

IMMATURE STAGES OF CURCULIONIDAE
OF HEARD ISLAND¹By Brenda M. May²

Abstract: Larvae and pupae of *Canonopsis sericeus* C. O. Waterhouse, *Ectemnorhinus griseus* (Enderlein) and *Antarctonesiotes gracilipes* C. O. Waterhouse are described. *Mesembriorhinus brevis* C. O. Waterhouse was not represented. Identification of the smaller species was tentative owing to lack of reared material. A more advanced stage of evolution is indicated in Ectemnorhinae than in the bulk of the Adelognatha. There was no evidence of close relationship with the adelognathous weevils of the subantarctic islands of New Zealand.

A collection of weevil larvae and pupae from Heard and Kerguelen Islands, made in 1965 for the Bishop Museum, Honolulu, has become available for study. Heard Island, from which all but 2 of the specimens were taken, is the southernmost of the subantarctic islands of the Indian Ocean. It lies on approximately latitude 53°S. with the Kerguelen archipelago some 480 km to the north.

It is obvious from previous studies of larvae from this group of islands (Womersley 1936, Jeannel 1940, Emden 1952, Brown 1964) that the absence of reared material has been a hindrance to decisive identification. That based on larvae/adult association can only be accepted with reservations.

One subfamily only, Ectemnorhinae, is represented.

Four species, in different genera, occur on Heard I. (Kuschel, preceding article). These are *Canonopsis sericeus* C. O. Waterhouse (length 15.0 mm), *Ectemnorhinus griseus* (Enderlein) (5.0-9.0 mm), *Antarctonesiotes gracilipes* C. O. Waterhouse (2.5-5.0 mm) and *Mesembriorhinus brevis* C. O. Waterhouse (2.5-5.0 mm).

Womersley figured 2 pupae and 2 larvae from Kerguelen and Heard Islands. The size of the *Canonopsis* adult would make its pupa unmistakable but the figure captioned *Ectemnorhinus crozetensis* End. was considered by Jeannel to represent *M. brevis* on account of the long setae. Brown subsequently confirmed that Jeannel was indeed correct. The larval figures of *Ectemnorhinus* spp. show much longer setae than in Jeannel's figure of *E. viridis* and could equally well belong to *M. brevis*. There are no descriptions.

Jeannel has figured the larva and pupa of *E. viridis* and the larva of *M. brevis* but the drawings are not precise and the descriptive notes are very brief.

Brown has included both dorsal and ventral aspects of the *Canonopsis* larva, but its description could refer to that of many other weevils. Some variations of the cephalic and thoracic setae of *Ectemnorhinus* pupae are also figured. Emden has defined the larval characters of Ectemnorhinae and of the genus *Ectemnorhinus* from larvae determined by G. Enderlein and taken in 1902 on Kerguelen. The present study therefore, which again lacks reared material for comparison, does not have as sound a basis as I would wish.

The larva of *A. gracilipes* is here described for the first time. The larvae of *C. sericeus* and of *E. griseus* are described more fully. The larva of *M. brevis* was not represented among the material and, therefore, the characters on which the species has been inserted in the key for separation are those given by Jeannel.

The system of larval nomenclature used is substantially that of Thomas (1957) as discussed in

¹Results of fieldwork on the South Indian Ocean Expedition to Heard I. (private), partly supported by Bishop Museum.

²Entomology Division, Department of Scientific and Industrial Research, Auckland, New Zealand.

a previous paper (May 1967). The small lobe (Anderson's (1947) alar area), laterad of the meso- and metathoracic fold II (postdorsal), bearing 1 or more setae, is here referred to as the dorso-lateral lobe (Fig. 1). These setae are regarded by Thomas as belonging to the postdorsal group in Scolytidae but in most of the curculionid larvae examined, they are clearly separated by an oblique fold. The condition of the specimens did not allow examination of the alimentary canal which has characters to supplement those of the exterior.

A tabled index of larval setae has been prepared in order to avoid tedious repetition in the descriptions and also for ease of comparison between genera. The column containing the "model" or most usual numbers of setae in Adelognatha was compiled from the work of Emden.

The apparent presence or absence of setae is largely a matter of the degree of magnification used. A seta which is absent is nearly always represented by a sensillum. The term "microscopic" has therefore been used when an actual hair can be seen under $240 \times$ magnification. "Not visible" is used to imply that a sensillum only, can be seen. "Absent" would mean that the sensillum also, was missing. The setal index includes microscopic hairs but not sensilla. The numbers of major setae and obviously smaller setae are given separately with minor setae in italics (for example, postdorsal 2 + 3) are given for one side only.

SUBFAMILY ECTEMNORHININAE

Head free, with posterior margin moderately excavated, with sutures distinct but with endocarinal line absent. Anterior and posterior ocelli conspicuous with convex corneae. Frons with 1 major seta (*fs* 4) and with *fs* 5 microscopic. Antennae circular, only slightly convex. Mandibles with 2 accessory teeth (weak in *Canonopsis*) below the bifid apex. Labrum with lateral sensilla level with or below posterior setae. Epipharyngeal lining with anterolateral and anteromedian setae on margin; 3 pairs of median spines on distal 1/3 with clustered sensilla between the 2 anterior pairs. Premental sclerite with median extension distinct. Postlabium (postmentum) with posterior pair of setae closer together than median pair.

Prothoracic shield and often other thoracic lobes pigmented. Terminal segments not modified. Thoracic segments II and III with an additional prodorsal microseta; pedal area with 1 major seta. Abdominal segments with 4 dorsal folds; spiracular setae on 3rd fold throughout. Thoracic and abdominal spiracles of similar structure, bicameral, with annulated airtubes.

The somewhat aberrant position held by adult Ectemnorhininae in the Adelognatha is confirmed by their larval structure despite the typical antennal formation. Exceptionally well developed accessory teeth, ocellar corneae and sclerotisation of the thoracic lobes in addition to the unusual positions of the labral and clypeal sensilla relative to setae, set them apart from most other adelognathous larvae.

Canonopsis however, is much nearer the typical form with accessory teeth scarcely noticeable; thoracic lobes sclerotised only at the apices and sensilla less aberrant.

The first character, "ninth abdominal epipleurite with a single seta", used in Emden's key to separate Ectemnorhinini from Brachycerini and Sitonini, is evidently not reliable since slide-mounted specimens show an additional minute seta on the pleural lobe.

KEY TO LARVAE OF ECTEMNORHININAE OF HEARD ISLAND

1. Spiracles with airtubes oblique, directed dorsocaudad. Shorter abdominal setae stout and spinelike (Fig. 2).....***Canonopsis sericeus***
Spiracles with airtubes vertical, directed dorsad. Shorter abdominal setae slender.....2
2. Head capsule pale red-brown. Thoracic sclerotisation light. Labral tormae unpigmented, pliable (Fig. 26).....***Ectemnorhinus grisescens***
Head capsule brown or black. Thoracic sclerotisation dark. Tormae dark, rigid.....3

Table 1. Setal index for species of Ectemnorhinae from Heard Island. The figures in bold face indicate minor setae or microsetae.

	<i>C. sericeus</i>	<i>E. viridis</i>	<i>A. gracilipes</i>	*Model number
PROTHORAX				
pronotum	3 + 7	2 + 9	2 + 8	8-12
ventropleural	2	2	2	2
mediosternal	1	1	1	1
pedal area	1 + 5	1 + 5	1 + 5	7
MESO-, METATHORAX				
prodorsal	1 + 1	1 + 1	1 + 1	1
postdorsal	1 + 3	1 + 3	1 + 3	4
dorsolateral	1	1	1	1-2
alar area	2	1	0	1-2
dorsopleural	1	1	1	1
ventropleural	1	1	1	1
mediosternal	1	1	1	1
pedal area	1 + 5	1 + 5	1 + 5	7
ABDOMEN I-VIII				
prodorsal I-VII	1	1	1	1
VIII	0	0	0	1
postdorsal I-VII	2 + 3	2 + 3	2 + 3	2 + 3
VIII	2 + 1	1 + 1	1 + 1	3-4
spiracular I-VII	1 + 1	1 + 1	1 + 1	1 + 1
VIII	1	1	1	?
dorsopleural	1 + 1	1 + 1	1 + 1	2
ventropleural	1 + 1	1 + 1	1 + 1	2
laterosternal	1	1	1	1
mediosternal	2	2	2	2
ABDOMEN IX				
dorsal	1 + 1	1 + 1	1 + 1	3
pleural	1	1 + 1	1 + 1	2
sternal	2	2	2	2
ABDOMEN X				
anal	1	2	2-3	3
HEAD				
dorsal	3 + 2	3 + 2	3 + 2	5
posterior	4	4	4	4
lateral	1 + 1	1 + 1	1 + 1	2
ventral	1 + 1	1 + 1	2	2
frontal	1 + 4	1 + 1	1 + 1	5
clypeal	2	0	2	2
labral	3	3	3	3
mandibular	1 + 1	1 + 1	1 + 1	2
EPIPHARYNGEAL				
LINING				
anterolateral	3	3	3	3
anteromedian	2	2	2	2
median	3	3	3	3
MAXILLA				
lacinial	12 + 1	12 + 1	12 + 1	12 (+1)
palpal	0	1	1	1
stipital	1	1	1	1
palpiferal	2	2	2	2
LABIUM				
postlabial	1 + 2	1 + 2	1 + 2	3
prelabial	1	1	1	1
ligular	2	2	2	2

*Model numbers of setae in Adelognatha, after Emden.

3. Abdominal macrochaetae of moderate length, approximately $6 \times$ longer than short setae (Fig. 10).....**Antarctonesiotes gracilipes**
 Abdominal macrochaetae "tres longs" (Jeannel *loc cit*).....**Mesembriorhinus brevis** (not examined)

Genus **Canonopsis** Waterhouse

Setal index as Table 1.

Head somewhat flattened with sides gently rounded; postoccipital condyles small; *des* 3 contiguous with frontal suture. Antennal cone narrower and more convex than in *Ectemnorhinus*, occupying $1/3$ of basal cushion. Clypeus with sensilla in front of interior setae.

Labrum quadrate, indistinctly lobed, the paired sensilla level with posterior setae. Mandibles stout, with setae arranged longitudinally; apical teeth short and accessory teeth obsolete. Maxilla with basal sensillum (ventral) of lacinia unusually remote from its associated microseta; palpus without seta.

Body with all seta-bearing lobes and folds lightly sclerotised on tips. Short setae, especially on Abd. I–IV, thick, dark and spinelike. Spiracles subcircular, surrounded by a lightly pigmented area; abdominal airtubes directed obliquely, dorsocaudad. Anus terminal, 4-lobed.

Canonopsis sericeus C. O. Waterhouse Fig. 1–8, 18–20.

Head width 2.0 mm.

Head deep red-brown with darker mottling dorsolaterally. Mandibles black. Hypopharyngeal bracon with 2 paramedian dark patches.

Labral tormae dark, thickened apically, slightly convergent. Pronotum with 3 major setae. Abd. IX with 1 + 1 dorsal (1 + 2 in earlier instar), 1 pleural, 2 sternal setae.

MATERIAL EXAMINED. HEARD I.: Spit Bay, sea level +, 31.I.1965, 1 larva, probably immature; Poly Gully, Winston Lagoon, sea level +, 2.II.1965, 2 larvae, immature (1 spn. slide mounted), (P. Temple).

Genus **Antarctonesiotes** Jeannel

Setal index as Table 1.

Head more or less quadrate, with sides straight, subparallel; postoccipital condyles acute angled; *des* 3 not in contact with frontal suture. Antennal cone $1/2$ the width of basal cushion, weakly convex. Clypeus with sensillum between and level with setae.

Labrum truncate in front, not lobed, with paired sensilla placed basad of posterior setae. Tormae dark, expanded at base, subparallel. Mandibles slender, with apical and accessory teeth well developed. Epi- and hypopharyngeal linings with large spicules in addition to usual armature. Postlabium divided by oblique furrows. Maxilla with lacinia strongly sclerotised except for apex.

Pronotum with 2 major setae. All spiracles circular, with outer margin obscurely lobed and with airtubes directed dorsad. Anus terminal, 4-lobed.

Antarctonesiotes gracilipes C. O. Waterhouse Fig. 9–17, 21–23.

Head width 1.0 mm.

Head and labrum dark smoky brown. Clypeus colorless. Mandibles black. Prothoracic shield dark smoky brown; sclerotisation on other thoracic lobes paler smoky brown. Clypeal setae microscopic.

Major postdorsal setae as long as width of fold. Dorsopleural lobes with major seta $5 \times$ longer than minor seta. Spiracles with airtubes $2 \times$ peritreme. Abd. IX with 1 + 1 dorsal, 1 + 1 pleural, 2 sternal setae.

MATERIAL EXAMINED: HEARD I.: Spit Bay, sea level +, 31.I.1965, 1 larva; Poly Gully, Winston Lagoon, sea level +, 2.II.1965, 1 larva; under cone, S. Barrier, ± 600 m, 8.II.1965, 4 larvae (1 spn. slide mounted) (P. Temple). KERGUELEN I.: Port Jeanne d'Arc, 31.I.1965, 1 larva (M. Hay).

Genus **Ectemnorhinus** Waterhouse

Setal index as Table 1.

Emden's generic definition is extremely detailed and includes some characters which, being common

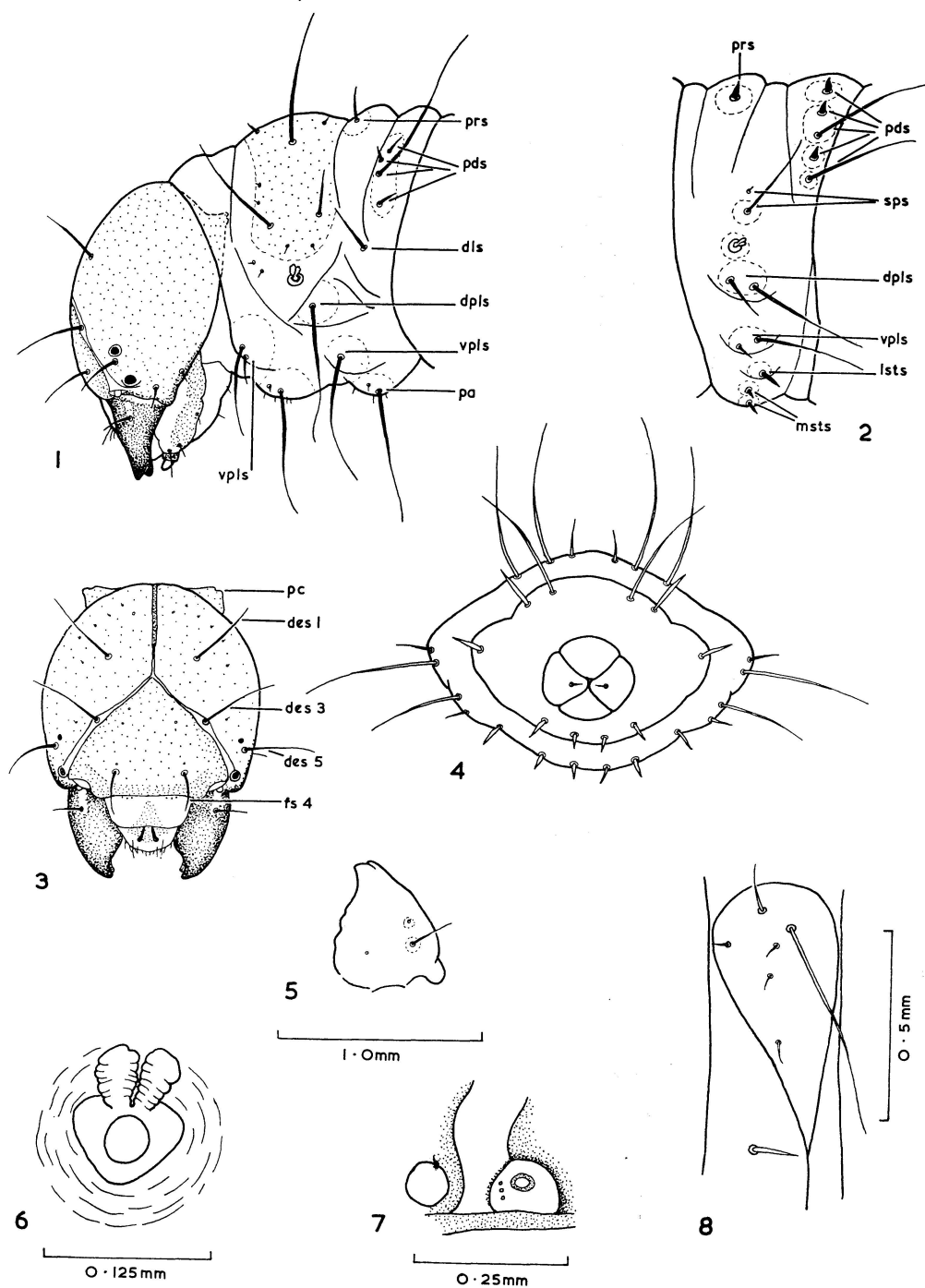


Fig. 1-8. Larva of *Canonopsis sericeus*: 1, head and thoracic segments I, II; 2, abdominal segment V; 3, head; 4, abdominal segments VIII, IX, X; caudal view; 5, mandible, outer side; 6, thoracic spiracle; 7, right antenna and cornea; 8, thoracic pedal and mediosternal areas. Abbreviations: prs, prodorsal setae; pds, postdorsal setae; dls, dorsolateral setae; dpls, dorsopleural setae; vpls, ventropleural setae; pa, pedal area; sps, spiracular setae; lsts, laterosternal setae; msts, mediosternal setae; pc, postoccipital condyle; des, dorsal epicranial setae; fs, frontal setae.

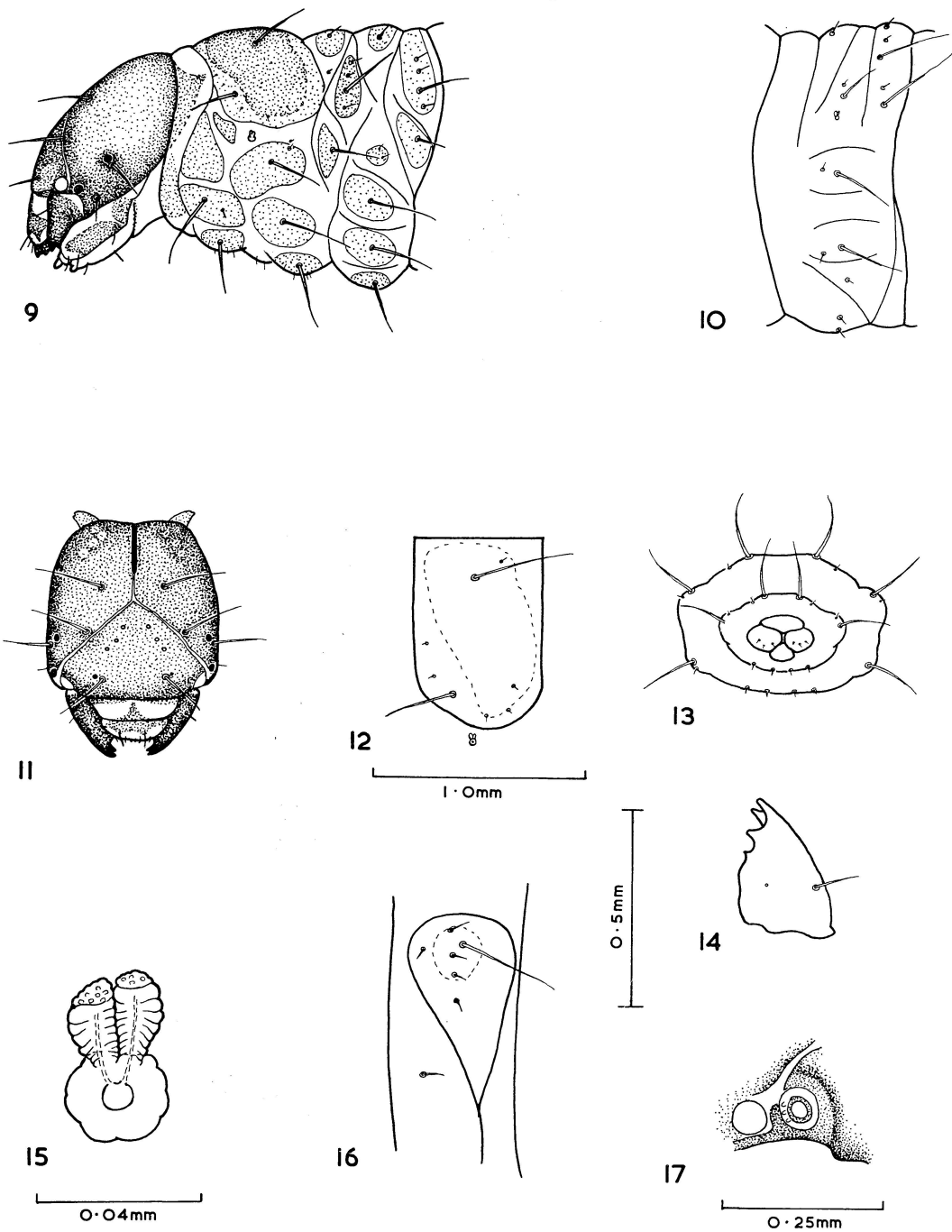


Fig. 9-17. Larva of *Antarctonesiotes gracilipes*: 9, head and thorax; 10, abdominal segment V; 11, head; 12, diagrammatic view of pronotum; 13, abdominal segments VIII, IX, X, caudal view; 14, mandible, outer side; 15, thoracic spiracle; 16, thoracic pedal and mediosternal areas; 17, right antenna and cornea.

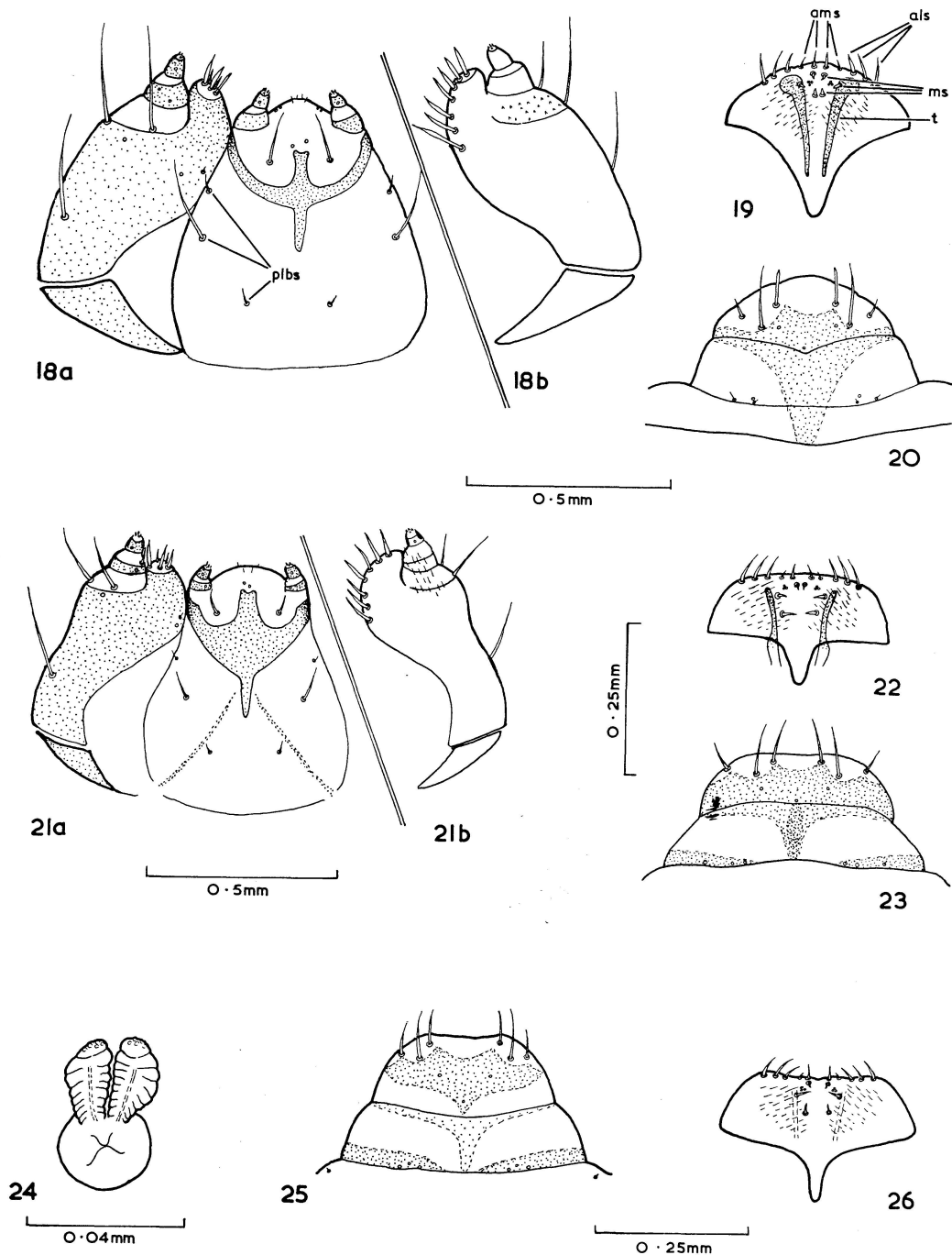


Fig. 18-20. Larva of *Canonopsis sericeus*: 18, maxilla and labium. a, ventral view; b, dorsal view; 19, epipharyngeal lining; 20, clypeus and labrum. Fig. 21-23. Larva of *Antarctonesiotes gracilipes*. 21, maxilla and labium. a, ventral view; b, dorsal view; 22, epipharyngeal lining; 23, clypeus and labrum; Fig. 24-26. Larva of *Ectemnorhinus grisescens*. 24, thoracic spiracle; 25, clypeus and labrum; 26, epipharyngeal lining. Abbreviations; plbs, postlabial setae; ams, anteromedian setae; als, anterolateral setae; ms, median spines; t, tormae.

to the 3 genera examined, have now been transferred to that of the subfamily.

The labral tormae and the thoracic spiracles provide the only observed differences between *Ectemnorhinus* and *Antarctonesiotes* likely to be of generic significance. The tormae were not mentioned by either Emden or Jeannel. These rods, usually tough and heavily pigmented, which provide bracing between the labrum and epipharyngeal lining, are pliable and colorless in *E. grisescens*. The spiracles are evenly rounded.

The alimentary canal should provide further distinctive characters.

***Ectemnorhinus grisescens* (Enderlein)** Fig. 24-26.

Head width 1.25 mm.

Head, labrum and prothoracic shield light red-brown. Sclerotisation on other thoracic lobes paler. Clypeus colorless; setae microscopic.

Major postdorsal setae $1.5\times$ longer than width of fold (measured on Abd. V). Dorsopleural lobe with major seta $8\times$ longer than minor seta. Abd. IX with 1 + 1 dorsal, 1 + 1 pleural, 2 sternal setae. Spiracles with airtubes $2\times$ width of peritreme.

MATERIAL EXAMINED. HEARD I. Poly Gully, Winston Lagoon, sea level +, 2.II.1965, 2 larvae (1 spn. slide mounted) (P. Temple).

PUPAE

Setae tuberculate, coarsely tapered, often spinelike. Antennae with theca of club smooth. Primary pterotheca (elytra) smooth. Thoracic spiracle circular, hidden beneath prothoracic fold. Legs with 2 femoral and 1 minute tarsal setae. Rostrum with lateral, epistomal and mandibular setae present. All sternal and pleural folds bearing at least 1, usually 2, setae. Abdominal setae becoming progressively longer and more spinelike towards terminal segments. Pseudocerci not developed.

***Canonopsis sericeus* C. O. Waterhouse** Fig. 27-30.

Approximate size (distorted specimen) 9.0×5.0 mm.

Setae red-brown, mostly tuberculate, stout, spinelike, coarsely tapered. Rostrum reaching to midway along fore tarsi. Antennae reaching apex of fore femora. Primary pterotheca slightly pointed at apex. Secondary pterotheca (hind wing) $1/4$ length of primary. Scutellum protruding. Abdominal spiracles dark margined.

Setae in ventral view: Head with 1 strong vertical; 1 strong, 2 weak orbitals; 1 strong, 1 very weak supraorbitals; 1 strong postantennal; 1 weak lateral; 2 weak rostrals; 3 very weak epistomals; 2 very weak mandibulars.

Setae in dorsal view: Pronotum with 2 moderate apicals; 1 very strong (broken in specimen), 1 weak laterals; 1 anterior, 1 posterior discals; 2-3 moderate basals. Meso- and metanotum each with 4 mounted on a tubercle. Abdominal segments each with normal complement of 5 postdorsals of more or less equal size; small or minute prodorsal; 1 weak, 1 strong spiracular.

MATERIAL EXAMINED. HEARD I.: Spit Bay, sea level +, 31.I.1965, 1 pupa (P. Temple).

***Ectemnorhinus grisescens* (Enderlein)** Fig. 31-34.

Size 7.0×3.5 mm.

Setae red-brown. Rostrum reaching to midway along fore tarsi. Antennae reaching apex of middle femora. Primary pterotheca rounded at apex. Secondary pterotheca $1/3$ length of primary. Scutellum flat. Abdominal spiracles inconspicuous.

Setae in ventral view: Head with 1 strong vertical; 1 strong, 3 very weak orbitals; 2 weak supraorbitals; 1 strong postantennal; 3 rostrals, 1 epistomal, 1 mandibular, all small and apparently variable. Segment IX with 2 strong setae mounted laterally on a short but pointed tubercle.

Setae in dorsal view: Pronotum with 2 moderate apicals; 1 strong lateral; 1 strong anterior, 1 weak posterior discals; 3 moderate basals. Meso- and metanotum each with 4 clustered tuberculate setae. Abdominal segments with postdorsals 1, 3, 5 stronger than 2, 4; prodorsals very small. Abd. IX with 2 strong setae mounted laterally on a short but pointed tubercle similar to that of *Canonopsis*.

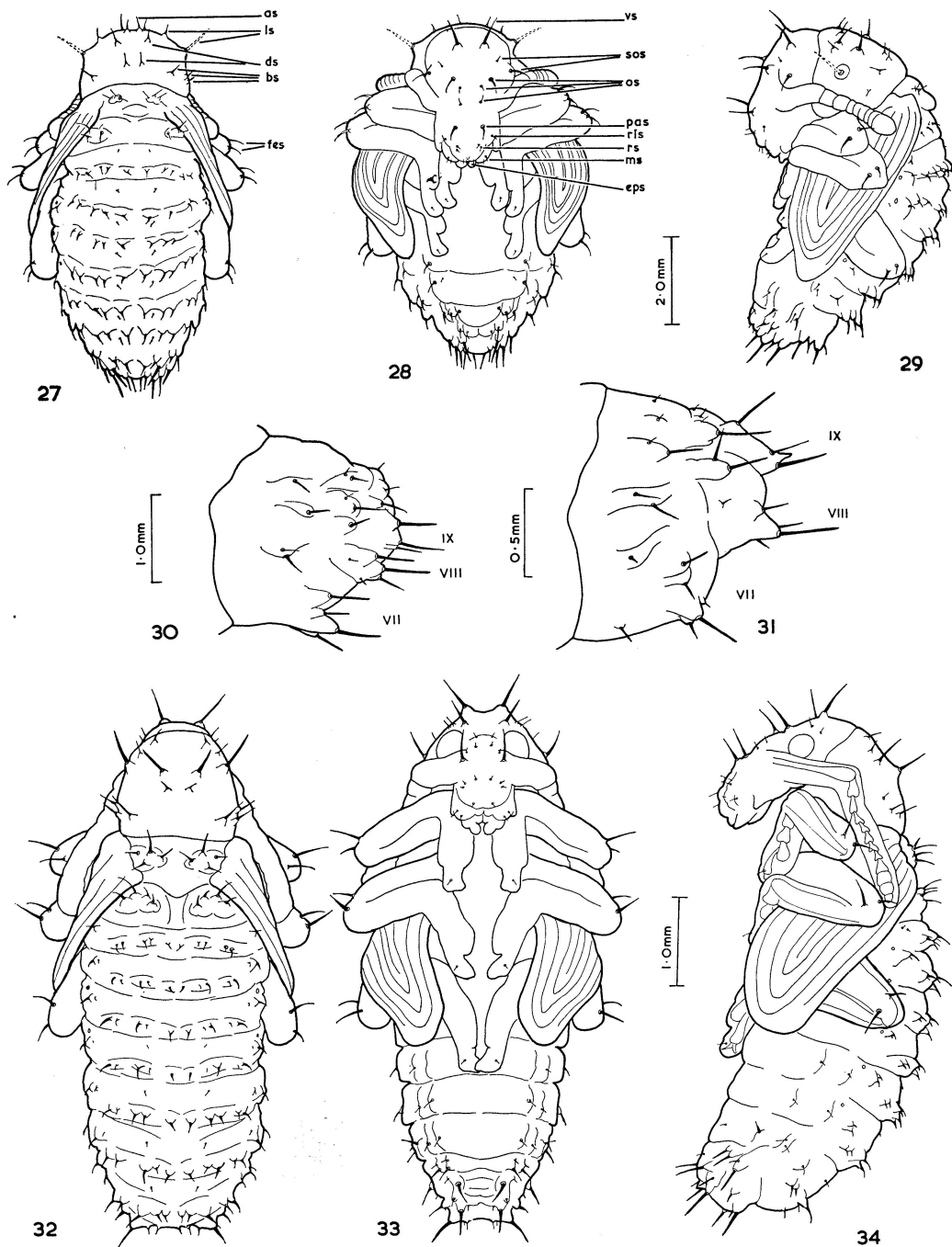


Fig. 27-30. Pupa of *Canonopsis sericeus*: 27, dorsal view; 28, ventral view; 29, lateral view; 30, abdominal segments VII, VIII, IX. Figs. 31-34. Pupa of *Ectemnorhinus grisescens*: 31, abdominal segments VII, VIII, IX; 32, dorsal view; 33, ventral view; 34, lateral view, showing teneral adult. Abbreviations: as, apical setae; ls, lateral setae; ds, discal setae; bs, basal setae; fes, femoral setae; vs, vertical setae; sos, supraorbital setae; os, orbital setae; pas, postantennal setae; rs, rostral setae; rls, rostral lateral setae; ms, mandibular setae; eps, epistomal setae.

MATERIAL EXAMINED. HEARD I.: Spit Bay, sea level +, 31.I.1965, 1 pupa; S. Barrier, under cone, ± 600 m, 8.II.1965, 1 pupa (P. Temple).

A smaller (5.0 mm) pupa from S. Barrier, 600 m, which differs from those described by having a lightly sclerotised tip to the pterotheca and stronger, darker setae, may belong to *A. gracilipes* but there is insufficient evidence on one specimen only, for its separation from *E. grisescens*.

The pupa of *M. brevis* was not examined. According to Brown, the figure of *E. crozetensis* pupa in Womersley's report should properly belong to *M. brevis*. The only good character which can be gleaned from it is that of the long setae which are conspicuous, as they are in the larva.

DISCUSSION

The New Zealand and Indian Ocean groups of subantarctic islands are each inhabited by a single subfamily of adelognathous weevils; the former by the Leptopiinae, the latter by the Ectemnorhininae. The larvae of these two subfamilies however, show no evidence of close relationship, having more points of difference than of similarity. Both groups exhibit circular, bicameral spiracles, an antennal seta (*fs* 5) which is small or absent, and both lack an endocarinal line. But in the Leptopiinae of Adams Island, at present being studied, the posterior cephalic margin is entire, antennae are oval, ocelli are small and without raised corneae, mandibles lack accessory teeth and the cephalic setae are less reduced.

There is more similarity in the pupal stage where the presence of prodorsal, sternal and pleural setae additional to the normal complement, and the absence of pseudocerci, are common to both populations.

Adult Ectemnorhininae occupy a somewhat anomalous position among Adelognatha by reason of the absence of accessory, deciduous cusps in the emergent weevil and hence the lack of a mandibular scar. In the pupa, although hind wing vestiges are considerably larger than in the adult, no vestigial cusps can be seen, but the theca of the mandible does bear an important seta. Since a seta is present in this position on all adelognathous pupae examined (9 genera) but is absent in phanerognathous pupae (37 genera examined), it would appear to be associated with the cusp rather than with the mandible itself. This suggests, in Ectemnorhininae, the loss of the cusps through regression, a trend not uncommon among isolated communities living in a rigorous environment. It is exhibited, for instance, by the loss of eyes and pigment in cave dwelling Coleoptera.

Jeannel has referred to Ectemnorhininae as "Otiorrhynchides" in which the adelognathous character has not yet developed. If the "loss" hypothesis is accepted however, it follows that the subfamily is more specialised than the bulk of Adelognatha and not more primitive.

REFERENCES

- Anderson, W.H. 1947. A terminology for the anatomical characters useful in the taxonomy of weevil larvae. *Proc. ent. Soc. Wash.* **49**: 123-32.
- Brown, K. G. 1964. The insects of Heard Island. *A. N. A. R. E. Rep.* (B) **1** (Zoology): 1-39.
- Emden, F. I. van. 1952. On the taxonomy of Rhyncophora larvae: Adelognatha and Alophinae (Insecta: Coleoptera). *Proc. zool. Soc. Lond.* **122**: 651-795.
- Jeannel, R. 1940. Croisiere du Bougainville aux Iles Australes Francaises. *Mem. Mus. natn. Hist. nat., Paris. n.s.* **14**: 326 pp.
- Kuschel, G. 1970. Coleoptera: Curculionidae of South Georgia and Heard Island. In *Pacif. Ins. Monogr.* **23**: 255-60. (J. L. Gressitt, Editor)
- May, B. M. 1967. Immature Stages of Curculionidae. 1. Some Genera in the Tribe Araucariini (Cossoninae). *N. Z. J. Sci.* **10**: 644-60.
- Thomas, J. B. 1957. The use of larval anatomy in the study of bark beetles (Coleoptera: Scolytidae). *Can. Ent.* **89**: (Suppl): 3-45
- Womersley, H. 1936. Coleoptera. *B. A. N. Z. Antarc. Res. Exped.* (B) **4**: 23-36.