

COLOURATION: (in alcohol). Head pale brown, postclypeus with faint striations, a slightly darker spot between antenna base and compound eye; genae pale. Antennae pale brown. Eyes black. Ocelli pale. Maxillary palps pale brown. Thoracic nota pale brown, the parapsidal sutures appearing as fine dark lines. There is a faint suggestion of a darker lateral band running from behind eye to base of abdomen. Legs very pale brown; tibiae a little darker. Fore wings hyaline, very faintly tinged with brown; slightly darker areas occur at the Rs and M junction, where veins meet the wing margin and at the proximal end of the pterostigma. Veins brown. Hind wing hyaline. Veins brown. Abdomen very pale except for terminal structures.

MORPHOLOGY: Length of body: 1.4 mm. Head with postclypeus hardly bulging; anterior margin straight. Median epicranial and epistomial sutures very distinct. Lengths of flagellar segments: f_1 :0.280 mm.; f_2 :0.168 mm. Eyes fairly large, larger than in female and just reaching level of vertex. IO/D (Badonnel): 2.1; PO: 0.6. Ocelli large. Head with some long and stout setae in addition to more densely arranged smaller setae. Fore wing length: 1.6 mm.; fore wing width: 0.6 mm. Pterostigma slightly broader distally than



FIGURES 31-36. — *Ectopsocus perplexus* sp. n. 31. ♂ forewing, 32. ♂ sclerification of 9th tergite, posterior marginal comb and dorsal plate, with rugose lobe and irregular teeth, 33. ♂ hypandrium, 34. ♂ phallosome, 35. ♀ epiproct, 36. ♀ subgenital plate.

proximally. Rs and M meet in a point; M_1 arises opposite radial fork. Margin and veins with very short, widely separated setae, visible only with magnification $\times 100$. Hind wing length: 1.2 mm.; hind wing width: 0.4 mm. A few marginal setae between R_{2+3} and R_{4+5} : Measurements of hind leg: F: 0.32 mm.; T: 0.53 mm.; t_1 : 0.17 mm.; t_2 : 0.07 mm.; rt: 2.2:1; ct: 12, 0. Epiproct simple, lightly sclerotized, setose. Eighth and ninth tergites (fig. 37) characteristically sclerotized. Ninth tergite with apical "comb" of about 26 teeth, lateral borders sclerotized and converging slightly towards the rear. Eighth tergite extended posteriorly into a coarsely papillate lobe and with a small median field of papillae at the anterior edge; a lateral papillate area occurs on each side and the body of the tergite is well sclerotized. Phallosome (fig. 38) with complex sclerifications of the penial bulb in addition to fused internal parameres.

FEMALE

COLORATION: (in alcohol). As in male but a little darker.

MORPHOLOGY: Length of body: 1.4 mm. Head larger than in male; eyes smaller. Lengths of flagellar segments: f_1 : 0.196 mm.; f_2 : 0.112 mm. IO/D (Badonnel): 2.7; PO: 0.75. Ocelli large. Measurements of hind leg: F: 0.29 mm.; T: 0.48 mm.; t_1 : 0.14 mm.; t_2 : 0.07 mm.; rt: 2:1; ct: 10, 0. Fore wing length: 1.25 mm.; fore wing width: 0.48 mm. Epiproct rounded, well sclerotized, setose. Paraproct with a small double cone on hind margin. Gonapophyses (fig. 39) spermathecal entrance with characteristic and, for *Ectopsocus*, unusual sclerifications (fig. 39). Subgenital plate (fig. 40) with heavy internal sclerifications laterally and a median reticulate pattern internally. Margin between posterior lobes straight.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂ (holotype), 1 ♀ (allotype), 13.xii.1973 (C.N.S., A.S.S.); Paratypes: 1 ♂, 1 ♀, 19.ix.1974 (C.N.S.); 1 ♀, 1.viii.1974 (C.N.S., A.S.S.) (AM).

Holotype, allotype and paratypes in the Australian Museum.

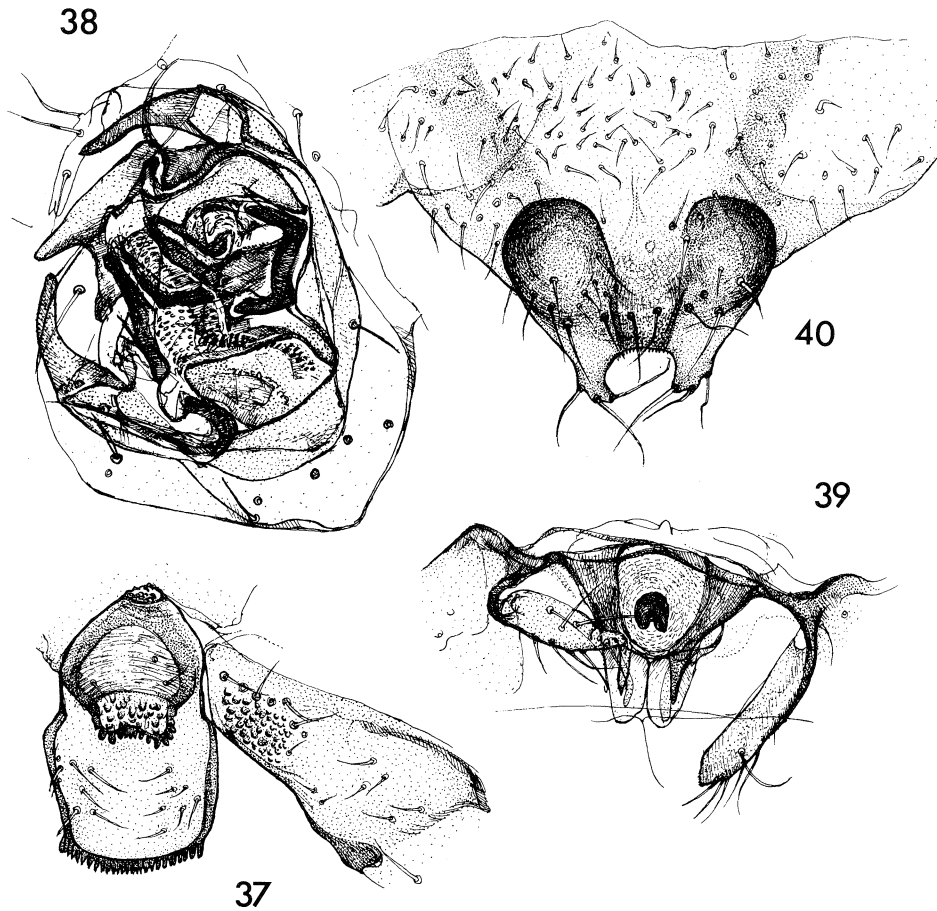
DISCUSSION: *Ectopsocus pteridii* is very similar to *E. punctatus* Thornton and Wong known from New Zealand, New Caledonia and Australia. The male differs in the proportions of the ninth tergite and in having the papillae of the ninth tergite larger and finer. In the female the dorsal valves are longer, the spermathecal entrance sclerifications differ and the margin of the subgenital plate between the posterior lobes is straight whereas in *E. punctatus* it is curved.

Ectopsocus parmatus sp.n.

MALE

COLORATION: (in alcohol). Head brown, median epicranial suture dark. Postclypeus without striations. Antennae and maxillary palps a little paler than head. Eyes black. Ocelli reddish. Thorax brown, the median posterior part of antedorsum pale. Legs pale brown. Fore wing hyaline, uniformly tinged with pale brown; veins dark. Hind wings hyaline, barely tinged with pale brown, veins brown. Abdomen pale except for sclerotized apical structures.

MORPHOLOGY: Length of body: 1.5 mm. Median epicranial suture very distinct. Postclypeus almost flat. Lengths of flagellar segments: f_1 : 0.28 mm.; f_2 : 0.17 mm. Eyes moderately large. IO/D (Badonnel): 2.6; PO: 0.8 Ocelli large. Measurements of hind leg: F: 0.38 mm.; T: 0.60 mm.; t_1 : 0.18 mm.; t_2 : 0.08 mm.; rt: 2.2:1; ct: 12, 0. Fore wing length: 1.6 mm.; fore wing width: 0.7 mm. Pterostigma only very slightly wider distally. Rs and M meet in a point. R, R_1 and IA with strong setae. Other veins more sparsely setose, Cu_2 glabrous. Marginal setae from R_1 to wing apex in a double row. Hind wing length: 1.3



FIGURES 37-40. — *Ectopsocus pteridii* sp. n. 37. ♂ 8th and 9th tergites, 38. ♂ phallosome, 39. ♀ gonapophyses and spermathecal entrance, 40. ♀ subgenital plate.

mm.; hind wing width: 0.5 mm. Margin setose (about 10 setae) between R_{2+3} and wing apex. Hypandrium (fig. 41). Phallosome (fig. 42). Sclerification of ninth tergite (fig. 43) with distal "comb", a proximal area of papillae, a transverse row of papillae about a quarter of distance from base and with sclerotized lateral margins.

FEMALE — Unknown.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂ (holotype), 4.iv.1974 (C.N.S., A.S.S.) (AM).

Holotype in the Australian Museum.

DISCUSSION: *Ectopsocus parmatus* belongs to the *E. cinctus* group of Thornton and Wong (1968) but can be distinguished from other species of that group by the form of the sclerification of the phallosome and of the ninth tergite.

***Ectopsocus russulus* sp.n.**

FEMALE

COLORATION: (in alcohol). Head and thorax reddish brown; abdomen yellowish brown. Antennae, maxillary palps and legs pale brown. Eyes black. Fore wings tinged with reddish brown; veins dark brown. Hind wings very faintly tinged with brown; veins pale brown.

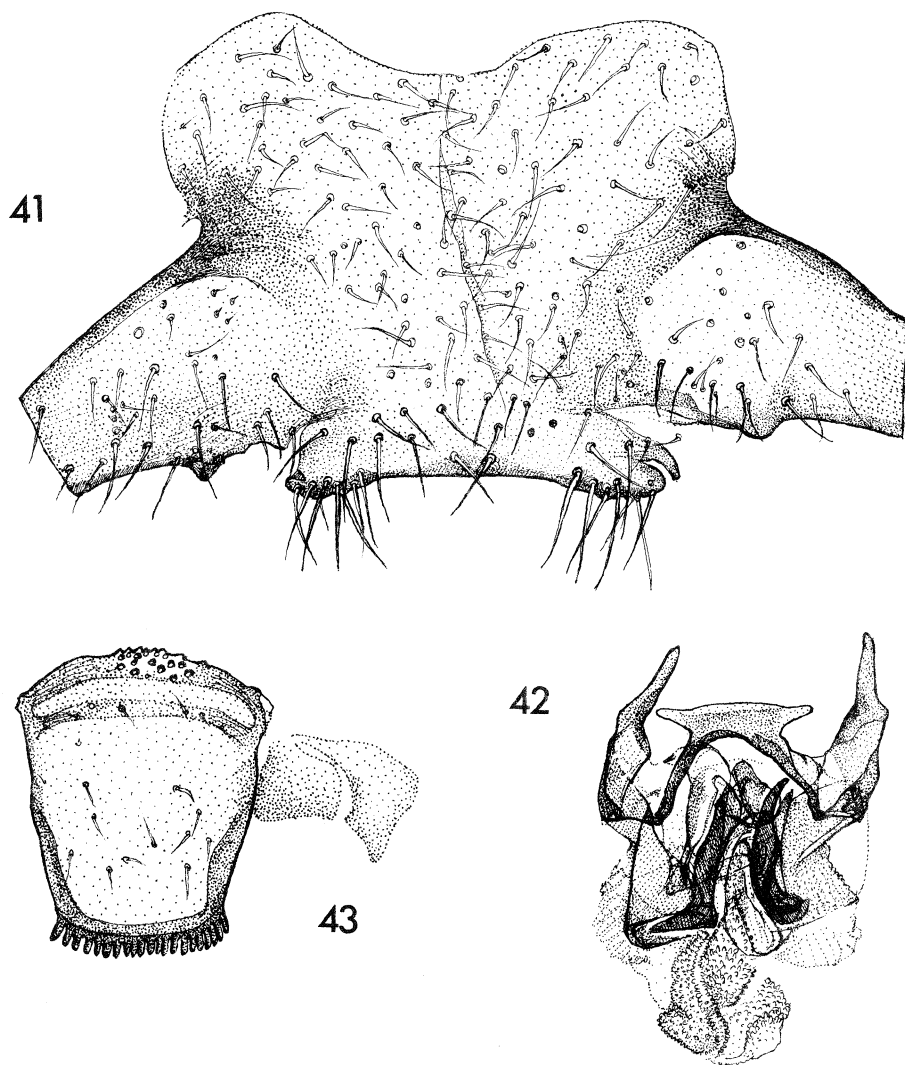
MORPHOLOGY: Length of body: 1.9 mm. Median epicranial suture very distinct. Head strongly setose. Eyes fairly large but not reaching level of vertex. IO/D (Badonnel): 3.0; PO: 0.6 Ocelli small, anterior ocellus only little smaller than lateral ocelli. Fore wing (fig. 44). Measurements of hind leg: F: 0.39 mm.; T: 0.63 mm.; t_1 : 0.21 mm.; t_2 : 0.08 mm.; rt : 2.6:1; ct : 11, 0. Fore wing length: 1.5 mm.; fore wing width: 0.6 mm. Pterostigma broadens a little towards apex. R_s and M meet in a point. Stem of R_s about as long as branches. (M_2 missing from right wing of holotype). Margin and veins (except Cu_2) strongly setose, a double row of setae on margin from Sc to R_{4+5} . Hind wing length: 1.3 mm.; hind wing width: 0.45 mm. $R_s - M$ crossvein very long. Wing glabrous except for margin between R_{2+3} and wing apex; margin setae fine but fairly long. Epiproct triangular with rounded apex. Paraproct with small trichobothrial field, a row of six strong setae and very well-developed double marginal cone. Subgenital plate (fig. 45) with widely separated, rounded, posterior lobes, the margin between them straight, each lobe with four strong setae. Subgenital plate with row of six strong setae near hind border; a small, well sclerotized patch lies basad of each lobe near the sides of the plate. Gonapophyses (fig. 46) with ventral valve reduced to a vestige; dorsal valves broad, tapering, supported by a median sclerotization and with a blunt, spiculate apex; external valve elongate; an incomplete arch lies anterior to the membranous entrance to the spermatheca (fig. 46).

MALE — Unknown

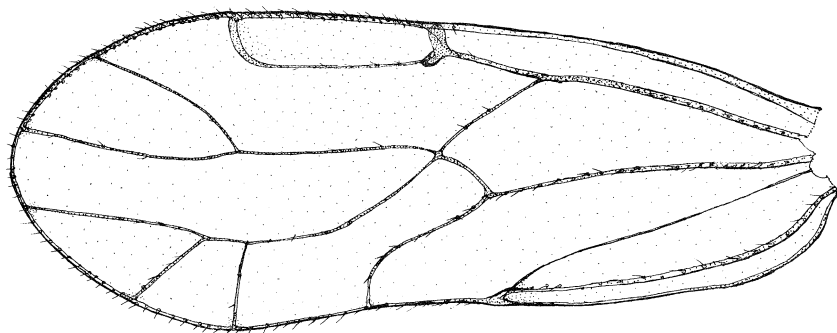
MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 2 ♀ (including holotype), 18.x.1973 (C.N.S., A.S.S.) (AM).

Holotype and paratype in the Australian Museum.

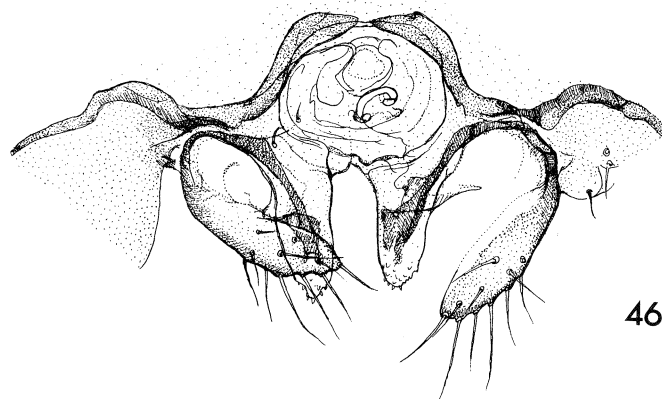
DISCUSSION: Only two species of *Ectopsocus* are known which lack a ventral valve to the gonapophyses, *E. vachoni* Badonnel and *E. spiculatus* New. In these species, however, the margin of the subgenital plate bears spicules between the apical lobes and the lobes are shorter than in *E. russulus*.



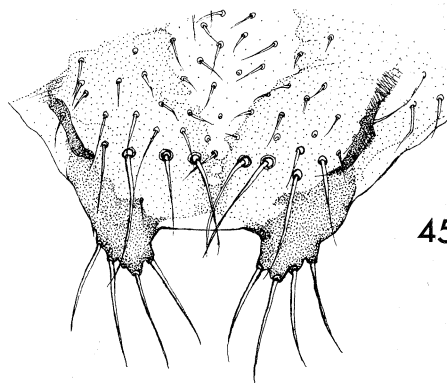
FIGURES 41-43. — *Ectopsocus parmatus* sp. n. 41. ♂ hypandrium, 42. ♂ phallosome, 43. ♂ sclerification of 9th tergite.



44



46



45

FIGURES 44-46. *Ectopsocus russulus* sp. n. 44. ♀ forewing, 45. ♀ subgenital plate, 46. ♀ gonapophyses and spermathecal entrance.

Ectopsocus albiceps* sp.n.*FEMALE**

COLORATION: (in alcohol). Head creamy white. Median epicranial suture distinct. Labrum brown. Eyes black. Ocelli colourless. Maxillary palp and antennae very pale, coloured as head. Thorax brown, with suggestion of a darker lateral line. Legs creamy white except for the brown coxae of the meso- and metathoracic legs. Fore wings (fig. 47) hyaline, with dark brown markings. Veins brown within and basad of the transverse band of colour, pale beyond. Hind wing hyaline, faintly tinged with brown in basal half, colourless beyond. Veins pale. Abdomen brown, segmentally banded, a little darker above.

MORPHOLOGY: Length of body: 1.7 mm. Median epicranial suture clear but not coloured. Head with dense clothing of setae. Lengths of flagellar segments: f_1 :0.294 mm.; f_2 :0.182 mm.; pedicel relatively large, flagellar segments narrow bearing setae much longer than their diameters. Eyes fairly large, but not reaching level of vertex. IO/D (Badonnel): 2.1; PO: 0.66. Ocelli small. Lacinia apically divided as usual in the genus, outer tooth much larger than inner. Measurements of hind leg: F: 0.38 mm.; T: 0.63 mm.; t_1 :0.20 mm.; t_2 :0.08 mm.; rt: 2.3:1; ct: 15, 0. Fore wing length: 1.7 mm.; fore wing width: 0.65 mm. Fore wing (fig. 47) with R_1 parallel to wing margin in pterostigmal area, i.e., the posterior margin of the pterostigma obviously slightly concave and pterostigma equally broad for its whole length. Stigmapophysis large and conspicuous. Rs and M meet in a point. Rs before bifurcation as long as R_{4+5} ; Cu_1 strongly recurved near wing margin. Margin glabrous, veins with a few very fine setae. Hind wing glabrous except for a few marginal setae between R_{2+3} and R_{4+5} . Epiproct triangular, bearing few setae but two of which, near the centre of the epiproct, are very long. Paraprocts with a small trichobothrial field and a row of five setae adjacent to it, there is a posterior field of small, evenly spaced setae; hind margin with a short double cone. Subgenital plate (fig. 48). Gonapophyses (fig. 49) with an unusual, broad, chitinized band from one external valve to the other; ventral valves exceptionally broad.

MALE

COLORATION: (in alcohol). Similar to female but some brown markings on vertex, especially near median epicranial suture, which is dark brown. Abdomen paler than in female, but each segment clearly marked in brown above.

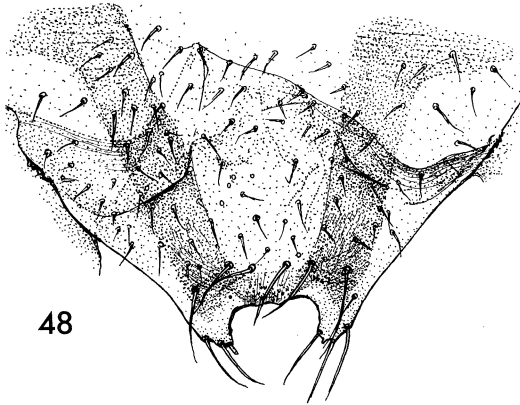
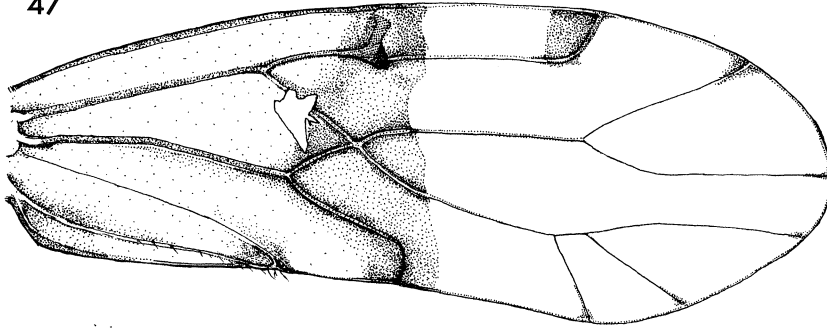
MORPHOLOGY: Length of body: 1.8 mm. Median epicranial suture very distinct. Lengths of flagellar segments: f_1 : 0.336 mm.; f_2 :0.252 mm. Eyes large, much larger than in female and reaching level of vertex. IO/D (Badonnel): 1.4; PO: 0.75. Ocelli very large, especially the lateral ocelli. Measurements of hind leg: F: 0.39 mm.; T: 0.66 mm.; t_1 :0.20 mm. (second tarsal segment missing on allotype); ct: 18, 0. Fore wing length: 1.8 mm.; fore wing width: 0.7 mm. Venation as in female. Ninth abdominal tergite with posterior "comb" and strongly sclerotized lateral margins (fig. 50). Hypandrium (fig. 51). Phallosome (fig. 52).

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 3 ♀ (holotype and paratypes), 15.xi.1973 (C.N.S., A.S.S.); 2 ♂ (allotype and paratype), 28.ii.1974 (C.N.S., A.S.S.) (AM).

Holotype, allotype and paratypes in the Australian Museum.

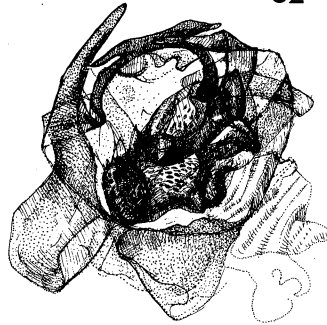
DISCUSSION: *Ectopsocus albiceps* can be distinguished from all other members of the genus by its distinctive wing pattern as well as genitalic features and body colour pattern. This pattern in life gives the impression that the insect has lost the hind part of its body and appears to be much shorter than it is.

47

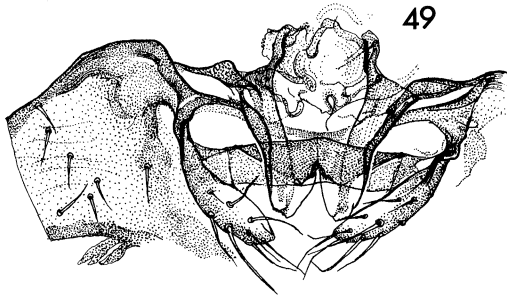


48

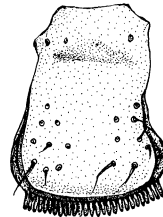
52



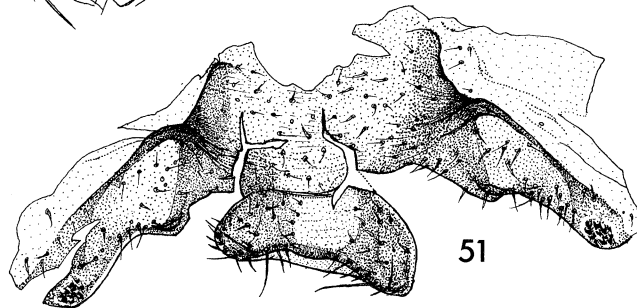
49



50



51



FIGURES 47-52 — *Ectopsocus albiceps* sp. n. 47. ♀ forewing, 48. ♀ subgenital plate, 49. ♀ gonapophyses, 50. ♂ 9th abdominal tergite, 51. ♂ hypandrium, 52. ♂ phallosome.

PERIPSOCIDAE

Peripsocus milleri (Tillyard)

Peripsocopsis milleri Tillyard 1923. *Trans. N.Z. Inst.* 54:195, fig. 20, pl. 18, fig. 14.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 1.xi.1973 (C.N.S.); 1 ♂, 29.xi.1973 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 30.i.1974 (C.N.S., A.S.S.); 2 ♀, 4.iv.1974 (C.N.S., A.S.S.); 1 ♂, 2.v.1974 (C.N.S., A.S.S.) (AM).

Peripsocus maoricus (Tillyard)

Peripsocopsis maoricus Tillyard 1923. *Trans. N.Z. Inst.* 54:194, fig. 18, pl. 18, fig. 12.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 8 ♀, 5 nymphs, 18.x.1973 (C.N.S., A.S.S.); 2 ♂, 19 ♀, 5 nymphs, 1.xi.1973 (C.N.S., A.S.S.); 12 ♂, 9 ♀, 8 nymphs, 15.xi.1973 (C.N.S., A.S.S.); 2 ♀, 1 nymph, 29.xi.1973 (C.N.S., G.F.S.); 3 ♀, 9 nymphs, 13.xii.1973 (C.N.S., A.S.S.); 1 ♀, 22.iii.1974 (C.N.S., A.S.S.); 1 ♂, 1 nymph, 22.viii.1974 (C.N.S., A.S.S.) (AM).

Peripsocus tillyardi New

Peripsocus tillyardi New 1973. *J. Aust. ent. Soc.* 12:343, figs. 11-13.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 4 ♀, 4 nymphs, 1.xi.1973 (C.N.S.); 4 ♂, 3 ♀, 1 nymph, 15.xi.1973 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 13.xii.1973 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 22.iii.1974 (C.N.S., A.S.S.); 1 ♀, 18.iv.1974 (C.N.S.); 1 ♀, 2.v.1974 (C.N.S., A.S.S.); 4 ♀, 23.v.1974 (C.N.S.); 1 ♂, 20.vi.1974 (C.N.S., A.S.S.); 1 ♀, 19.ix.1974 (C.N.S.) (AM).

Peripsocus hamiltonae sp.n.

FEMALE

COLORATION: (in alcohol). Head brown with irregular confluent darker spots on either side of median epicranial suture, across hind part of vertex and adjacent to compound eyes. A dark spot between antenna base and eye. Postclypeus with anteriorly convergent brown stripes which meet in midline. Labrum dark brown. Genae pale brown. Antennae brown. Eyes black. Ocellar tubercle very dark brown. Maxillary palp uniformly dark brown. Thorax as in male but with pale areas a little more extensive and with a pale fine median midline on antedorsum. Fore wing pattern (fig. 56) in various shades of brown.

MORPHOLOGY: Length of body: 2.0 mm. Epicranial suture distinct. Lengths of flagellar segments: f_1 :0.35 mm.; f_2 :0.27 mm. Antennae fine. Eyes small, much smaller than in male. IO/D (Badonnel): 2.1; PO: 0.71. Ocelli small. Measurements of hind leg: F: 0.5 mm.; T: 0.95 mm.; t_1 : 0.22 mm.; t_2 :0.10 mm.; rt: 2.2:1. Fore wing length: 3.0 mm.; fore wing width: 1.2 mm. Fore wing venation (fig. 56). Epiproct well sclerotized, especially laterally and in distal half; hind margin rounded. Paraproct well sclerotized with large trichobothrial field. Subgenital plate (fig. 57). Gonapophyses (fig. 58) with strong ventral valve; dorsal valve very broad, dorsal part folded in distal half and with long marginal setae and a posterior field of well developed papillae. External valve developed into a double lobe.

MALE

COLORATION: (in alcohol). Vertex brown, with a dark brown patch on each side of median epicranial suture. Frons dark brown. Postclypeus brown with darker, anteriorly, converging stripes which do not meet in the midline. Labrum dark brown. Genae brown. Antennae brown. Eyes black. Ocelli on very dark tubercle. Maxillary palp brown, apical segment not darker than third segment. Thorax dark brown above, including sutures,

except for a small, slightly paler area where lateral lobes are in contact and along posterior margin of lateral lobes. Fore and middle legs with pale coxae and femora, tibiae and tarsi dark brown; hind legs almost uniformly brown. Fore wings similar to that of female (fig. 56). Wings in various shades of brown. Distal half of pterostigma and stigmapophysis very dark brown; an irregular band a little darker than rest of membrane crosses wing from stigmapophysis to nodulus. Hind wings faintly tinged with brown. Abdomen pale, with irregular brown markings segmentally arranged; genital segments dark brown.

MORPHOLOGY: Length of body: 2.0 mm. Head small. Median epicranial suture very distinct. Eyes very large, reaching above level of vertex. IO/D (Badonnel): 0.54; PO: 0.84. Ocelli small, arranged on a circular tubercle, the anterior ocellus very small. Epiproct (fig. 53) with a broad, sclerotized marginal band, lightly setose but with four strong setae on posterior margin. In the allotype specimen (illustrated) setae have been lost but the alveoli indicate their position. Paraproct broad, rounded, with a large trichobothrial field occupying at least half of the paraproct. Hypandrium (fig. 54). Phallosome (fig. 55).

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀ (holotype), 1 ♂ (allotype) (specimen damaged), 1.viii.1974 (C.N.S., A.S.S.); Paratype: 1 ♀, 9.vii.1974 (C.N.S.) (AM).

Holotype, allotype and paratype in the Australian Museum.

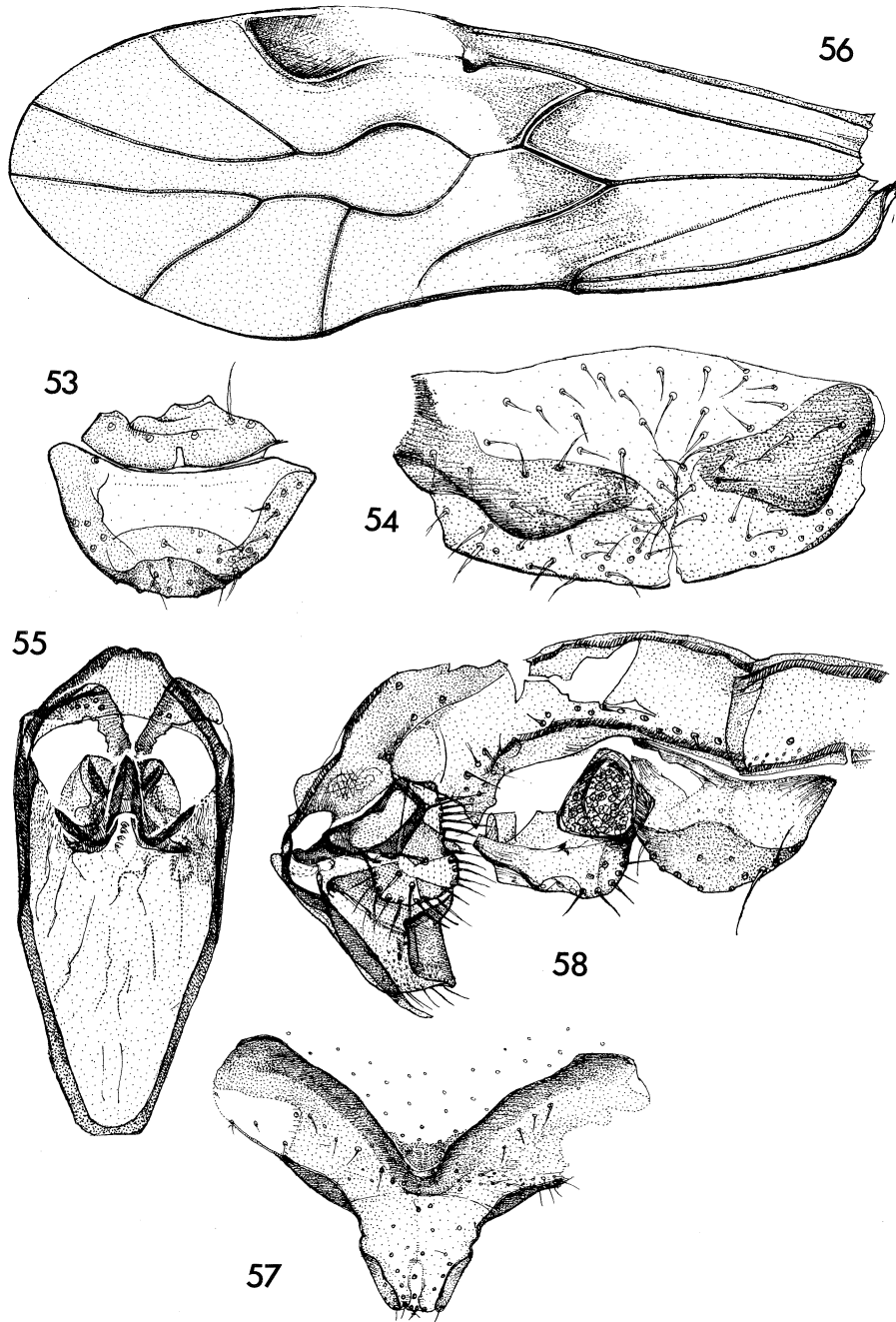
DISCUSSION: This species resembles *Peripsocus maoricus* (Tillyard) in general appearance but the wing colour is darker. It differs in that the male phallosome tapers anteriorly and lacks the three distinct posterior lobes. In the female the posterior lobe of the subgenital plate tapers more than in *P. maoricus*. *P. maoricus* lacks the double lobing of the external valve. This species is named for Mrs. Barbara Hamilton, as a mark of appreciation of her work with schoolchildren visiting Muogamarra Nature Reserve.

***Peripsocus roseus* sp.n.**

MALE

COLORATION: (in alcohol). Head pale yellowish brown with brown markings. Median epicranial suture dark brown, anterior arms a little paler. Vertex mottled brown, anterior to middle of eyes pale yellowish brown. Frons with a small dark triangle immediately in front of ocellar triangle, laterally paler. Postclypeus pale, without obvious striations. Labrum pale yellowish brown. Genae pale. Antennae uniformly pale yellowish brown. Eyes black. Ocellar tubercle pale as are the maxillary palps. Mesothoracic notum pale with brown lateral lobes and the antedorsum brown, divided by a longitudinal pale line; scutellum pale. Legs pale yellowish brown. Fore wings (fig. 59) hyaline and the veins pale except for the following which are brown: basal section of Rs, M after separation from M + Cu, basal section of Rs + M, basal half of stem of radial fork, R₂₊₃, distal part of R₄₊₅, distal part of Cu₁, distal half of stem of M after separation from Rs, rest of M and its branches except for basal part of M, and the nodulus. Distal half of pterostigma reddish in life. This colour pattern gives the appearance of a hyaline wing with a partly reddish pterostigma and with the vein system peculiarly broken. Hind wings hyaline, veins brown to pale brown in anterior half of wing, those in posterior half almost colourless. Abdomen evenly pale yellowish brown, the sclerifications of the penial bulb showing through ventrally at the apex as a dark spot.

MORPHOLOGY: Length of body: 1.5 mm. Epicranial suture very distinct, the anterior arms touching anterior margins of compound eyes. Lengths of flagellar segments: f₁:0.308 mm.; f₂:0.280 mm. Eyes very large, reaching above level of vertex.



FIGURES 53-58. — *Peripsocus hamiltonae* sp. n. 53. ♂ epiproct, 54. ♂ hypandrium, 55. ♂ phallosome, 56. ♀ forewing, 57 ♀ subgenital plate, 58 ♀ gonapophyses.

IO/D (Badonnel): 0.55; PO: 0.90. Ocelli fairly small, ovoid, the anterior ocellus not smaller than lateral ocelli. Lacinia (fig. 60) very narrow, in apical part, with bifid apex. Measurements of hind leg: F: 0.22 mm.; T: 0.77 mm.; t_1 : 0.20 mm.; t_2 : 0.08 mm.; rt: 2.3:1; ct: 13, 0. Femora narrow and almost parallel sided. Fore wing length: 2.6 mm.; fore wing width: 1.12 mm. Pterostigma with strongly curved hind margin in distal half giving a strongly broadened pterostigma. Hypandrium simple, setose lightly sclerotized with very small, median margination. Phallosome (fig. 61).

FEMALE

COLORATION: (in alcohol). Head pale yellowish brown, with brown markings. These differ considerably from those of the male and consist of a spot mesad of each compound eye, a spot on each side of the median epicranial suture about half way along its length, three tiny spots anterior to the ocellar triangle on the frons and clearcut, anteriorly convergent postclypeal stripes. In addition there is a small, indistinct mark behind the eyes. Labrum brown. Scape and pedicel pale brown, flagellum pale yellowish brown. Eyes black. Thorax as in male, but pigmentation darker. Fore wings (fig. 62) similar to male but darkened areas more extensive and darker; pterostigma in life coloured reddish as in male but brown when preserved in alcohol. Legs brownish. Abdomen pale, terminal structures brown.

MORPHOLOGY: Length of body: 1.9 mm. Epicranial suture distinct. Length of flagellar segments: f_1 : 0.28 mm.; f_2 : 0.25 mm. Flagellum fine. Eyes small, upper margin much lower than vertex in strong contrast to eyes of male. IO/D (Badonnel): 2.0; PO: 0.66. Ocelli ovoid, the anterior ocellus smaller than lateral ocelli. Lacinia strongly narrowed in distal half as in male. Measurements of hind leg: F: 0.35 mm.; T: 0.7 mm.; t_1 : 0.17 mm.; t_2 : 0.08 mm.; rt: 2:1; ct: 10, 0. Femora almost parallel sided; ctenidiobothria sparse on tibiae, especially proximally. Fore wing length: 2.36 mm.; fore wing width: 1.00 mm. Fore wings broad (fig. 62); venation as in figure. Epiproct (fig. 63). Subgenital plate (fig. 64) with a short broad, posterior lobe. Gonapophyses (fig. 65).

MATERIAL: Muogamarra Nature Reserve, N.S.W. 1 ♂ (holotype), 22.viii.1974 (C.N.S., A.S.S.); 1 ♀ (allotype), 1.xi.1973 (C.N.S., A.S.S.). Paratypes: 1 ♂, 1 ♀, 15.xi.1973 (C.N.S., A.S.S.); 1 ♀, 22.viii.1974 (C.N.S., A.S.S.); 1 ♂, 18.iv.1974 (C.N.S.) (AM).

Holotype, allotype and paratypes in the Australian Museum.

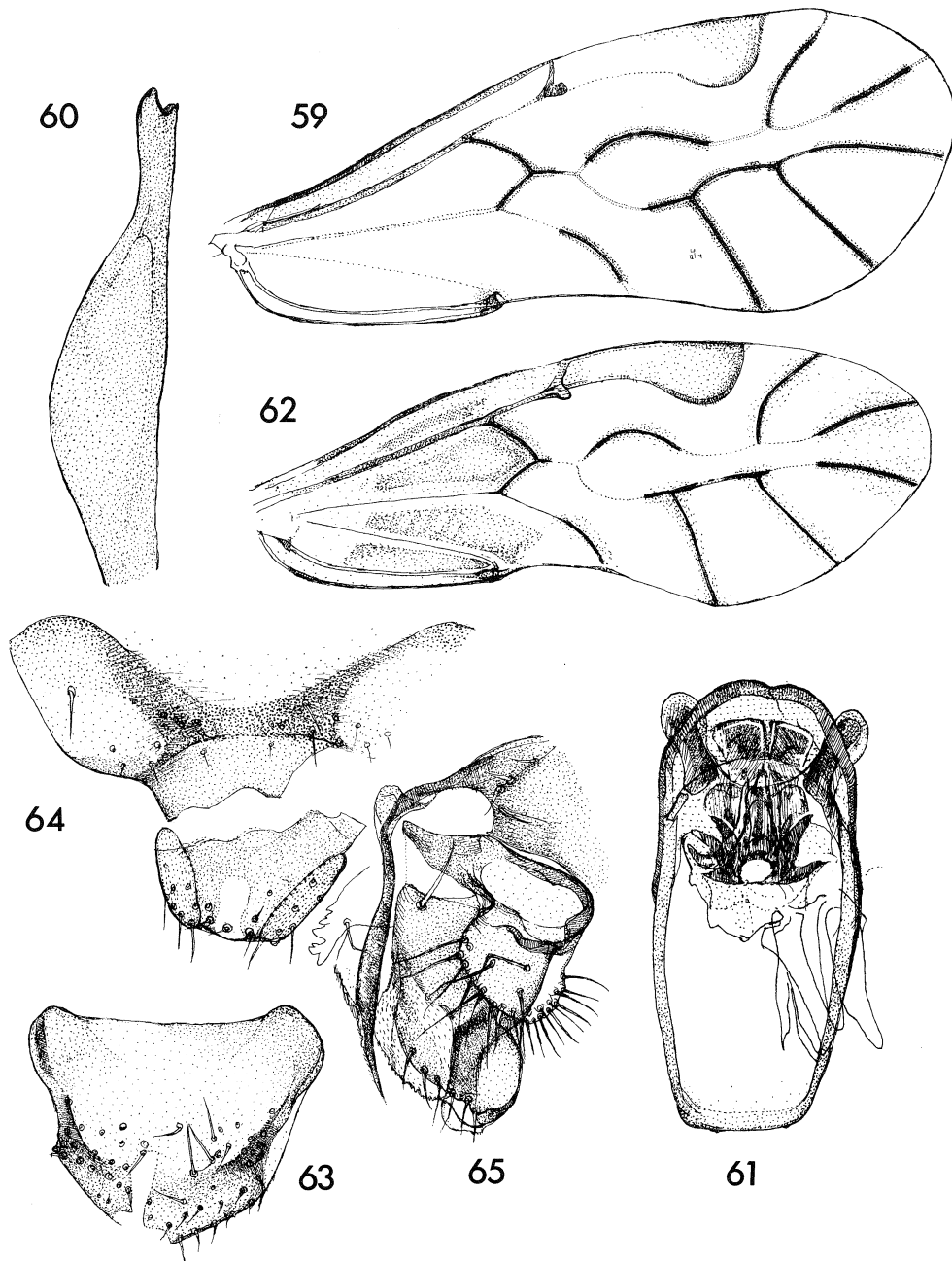
DISCUSSION: The wing pattern of *Peripsocus roseus* is very distinctive. The veins have the appearance of being broken in several places due to some sections of the veins being very dark whilst adjacent sections are almost colourless; also, the reddish pterostigma in life is distinctive. The sclerotizations of the male phallosome are characteristic.

PSEUDOCAECILIIDAE

Pseudocaecilius lachlani Enderlein

Pseudocaecilius lachlani Enderlein 1903. *Ann. hist.-nat. Mus. hung.* 1:263, pl. V. fig. 30.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 4 nymphs, 18.xi.1973 (C.N.S., A.S.S.); 3 ♂, 1 ♀, 1 nymph, 1.xi.1973 (C.N.S.); 1 ♀, 15.xi.1973 (C.N.S., A.S.S.); 2 ♂, 2 nymphs, 29.xi.1973 (C.N.S., G.F.S.); 1 ♂, 13.xii.1973 (C.N.S., A.S.S.); 1 ♀, 28.ii.1974 (C.N.S., A.S.S.); 2 ♀, 4.iv.1974 (C.N.S., A.S.S.); 1 ♂, 18.iv.1974 (C.N.S.); 1 ♂, 9.vii.1974 (R.D.B.); 1 ♂, 18.vii.1974 (C.N.S., A.S.S.); 1 ♂, 3 ♀, 1.viii.1974 (C.N.S., A.S.S.); 1 ♀, 19.ix.1974 (C.N.S.); 1 ♀, 22.x.1974 (C.N.S.) (AM).



FIGURES 59-65. — *Peripsocus roseus* sp. n. 59. ♂ forewing, 60 ♂ whole lacinia, 61. ♂ phallosome, 62. ♀ forewing, 63. ♀ epiproct, 64. ♀ subgenital plate, 65 ♀ gonapophyses.

Heterocaecilius brunellus (Tillyard)

Caecilius brunellus Tillyard 1923. *Trans. N.Z. Inst.* 54:190, fig. 15; pl. 18, fig. 10.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 2 ♀, 3 nymphs, 1.xi.1973 (C.N.S.); 1 ♂, 1 ♀, 1 nymph, 13.xii.1973 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 30.i.1974 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 4.iv.1974 (C.N.S., A.S.S.); 1 ♀, 1 ♂, 1 nymph, 18.iv.1974 (C.N.S.); 1 ♀, 2.v.1974 (C.N.S., A.S.S.); 1 ♂, 2 ♀, 2 nymphs, 23.v.1974 (C.N.S.); 4 ♂, 6 ♀, 2 nymphs, 20.vi.1974 (C.N.S., A.S.S.); 3 ♂, 1 ♀, 9.vii.1974 (C.N.S.); 1 ♂, 4 ♀, 2 nymphs, 18.vii.1974 (C.N.S., A.S.S.); 3 ♂, 2 ♀, 1.viii.1974 (C.N.S., A.S.S.); 1 ♂, 3 ♀, 3 nymphs, 19.ix.1974 (C.N.S.); 2 ♂, 3 ♀, 5 nymphs, 22.x.1974 (C.N.S.); 2 ♀, 7.xi.1974 (C.N.S.); 1 ♂, 2 ♀, 2 nymphs, 21.xi.1974 (C.N.S.) (AM).

Lobocaecilius monicus Lee and Thornton

Lobocaecilius monicus Lee and Thornton 1967. *Pacif. Insects Monogr.* 16:86, figs. 137-143.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀, 28.ii.1974 (C.N.S., A.S.S.); 1 ♀, 4.iv.1974 (C.N.S., A.S.S.); 1 ♀, 2.v.1974 (C.N.S., A.S.S.); 2 ♀, 23.v.1974 (C.N.S.); 2 ♂, 2 ♀, 1 nymph, 20.vi.1974 (C.N.S., A.S.S.); 3 ♂, 1 ♀, 18.vii.1974 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 22.x.1974 (C.N.S.) (AM).

Pseudoscotiella tanei sp. n.

MALE

COLORATION: (in alcohol). Head dark brown except for the slightly paler frons. Antennae brown. Eyes deep purple. Ocelli pale, without any obvious centripetal pigmentation; tubercle coloured as rest of head. Maxillary palps very pale. Mesonotum dark brown except for a paler area where lateral lobes meet and the scutellum. Legs very pale except for pale brown tibiae and tarsi. Fore wings (fig. 66) hyaline with brown markings. Hind wing (fig. 67) hyaline, markings pale brown. Abdomen pale with some irregular, segmentally arranged pale brown marks; terminal structures brown.

MORPHOLOGY: Length of body: 1.7 mm. Median epicranial suture very distinct, anterior arms less so but still quite evident. Vertex fairly flat with large, scattered, setae; those towards back of vertex being exceptionally long, longer than distance from median epicranial suture to eye. A row of 6 strong setae occurs on the back of the vertex, three on each side. Lengths of flagellar segments: f_1 : 0.378 mm; f_2 : 0.238 mm. Flagellum strongly setose. IO/D (Bandonnel): 2.7; PO: 0.8. Ocelli small. Measurements of hind leg: F: 0.370 mm; T: 0.40 mm; t_1 : 0.63 mm; t_2 : 0.15 mm; rt: 4.1:1; ct: 9, 0. Femora narrow, slightly curved. Tibiae devoid of ctenidiobothria in basal half. Fore wing length: 1.7 mm; fore wing width 0.6 mm. Fore wing (fig. 66) with costa in pterostigma strongly setose; pterostigma with a few setae near anterior margin, otherwise glabrous. Pterostigma narrow, not as wide as areola postica. Rs almost straight after separation from M, with which it has a long confluence. R_{4+5} in line with stem of Rs. Cu_2 strongly bent near nodulus. Hind wing length: 1.3 mm; hind wing width: 0.4 mm. Margin with only a few crossing setae, these between R_{4+5} and M. Rs and M fused for a long length. Epiproct sparsely setose but with a strongly developed area of papillae. Paraprocts with a field of about 10 large trichobothria. Paraproct sparsely setose but with a very long seta near posterior margin. Hypandrium (fig. 68). Phallosome (fig. 69) with frame strongly sclerotized basally, less so posteriorly where the external parameres are broadened and have their apices diverging. Internal parameres fused apically, the apex upturned and divided into small points. Two strong posteriorly directed rods lying within the frame are separate and angled anteriorly.

FEMALE — Unknown.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂ (holotype), 13.xii.1973 (C.N.S., A.S.S.) (AM).

Holotype in the Australian Museum.

DISCUSSION: Several species of *Pseudoscottiella* Badonnel have patterned wings. *Ps. tanei* differs from them all in details of the pigment pattern. It is somewhat similar to *Ps. ornatus* (Banks) from which it differs in the form of the sclerotized rods of the phallosome; it differs in this respect also from all other species.

This species is named for Mr. M. Tane, Ranger at Muogamarra Nature Reserve in appreciation of his help during the time material was being collected for this paper.

PHILOTARSIDAE

Aaroniella rawlingsi Smithers

Aaroniella rawlingsi Smithers 1969. *Rec. Canterbury Mus.* 8:324, figs. 163-168.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀, 1.xi.1973 (C.N.S.); 1 ♂, 23.v.1974 (C.N.S.); 1 ♀, 18.vii.1974 (C.N.S., A.S.S.) (AM).

Austropsocus viridis (Enderlein)

Philotarsus viridis Enderlein 1903. *Ann. hist. - nat. Mus. hung* 1:209, pl. ix, fig. 53.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀, 1.xi.1973 (C.N.S.); 1 ♀, 13.xii.1973 (C.N.S., A.S.S.); 2 ♀, 30.i.1974 (C.N.S., A.S.S.); 1 ♀, 4.iv.1974 (C.N.S., A.S.S.); 1 ♀, 22.viii.1974 (C.N.S., A.S.S.); 1 nymph, 19.ix.1974 (C.N.S.); 1 ♂, 1 nymph, 7.xi.1974 (C.N.S.); 2 ♂, 21.xi.1974 (C.N.S.) (AM).

Austropsocus tibialis Thornton and New

Austropsocus tibialis Thornton and New 1977, *Aust. J. Zool. suppl. ser.* 54:30, figs. 116-124.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 5 ♀, 2 nymphs, 18.x.1973 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 1.xi.1973 (C.N.S.); 3 ♀, 1 nymph, 29.xi.1973 (C.N.S., G.F.S.); 2 ♀, 28.ii.1974 (C.N.S., A.S.S.); 1 ♀, 22.iii.1974 (C.N.S., A.S.S.); 1 ♀, 4.iv.1974 (C.N.S., A.S.S.) 2 ♀, 2 nymphs, 2.v.1974 (C.N.S., A.S.S.); 1 ♀, 1 nymph, 23.v.1974 (C.N.S.); 1 ♂, 1 ♀, 1.viii.1974 (C.N.S., A.S.S.); 1 ♂, 1 ♀, 22.viii.1974 (C.N.S., A.S.S.); 1 ♂, 1 nymph, 19.ix.1974 (C.N.S.); 1 ♂, 3.x.1974 (C.N.S.); 1 ♂, 7.xi.1974 (C.N.S.) (AM).

Haplophallus ornatus Thornton and New

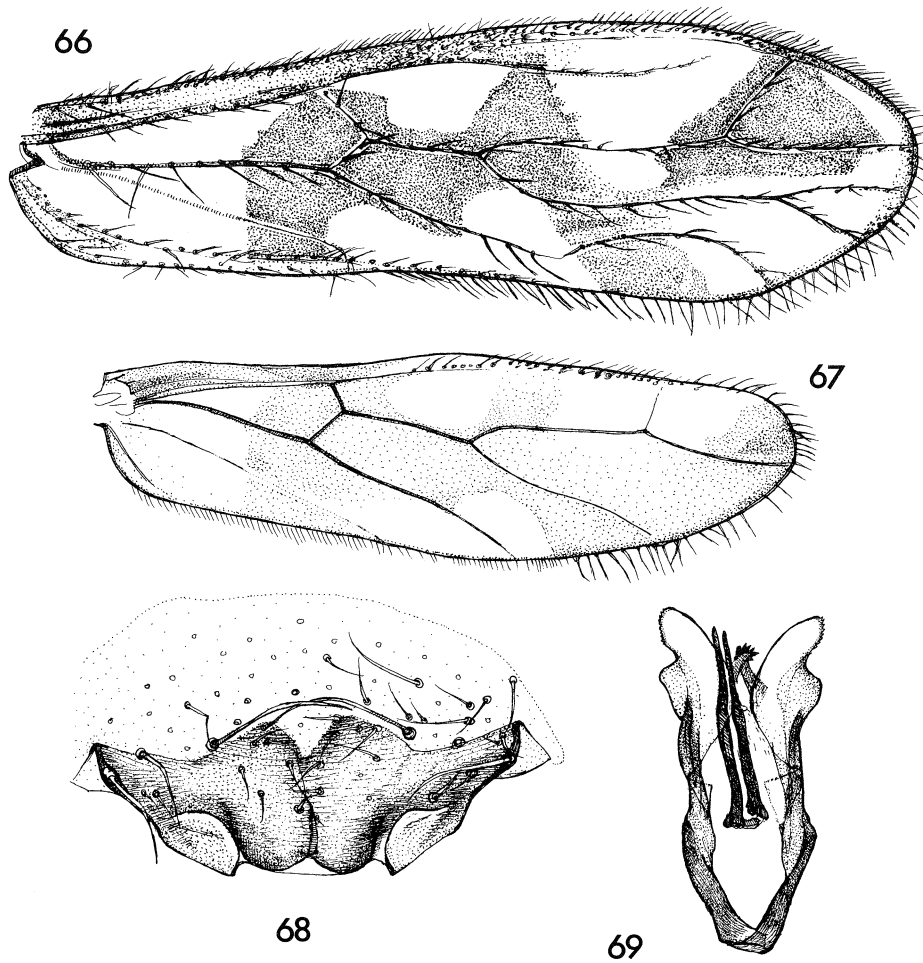
Haplophallus ornatus Thornton and New 1977. *Aust. J. Zool. suppl. ser.* 54:9, figs. 7-12.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 1.xi.1973 (C.N.S.); 1 ♀, 2 nymphs, 22.iii.1974 (C.N.S., A.S.S.); 2 ♂, 18.iv.1974 (C.N.S.); 2 ♂, 1 ♀, 2.v.1974 (C.N.S., A.S.S.); 2 ♂, 1.viii.1974 (C.N.S., A.S.S.) (AM).

Haplophallus sinus Thornton and New

Haplophallus sinus Thornton and New 1977. *Aust. J. Zool. suppl. ser.* 54:20, figs. 62-68.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 1 ♀, 1 nymph, 18.x.1973 (C.N.S., A.S.S.); 1 ♂, 2 ♀, 1.xi.1973 (C.N.S.); 1 ♀, 30.i.1974 (C.N.S., A.S.S.); 1 ♀, 4.iv.1974 (C.N.S., A.S.S.); 2 ♀, 2.v.1974 (C.N.S., A.S.S.); 1 ♀, 23.v.1974 (C.N.S.); 1 ♀, 22.viii.1974 (C.N.S., A.S.S.); 1 ♀, 7.xi.1974 (C.N.S.) (AM).



FIGURES 66-69. — *Pseudoscottiella tanei* sp. n. 66. ♂ forewing, 67. ♂ hindwing, 68. ♂ hypandrium, 69. ♂ phallosome.

Haplophallus guttatus (Tillyard)

Philotarsus guttatus Tillyard 1923. *Trans. N.Z. Inst.* 54:181, fig. 8.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1♂, 2 nymphs, 2.v.1974 (C.N.S., A.S.S.); 1♀, 23.v.1974 (C.N.S.); 2♂, 1♀, 20.vi.1974 (C.N.S., A.S.S.); 1♂, 1♀, 9.vii.1974 (C.N.S.); 1♀, 22.viii.1974 (C.N.S., A.S.S.); 1♀, 1 nymph, 19.ix.1974 (C.N.S.) (AM).

ELIPSOCIDAE

Spilopsocus ruidis Smithers

Spilopsocus ruidis Smithers 1963. *Pacif. Insects* 5 (4):894, figs. 19-25.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1♀, 9.vii.1974 (C.N.S.) (AM).

Paedomorpha gayi Smithers

Paedomorpha gayi Smithers 1963. *Proc. R. ent. Soc. Lond (B)* 32:32, figs. 1-6.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 2♀, 18.vii.1974 (C.N.S., A.S.S.); 1♀, 1.viii.1974 (C.N.S., A.S.S.) (AM).

PSOCIDAE

Blaste tillyardi Smithers

Blaste tillyardi Smithers 1969. *Rec. Canterbury Mus.* 8:338, figs. 197-204.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1♂, 1♀, 1 nymph, 18.x.1973 (C.N.S.); 1♂, 1♀, 1.xi.1973 (C.N.S.); 1♂, 1 nymph, 15.xi.1973 (C.N.S., A.S.S.); 1 nymph, 18.iv.1974 (C.N.S.); 1♂, 19.ix.1974 (C.N.S.) (AM).

Blaste taylori New

Blaste taylori New 1974. *J. Aust. ent. Soc.* 13:286, figs. 1-7.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1♂, 1♀, 7.xi.1974 (C.N.S.) (AM).

Blaste michaelsoni (Enderlein)

Lasiopsocus michaelsoni Enderlein 1907. *Fauna S.W. Aust.* 1(3):234, figs. 1-5.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1♂, 1.viii.1974 (C.N.S., A.S.S.) (AM).

Copostigma (Clematostigma) latimentula sp.n.

MALE

COLORATION: (in alcohol). Head creamy white with dark brown markings. A double row of irregular spots adjacent to median epicranial suture, across back of head and adjacent to compound eyes; each ocellus surrounded by a dark ring; a dark stripe in position of anterior arms of epicranial suture; a dark triangle anterior to ocelli; narrow

postclypeal stripes. Gena with a spot below eye and another near base of mandible. Antennae dark brown. Eyes black. Maxillary palps pale, third and fourth segments dark brown. Mesothoracic notum dark brown with a pale longitudinal stripe on antedorsum and with pale sutures. Legs pale, with a brown band at base and distal end of femora; distal end of tibiae brown, tarsi brown. Fore wings (fig. 70) hyaline; pterostigma and post pterostigmal mark dark brown; veins brown. Hind wings hyaline with brown veins. Ninth tergite and paraprocts very dark; base of phallosome shows through hypandrium as a dark curved line.

MORPHOLOGY: Length of body: 2.8 mm. Median epicranial suture fine but distinct. Lengths of flagellar segments: f_1 :0.80 mm.; f_2 : 0.80 mm. Antennae fine, with long fine setae many of which are slightly recurved. Eyes fairly large but not quite reaching level of vertex. IO/D (Badonnel): 1.9; PO: 0.77. Ocelli large. Measurements of hind leg: F: 0.56 mm.; T: 1.14 mm.; t_1 :0.30 mm.; t_2 :0.14 mm.; rt:2.1:1; ct: 18, 4. Fore wing length: 3.5 mm.; fore wing width: 1.3 mm. Fore wing (fig. 70) with narrow pterostigma; spur-vein very short. Sc evanescent distally but tending towards R_1 ; Rs and M confluent for a length. First section of Cu_{1a} little longer than second; epiproct (fig. 71) with two broad, lightly sclerotized lobes which stand erect. Paraproct (fig. 72). Hypandrium (fig. 73) distally upturned and apically bilobed. Phallosome (fig. 74) with strong basal fusion, broad. Ninth tergite very strongly sclerotized with strong transverse band along hind border.

FEMALE — Unknown.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 3 ♂, (including holotype), 17.iv.1975 (C.N.S.) (AM).

Holotype and paratypes in the Australian Museum.

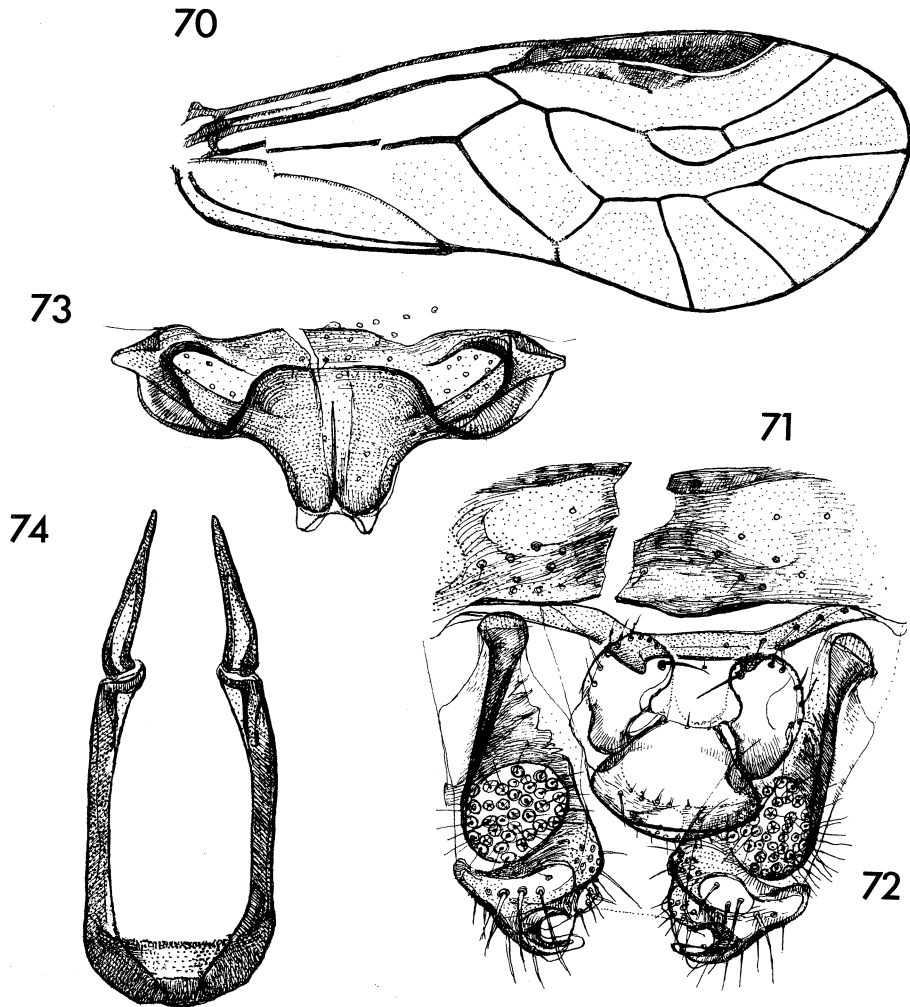
DISCUSSION: *Copostigma (Clematostigma) latimentula* belongs to that group of species in which the pterostigma is wholly darkly pigmented, narrow and long and in which the hypandrium is lobed. It differs from other species so far described in having a very broad-based phallosome and in having the posterior hypandrial lobes more extended.

Copostigma (Clematostigma) paula sp.n.

MALE

COLORATION: (in alcohol). Head brown with dark brown markings. A double row of irregular brown spots on each side of median epicranial suture, across back of head and adjacent to compound eyes; a dark band from lateral ocellus to antenna base; ocelli each encircled by a dark ring; a brown triangle anterior to median ocellus; postclypeus with stripes. Labrum dark brown. Gena with a spot near antenna base. Scape, pedicel and basal half of first flagellar segment pale brown, remainder of flagellum dark. Eyes black. Ocelli on pale tubercle but each ringed with dark brown. Maxillary palp with first and second segments pale, third and fourth very dark brown; mesonotum dark brown except for pale sutures and a pale median line on antedorsum. Coxae dark. Femora pale with a basal dark band and another about three quarters of way to tibia; tibia pale brown a little darker at each end. Tarsi brown. Fore wings (fig. 75) hyaline with very faint brownish tinge; veins brown; pterostigma and adjacent marking very dark brown. Abdomen with dark terminal structures.

MORPHOLOGY: Length of body: 2.0 mm. Median epicranial suture fine; anterior arms faintly discernible. Antennae fine. Length of flagellar segments: f_1 :0.72 mm.; f_2 :0.76 mm. Eyes moderately large but not reaching level of vertex. IO/D (Badonnel): 2.1; PO:



FIGURES 70-74. — *Copostigma (Clematostigma) latimentula* sp. n. 70.♂ forewing, 71.♂ epiproct, 72.♂ paraproct, 73.♂ hypandrium, 74.♂ phallosome.

0.87. Measurements of hind leg: F: 0.56 mm.; T: 1.08 mm.; t_1 :0.308 mm.; t_2 :0.168 mm.; rt:1.8:1; ct: 17, 4. Tibiae a little broadened towards distal end. Fore wing length: 3.3 mm.; fore wing width: 1.2 mm. Sc well developed, ending free in costal cell, curving neither forward nor backward. Pterostigma long and narrow with only slight hind angle from which arises a short spur-vein. First and second sections of Cu_{1a} at a distinct angle to one another. Veins and margin glabrous. Hind wing length: 2.5 mm.; hind wing width: 0.8 mm. Sc well developed, fusing with C distally. Veins and margin glabrous except for one or few fine setae near wing apex. Epiproct (fig. 76) of peculiar form, with two erect, lightly-sclerotized lobes arising at base. Paraproct (fig. 77). Hypandrium (fig. 78) curved upwards distally to form a bowl-like structure in which lies the phallosome. Phallosome (fig. 79) with parameres basally separate but joined by a thin membrane; distally two stout hook-like extensions of the parameres curve strongly upwards.

FEMALE

COLORATION: (in alcohol). Similar to male but labrum paler laterally. Fore wing (fig. 80) hyaline with a few brown marks. Hind wing (fig. 81).

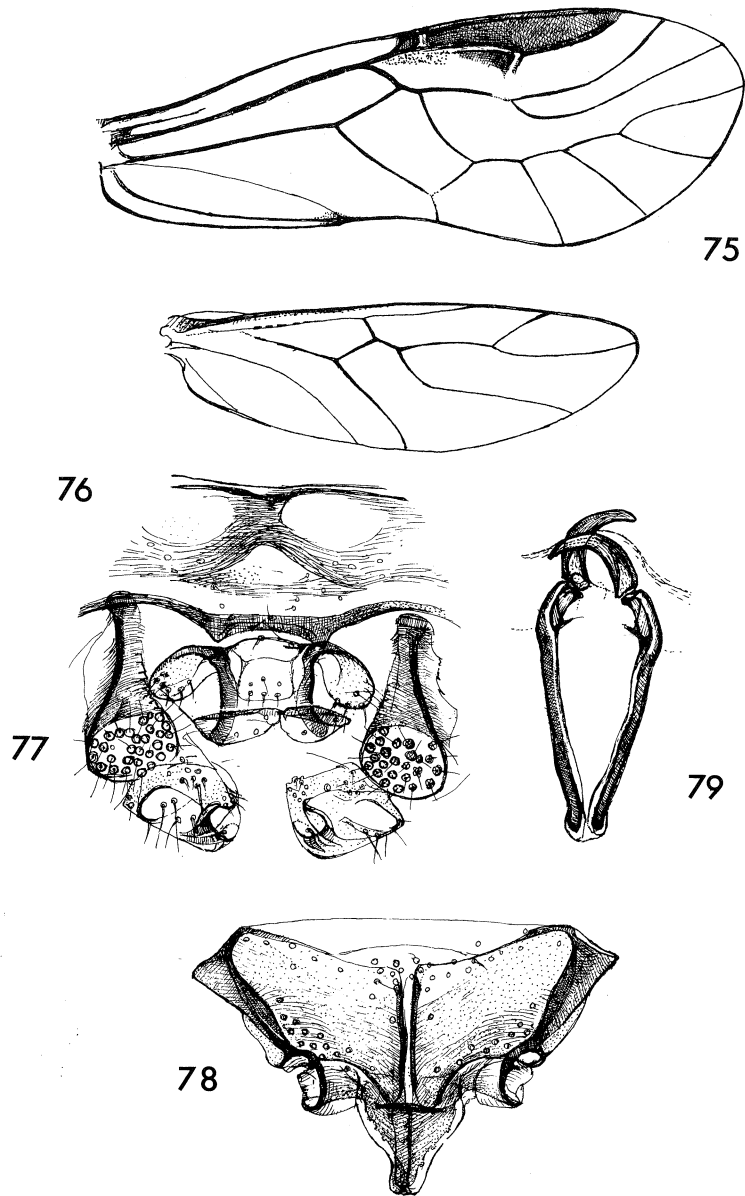
MORPHOLOGY: Length of body: 3.2 mm. Median epicranial suture distinct but anterior arms not easily discerned although their position is well marked by a dark line. Lengths of antennal segments: f_1 :0.76 mm.; f_2 :0.72 mm. Eyes fairly large. IO/D (Badonnel): 2.2; PO: 0.77. Anterior ocellus smaller than lateral ocelli. Measurements of hind leg: F: 0.56 mm.; T: 1.24 mm.; t_1 :0.308 mm.; t_2 :0.196 mm.; rt: 1.6:1; ct: 18, 2. Fore wing length: 4.0 mm.; fore wing width: 1.4 mm.; venation as in figure 80. Hind wing glabrous except for a few very small, fine setae on margin at apex. Subgenital plate (fig. 82). Epiproct (fig. 83) with very strongly sclerotized lateral bars. Paraprocts (fig. 83) mostly well sclerotized with a ventral, lightly sclerotized, setose area; trichobothrial field large, almost circular, the "rosette" bases to the setae rather small and not always in contact with neighbouring "rosettes". Gonapophyses (fig. 84) with dorsal and external valves bilobed, external valve with inner lobe extended backwards on dorsal side into a tapering but blunt-ended lobe; dorsal and ventral valves both spiculate apically. Sclerotization of entrance to spermatheca (fig. 85).

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, (holotype), 22.iii.1974 (C.N.S., A.S.S.); 1 ♀ (allotype) 10.vii.1975 (C.N.S., A.S.S.); Paratype: 1 ♀, 17.iv.1975 (C.N.S.) (AM).

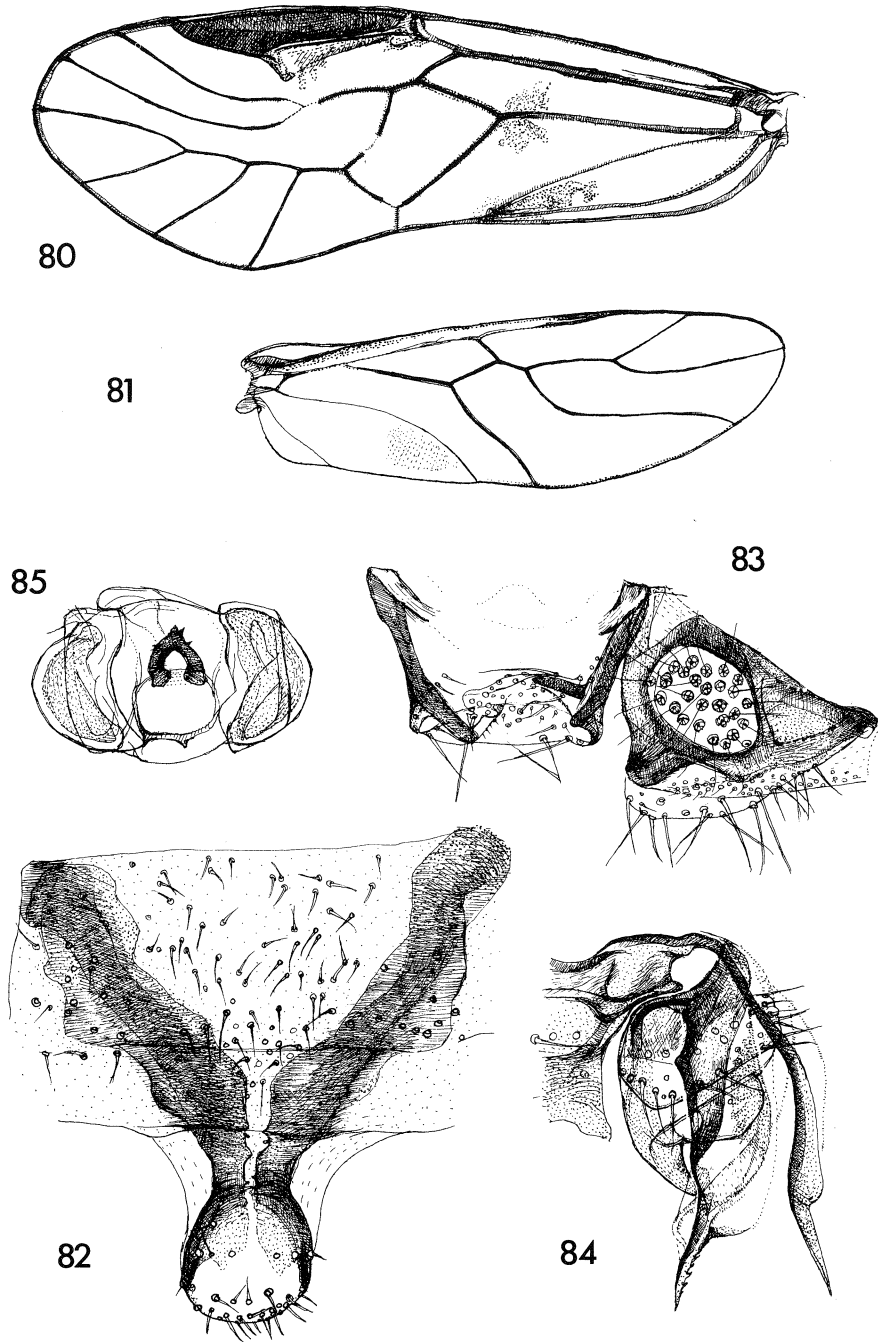
Holotype, allotype and paratype in the Australian Museum.

DISCUSSION: Both sexes of *Copostigma* (*Clematostigma*) *paula* can be distinguished from *C. maculiceps* Enderlein and *C. vinctum* (Enderlein) by the slightly angled hind margin of the pterostigma. It differs from *Clematostigma dubium* New (female only known) in the extent of wing markings and sclerotization of the subgenital plate; from *Clematostigma edwardsi* New (males only known) in the form of the hypandrium and from *Clematostigma inglewoodense* New (female only known) in wing pattern. The only species which it resembles in colour pattern and genitalia in both sexes is *Clematostigma tardipes* Edwards but it is much smaller and there are differences in hypandrial structure. From *Psocidus notialis* Smithers, which may be congeneric with it, it is distinguishable by the form of the apex of the parameres and the hypandrium in the male and the subgenital plate in the female; it is also larger than *C. paula*.

This species is referred to the genus *Copostigma* Enderlein. Enderlein (1903) erected the genus *Copostigma* with *C. dorsopunctatum* Enderlein as type species. This species has a cross-vein between Rs and M. Enderlein (1906) later erected *Clematostigma* with *Copostigma maculiceps* Enderlein as type species for those species of *Copostigma* in which Rs and M are fused for a length. Roesler (1944) regarded *Clematostigma* as a



FIGURES 75-79. — *Copostigma (Clematostigma) paula* sp. n. 75. ♂ forewing and hindwing, 76. ♂ epiproct, 77. ♂ paraproct, 78. ♂ hypandrium, 79. ♂ phallosome.



FIGURES 80-85 — *Copostigma (Clematostigma) paula* sp. n. 80. ♀ forewing, 81. ♀ hindwing, 82. ♀ subgenital plate, 83. ♀ epiproct and paraproct, 84. ♀ gonapophyses, 85. ♀ sclerification of spermathecal entrance.

subgenus of *Copostigma* and this is the arrangement adopted here as it is known that the Rs-M relationship alone is not reliable as a generic character. New (1974) has, however, accepted *Clematostigma* as of generic status when describing *C. dubium*, *C. edwardsi* and *C. inglewoodense*. When these and other related genera are studied a reallocation of species may be necessary.

***Ptycta muogamarra* sp.n.**

MALE

COLORATION: (in alcohol). Head brown with dark brown markings. A double row of spots adjacent to compound eyes, across back of head and along either side of median epicranial suture; a mark along anterior arms and a spot on each side of the frons; a triangular spot anterior to ocellar triangle. Base of antenna surrounded by a narrow brown ring. Postclypeus with parallel stripes. Labrum pale laterally, darker medially. Antennae brown. Eyes black. Ocelli ringed in black. Maxillary palps pale, fourth segment black. Mesonotum dark brown; sutures, median antedorsal stripe and posterolateral edges of lateral lobes paler. Legs pale, tarsi brown. Fore wings (fig. 86) hyaline, very faintly tinged with brown; pterostigma dark brown; veins brown. Abdomen pale, apex very dark.

MORPHOLOGY: Length of body: 2.2 mm. Median epicranial suture distinct, anterior arms evanescent but position marked by dark line. Lengths of antennal segments: f_1 :0.574 mm.; f_2 :0.530 mm. Eyes fairly large, reaching a little above vertex. IO/D (Badonnel): 1.8; PO: 1.0. Ocelli large. Measurements of hind leg: F: 0.52 mm.; T: 0.10 mm.; t_1 :0.336 mm.; t_2 :0.140 mm.; rt: 2.4:1; ct: 21, 3. Fore wing length: 3.4 mm.; fore wing width: 1.2 mm. Fore wing (fig. 86) with Sc ending free in costal cell; pterostigma elongate with only slight posterior angle. Rs and M meeting in a point or fused for a short length; stem of Rs short in relation to fork. Basal section of Cu_{1a} almost in line with second but a little sinuous; long fusion of Cu_{1a} with M. Hind wing length: 2.5 mm.; hind wing width: 0.8 mm.; Rs and M fused for a length; Sc approaching costal margin. A few very small, fine setae on wing margin at apex. Ninth tergite forms a well sclerotized band. Epiproct (fig. 87). Paraproct (fig. 88). Hypandrium (fig. 89) with a broad, median, upcurved strap-like sclerotization and two lateral, posterior sclerotized extensions. Phallosome (fig. 90) closed proximally, with a strongly upcurved, narrow process posteriorly.

FEMALE

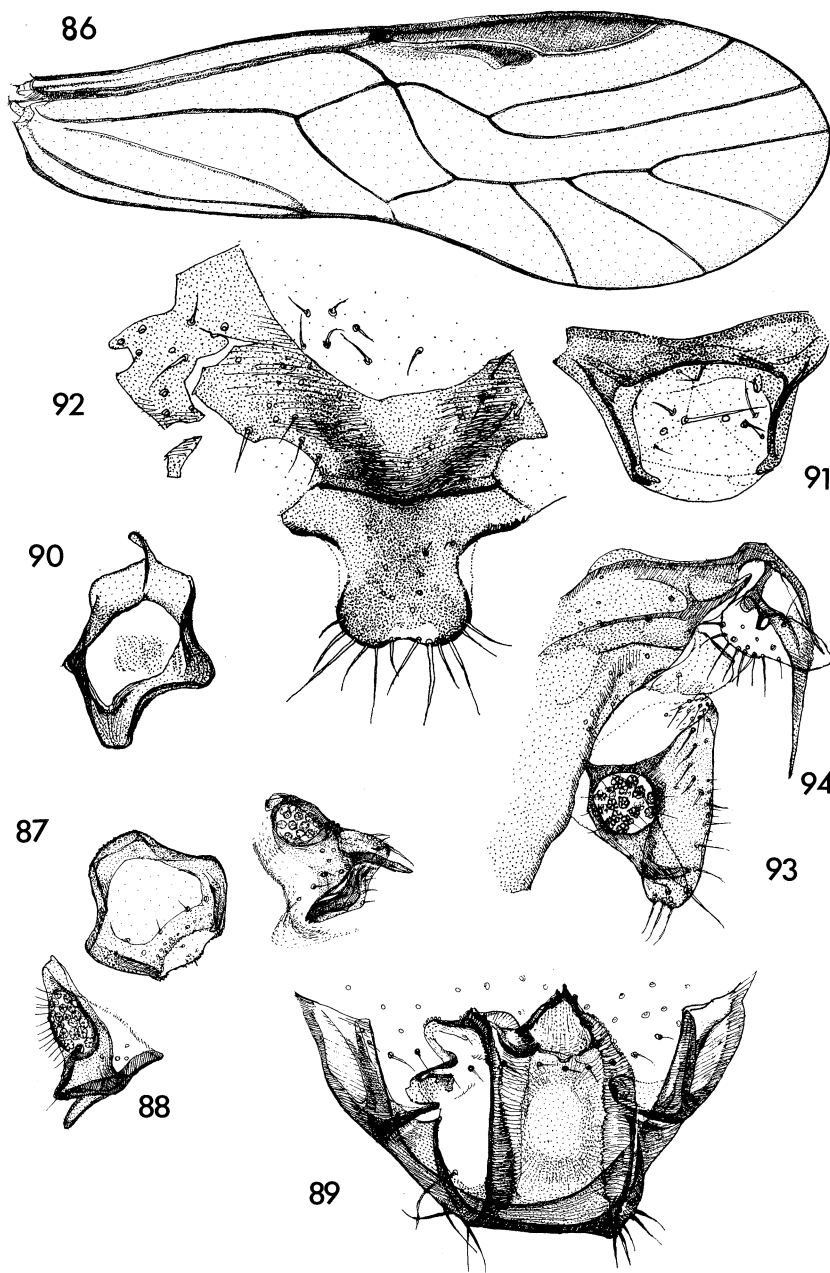
COLORATION: (in alcohol). As in male; the female also has the small spot on each side of the frons.

MORPHOLOGY: Length of body: 2.5 mm. Lengths of flagellar segments: f_1 :0.462 mm.; f_2 :0.448 mm. Eyes fairly small. IO/D (Badonnel): 1.8; PO: 0.87. Measurements of hind legs: F: 0.44 mm.; T: 0.96 mm.; t_1 :0.266 mm.; t_2 :0.126 mm.; rt: 2.1:1; ct: 20, 3. Fore wing length: 2.9 mm.; fore wing width: 0.9 mm. Venation as in male. Epiproct (fig. 91). Subgenital plate (fig. 92). Paraproct (fig. 93). Gonapophyses (fig. 94).

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 2 ♂ (including holotype), 3.iii.1975 (C.N.S., A.S.S.); 2 ♀ (including allotype), 15.xi.1973 (C.N.S., A.S.S.); Paratypes: 1 ♂, 17.iv.1975 (C.N.S.); 1 ♀, 2.v.1975 (C.N.S., A.S.S.); 1 ♀, 10.vii.1975 (C.N.S., A.S.S.); 1 ♀, 22.iii.1974 (C.N.S., A.S.S.) (AM).

Holotypes, allotype and paratypes in the Australian Museum.

DISCUSSION: *Ptycta muogamarra* differs from the other species placed in this genus by New (1974) except *cornigera* New in lacking marking adjacent to M + Cu. From *P.*



FIGURES 86-94. — *Ptycta muogamarra* sp. n. 86. ♂ forewing, 87. ♂ epiproct, 88. ♂ paraproct, 89. ♂ hypandrium, 90. ♂ phallosome, 91. ♀ epiproct, 92. ♀ subgenital plate, 93. ♀ paraproct, 94. ♀ gonapophyses.

cornigera (males only known) it differs in the form of the phallosome and hypandrium. Wing length of paratypes: ♂♂ : 3.4, 3.1, 3.0 mm; ♀♀ : 2.9, 2.9, 3.0 mm.

***Sigmatoneura formosa* (Banks)**

Amphigerontia formosa Banks 1918. *Bull. Mus. comp. Zool. Harv.* 62:4, pl. II.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 2 ♀, 15.xi.1973 (C.N.S., A.S.S.); 1 ♂, 18.iv.1974 (C.N.S.); 1 ♂, 2.v.1974 (C.N.S., A.S.S.); 1 ♂, 7 ♀, 23.v.1974 (C.N.S.); 1 nymph, 20.vi.1974 (C.N.S., A.S.S.); 1 ♂, 18.vii.1974 (C.N.S., A.S.S.) (AM). (Note: — This material has already been listed (Smithers 1976) in a paper on the nomenclature of this species. It is repeated here for convenience when discussing habitat preferences elsewhere in this paper).

***Trichadenotecnum enderleini* (Roesler)**

Psocus conspurcatus Enderlein 1903. *Ann. hist. – nat. Mus. hung.* 1:224, taf. IV, fig. 13. (nec. Rambur)

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 2 ♀, 1 nymph, 18.x.1973 (C.N.S., A.S.S.); 1 ♂, 15.xi.1973 (C.N.S., A.S.S.) 2 ♂, 1 ♀, 7 nymphs, 13.xii.1973 (C.N.S., A.S.S.); 1 nymph, 16.i.1974 (C.N.S., H.G.S.); 1 ♀, 28.ii.1974 (C.N.S., A.S.S.); 1 ♀, 21.xi.1974 (C.N.S.) (AM).

MYOPSOCIDAE

***Phlotodes australis* (Brauer)**

Psocus australis Brauer 1865. *Ver. zool. – bot. Ges. Wien* 15:908.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♂, 1.xi.1973 (C.N.S.); 1 ♂, 2 ♀, 2 nymphs, 15.xi.1973 (C.N.S., A.S.S.); 1 ♀, 16.i.1974 (C.N.S., H.G.S.); 1 ♂, 30.i.1974 (C.N.S., A.S.S.); 1 ♀, 5 nymphs, 22.iii.1974 (C.N.S., A.S.S.); 5 nymphs, 4.iv.1974 (C.N.S., A.S.S.); 1 ♀, 18.iv.1974 (C.N.S.); 1 ♀, 18.vii.1974 (C.N.S., A.S.S.) (AM).

***Phlotodes furcatus* (Smithers)**

Myopsocus furcatus Smithers 1964. *Proc. R. ent. Soc. Lond.* (B) 33:137-138, figs. 1, 2, 7.

MATERIAL EXAMINED: Muogamarra Nature Reserve, N.S.W. 1 ♀, 1.xi.1973 (C.N.S.); 1 ♂, 15.xi.1973 (C.N.S., A.S.S.); 1 ♀, 16.i.1974 (C.N.S., A.S.S.) (AM).

HABITAT COLLECTIONS OF PSOCOPTERA IN MUOGAMARRA
NATURE RESERVE

Within Muogamarra Nature reserve eight distinct habitats were chosen from which Psocoptera were periodically collected; these were in or near Peat's Crater. Peat's Crater is a somewhat circular, crater-like area of steep sandstone slopes, the bottom of the crater being formed by a diatreme of volcanic breccia covered with recent sediments. The crater has an area at base of approximately 12 hectares. It is drained by a series of streams which combine before flowing through a narrow gap in the western wall. Beyond the crater the stream flows across a flat, sedimentary area over a second small diatreme, bounded on the north and south by sandstone slopes, to a tidal channel leading to an inlet on Berowra Water, which is part of the Hawkesbury River system. The walls of the

crater and adjacent sandstone country are typically clothed with dry sclerophyll forest. The floor of the crater is covered with grassland which has been grazed by cattle; patches of bracken (*Pteridium esculentum*) occur in the grassland and groups or isolated specimens of *Acacia floribunda* of various ages occur near the drainage streams. A row of *Maclura pomifera*, which once formed a hedge, occurs across the crater floor and isolated specimens of this and weed species, e.g., blackberry, occur in the grassland area.

The habitats selected for sampling were:

1. A stand of *Casuarina glauca* Sieb. ex Spreng (fig. 95a) growing behind the tidal channel and through which flowed the stream from the crater.
2. A dense stand of bracken (*Pteridium esculentum* (Forst. f.) Cockayne) (fig. 95b). This was bounded in the north by an area of periodically boggy grassland between it and the drainage stream.
3. A mixed stand of *Casuarina littoralis* Salisb. and *C. torulosa* Ait. (fig. 95c). This was situated on the southern side of the crater floor where it meets the bottom of the sandstone slope.
4. A stand of *Acacia floribunda* (Vent.) Wild. (fig. 95d) which grew on slightly higher ground along the streamside.
5. A small patch of depauperate rainforest (fig. 96a) in the narrow gully where the stream draining the crater breaks through the rim. Although referred to here as "rainforest" this small isolated patch of vegetation can more truly be described as a patch of vegetation consisting of a few species normally found in temperate rainforest but not in sclerophyll forest.
6. A hedge of mature specimens of *Maclura pomifera* (Raf.) Schneid. (fig. 96b). This consists of a row of trees across the crater floor from near its southern margin almost to the drainage stream which at this point is more or less in the middle of the crater floor.
7. *Eucalyptus* spp. (fig. 96c) forming the upper storey on a sandstone ridge to the southeast of the crater.
8. Low, mixed, shrubby vegetation on the same ridge forming the lower storey below the eucalypt layer (fig. 96c). This is referred to in this paper as the shrub layer.

METHODS

Approximately fifteen minutes were spent collecting, by beating, in each habitat on each occasion. Collections from a habitat can be considered comparable but owing to the differences in physiognomy of the habitats and the fact that some habitats were of mixed plant species whereas others were pure stands, strict quantitative comparison between population levels is not warranted. An exception is the case of the two areas of *Casuarina* where, although of different species, general form and accessibility for beating were similar.

The first of the twenty-three collections was made on 18th October 1973, and the last on 21st November, 1974; this represents 5¾ hours collecting in each habitat between the two dates. All of the material discussed here, except the three specimens of *Copostigma (C.) latimentula*, the holotype and some paratypes of *Ptycta muogamarra* and allotype and paratype material of *C. (C.) paula* was collected between the dates given above; *C. (C.) latimentula* was taken once only during a casual collection in the area on 17.iv.1975, and

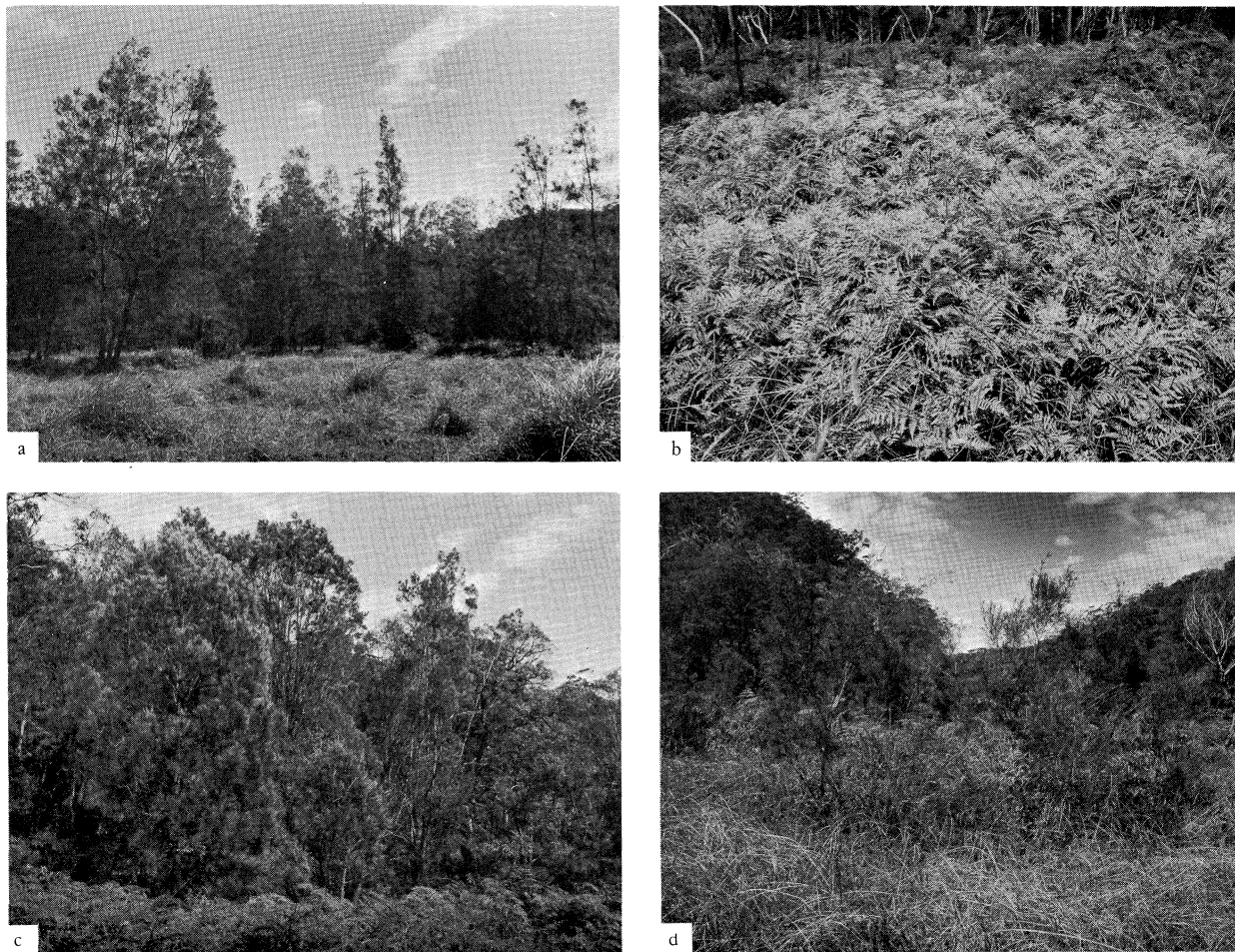


FIGURE 95. — Habitats from which Psocoptera were collected. a. *Casuarina glauca*, b. *Pteridium esculentum* (bracken), c. *Casuarina littoralis* – *C. torulosa*. d. *Acacia floribunda*.



FIGURE 96. — Habitats from which Psocoptera were collected. a. Rainforest, b. *Maclura pomifera*, c. *Eucalyptus* spp. (upper storey) and shrub layer (lower storey).

C. (C.) paula was taken on 10.vii.1975 and 17.iv.1975; *P. muogamarra* was taken on 3.iii.1975, 17.iv.1975, 2.v.1975 and 10.vii.1975. A few unidentifiable nymphs are ignored in the discussions.

DISCUSSION

Original data sheets of details of the specimens taken from each habitat on each occasion are deposited in the Australian Museum; appropriate summaries of the data only can be included in this paper.

Table I lists the species and gives the total number of specimens taken from each habitat and the number of days on which each species was taken. Table II gives a summary of the number of specimens and number of species (in brackets) taken from each habitat on each occasion.

In all, forty-three species of Psocoptera were taken in Muogamarra Nature Reserve, of which sixteen were undescribed. Fifteen of these have been described in this paper.

The two habitats consisting of *Casuarina* species have much in common although clearly *C. glauca* is less favoured than the other species. The *Eucalyptus*, *C. littoralis*, *C. torulosa* and the shrub layer make up what is generally regarded as vegetation cover typical of the Hawkesbury sandstone environment and it will sometimes be useful to discuss these habitats together.

The richest habitats were the mixed stand of *Casuarina littoralis* and *C. torulosa* (twenty-two species) and the rainforest (nineteen species) with specimens being more abundant in the rainforest. Bracken (six species), *Acacia floribunda* (six species) and *Casuarina glauca* (nine species) were the poorest in terms of species but both bracken (fifty specimens) and *C. glauca* (sixty-one specimens) have fairly high populations of their few species but *Acacia floribunda* is clearly an unsuitable habitat for Psocoptera in general as only seven specimens were taken from it.

These species numbers and population levels are consistent with experience gained during general collecting in the Australian environment. Dense populations which are sometimes met with in African and European situations are seldom encountered here. Nevertheless, there is little doubt that the Psocoptera are the major intermediary through which much of the resources bound up in the microflora are made available to other organisms.

Many species (twenty-two) were taken on less than five occasions and some of these (nine species) were represented by only one specimen. Little can be said about habitat preferences when a species is taken on so few occasions; on the other hand, specimens of one species taken singly from several habitats suggest little specificity in habitat requirement even though populations may be quite low. It may be noted that unexpectedly small numbers were taken on 16th January, 1974. This collection was made following a lengthy period of rain and this probably accounts for several of the habitats yielding no specimens at all.

With these points in mind and with general observations of the microhabitat occupied by some of the species some useful discussion of this collection data is possible. As mentioned in the introduction to this paper one of the objects of the work was to make preliminary observations on which future, more detailed work could be planned. The comments which follow should be considered as preliminary in nature.

Table I. List of species, total specimens from each habitat and number of days on which each species was taken.

Species	<i>C. glauca</i>	<i>C. littoralis</i>	<i>C. torulosa</i>	Shrub layer	<i>Eucalyptus</i>	Bracken	Rainforest	<i>M. pomifera</i>	<i>A. floribunda</i>	Occasions collected	Total specimens
<i>Echmepteryx brunnea</i>		3	3	7			1			9	14
<i>E. picta</i>				1						1	1
<i>Caecilius macrostigma</i>		1					3	1		4	5
<i>C. lineatus</i>	19	49				3	1			17	72
<i>C. pteridii</i>		3	4			12	1		2	12	22
<i>Paracaecilius hylobius</i>							7			6	7
<i>Enderleinella globiclypeus</i>		1					2			2	3
Caeciliid sp			1							1	1
<i>Taeniostigma trickettae</i>							69			19	69
<i>Ectopsocus californicus</i>			1	2	1	21	6			12	31
<i>E. punctatus</i>		1								1	1
<i>E. perplexus</i>		10								3	10
<i>E. pteridii</i>			2		7					4	9
<i>E. parmatus</i>		1								1	1
<i>E. russulus</i>		2								1	2
<i>E. albiceps</i>						5				2	5
<i>Peripsocus milleri</i>	1	3					1	1	1	5	7
<i>P. mauricus</i>		3						83		7	86
<i>P. tillyardi</i>	5	8	9			2	4	1		9	29
<i>P. hamiltonae</i>							3			2	3
<i>P. roseus</i>							6	2		4	8
<i>Pseudocaecilius lachlani</i>			4	7				16	1	13	28
<i>Heterocaecilius brunellus</i>			76							15	76
<i>Lobocaecilius monicus</i>							16			7	16
<i>Pseudoscottiella tanei</i>				1						1	1
<i>Aaroniella rawlingsi</i>			2	1						3	3
<i>Austropsocus viridis</i>							11			8	11

Table I. List of species, total specimens from each habitat and number of days on which each species was taken.

Species	<i>C. glauca</i>	<i>C. littoralis</i> <i>C. torulosa</i>	Shrub layer	<i>Eucalyptus</i>	Bracken	Rainforest	<i>M. pomifera</i>	<i>A. floribunda</i>	Occasions collected	Total specimens
<i>Austropsocus tibialis</i>		4			25	2			13	31
<i>Haplophallus ornatus</i>	3					4	4		5	11
<i>H. sinus</i>		6	3	1		1	2	1	8	14
<i>H. guttatus</i>			11				1		6	12
<i>Spilopsocus ruidis</i>						1			1	1
<i>Paedomorpha gayi</i>		1		2					2	3
<i>Blaste tillyardi</i>	7	1					1		5	9
<i>B. taylori</i>		1	1						1	2
<i>B. michaelseni</i>				1					1	1
<i>Copostigma latimentula</i>			3						1	3
<i>C. paula</i>			1						1	1
<i>Ptycta muogamarra</i>	1	2							2	3
<i>Sigmatoneura formosa</i>	9	1					3	1	6	14
<i>Trichadenotecnum enderleini</i>		1					17		6	18
<i>Phlotodes australis</i>	15	1		1		6	16	1	8	40
<i>P. furcatus</i>	1	2							3	3
Total species	9	22	13	10	6	19	15	6		42
Total specimens	61	105	118	24	50	164	155	7		684

23 spp.

166 specs.

33 spp.

247 spec.

Table II. Number of specimens and number of species (in brackets) taken from each habitat on each occasion.

Date	<i>C. glauca</i>	<i>C. littoralis</i> - <i>C. torulosa</i>	Shrub layer	<i>Eucalyptus</i>	Bracken	Rainforest	<i>M. pomifera</i>	<i>Acacia floribunda</i>
18/10/73	4 (2)	15 (7)			8 (4)		21 (4)	
1/11/73	12 (4)	16 (8)	7 (2)		2 (1)	23 (7)	39 (5)	
15/11/73	24 (3)	20 (6)	1 (1)		3 (2)	16 (7)	33 (5)	
29/11/73		2 (2)			4 (1)	5 (3)	7 (3)	2 (2)
13/12/73		8 (2)	4 (2)	1 (1)	6 (2)	6 (6)	23 (3)	
16/1/74	2 (2)	8 (1)					1 (1)	
30/1/74		6 (4)	2 (1)			10 (2)	1 (1)	2 (2)
28/2/74		7 (1)			2 (1)	4 (2)	3 (3)	
22/3/74	3 (3)	3 (2)	1 (1)	2 (1)	1 (1)	3 (1)	19 (2)	
4/4/74		6 (4)	2 (1)	3 (2)		14 (7)		
18/4/74	3 (2)		6 (3)			3 (2)	2 (2)	2 (2)
2/5/74	2 (2)		9 (5)		5 (2)	11 (4)		
23/5/74	8 (1)	1 (1)	17 (8)		2 (1)	6 (3)		
20/6/74		3 (2)	16 (3)			12 (3)		
9/7/74			6 (2)	2 (2)		3 (2)		
18/7/74	1 (1)		7 (1)	8 (6)		5 (1)		1 (1)
1/8/74	1 (1)	1 (1)	8 (2)	2 (2)	2 (1)	10 (5)		
22/8/74		1 (1)	2 (1)		1 (1)	6 (3)	5 (3)	
19/9/74	1 (1)	1 (1)	12 (4)	5 (3)	5 (2)	7 (4)		
3/10/74		1 (1)			2 (2)	4 (1)		
22/10/74		1 (1)	10 (1)	1 (1)	2 (1)	3 (2)		
7/11/74		5 (3)	3 (2)		4 (2)	11 (4)		
21/11/74			5 (1)		1 (1)	2 (1)	1 (1)	

COMMENTS ON HABITATS

CASUARINA GLAUCA

Nine species were found on *Casuarina glauca*, all of which were taken from other habitats. Psocoptera were somewhat more numerous in October and November, 1973 with fewer being taken from late November onwards (fig. 97); populations showed no rise to comparable levels in October-November 1974; in fact, none was taken from *C. glauca* after September 1974. The dominant species were *Caecilius lineatus* and *Blaste tillyardi*. The former is mainly an inhabitant of the distal branchlets and the latter is a bark dweller. Of a total of seventy two specimens of *Caecilius lineatus* taken during the survey all but four were taken from *C. glauca* or the other *Casuarina* habitat. *Peripsocus tillyardi* was also taken from this habitat; it also occurred in all the other habitats except *Eucalyptus* and *Acacia floribunda*. *Phlotodes australis* and *Sigmatoneura formosa*, although taken in some numbers, were each taken on only two occasions from *C. glauca*. Both species have the habit of congregating into groups during the nymphal stages after which they disperse. This habit would account for the capture of specimens in isolated batches.

CASUARINA LITTORALIS AND *C. TORULOSA*

Twenty-two species were taken from this habitat; all except one of the species taken from *C. glauca* (*Haplophallus ornatus*) were taken also from this habitat. As in the case of *C. glauca* the October-November, 1973 collections yielded more specimens than later with the period from mid-April to late October yielding few (fig. 97); again, populations did not return to 1973 levels in October-November, 1974. The dominant species was, as in *C. glauca*, *Caecilius lineatus*. *Ectopsocus perplexus* (ten specimens) was taken on three occasions only, but as all were from this habitat there is a possibility that it may prefer *Casuarina* to other habitats. Numbers were, however, too low for a definite statement on this point. *Ptycta muogamarra* and *Phlotodes furcatus* were also taken in small numbers from the two *Casuarina* habitats only; they may well prefer these hosts. In general, the psocopteran fauna of the *C. littoralis* and *C. torulosa* habitat is similar to that of *C. glauca* but with a greater number of species occurring in small numbers on the former, several of which were taken only from this habitat. The proximity of the *C. glauca* stand to the tidal area with a somewhat salt-laden atmosphere may account for the fewer species there.

SHRUB LAYER

The sandstone flora shrub layer in reasonably rich is species with two dominants, i.e., *Heterocaecilius brunellus* and *Haplophallus guttatus*. *H. brunellus* was taken only in this habitat and of *Haplophallus guttatus* only one specimen was taken elsewhere (on *Maclura pomifera*). Several species were taken only from the shrub layer but as one or two of each were collected nothing can be said concerning their habitat preferences. The two dominant species, which made up the bulk of specimens from this habitat, were distinctly more abundant during the colder part of the year (fig. 97); several of the species of which few specimens were taken occurred during this period. Figure 98 shows the collection cumulative totals of species taken through the survey from the shrub layer. This shows a distinct increase in the rate of appearance of species taken for the first time during April and May (cf. fig. 98 for similar data for the *Casuarina littoralis* - *C. torulosa* habitat). The psocopteran fauna of the shrub layer seems to be cool-climate adapted and one is tempted to postulate a close association with the strongly endemic sandstone flora; indeed, *Haplophallus* is a genus of southern origin and belongs to a family (Philotarsidae) which has its greatest development and proliferation of species in Australasia and New Caledonia.

EUCALYPTUS SPP.

Eucalyptus spp. yielded ten species of Psocoptera. Of these only one (*Pseudoscottiella tanei*) is possibly a green leaf dweller. One (*Ectopsocus californicus*) is a dried leaf inhabitant but, in all, only three specimens were taken of these two species. The remaining species are all bark dwellers. Little general comment can be made about the *Eucalyptus* psocopteran fauna except to indicate its sparse nature and the preference of species which do occur on it for the parts of the plant other than the green living leaves. No specimens of the families Caeciliidae nor Peripsocidae were taken from the *Eucalyptus* habitat and only a single specimen of the family Psocidae was taken. The Pseudocaeciliidae, Lepidopsocidae and Philotarsidae made up the bulk of the material taken.

PTERIDIUM ESCULENTUM (Bracken)

Only six species were taken from bracken but fifty specimens were collected. Half of these were *Austropsocus tibialis*, which was taken elsewhere only from the *C. littoralis* – *C. torulosa* habitat and the rainforest in small numbers. This is clearly a species with a preference for bracken fronds. *Caecilius pteridii* was taken mostly from bracken during the spring being absent from bracken during the rest of the year. In general, Psocoptera were more numerous on bracken during spring and summer (fig. 97). Psocidae, Pseudocaeciliidae and Lepidopsocidae were not taken from bracken.

RAINFOREST

Rainforest yielded nearly as many species as the *C. littoralis* – *C. torulosa* association and provided far more specimens than any of the other habitats. This is clearly the most suitable habitat, in general, for Psocoptera. Seven species were found only in the rainforest, four of them being taken on more than five occasions. *Paracaecilius hylobius*, *Taeniostigma trickettae*, *Lobocaecilius monicus* and *Austropsocus viridis* are probably restricted to the rainforest type habitat. *T. trickettae* was a very common species. *Ectopsocus albiceps* and *Spilopsocus ruidis* are also probably restricted to the rainforest habitat; although numbers taken in the present survey were low, there is evidence from other casual collecting that they are so restricted. As might be expected from a habitat with relatively less variable seasonal conditions there was little indication of seasonal preferences nor of gross population fluctuations (fig. 97). It is interesting to note that of the eight species of the family Psocidae collected in the present survey not one was taken from the rainforest habitat.

MACLURA POMIFERA

Although fifteen species were taken from *Maclura pomifera* only three were common, namely, *Peripsocus maoricus*, *Pseudocaecilius lachlani* and *Trichadenotecnum enderleini* (sixteen specimens of *Phlotodes australis* were taken from *M. pomifera* but all were taken on the one occasion). *Maclura pomifera* is a deciduous plant, losing its leaves (in Muogamarra Nature Reserve) in late April-early May. The commonest species, listed above, in this habitat are all mainly bark dwellers, as are most of the species taken in smaller numbers from this habitat. It is remarkable, therefore, that at the time of leaf fall the entire psocopteran fauna virtually disappeared from the trees and only eight specimens were taken after early April, 1974 out of a total of one hundred and fifty-five from this habitat (fig. 97). This sudden disappearance was quite dramatic; the presence of leaves appears essential for the bark inhabiting Psocoptera in this habitat. The apparently anomalously large number of specimens taken on 22nd March, 1974 is accounted for by the capture of many nymphs of *Phlotodes australis*, a species in which the nymphs congregated in groups.

ACACIA FLORIBUNDA

Only seven specimens were taken from *Acacia floribunda*, belonging to six species. None was restricted to this habitat and all were taken from at least three other habitats. *Acacia floribunda* is clearly unsuitable for Psocoptera in general but is occasionally inhabited by species of wide habitat tolerance. Leaf cover is sparse in this species, all other habitats sampled were more leafy and more shady. In this connection it is, perhaps, significant that the Psocoptera on *M. pomifera* disappeared at leaf fall.

One general comment on overall population levels of Psocoptera may be made. The *Casuarina* habitats supported greater populations in October-November than at other times. The shrub layer of the sandstone flora supported its greatest population from April to July and the rainforest population, although fluctuating from sample to sample, showed little overall seasonal variation.

COMMENTS ON SPECIES

LEPIDOPSOCIDAE

Echmepteryx brunnea was taken from the shrub layer habitat, *C. littoralis* – *C. torulosa* (but not *C. glauca*) and from *Eucalyptus*. A single female was taken from *M. pomifera*. It is essentially a species of the true sandstone flora; adults were taken from November to September but were not common at any time.

CAECILIIDAE

Caecilius lineatus was taken mainly from the three *Casuarina* species, only four specimens out of seventy-two were taken from other habitats (three from bracken, one from rainforest). Although common from September to April very few specimens were taken during May, June, July or August. *C. lineatus* was the dominant psocopteran on *Casuarina* spp.

Caecilius pteridii was taken from all habitats, except *C. glauca*, *M. pomifera* and *Eucalyptus*. From September to December specimens were taken mainly from bracken. None was taken from January to early April nor from June to August. The few autumn specimens which were taken were from the sandstone flora shrub layer (with one on *Acacia floribunda*) and these were all taken during late April to late May. This suggests that this species has a strong association with bracken and spends the warmer months there, moving to the shrub layer of the sandstone flora during the colder periods of the year.

Paraecilius hylobius was taken from rainforest only and is clearly a species preferring, perhaps restricted to, that habitat.

STENOPSOCIDAE

Taenio stigma trickettae is clearly a rainforest species. It was the dominant one taken from that habitat and was taken nowhere else.

ECTOPSOCIDAE

Ectopsocus californicus is an inhabitant of dried leaves of broad-leaved plants. It was taken mainly from the rainforest habitat but was also taken from all other habitats except bracken and *Casuarina*. Many species of *Ectopsocus* are dependent on the occurrence of dead, dry leaves which are rapidly colonized at a certain stage of decomposition as opportunity arises.

Ectopsocus perplexus was taken only in small numbers from *Casuarina littoralis* – *C. torulosa* in spring and summer. It probably prefers these host plants.

PERIPSOCIDAE

Peripsocus maoricus was taken in large numbers from *M. pomifera* from October to mid-November, 1973. Populations declined during December 1973 after which very few specimens were taken. Apart from those taken from *M. pomifera* only three others were taken, all from *C. littoralis* – *C. torulosa*. *P. maoricus* appeared to be an early-season species which moves to some other habitat at other periods. Although Psocoptera in general virtually disappeared from *M. pomifera* with leaf fall in April, the disappearance of *P. maoricus* occurred much earlier, in December. Populations did not reappear the following October.

Peripsocus milleri and *P. tillyardi* were both taken from a wide range of habitats the former in small numbers; neither occurred on bracken nor *Eucalyptus*. *Peripsocus hamiltonae* was taken only from the rainforest but very few were taken. *P. roseus* was taken from rainforest (six specimens) and *M. pomifera* (two specimens).

PSEUDOCAECILIIDAE

Pseudocaecilius lachlani was taken mainly from *M. pomifera* from October to December, 1973. From April to October 1974 it was taken mainly from *Eucalyptus* with a few specimens from the shrub layer. The numbers taken suggest that it is a spring-summer species with some seasonal change of habitat.

Heterocaecilius brunellus is the dominant psocopteran of the shrub layer of the sandstone flora; it was taken in large numbers and only from that habitat. It was distinctly more abundant during the colder months of the year.

Lobocaecilius monicus was taken only from rainforest but followed, remarkably, the seasonal pattern of *Heterocaecilius brunellus* in being essentially a cold season species; it was taken mainly from March to July with only two additional specimens taken in October.

PHILOTARSIDAE

Austropsocus viridis is a bright green species taken only in rainforest and, unusual for a philotarsid, appears to be a leaf dweller. It is, apparently, confined to rainforest habitats.

Austropsocus tibialis, on the other hand, was taken mainly from bracken and with *Caecilius pteridii* made up the bulk of the specimens from that habitat. Other specimens (two) were taken from rainforest and the *Casuarina littoralis* – *C. torulosa* habitat.

Haplophallus ornatus and *H. sinus* both occurred in several habitats whereas *H. guttatus* was almost restricted to the shrub layer.

PSOCIDAE

Blaste tillyardi was taken from the *Casuarina* habitats and (one specimen only) from *M. pomifera*.

Trichadenotecnum enderleini was taken from *M. pomifera* in fairly large numbers with one specimen from *C. littoralis* – *C. torulosa*. Like *P. maoricus* it had virtually disappeared from *M. pomifera* by January.

Sigmatoneura formosa was taken from several habitats with woody stems, but not from rainforest nor *Eucalyptus*.

MYOPSOIDAE

Phlotodes australis was taken from all habitats in small numbers but not from the shrub layer nor bracken. It is a bark inhabitant.

Phlotodes furcatus, also a bark dweller, was taken only from the *Casuarina* habitats but the small numbers involved make it impossible to generalize on its habitat preferences.

HABITAT PREFERENCES

Owing to the small numbers of specimens taken of many of the species apparent habitat preferences and restrictions of only some species can be indicated.

Caecilius lineatus, *Ectopsocus perplexus* and *Blaste tillyardi* all seemed to have a preference for *Casuarina* spp. *Heterocaecilius brunellus* appeared to be restricted to shrub layer of the sandstone flora habitat whilst *Haplophallus guttatus* had a strong preference for it. *Pseudocaecilius lachlani* seemed to have a winter preference for *Eucalyptus*. *Caecilius pteridii*, *Ectopsocus pteridii* and *Austropsocus tibialis* had a preference for bracken. *Paracaecilius hylobius*, *Taeniosigma trickettae*, *Ectopsocus albiceps*, *Lobocaecilius monicus* and *Austropsocus viridis* were all restricted to rainforest with *Ectopsocus californicus* having a preference for it (it should be remembered, however, that this species is an inhabitant of dried leaves). *Peripsocus maoricus* and *Trichadenotecnum enderleini* preferred *Maclura pomifera* whilst *Pseudocaecilius lachlani* had a summer preference for it. Only two habitats, therefore, had species which appear to be restricted to them, shrub layer of the sandstone flora (which had *H. brunellus*) and rainforest (which had *P. hylobius*, *T. trickettae*, *E. albiceps*, *L. monicus* and *A. viridis*).

ACQUISITION OF SPECIES THROUGH THE COLLECTING PERIOD

Figure 98 indicates the total number of species which had been collected from each habitat by each date. It can be expected that as the species normally occurring in a habitat are taken, the "curve" will flatten out with few additional species being recorded as collecting progresses through the season.

From *Casuarina glauca* (fig. 98) a total of nine species was collected. These had all been taken by 23 May, 1974, i.e. in about eight months, after which no further species were recorded. More than half of these had been taken at the end of one month's collecting, i.e. in three visits involving three quarters of an hour's collecting time in all. Thereafter species were added infrequently, the last four taking six months to be found and of these only a few specimens were taken. In all probability the collection includes most of the species occurring on *C. glauca*.

In the *Casuarina littoralis* – *C. torulosa* habitat (fig. 98) twenty two species were taken and the pattern of acquisition is much the same as in *C. glauca*. In the first five weeks fifteen species had been taken after which additional species were taken infrequently. The last species to be taken was first collected on 7th November, 1974. It is possible that a

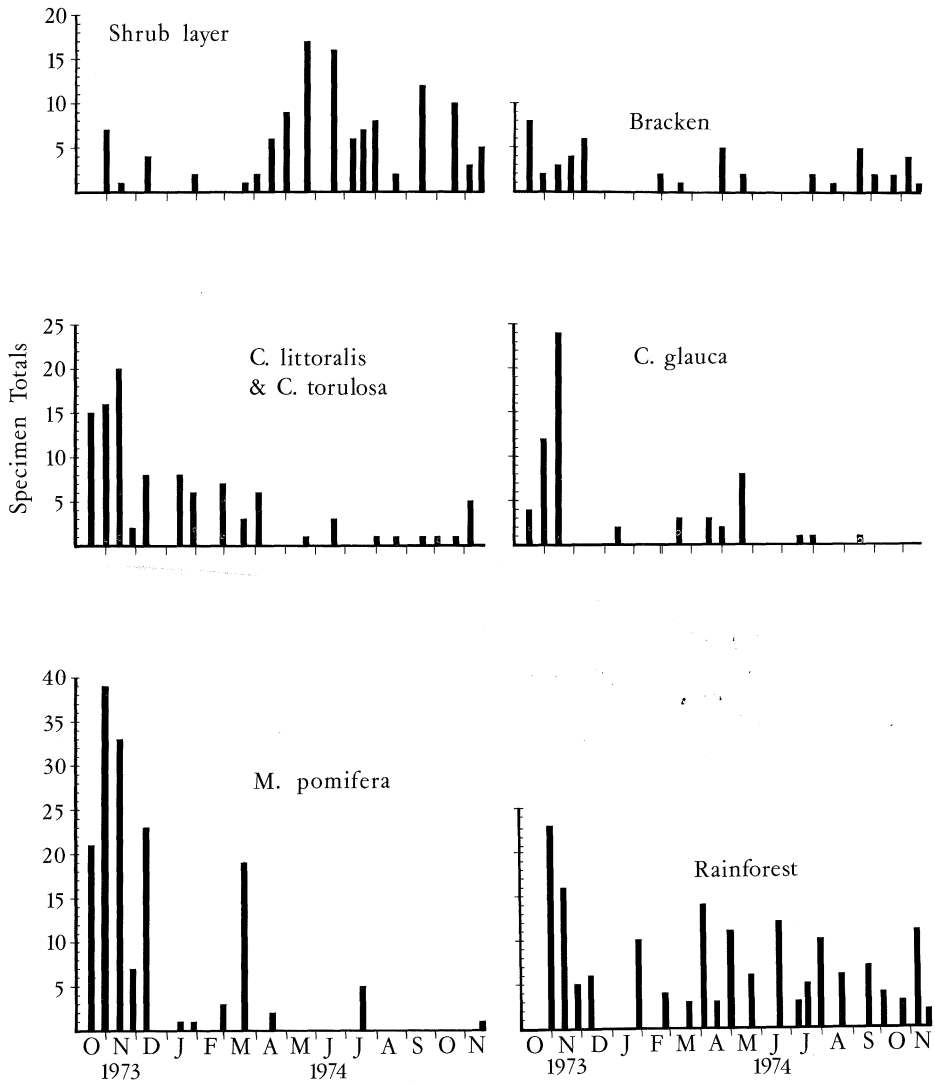


FIGURE 97. — Total number of specimens taken from bracken, *M. pomifera*, Rainforest, shrub layer, *C. littoralis* – *C. torulosa* and *C. glauca*.

few more species which were not detected might have been present in the habitat. Species taken for the first time late in the collecting period were taken only in very small numbers.

The shrub layer of the sandstone flora habitat (fig. 98) yielded thirteen species during the collecting period (another was taken during casual collecting on 17th December, 1975) but the pattern of acquisition is in contrast to that from the *Casuarina* habitats. Only three species were taken in the first month and it was another four months before a fourth was added. In the next two months, however, another seven species appeared after which it took until almost the end of the collecting period to find the last two species. There was a marked increase in the number of species appearing during the cooler part of the year. It is also interesting that those species which had been present from the beginning of the sampling period reached their highest numbers during the cooler months. Species (and populations) increased during the cooler period suggesting, again, that the fauna of the shrub layer of the sandstone flora is mainly cool-climate adapted.

In the *Eucalyptus* habitat (fig. 98) ten species were taken. Acquisition of species was slow until April 1974, as in the shrub layer but with fewer species involved.

Bracken (fig. 98) (and ferns in general) is not a rich habitat for any group of insects and Psocoptera are no exception. Only six species were taken and these were all collected in the first two months. One of the dominant species (*Austropsocus tibialis*) was taken throughout the sampling period but the other (*Caecilius pteridii*) was present on bracken during the warmer months only but appeared in the sandstone flora habitat during the cooler months. As no additional species were taken after 29th November, 1973, it is very likely that all species occurring on bracken were recorded.

Rainforest (fig. 98) is generally accepted as a rich habitat for Psocoptera; nineteen species were taken. Almost half of these were taken in the first three occasions after which no additional species were recorded for another three and a half months. Surprisingly, additional species did appear from then on with another six being recorded over the next seven months. As one additional species was recorded as late as 7th November, 1974, it seems likely that a few species might have remained undetected in this habitat.

From *Maclura pomifera* (fig. 98) fifteen species were collected. Nine of these had been taken in the first month after which the additional species were taken in small numbers. No further species were recorded after the 22nd August, 1974, and it seems likely that from this habitat all available species were taken.

The populations on *Acacia floribunda* (fig. 98) were low in species and specimens. The habitat is clearly very unsuitable for Psocoptera. The first of the six species was not taken until the fourth collecting date (29th November, 1973) and the last on 18th July, 1974.

The data collected during this preliminary brief, single-cycle, sampling period suggests that for most habitats collecting in brief spells over a month of two during the spring or summer will suffice to yield a fair proportion (a half or more) of the species present. This, however, would be unsatisfactory for the shrub layer of the sandstone flora and *Eucalyptus* habitats which yield more species in the cooler months.

CONCLUSION

The preliminary nature of this work was pointed out in the introduction to this paper and the results have been assessed somewhat conservatively. The work has, however,

provided an inventory of the common species of Psocoptera and some interesting indications of their seasonal occurrence and preferences for the main habitats in Muogammara Nature Reserve; at the same time it has provided data on which more detailed studies of the biology and ecology of the group can be planned.

ACKNOWLEDGEMENTS

I would like to thank the Director of the National Parks and Wildlife Service for permission to work in Muogamarra Nature Reserve, Mrs. B. Hamilton and Mr. M. Tane for their help during the work, the collectors listed earlier in this paper for assistance in the field, Professor I. W. B. Thornton for determination of the Philotarsidae, the staff of the National Herbarium for plant identification, Mr. G. Millen for taking habitat photographs and Miss J. O'Regan and Mr. G. Daniels for preparing the illustrations to this paper.

REFERENCES

- Ball, A. 1943. Contribution a l'étude des Psocoptères. III. *Ectopsocus* du Congo belge, avec une remarque sur le rapport IO/D. *Bull. Mus. Hist. nat. Belg.* 19 (38): 1-28, 22 figs.
- Badonnel, A. 1967. Insectes Psocoptères. *Faune de Madagascar* 23: 1-238, 496 figs.
- Badonnel, A. 1969. Psocoptères de l'Angola, et de pays voisins avec revision de types africains d'Enderlein (1902) et de Ribaga (1911). *Pub. cult. Cia. Diamant Angola* 79: 1-52, 256 figs.
- Enderlein, G. 1903. Die Copeognathen fauna des indo-australischen faunengebietes. *Ann. hist.-nat. Mus. hung.* 1: 179-344, 12 figs, pls. iii-xiv.
- Enderlein, G. 1906. Die australische Copeognathen. *Zool. Jb. Abt. Syst.* 23:401-412, pl. 23.
- Mockford, E. L. 1965. The genus *Caecilius* (Psocoptera: Caeciliidae). Part I. Species groups and the North American species of the *flavidus* group. *Trans. Amer. ent. Soc.* 91:121-166, 10 pls.
- Mockford, E. L. 1966. The genus *Caecilius* (Psocoptera: Caeciliidae). Part II. Revision of the species groups and the North American species of the *fasciatus*, *confluens* and *africanus* groups. *Trans. Amer. ent. Soc.* 92:133-172, pls. 9-15.
- Mockford, E. L. 1969. The genus *Caecilius* (Psocoptera: Caeciliidae). Part III. The North American species of the *alcinus*, *caligonus* and *subflavus* groups. *Trans. Amer. ent. Soc.* 95:77-151, pls. 1-16.
- New, T. R. 1974. Psocidae (Psocoptera) from southern Australia. *J. Aust. ent. Soc.* 13: 285-304, 64 figs.
- Pidgeon, I. M. 1938. The ecology of Central coastal areas of New South Wales. II. *Proc. Linn. Soc. N.S.W.* 83:1-26, 1 fig.; pls. i-iv.
- Roesler, R. 1944. Die Gattungen der Copeognathen. *Stettin. ent. Ztg.* 105: 117-166.
- Smithers, C. N. 1976. The generic position of *Amphigerontia formosa* Banks (Psocoptera: Psocidae) and related species. *Aust. ent. Mag.* 3 (4): 67-74, 12 figs.
- Thornton, I.W.B. and Wong, S.K. 1968. The Peripsocid Fauna (Psocoptera) of the Oriental Region and the Pacific. *Pacif. Insects Monogr.* 19: 1-158, 302 figs.

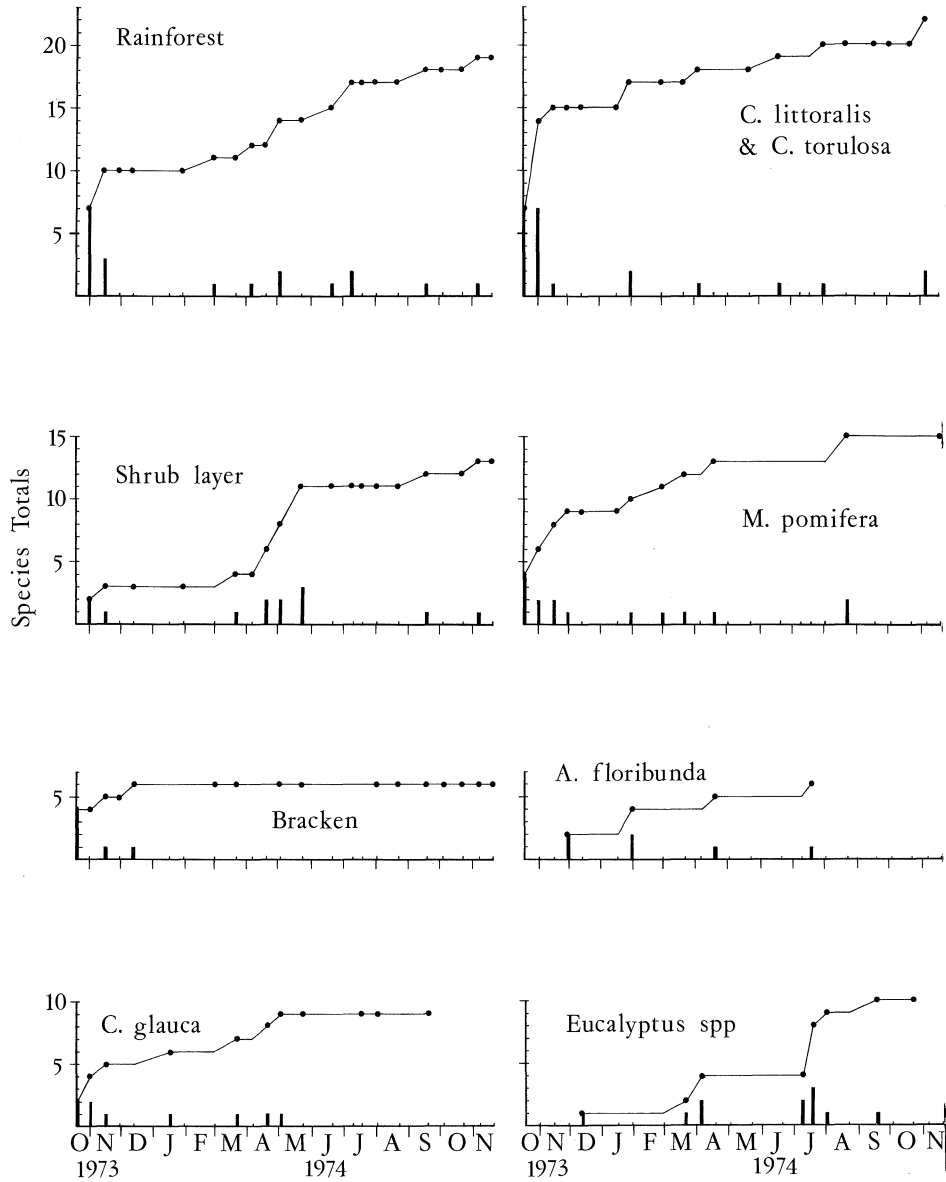


FIGURE 98. — Cumulative totals of species taken (continuous line) and number of species recorded for the first time in each habitat (bars).