

## ENTOMOLOGY OF THE AUCKLANDS AND OTHER ISLANDS SOUTH OF NEW ZEALAND: IMMATURE STAGES OF CURCULIONOIDEA

By **Brenda M. May**<sup>1</sup>

**Abstract:** The larvae of 19 curculionid and 2 anthribid weevil species inhabiting the Subantarctic Islands of New Zealand, and the pupae of 9 of them, are described and figured. Subfamily and generic definitions are included and a key is given for larval separation.

### INTRODUCTION

The larvae presently available for study have resulted from collections made on Campbell Island in December 1961, by Dr J. L. Gressitt of the Bishop Museum, Honolulu; on Auckland Islands, in January 1966, by Dr G. Kuschel of Entomology Division, D.S.I.R., Nelson, New Zealand, P. M. Johns of Canterbury University, Christchurch, New Zealand and K. A. J. Wise of the War Memorial Museum, Auckland, New Zealand; and on Snares Islands by P. M. Johns in January 1967. Dr Kuschel visited Antipodes Island in 1969.

The Snares are situated 190 km south of the South Island of New Zealand, the Auckland Islands, 290 km further south, on latitude 51° 30'S and Campbell Island, 165 km further again to the southeast. The Antipodes lie in longitude 178° 43'E and latitude 49° 41'S.

The assemblage of larvae is not complete, but most of the genera as given by Kuschel (1964, 1971) are represented. A list of the known species indicating which larvae have been examined, their habitats and their distribution between island groups, is given in Table 1. The two representatives of Anthribidae are included.

Of the larvae not yet discovered on these islands, *Pentarthrum spadiceum* Broun can be described from larvae taken on Big South Cape I, southwest of Stewart I. *Bryocatus serripes* (Kuschel) can be referred to an almost identical unnamed species from Arthurs Pass on the mainland of New Zealand. The genus *Exeiratus* is defined with reference to *E. setarius* Broun from Big South Cape I and *Phrynixus* to other species in the *astutus*-complex, from the mainland. Larval characters of *Catoptes brevicornis brevicornis* (Broun) from Big South Cape I have been used for purposes of separation in the absence of larvae of *C. brevicornis australis* (Kuschel). *Notonesius* Kuschel and *Nestrius* Broun are thus the only genera which cannot be included in the key. Identification in certain groups is not as decisive as I would wish, since reared material, providing head capsules for comparison with those of collected larvae, is lacking.

The system of larval nomenclature and chaetotaxy used is substantially that of Thomas (1957) and is discussed in two previous papers (May 1967, 1968). Indices of larval setae (Table 2) and of pupal setae (Table 3) have been prepared for ease of comparison and to avoid tedious repetition in the descriptions. The terminology used to describe pupae is based on that of Scherf (1964).

### MATERIALS AND METHODS

Submature final instar specimens, if available, are chosen for detailed study in preference to prepupae because the large quantity of fat body deposited before pupation tends to make dissection

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Table 1. Species, distribution, habitat.

Known Species	Examined or Not	Antip.	Campb.	Auck.	Snar.	Habitat
<b>Anthribidae</b>						
1. <i>Cacephatus aucklandicus</i>	+	—	—	+	+	decaying wood
2. <i>Lichenobius littoralis</i>	+	—	—	—	+	crustose lichen on shore rocks
<b>Curculionidae</b>						
Cossoninae						
3. <i>Exeiratus laqueorum</i>	—	—	—	—	+	—
4. " <i>turbotti</i>	—	—	—	+	—	—
5. <i>Pentarthrum spadiceum</i>	+	—	—	+	+	dead wood
Cryptorhynchinae						
6. <i>Pachyderris punctiventris</i>	+	—	—	+	?	dead wood
7. <i>Notacalles planidorsis</i>	+	—	+	+	+	dead branchlets <i>Hebe elliptica</i>
8. " <i>pivicentris</i>	+	—	+	+	—	dead branchlets, various
9. " <i>kronei</i>	+	—	+	+	—	dead branchlets
10. " <i>latitarsis</i>	—	—	—	+	—	—
11. " <i>ferrugo</i>	—	—	—	+	—	—
12. " <i>suillus</i>	—	—	+	+	—	—
13. " <i>multisetosus</i>	+	—	+	+	—	dead branchlets
Hylobiinae						
14. <i>Hadramphus stilbocarpae</i>	+	—	—	—	+	in rhizomes of <i>Stilbocarpa robusta</i>
Phrynixinae						
15. <i>Notonesius aucklandicus</i>	—	—	—	+	—	—
16. <i>Phrynixus laqueorum</i>	—	—	—	—	+	decaying wood
Erirhininae						
17. <i>Bryocatus serripes</i>	—	—	+	—	—	probably below moss
Eugnominae						
18. <i>Pactolotypus subantarcticus</i>	—	—	+	+	—	—
19. " <i>depressirostris</i>	+	—	—	+	—	dead branchlets of <i>Hebe elliptica</i>
Tychiinae						
20. <i>Peristoreus innocens</i>	+	—	+	+	+	flowers and green fruits of <i>Dracophyllum</i> <i>longifolium</i>
21. <i>Notinus cordipennis aucklandicus</i>	+	—	—	+	—	blotch leaf mines on <i>Coprosma</i> spp.
Rhytirhininae						
22. <i>Gromilus laqueorum</i>	—	—	—	—	+	—
23. " <i>insularis insularis</i>	+	—	—	+	—	among roots
" <i>robustus</i>	+	—	+	—	—	among roots
" <i>antipodarum</i>	+	+	—	—	—	among roots
24. " <i>exiguus</i>	+	—	+	—	—	among roots
25. " <i>veneris veneris</i>	—	—	—	+	—	—
" <i>setarius</i>	+	—	+	—	—	among roots
26. " <i>aucklandicus</i>	—	—	—	+	—	—
27. " <i>cockaynei</i>	—	—	—	+	—	—
28. " <i>narinosus</i>	—	—	—	+	—	—
29. " <i>fallai</i>	+	—	—	+	—	among roots
30. <i>Nestrius laqueorum</i>	—	—	—	—	+	—
Leptopiinae						
31. <i>Catoptes brevicornis australis</i>	—	—	—	—	+	among roots
32. <i>Heterexis sculptipennis</i>	+	—	—	+	—	among roots
33. " <i>seticostatus</i>	—	—	+	—	—	—
34. <i>Oclandius vestitus</i>	—	—	—	—	+	—
35. " <i>cinereus</i>	+	—	+	+	—	among roots
36. " <i>laeviusculus</i>	+	—	—	+	—	among roots
37. <i>Catodryobiolus antipoda</i>	+	—	+	+	—	among roots

difficult and to obscure the internal structures. After general external examination, the material is prepared as follows:

1. The lower mouthparts are separated, but not completely severed, from the head, using a small scalpel made from a sliver of razor blade.
2. The head (including lower mouthparts) is cut off, avoiding damage to the postoccipital condyles.
3. The lower mouthparts and mandibles can now be removed from the head capsule. Preliminary drawings are made at this stage.
4. The cuticle is cut along the mid lines of dorsum and venter, with a pair of fine corneal scissors, leaving the body contents intact. The halves can then be pulled apart and the alimentary canal examined.
5. All parts except the alimentary canal are prepared as slide mounts by the following method:
  - (a) Heat in 10% KOH until cleared
  - (b) Wash in distilled water
  - (c) Stain in 100% ethanol to which a few drops of chlorazol black solution have been added
  - (d) Wash in 100% ethanol
  - (e) Mount in Euparal. Minute knobs of jelutong (chewing gum) are used to support the cover slip over head capsules. This material is easily pressed to the required depth and remains inert provided no direct heat is applied.
  - (f) Dry at 30°C.

#### KEY TO LARVAE

Larvae of the family Anthribidae, as represented in the New Zealand Subantarctic Islands, may be recognised from the following couplet.

- Legs (lacking claws) present. Frons bearing numerous setae. Tormae (labral bracing) consisting of lateral scleromes.....Anthribidae
- Legs absent. Frons bearing 10 or fewer setae. Tormae consisting of a pair of paramedian rods .....Curculionidae

#### CURCULIONIDAE

1. Antenna transverse, much shorter than wide (Fig. 125). Abdominal segments I-VII with both spiracular setae above spiracle on middle fold.....(Adelognatha) Leptopiinae...2
- Antenna variously shaped, but always as long, or longer, than wide. Abdominal segments I-VII with location of major spiracular seta varying progressively from middle fold to postdorsal fold .....(Phanerognatha)...5
2. Abdominal segment IX with pleural lobes sclerotised and extended, reducing dorsal and sternal areas, and with inner margin sharply defined; dorsum with 2 macrochaetae.....3
- Abdominal segment IX, if sclerotised, not as above; dorsum with 3 macrochaetae.....4
3. Abdominal segment VIII with pleural and ventral lobes pigmented. Anal lateral lobes with 2 macrochaetae (Fig. 139).....**Catodryobiolus antipoda**
- Abdominal segment VIII with pleural and ventral lobes unpigmented. Anal lateral lobes with 1 macrochaeta (Fig. 141).....**Catoptes brevicornis**
4. Abdominal segment IX with middle pair of dorsal setae more widely separated than posterior pair (Fig. 133); pleural lobe sclerotised.....**Heterexis sculptipennis**
- Abdominal segment IX with middle pair of dorsal setae less widely separated than posterior pair (Fig. 130); pleural lobe not sclerotised.....**O. laeviusculus; O. cinereus**
5. Hypopharyngeal bracon wholly or partially pigmented.....6

- Hypopharyngeal bracon colorless.....12
6. Labrum heavily pigmented; longer than wide (Fig. 21). Anterolateral setae of epipharyngeal lining arranged longitudinally (Fig. 19).....7
- Labrum lightly pigmented; wider than long. Anterolateral setae of epipharyngeal lining arranged transversely.....8
7. Abdominal spiracles unicameral (Fig. 17). Frons with 4 major setae.....**Exeiratus setarius**
- Abdominal spiracles bicameral. Frons with 2 major setae.....**Phrynixus** spp.
8. Posterior pair of postlabial setae less widely separated than median pair (Fig. 98a). Most minor abdominal setae coarse and spinelike.....**Gromilus** spp...9
- Posterior pair of postlabial setae more widely separated than median pair (Fig. 4a). All minor setae slender.....**Pentarthrum spadiceum**
9. Cuticle of pedal lobes unpigmented.....10
- Cuticle of pedal lobes with a small light brown patch (Fig. 96) .....probably **G. fallai**
10. Body cuticle spiculate on lobes and folds; sclerotised around setae (Fig. 91, 92).....11
- Body cuticle without spicules; not sclerotised around setae.....**G. veneris setarius**
11. Sclerotisation around setal bases pigmented in mature larvae.....**G. exiguus**
- Sclerotisation around setal bases unpigmented.....**G. insularis**
12. Antenna hemispherical, with apex smoothly rounded. Postoccipital condyles conspicuous through cuticle.....**Bryocatus** near **serripes**
- Antenna variously shaped, with apex pointed. Postoccipital condyles not, or scarcely visible through cuticle.....13
13. Pedal lobes with 1 macrochaeta. Posterior postlabial setae less than 0.25 length of median setae (Fig. 77a, 88a).....14
- Pedal lobes with more than 1 macrochaeta. Posterior postlabial setae at least 0.5 length of median setae .....15
14. Head capsule dark, smoky brown; posterior margin notched almost to frontal suture (Fig. 81). Mandibles with 3 teeth.....**Notinus cordipennis aucklandicus**
- Head capsule yellow; posterior margin only slightly notched. Mandibles with 2 teeth.....**Peristoreus innocens**
15. Spiracles inconspicuous; airtubes unpigmented. Head light red brown or paler.....16
- Spiracles conspicuous; airtubes pigmented (Fig. 117). Head dark brown...**Hadramphus stilbocarpae**
16. Labral tormae conjoined proximally. Posterior pair of postlabial setae less widely separated than the median pair.....17
- Labral tormae entirely separate, parallel. Posterior pair of postlabial setae more widely separated than the median pair.....unidentified cossinine larva. (Fig. 13-16)
17. Frons with 5 macrochaetae. Mandibular setae aligned transversely. Anus 4-lobed.....18
- Frons with 2 macrochaetae. Mandibular setae aligned longitudinally Anus 6-lobed (Fig. 57).  
.....**Pactolotypus depressirostris**
18. Thoracic spiracle ovate; much larger than abdominal spiracles (Fig. 29). Head creamy white. Posterior ventriculus of alimentary canal with 4 coils; gastric caeca present (Fig. 30) .....**Pachyderris punctiventris**
- Thoracic spiracle circular; similar in size to abdominal spiracles. Head light red brown. Posterior ventriculus with 2 coils; gastric caeca lacking.....**Notacalles** spp...19
19. Pedal areas with 5 setae. Frontal projection covering less than 0.5 length of antenna, viewed from above (Fig. 41).....20
- Pedal areas with 6 setae. Frontal projection covering more than 0.5 length of antenna (Fig. 35, 45).....**N. planidorsis**-group
20. Airtubes of spiracles very long, approximately  $10 \times$  width of peritreme; curved in an inverted U-shape (Fig. 40).....**N. multisetosus**
- Airtubes of spiracles shorter, approximately  $5 \times$  width of peritreme; only slightly curved (Fig. 39).....**N. kronei**

## ANTHRIBIDAE

The assemblage of characters which define larval Anthribidae has been adequately summarised by Gardner (1936), Emden (1938) and Anderson (1947). From the work of these authors and from my own examination of a rather limited range of species, it is apparent that the characters which are useful in Curculionidae are not necessarily so in Anthribidae.

Setae, being for the most part fine and numerous, lose much of their importance. The antennae, which are small and narrow, are constant in shape. The postoccipital condyles are represented only by a ridge and neither the terminal segments of the abdomen nor the alimentary canal appear to show much variation. On the other hand, the mouthparts and other structures of the head capsule are more diverse and usually offer the means for discrimination, even at specific level. The epipharyngeal, and often the labral, setae are similar to those of Curculionidae. There is also variation in the spiracles, in the legs, and in the micro-vestiture of the cuticle.

Genus *Cacephatus* Blackburn

Robust larvae with strong musculature, especially of thoracic segments. Pronotum not, or scarcely, pigmented. Head variable in color, with sides rounded, widest behind middle; posterior margin entire. Anterior ocellus distinct; posterior faint; a third, ventrally situated, ocellar spot is present on most specimens. Endocarinal line present. Clypeus quadrate, pigmented on basal 1/2. Hypopharyngeal bracon heavily pigmented along anterior margin and on median sclerome. Mandibles with 2 prominent apical teeth carried on an elongate projection; molar part with serrate cutting edge.

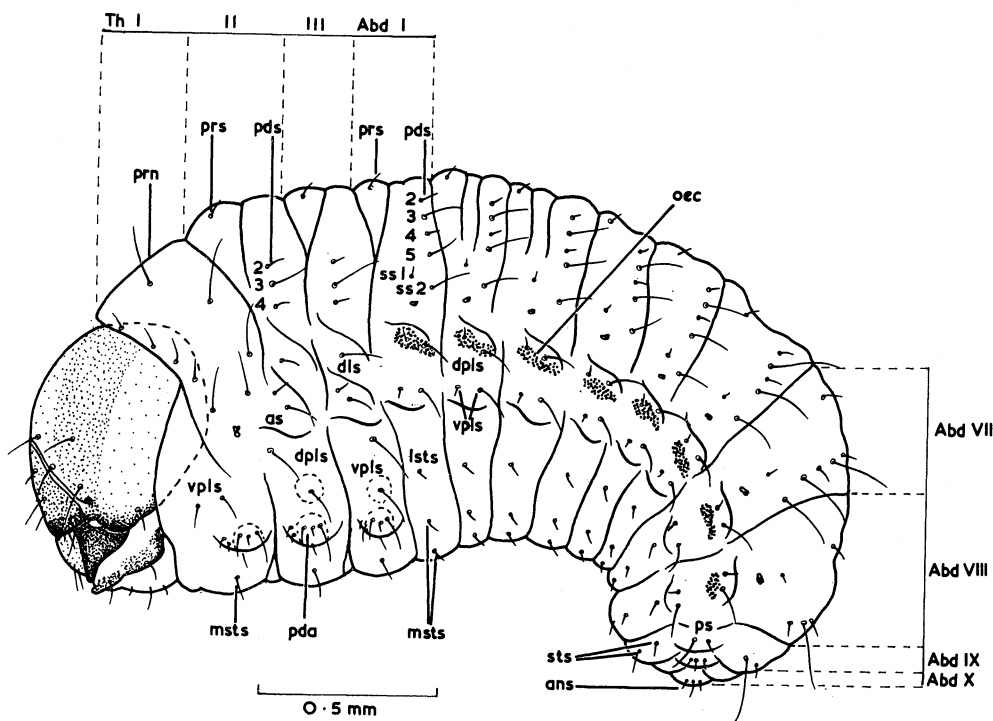


Fig. 1. Larva of *Pentarthrum spadiceum* Broun, Big South Cape I.

Labrum subcircular, heavily pigmented, bearing 4 setae. Epipharyngeal lining with 4 marginal setae, 3 paramedian pairs of short, dark setae with sensilli before and after the middle pair; proximally with 2 fan-shaped clusters of dark setae. Lateral tormae Y-shaped. Prementum with a pair each of dorsal and ventral setae; sclerite medially obsolete. Lacinia acute; spinal area bearing laminate setae.

Body cuticle microasperate with coarse spinules on sternal fold of Abd. IX. Legs with 2 segments of equal length, clothed with numerous pale, slender setae as long as those of the pedal lobe. Thoracic spiracle ovate with 2 very small, simple (not annulate) airtubes, directed dorsad. Abdominal spiracles much smaller, sub-circular, with small airtubes directed dorsad. Anus terminal, 4-lobed.

Alimentary canal: Proventriculus simple. Oesophageal caeca absent. Anterior ventriculus smooth, long and bulky, occupying 0.6 of the body cavity; posterior ectesion 0.5–0.25 width of anterior, with 1 coil. Gastric caeca lacking. Malpighian tubules evenly distributed around a slightly thickened ring, rejoining hind gut at final bend. Cryptonephridium well developed caudoventrally, beneath a pigmented rectal bracon in the form of an elongate loop.

**Cacephatus aucklandicus** (Brookes) Fig. 142–151.

Maximum size 7.0 × 2.5 mm. Head width 1.75 mm.

Body dense white, strongly and evenly curved, not much wider than head; pronotum not pigmented. Head deep yellow brown, paling to creamy white posteriorly. Labrum yellow brown. Epistoma, clypeus, genae and mandibles red brown. Hypopharyngeal sclerome rectangular with a median projection. Frontal suture distinct, narrow, not angled before apex, which is rounded. Coronal suture faint; 0.5 length of head. Endocarinal line 0.4 length of frons. Sternal fold of Abd. IX with coarse spinules usually interspersed with microspinules.

The northern *C. inornatus* (Sharp) has a pale head and a rounded hypopharyngeal sclerome.

*Biology.* *Cacephatus* species feed in dead wood which has started to decay.

*Material examined.* AUCKLAND ISLANDS: Ewing I, in dead *Olearia* branches, 15.I.1963, 13 larvae (P. M. Johns); Adams I, in dead wood, *Neopanax simplex*, 30.I.1966, 1 larva; in dead wood, *Hebe elliptica*, Fairchild's Garden, 20.I.1966, 7 larvae (G. Kuschel).

Genus **Lichenobius** Holloway

Larvae compact, with dense fat body. Head almost as wide as thorax, evenly rounded with posterior margin entire and bearing numerous, long, fine setae; sutures narrow but distinct. Ocelli absent. Mandibles tricuspid, the outer tooth being longer and more slender than the others, with 2 setae placed obliquely.

Labrum transversely oval, with 3 setae; lateral tormae acute. Epipharyngeal lining with 3 anterolateral and 2 anteromedian setae, on margin; 3 paramedian setae, well separated. Prementum with a pair each of dorsal and ventral setae.; sclerite scarcely visible. Maxilla with lacinia small, acute, bearing 11–12 dorsal, 5 ventral, blade-like setae in addition to fine hairs; spine slender, nearly as long as lacinia.

Legs 2-segmented, each segment bearing 6 long setae. All spiracles minute, circular, with 2 marginal, separated airtubes, directed dorsad. Anus terminal, with 4 equal lobes. The alimentary canal is similar, on a smaller scale, to that of *Cacephatus*. It has no distinctive features beyond the cryptonephridium which is well developed caudoventrally, and the pigmented, loop-shaped rectal bracon.

**Lichenobius littoralis** Holloway Fig. 152–159.

Maximum size 3.0 × 0.75 mm. Head width 0.5 mm.

Body tapering and strongly curved in terminal 1/3; yellow when alive, dense white in alcohol; pronotum unsclerotised; cuticle smooth; setae slender, pallid, short and sparse except on head and legs. Head smoky brown with epicranium darker than frons; epistoma, mandibles and labrum red brown; setal bases colorless but sensilli dark-rimmed; frontal suture not angled before apex which is rounded; coronal suture short, 0.3 length of head. Endocarinal line 0.5 length of frons. Hypopharyngeal sclerome transverse, quadrate, extended posteriorly in 2 divergent lobes.

*Biology.* The larvae live in the thin layer of grey-green lichen which encrusts the coastal rocks

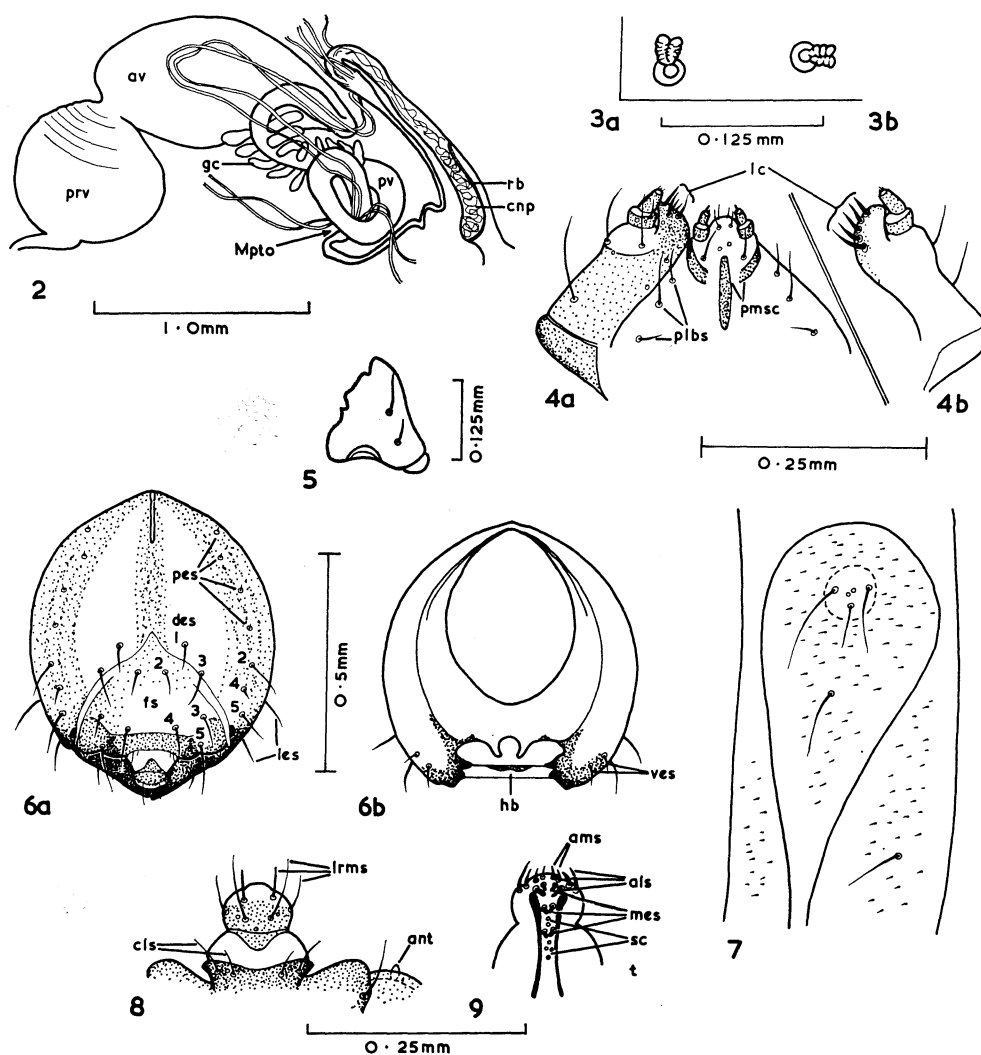


Fig. 2-9. Larva of *Pentarthrum spadiceum* Broun: 2, alimentary canal; 3, spiracles, showing alignment -a, thoracic; b, abdominal segment VIII; 4, maxilla and labium -a, ventral view; b, dorsal side of maxilla; 5, mandible, outer side; 6, head -a, dorsal view; b, ventral view; 7, thoracic pedal and mediosternal areas; 8, epistoma, clypeus, labrum and antenna; 9, epipharyngeal lining.

immediately above high water mark. This situation is exposed to salt spray, wind and extremes of temperature but the larval tunnels are protected by the hard texture of the lichen. A completed burrow is approximately 3 cm long, ending in a pupal chamber. The morphological response of these larvae to a rigorous environment is similar to that of *Bryocatus serripes* in alpine mosses, that is, reduction in numbers of setae and in size of spiracles, and melanic coloring of the head capsule.

*Material examined.* STEWART I: Big South Cape I, NE shore rocks, in crustose lichen, 8.II. 1969, 44 larvae (B. M. May).

*Remarks.* Adults of this species have been taken on Snares I by P. M. Johns.

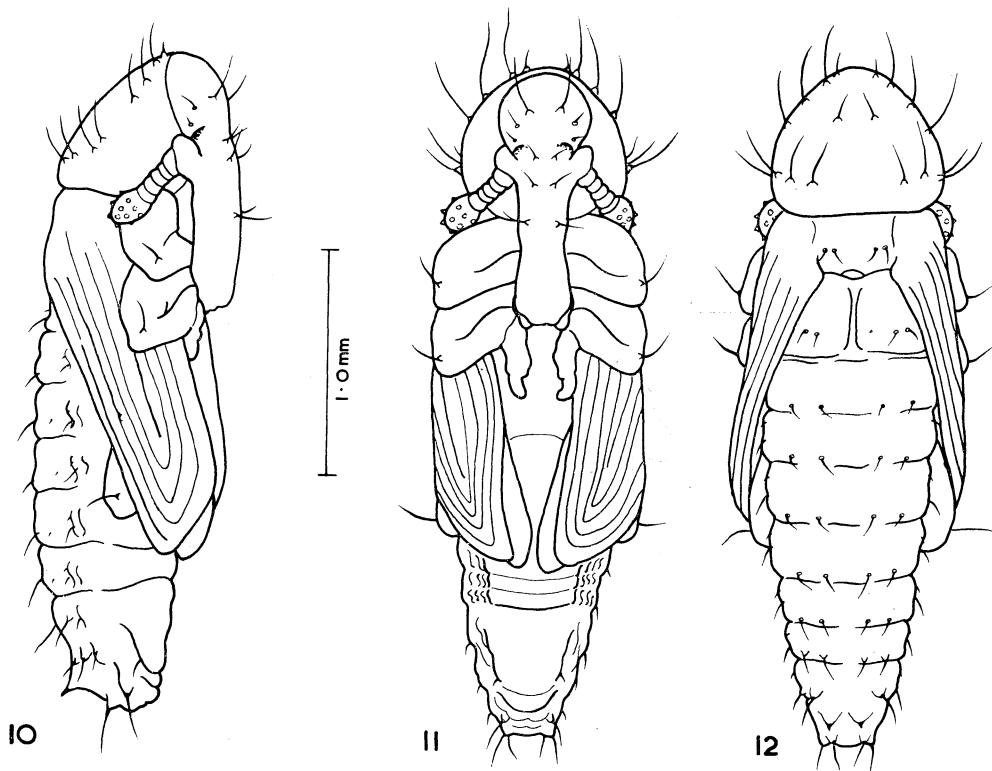


Fig. 10-12. Pupa of *Pentarthrum spadiceum* Broun, Big South Cape I: 10, lateral view; 11, ventral view; 12, dorsal view.

## CURCULIONIDAE

### Subfamily COSSONINAE

Anderson's (*loc. cit.*) definition of the subfamily in North America is adequate to cover the New Zealand group of cossonines when amended as follows:

Head free (except in *Pentarthrum*), usually as broad as long, evenly rounded to deeply emarginate posteriorly. Epicranium with 4 or 5 setae. Frons with a variable number of setae, *fs* 5 subequal to or longer than 4, never distinctly shorter. Epipharyngeal lining with 2 anteromedian and 3 median pairs of setae (difference in nomenclature only). Premental sclerite (labial trident) often weakly pigmented and medianly obsolete, posterior postlabial setae wider apart than the median (except in *Araucariini*). Mandibular setae arranged longitudinally. The usual numbers of body setae are variable in *Pentarthrum*. The dark subcutaneous patches visible laterally on each abdominal segment in most cossonines, conspicuous only in live or freshly killed larvae, are oenocyte clusters associated with the formation of the cuticulin layer (Wigglesworth 1950). Each patch, comprising an irregular series of large cells, set between the muscular layer and the fat body, is attached to a branch of the tracheae. The cells are dark colored in a few other weevil groups such as *Cryptorhynchinae* and *Eugnominae*, but are otherwise unpigmented and not easily distinguished from the fat body.



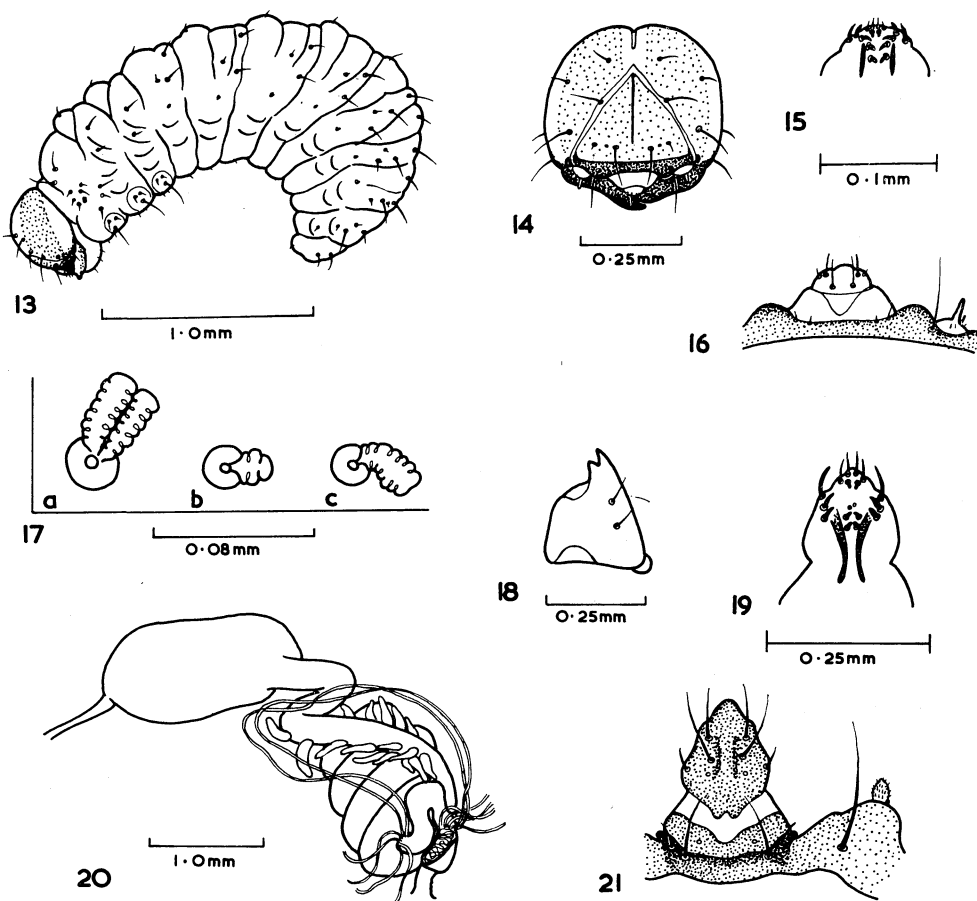


Fig. 13-16. Unidentified cossonine: 13, larva; 14, head; 15, epipharyngeal lining; 16, epistoma, clypeus, labrum and antenna. 17-21. Larva of *Exeiratus setarius* Broun, Big South Cape I: 17, spiracles -a, thoracic; b, abdominal segment IV; c, abdominal segment VIII; 18, mandible, outer side; 19, epipharyngeal lining; 20, alimentary canal; 21, epistoma, clypeus, labrum and antenna.

#### Genus *Exeiratus* Broun Fig. 17-21

Setal index as in Table 1 (taken from *E. setarius* Broun).

Body robust, evenly curved. Cuticle almost transparent, micro-asperate, more coarsely on sternal lobes of Abd. VIII and IX. Head subspherical with posterior margin scarcely indented; postoccipital condyles inconspicuous; sutures indistinct; endocarinal line weak. Anterior ocelli large, with corneae. Antennae acute, pubescent. Mandibles bidentate, without accessory teeth but with median cutting edge strongly produced to form a shoulder, as in Phrynixinae. Hypopharyngeal bracon completely pigmented. Labrum diamond-shaped, completely pigmented, longer than wide. Tormae bowed with apices divergent. Epipharyngeal lining with anterolateral setae arranged longitudinally, well away from margin. Premental sclerite distinct with anterior median extension spatulate. Posterior and median pairs of postlabial setae equally separated. Thoracic spiracle circular, bicameral, with airtubes directed obliquely dorsad. Abdominal spiracles much smaller, unicameral, directed caudad. Anus terminal, 4-lobed.

Alimentary canal (Fig. 20): Proventriculus simple. Oesophageal caeca absent. Posterior ventriculus abruptly becoming 0.25 width of anterior part; extremely elongated, arranged in 4–5 tight coils. Gastric caeca finger-shaped. Origin and bases of Malpighian tubules simple. Hind gut and cryptonephridium short. Rectal bracon a short loop, unpigmented.

*Remarks.* The larvae of *Exeiratus*, as the adults, are not typical cossonines. In company with *Phronira* Broun, the mouthparts are more like those of Phrynixinae, with which they share the same habitat, in the unrotted parts of damp, dead wood. Certain other characters, however, including the alimentary canal, are not in agreement with that subfamily. The unicameral type of spiracle is not uncommon among Cossoninae.

#### Genus *Pentarthrum* Wollaston

Size  $3.0 \times 1.0$  mm to  $4.0 \times 1.5$  mm. Body gently curved, sometimes expanded anteriorly giving a hump-backed appearance.

Head lightly pigmented, variable in shape, partially retracted into prothorax; sutures only moderately distinct; endocarinal line absent; posterior margin entire or slightly indented. Ocelli variable. *des* 1 and 2 situated well forward, level with frontal apex. Frontal seta 1 absent. Both clypeal setae distinct. Hypopharyngeal bracon pigmented or not. Mandibles with median grinding ridge but sometimes with subapical tooth lacking; setae arranged longitudinally. Labrum with lateral setae as long or longer than anterior setae. Epipharyngeal lining with sensilli clusters above and below the proximal pair of median setae; tormae subparallel or convergent. Maxilla with 10 lacinial setae evenly disposed between dorsal and ventral sides. Labial palpi with an unusually large apical sensory process. Postlabial setae all distinct, the posterior pair being more widely separated than the median pair. Premental sclerite weak. Pronotum and prosternum lightly sclerotised but scarcely pigmented; strongly transverse. Abdominal segments II to VII with 4–5 dorsal folds. Setae on postdorsal folds reduced in number. Pedal areas with 5–6 setae. Spiracles small, circular, bicameral. Anus 4-lobed, terminal.

Alimentary canal: Proventriculus simple or expanded. Oesophageal caeca absent. Anterior ventriculus smooth, bulky. Posterior ventriculus arranged in a transverse coil, followed by one and a half longitudinal coils, the latter bearing finger-shaped caeca in a single row on each side. Malpighian tubules with bases and point of origin simple; arising within the posterior coil and reuniting with the hind gut in front of the final bend. Cryptonephridium expanded caudoventrally to form a foot. Rectal bracon pigmented or colorless, shaped as an elongate loop.

*Biology.* The larvae live in dead, dry, sound wood or thick bark. Their tunnels are filled with compacted frass which is later excavated by adults inhabiting the old galleries.

#### *Pentarthrum spadiceum* Broun Fig. 1–10.

Maximum size  $3.0 \times 1.0$  mm. Head width 0.5 mm. Setal index as in Table 2.

Body robust. Cuticle coarsely spiculate. Setae rather short, slender. Head cream colored with frons and sides yellow brown; epistoma, genae and mandibles red brown; longer than wide with posterior margin medially produced. Postoccipital condyles obsolete. Anterior ocelli distinct; posterior absent. *des* 4 well developed, *fs* 1 absent. Clypeus with inner seta stouter than outer. Mandibles with a small accessory tooth. Pedal areas with 6 setae. Spiracles with airtubes slightly longer than width of peritreme.

Alimentary canal (Fig. 2) with proventriculus subspherical, the same color but wider than ventriculus. Gastric caeca twice as long as width of tube.

*Material examined.* BIG SOUTH CAPE I: In dead wood, *Olearia colensoi grandis* Simpson, 200 ft (60 m), 14.II.1969, 16 larvae (B. M. May).

*Remarks.* *P. zealandicum* Wollaston differs from this species in possessing a simple proventriculus, smoother cuticle, much shorter tormae and in lacking ocelli. *Agastegnus ornatus* Broun from Chatham Is has a similarly retracted head and reduced number of post dorsal setae but is different in body shape.

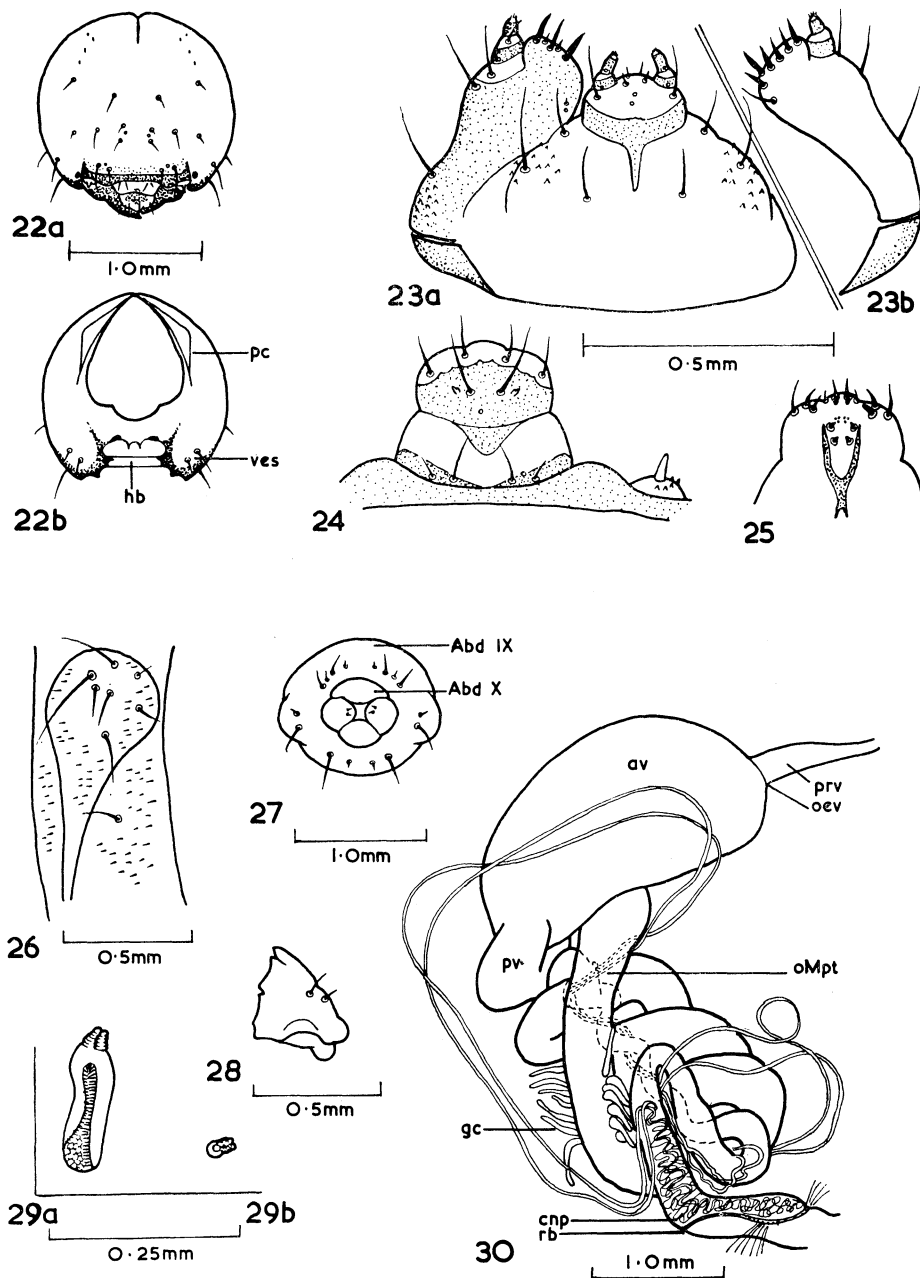


Fig. 22-30. Larva of *Pachyderis punctiventris* Broun, Adams I: 22, head -a, dorsal view; b, ventral view; 23, maxilla and labium -a, ventral view; b, dorsal side of maxilla; 24, epistoma, antenna, clypeus and labrum; 25, epipharyngeal lining; 26, thoracic pedal and mediosternal areas; 27, abdominal segments IX, X, caudal view; 28, mandible, outside; 29, spiracles, showing alignment -a, thoracic, b. abdominal segment VIII; 30, alimentary canal.

**Table 2.** Setal index for curculionid larvae of the Subantarctic Islands of New Zealand.

	<i>Exeiratus setarius</i>	<i>Pentarthrum spadicum</i>	unidentified cossonine	<i>Pachyderis punctiventris</i>	<i>Notacalles</i> spp.	<i>Hadramphus stilbocarpae</i>	<i>Phrynix</i> sp.	<i>Bryocatus</i> nr <i>serripes</i>	<i>Pacholitus depressirostris</i>	<i>Peristoreus innocens</i>	<i>Notinus</i> c. <i>aucklandicus</i>	<i>Gromilus</i> sp.	<i>Heterexis sculptipennis</i>	<i>Oelandius laeviusculus</i>	<i>O. cinereus</i>	<i>Catodryobolus antipoda</i>
PROTHORAX																
Pronotum	3+8	10	7	11	9-11	5+4	8-10	3	11	4+4	1+5	3+4	4+6	6+5	6+5	8+4
dorsopleural (prothoracic epipleurite of Emden 1952)	0	0	0	0	0	0	0	0	0	0	0	0	1+2	1+3	3	3
ventropleural	2	2	1	2	2	2	2	1-2	2	1+1	1+1	2	2	2	2	2
mediosternal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
pedal area	6	6	4	5+2	5-6	6	1+5	1+2	6+1	1+3	1+2	6	6+1	6+1	6+1	6+2
MESO-, METATHORAX																
prodorsal	1	1	1	1	1	1	1	1	1	1	0	1	1-2	1	1	1
postdorsal	1+3	3	1	4	4	2+2	4	2	4	2+2	2	3-4	4	4	4	4
dorsolateral	1	1	1	1	1	1	1	0-1	1	1	1	1	1+1	1+1	1+1	2
alar area	2	2	2	2	2	2	1	0	2	1	2	1	1+2	1+2	1+2	2+1
dorsopleural	1	1	1	1	1	1	1	1	1	1	1+1	1	1	1	1	1
ventropleural	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
mediosternal	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
pedal area	6	6	4	5+2	5-6	6	1+5	1+2	6+1	1+3	1+2	6	6+1	6+1	6+1	6+2
ABDOMEN I-VIII																
prodorsal I-VII	1	1	1	1	1	1	1	1	1	1	0	1	1-2	1	1	1
VIII	1	0	0	0	0-1	1	1	0	0	0	0	1	2	1	1	1
postdorsal I-VII	1+4	4	2	5	5	I-VI 2+3	1+4	3	5	2+3	2+3	I-V 5 VI- VII 4	5	5	5	5
spiracular I-VII	2	1+1	1	2	2	VII 2+2	2	2	2	2	1	2	1+1	1+1	1+1	1+1
VIII	0	1	0	2	2	1	2	0	1	1	1	2	1+1	1+1	1+1	1+1
dorsopleural	1+1	2	1	2	2	2	1+1	2	I-II 3 III- VIII 2	1+1	1+1	2	2	2	2	2
ventropleural	1+1	2	1	2	2	1+1	2	2	2	1+1	1	2	2	2	2	2

	<i>Exeiratus setarius</i>	<i>Pentarthrum spadiceum</i>	unidentified cossonine	<i>Pachyderis punctiventris</i>	<i>Notacalles</i> spp.	<i>Hadramphus stilbocarpae</i>	<i>Phrynix</i> sp.	<i>Bryocatus</i> nr <i>serripes</i>	<i>Pacholotopus depressirostris</i>	<i>Peristoreus innocens</i>	<i>Notinus c. aucklandicus</i>	<i>Gromilus</i> sp.	<i>Heterexis sculptipennis</i>	<i>Oelandius laeviusculus</i>	<i>O. cinereus</i>	<i>Catodryobolus antipoda</i>
laterosternal	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
mediosternal	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
ABDOMEN IX																
dorsal	1+2	2	2	4	4-5	1+1	2+1	1	3	1+1	2+1	3	3	3	3	2+1
pleural	1+1	2	1	2	2	1+1	1+1	1+1	2	1	1	2	—	—	—	—
dorsopleural		—	—	—	—	—	—	—	—	—	—	—	3+1	1+1	1+1	2
ventropleural		—	—	—	—	—	—	—	—	—	—	—	1	1	1	1
sternal	2	2	2	2	2	2	2	0	2	0	2	2	3	3	2	2
ABDOMEN X																
anal lateral	1+2	2	1	2	1-3	1	2	0	3	0	2	3	2+1	3+1	2+1	2+1
HEAD																
dorsal	4+1	5	4	5	5	4+1	4+1	2	4+1	2+3	1+1	4	3+2	4+1	3+2	3+1
posterior	4	4	4	4	4	4	0	0	4	4	4	4	4	4	4	4
lateral	2	2	1+1	2	2	2	2	1	2	1+1	1+1	2	2	2	2	2
ventral	2	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2
frontal	5	4	2+1	5	5	2+3	2+3	0-1	2+3	1+1	2+1	1+1	1+4	2+3	1+4	1
clypeal	1+1	2	2	2	2	2	2	2	2	0	2	0	2	2	2	0
labral	3	3	2+1	3	3	3	3	0-3	3	3	3	2+1	2+1	2+1	2+1	2+1
mandibular	2	2	2	2	2	1+1	2	1	1+1	2	2	1	1+1	1+1	1+1	1
EPIPHARYNGEAL LINING																
anterolateral	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
anteromedian	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
median	3	3	3	3	3	3	3	?	3	3	3	3	3	3	3	3
MAXILLA																
lacinia dorsal	7	5	10	7	7	7	10	?	6	6	?	7	8	8	8	8
ventral	4+1	5+1	3+1	5+1	5+1	3+1	3+1	3+1	4+1	4+1	?	4-5+1	4+1	4+1	4+1	4+1
palpal	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1
stipital	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
palpiferal	2	2	2	2	2	2	3	2	2	2	1+1	2	2	2	2	2
LABIUM																
postlabial	3	3	2+1	3	3	3	3	1+2	3	1+2	1+2	2+1	3	3	3	3
prelabial	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ligular	2	2	2	2	2	2	2	?	2	2	?	2	2	2	2	2

**Table 3.** Setal index for curculionid pupae of the Subantarctic Islands of New Zealand.

	<i>Pentarthrum spadicum</i>	<i>Pachyderis punctiventris</i>	<i>Notacalles kroni-group</i>	<i>Phrynixus laqueorum</i>	<i>Pactolotypus depressiventris</i>	<i>Gromilus</i> spp.	<i>Oelandius laeviusculus</i>
<i>Head</i>							
vertical	1	1	1	1	1	1	1
supra orbital	2	2	0	0	1	1	2
post orbital	0	0	0	0	0	0	1
orbital	0	1	0	1	1	1	2
post antennal	1	3	0	2	0	0	2
rostral	2	1+1+1	2	1	1	1	1
lateral	0	1	0	0	0	0	1
epistomal	0	2	0	0	1	0	2+2
mandibular	0	0	0	0	0	0	1
Total setae	6	11	3	5	5	4	15
<i>Pronotum</i>							
apical	1	2	1	1	1	1	3
lateral	3	1	2	1	2	3-4	3
discal	1	1	1	2	1	1	1
basal	4	4	4	3	2	2	5-6
Total setae	9	8	8	7	6	7-8	12-13
<i>Mesonotum</i>	2	2	2	0	2	1	4+1
<i>Metanotum</i>	2	2	2	1	2	1	4+1
<i>Abdomen I-VI</i>							
prodorsal	0	0	0	0	0	0	1
postdorsal	2	2	2	1	2	2	5
spiracular	1+1	1+1	1+1	1	1	2	1
Abd. VII	1+2	2+2	3	1+1	3	2	5+1
Abd. VIII	pc+2	2	3	1+1	3	2	4+1
Abd. IX	1+1	pc+2	pc	pc+2	pc	pc+1	pc+4
<i>Legs</i>							
femoral	1	2	1	2	2	2	2
terminal	0	0	0	0	0	0	1

*Pupa* Fig. 11-13.

Average size 3.0 × 1.0 mm. Setal index as in Table 3.

Setae very slender, light brown or colorless, mounted on minute tubercles. Antennae with theca of club tuberculate. Primary pterotheca (elytra) smooth. Secondary pterotheca (hind wings) as long as primary. Rostrum reaching fore tarsi. Legs with 1 femoral seta. Hind legs completely hidden. Spiracles insignificant. Abd. I-VI with *pds* 1, 2, 4, absent; 3, 5, short; *sps* 1 very short, 2 moderately long. Abd. VII with *pds* 3, 5 as a short spine on a mammiliform tubercle. Pseudocerci on Abd. VIII represented on each side by a caudally directed, slender, tuberculate seta.

*Material examined.* 4 pupae, same data as larvae.

*Remarks.* In *P. zealandicum*, the rostrum is shorter and the small apical setae are lacking. In *Agastegnus ornatus*, the orbital setae are absent, the rostrum bears only 2 pairs of setae and the pseudocerci are short, dorsally directed, tuberculate spines.

#### Subfamily CRYPTORHYNCHINAE

Gardner's (1938) definition in respect to the Indian elements of Cryptorhynchinae may be extended to include those of New Zealand as follows.

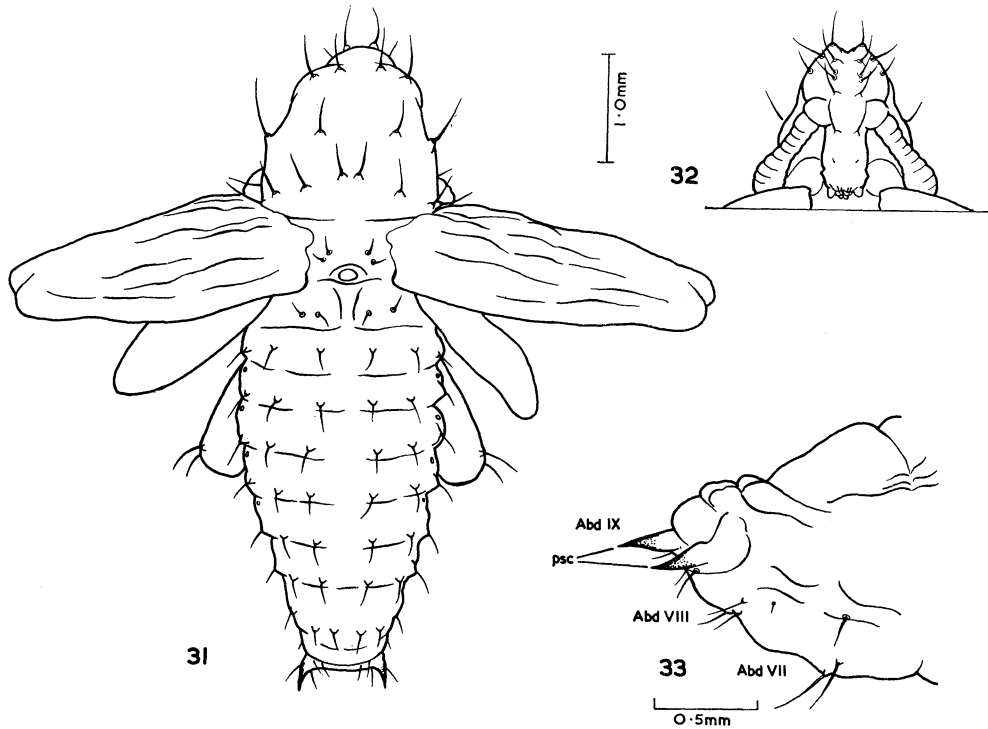


Fig. 31-33. Pupa of *Pachyderis punctiventris* Broun, Adams I: 31, dorsal view; 32, head; 33, abdominal segments VII, VIII, IX.

Head free or partially retracted; usually with a full complement of setae; *fs* 5 never shorter than *fs* 4, ocelli variable. Posterior pair of postlabial setae much less widely separated than the median pair. Mandibular setae usually transverse (oblique in *Psepholax* White). Labral tormae united for at least part of their length, often bifurcate at base. Premental sclerite usually complete. Thoracic spiracles ovate with very short airtubes (*Notacalles* Kuschel is an exception). Oenocyte clusters usually visible beneath pleural cuticle. Anus subdorsal to terminal; 4-6 lobed.

#### Genus **Pachyderis** Broun

Body robust, strongly but evenly curved. Setae pallid and very fine. Cuticle minutely spiculate, more coarsely on ventral side on Abd. VIII and IX.

Head with posterior margin slightly produced; sides rounded; frons noticeably convex. Postoccipital condyles obtuse, inconspicuous. Antennal cone narrow, smooth. Hypopharyngeal bracon colorless. Mandibles with obscure accessory teeth and smooth grinding surface. All setae of mouthparts well developed. Epipharyngeal lining with inner lateral seta removed from margin; middle pair of median setae more widely separated than the other 2 pairs. Premental sclerite with anterior extension obsolete. Maxilla with lacinia somewhat flattened apically; stipes lightly pigmented, microasperate. Thoracic spiracle elongate-oval with fringed atrium; airtubes shorter than width of peritreme. Abdominal spiracles much smaller, circular, with airtubes  $2 \times$  width of peritreme, directed caudad. Abdominal postdorsal setae short, becoming longer posteriorly. Anus terminal, 4-lobed; dorsal lobe wider than the others.

Alimentary canal (Fig. 30): Proventricular area faintly striated. Anterior ventriculus moderately bulky, smooth. Posterior ventriculus arranged in a complicated series of convolutions: 1 transverse coil leading

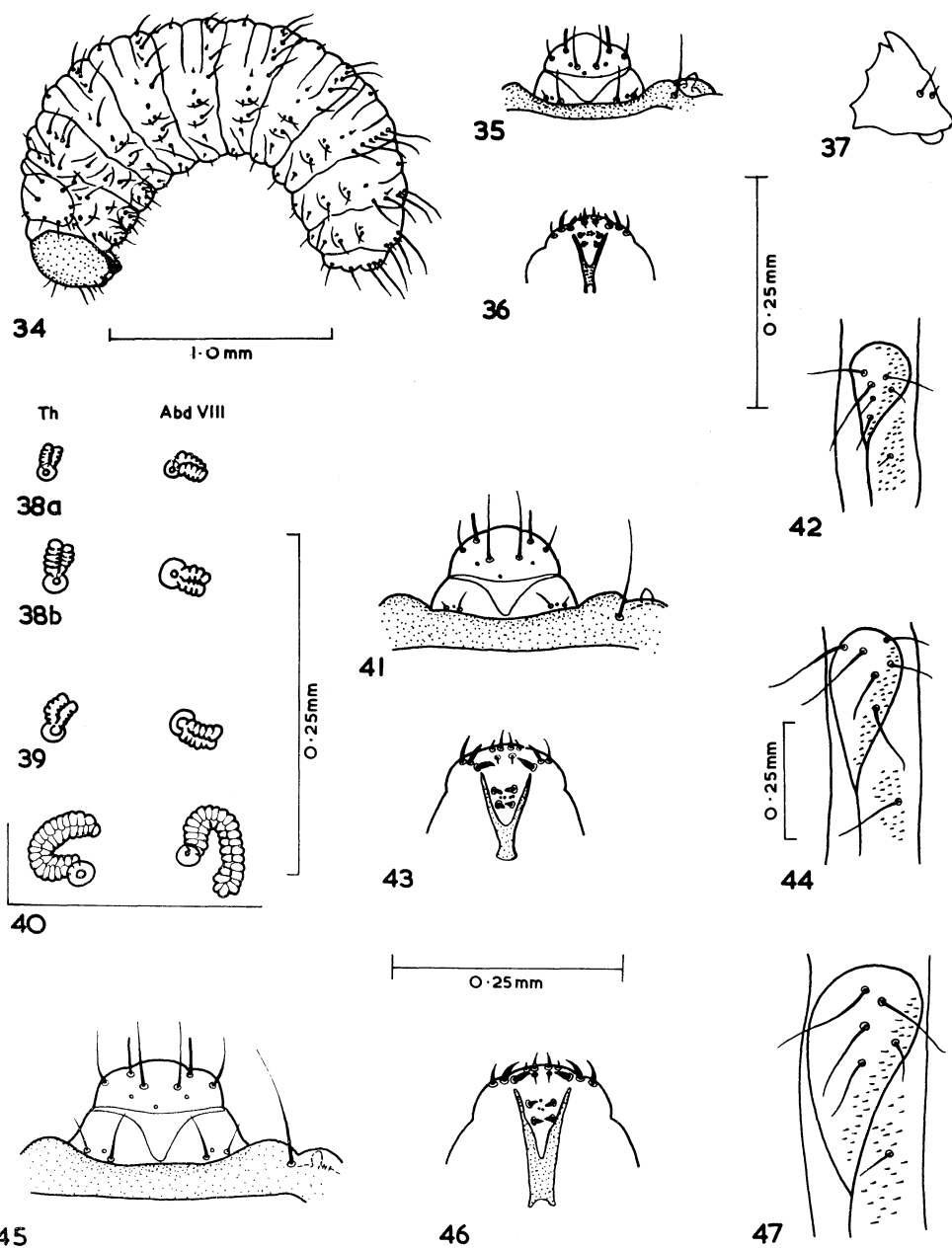


Fig. 34-47. Larvae of *Notacalles* spp., Adams I. *N. piciventris* (Broun): 34, larva, lateral view; 35, epistoma, antenna, clypeus and labrum; 36, epipharyngeal lining; 37, mandible, outer side; 38a, spiracles; 42, thoracic pedal and mediosternal areas. *N. planidorsis* (Kirsch): 38b, spiracles; 44, thoracic pedal and mediosternal areas; 45, epistoma, antenna, clypeus and labrum; 46, epipharyngeal lining. *N. kronei* (Kirsch): 39, spiracles; 41, epistoma, antenna, clypeus and labrum; 43, epipharyngeal lining; 47, thoracic pedal and mediosternal areas. *N. multisetosus* (Broun): 40, spiracles.



to an oblique straight section bearing gastric caeca, followed by 3 coils spiraling anteriad. Ileocolic valve within the spiral. Malpighian tubules arising at this point from a thickened ring, 2 proceeding cephalad, 4 entwining with hind gut to emerge below coils, rejoining hind gut after the final bend. Cryptonephridium slightly expanded ventrad. Rectal bracon distinct.

**Pachydermis punctiventris** Broun Fig. 22–30.

Maximum size  $7.5 \times 2.5$  mm. Head width 1.5 mm. Setal index as in Table 2.

Head pale creamy yellow with epistoma, genae and labrum brown; mandibles darker. Anterior ocelli distinct with convex cornea; posterior faint or absent. Coronal and frontal sutures not visible. Ecdysial line dark. Endocarinal line short, scarcely reaching  $fs$  2. Clypeus with inner seta  $2 \times$  length of the outer.

Labrum with lateral and anterior setae subequal. Tormae united for proximal  $1/3$ , bifurcate at base. Pedal area with a lightly sclerotised lobe bearing 4 of the 7 setae.

Alimentary canal with 6–8 gastric caeca each side, close together, in a single row, finger shaped, each as long as width of canal. Rectal bracon lightly pigmented.

These larvae differ from other “*Acalles*”-related larvae only in relative positions of setae, shape of labral tormae and in numbers, position and size of gastric caeca.

**Biology.** Larvae are xylophagous, tunnelling in dead, sound and partially decayed wood of various shrubs. Pupation takes place in a simple chamber formed partly in the wood and partly in the compacted frass of the tunnel. Pupae were taken in January, but emergence is probably continuous throughout the summer.

**Material examined.** AUCKLAND IS: Adams I, Ranui Cove, in dead branch of *Metrosideros*, 8.I.1963, 6 larvae (P. M. Johns); in *Metrosideros umbellata*, 25.I.1966, 1 larva; in *Myrsine divaricata* A. Cunn., 29.I.1966, 40 larvae, 7 pupae; in pith, *Coprosma foetidissima* J. R. et G. Forst, 3.II.1966, 2 larvae (G. Kuschel).

**Pupa** (expanded specimens) Fig. 31–33.

Average size  $6.0 \times 2.5$  mm. Setal index as in Table 3.

Setae red brown, moderately long, finely tapering, mounted on small tubercles. Antennae smooth. Pronotum widest at base. Thoracic spiracle large, oval, protruding, those of the abdomen smaller, circular. Primary pterotheca with interstitial bullae. Secondary pterotheca reduced, 0.6 length of primary. Rostrum reaching apex of fore tibiae. Legs with 2 strong femoral setae.

Pronotum with setae subequal. Abd. I–VII with  $pds$  1, 2, 4 absent; 3, 5 and  $sps$  2 equal. Abd. VIII with setae weak. Pseudocerci on Abd. IX thornlike, caudally directed, bearing 2 strong setae.

**Material examined.** AUCKLAND IS: Adams I, Ranui Cove, in dead branch of *Metrosideros*, 8.I.1963, 1 pupa (P. M. Johns); in *Myrsine divaricata*, 29.I.66, 7 pupae (G. Kuschel).

**Genus Notacalles** Kuschel

Setal index as in Table 2.

Body robust, scarcely curved. Cuticle spiculate. Head widest behind the middle, somewhat depressed, truncate in front, slightly emarginate behind. Anterior ocelli distinct.  $fs$  1 and 2 well forward from apex of suture. Antennae broadly conical, pubescent, overhung by a frontal projection. Hypopharyngeal bracon colorless. Mandibles with distinct median and basal teeth; setae close together. Labrum with lateral setae as long as anterior ones. Epipharyngeal lining with sensilli clusters in front of posterior and middle pairs of median spines. Tormae subparallel, joined and thickened basally, usually bifurcate there. Lacinia with basal, dorsal seta offset towards maxillary palpus. Premental sclerite sometimes with median extension obsolete. Thoracic spiracles circular, not, or only slightly, larger than those of the abdomen; airtubes usually much longer than width of peritreme, moderately to strongly curved. Anus terminal, 4-lobed, with dorsal lobe widest.

Alimentary canal: A similar type to that of *Pentarthrum*, but with proventriculus simple and gastric caeca lacking. Cryptonephridium shorter, produced caudally into a foot or lamina. Rectal bracon an extended loop, pigmented or colorless.

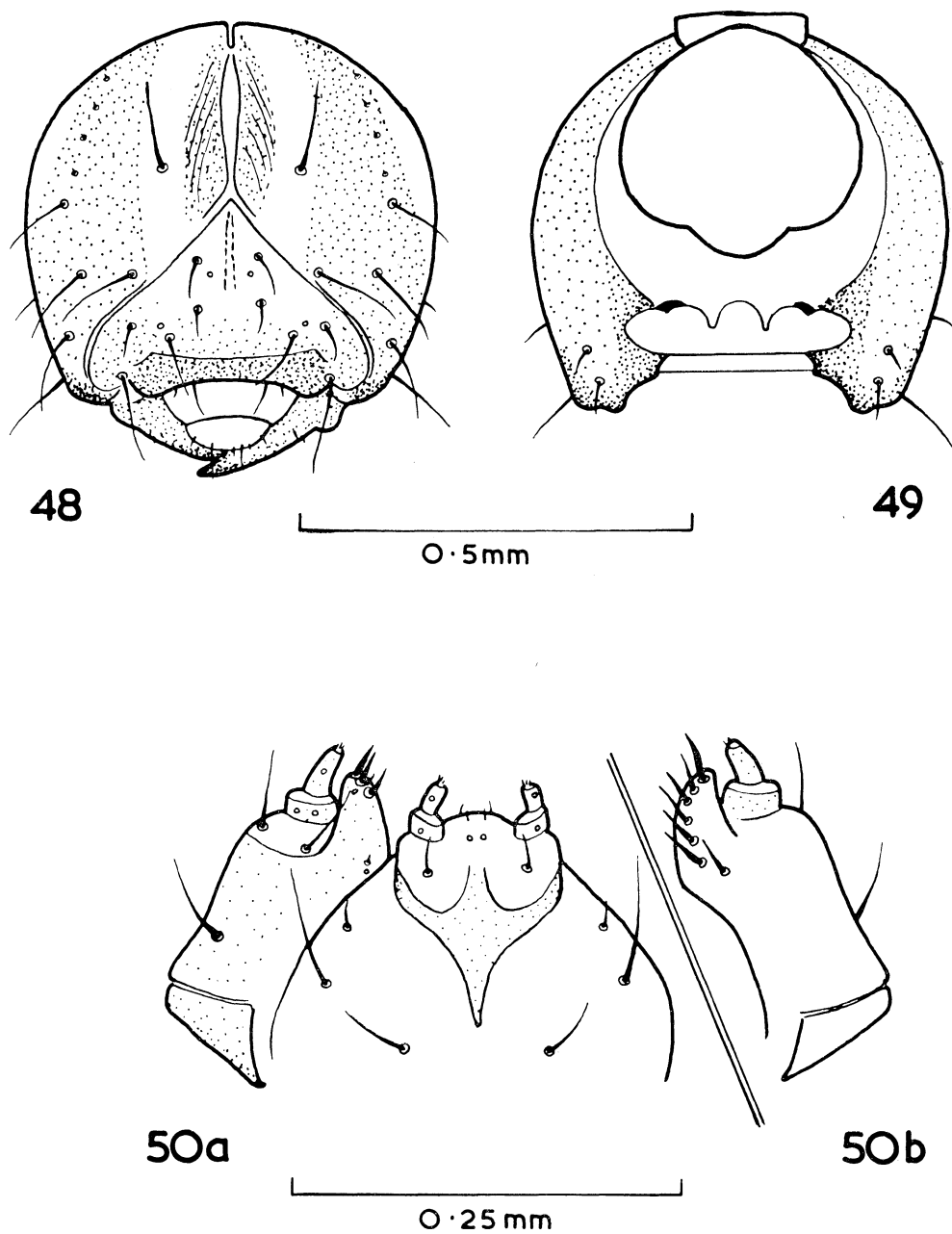


Fig. 48-50. Larva of *Notacalles planidorsis* (Kirsch), Adams I: 48, head, dorsal view; 49, head, ventral view; 50, maxilla and labium -a, ventral view; b, dorsal side of maxilla.

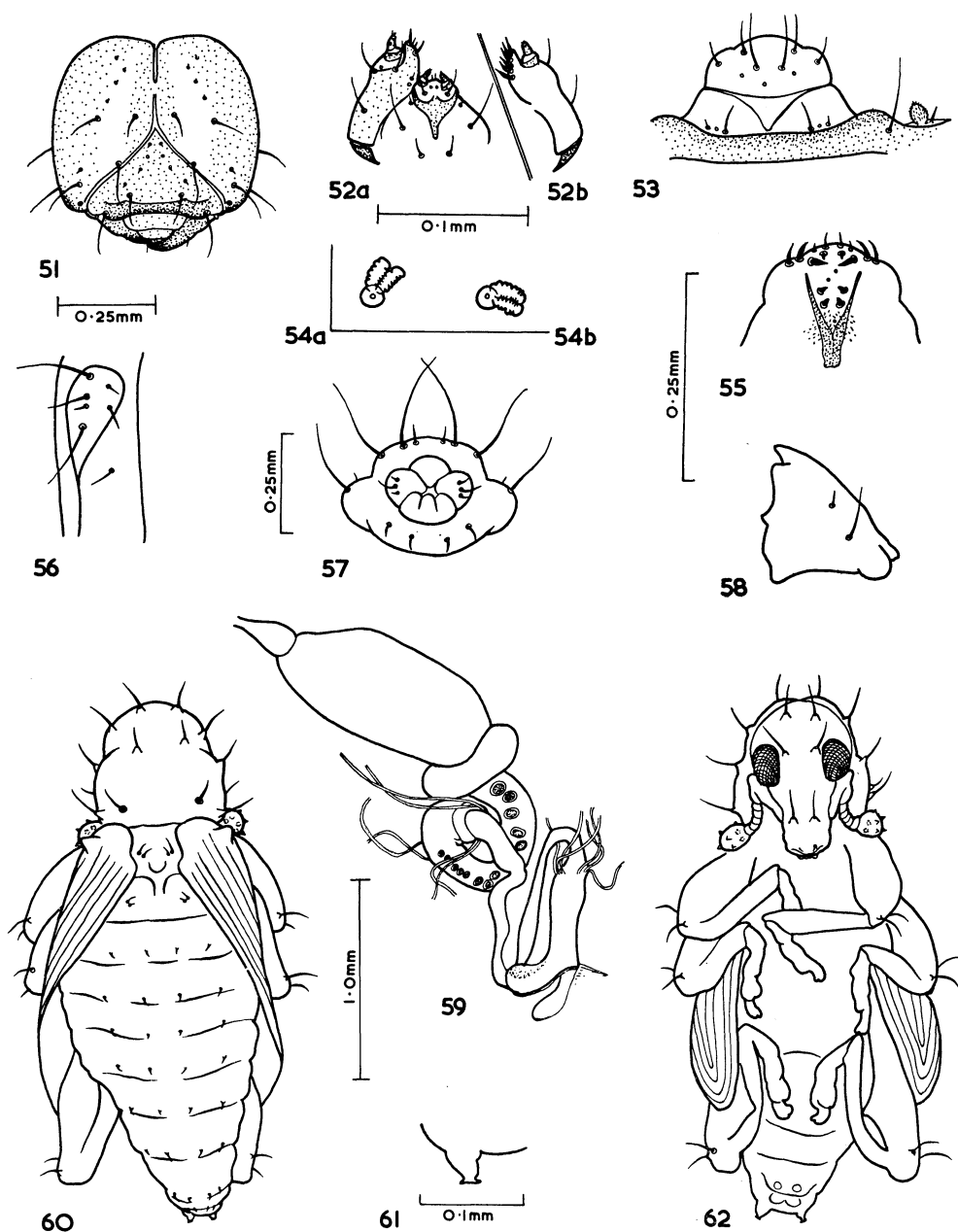


Fig. 51-62. Larva and pupa of *Pactolotypus depressirostris* (Kirsch), Adams I: 51, head, dorsal view; 52, maxilla and labium -a, ventral view; b, dorsal side of maxilla; 53, epistoma, antenna, clypeus and labrum; 54, spiracles, showing alignment -a, thoracic; b, abdominal segment VIII; 55, epipharyngeal lining; 56, thoracic pedal and mediosternal areas; 57, abdominal segments IX, X, caudal view; 58, mandible, outer side; 59, alimentary canal; 60, pupa (distorted specimen), dorsal view; 61, pseudocercus of pupa; 62, pupa, ventral view.

*Remarks.* In some respects, *Notacalles* larvae closely approach those of Cossoninae. Circular mesothoracic spiracles and an indistinct premental sclerite are cossonine rather than cryptorhynchine characters. The labral tormae, in the joined portion, have retained the width of two separate rods, whereas in *Pachydermis*, the combined section is slender.

The only two pupae available were in poor condition. They resemble *Pentarthrum* pupae in the number and arrangement of pronotal and cephalic setae and in possessing a single femoral seta.

**Notacalles planidorsis** (Kirsch) Fig. 39, 44–46, 48–50.

Maximum size  $3.0 \times 1.25$  mm. Head width 0.75.

Head red brown with epistoma, genae and mandibles darker, and a lighter epicranial stripe. Sutures distinct. Endocarinal line faint, 0.75 length of frons, extending level with *fs* 2. Postoccipital condyles right-angled, small, colorless. Antennae almost covered by a frontal projection. Clypeus with inner seta  $2 \times$  length of the outer. Labral tormae slender at apices then thickened, united for proximal 1/3 with base slightly bifurcate. Premental sclerite with clearly defined median extensions.

Body setae pale, becoming long on terminal segments. Thoracic spiracles with airtubes  $2 \times$  width of peritreme, each with 5–7 annuli, aligned  $20^\circ$  from vertical. Abdominal spiracles similar, but aligned horizontally, that of Abd. VIII larger than the thoracic and situated dorsad. Pronotum with 11, pedal areas with 6 setae.

*Biology.* Larvae feed in the pith of dead twigs in association with *Pactolotypus depressirostris* (Kirsch). The species is probably host specific in *Hebe elliptica* (Forst. f.) Pennell.

*Material examined.* AUCKLAND IS: Adams I, in stems of *H. elliptica*, 31.I.1966, 4 larvae, exuviae of 1 (G. Kuschel).

**Notacalles piciventris** (Broun) Fig. 34–38, 42.

Maximum size  $3.0 \times 1.25$  mm. Head width 1.0 mm.

Head pale amber with epistoma, genae and mandibles red brown. Frontal suture visible only near antennae. Endocarinal line very faint. Postoccipital condyles right-angled, small but noticeable. Clypeus with inner seta  $2 \times$  length of the outer. Labral tormae united and thickened for proximal 1/3, with base distinctly bifurcate. Premental sclerite indistinct, with anterior median extension lacking. Body setae pale, shorter than in *N. planidorsis*. Typical segments with an extra dorsal fold. Spiracles as for *N. planidorsis* but with airtubes  $1.5 \times$  width of peritreme. Pronotum with 11, pedal areas with 6 setae.

*Biology.* Larvae feed subcortically in dead and dying branchlets, usually entering at a node and developing in the area of one internode. Pupation takes place in a shallow excavation in the wood. Pyemotid mites were feeding on some of the larvae.

*Material examined.* AUCKLAND IS: Adams I, under bark of *Hebe elliptica*, 31.I.1966, 12 larvae; under bark of *Metrosideros umbellata*, 28.I.1966, 3 larvae; Magnetic Cove Stn., in litter sample 66/88, 2.I.1966, 1 larva (G. Kuschel).

**Notacalles** prob. **kronei** (Kirsch) Fig. 40, 41, 43, 47.

Maximum size  $2.0 \times 0.8$  mm. Head width 0.5 mm.

Head light brown with mandibles, genae, epistoma and a wide frontal band red brown. Frontal, but not coronal, sutures distinct. Endocarinal line faint, reaching *fs* 2. Postoccipital condyles foliate. Antennae protruding more than halfway beyond frontal projection. Clypeus with outer seta minute. Labral tormae joined and thickened for proximal 1/3, but rounded, not bifurcate, at base. Premental sclerite distinctly trident shaped. Pronotum with 9, pedal areas with 5 setae. Cuticle coarsely spiculate on folds and lobes. Abdominal spiracles with airtubes  $3 \times$  width of peritreme, aligned subhorizontally. Alimentary canal with rectal bracon lightly pigmented.

*Material examined.* AUCKLAND IS: Adams I, in pith of *Coprosma foetidissima* Forst., 3.II.1966, 5 larvae (G. Kuschel).

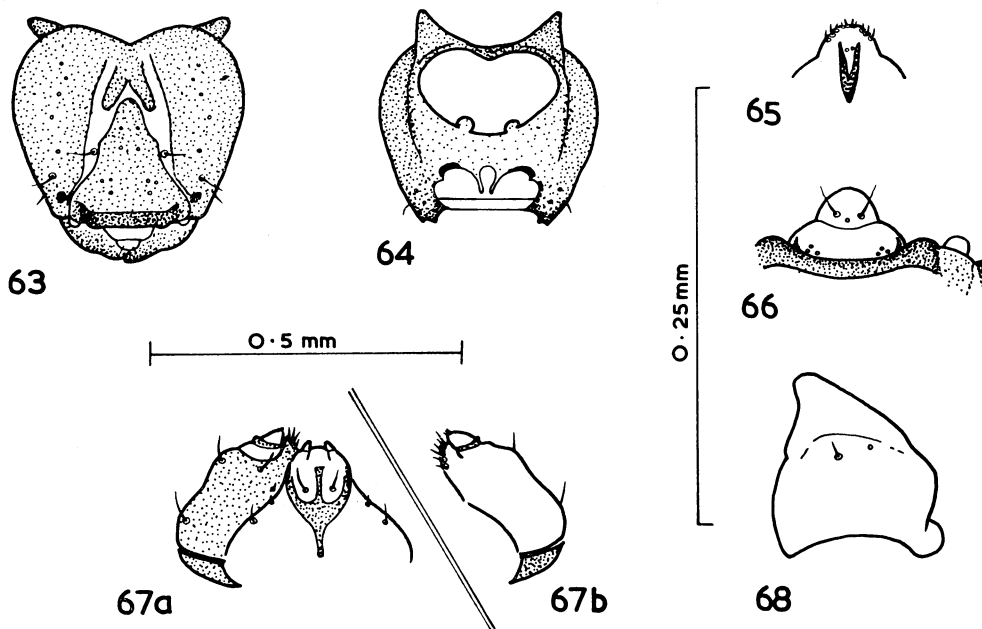


Fig. 63-68. Larva of *Bryocatus* sp. near *serripes* Kuschel, Arthur's Pass, South Island: 63, head, dorsal view; 64, head, ventral view; 65, epipharyngeal lining; 66, epistoma, antenna, clypeus and labrum; 67, maxilla and labium -a, ventral view; b, dorsal side of maxilla; 68, mandible, outer side.

**Notacalles multisetosus** (Broun) Fig. 40.

Size of specimen  $2.5 \times 0.75$  mm. Head width 0.5 mm.

Head amber colored with mandibles, genae and a wide epistomal band, dark red brown. Frontal suture distinct anteriorly. Endocarinal line scarcely visible. Antennae protruding more than halfway beyond frontal projection. Labral tormae bifurcate below united base. Pronotum with 11, pedal areas with 5, setae. Cuticle on lobes and folds very finely spiculate. Spiracles with airtubes distinctively long, curved; the thoracic spiracle aligned horizontally, those of the abdomen, vertically. Alimentary canal with proventriculus slightly swollen.

*Remarks.* This specimen has been identified from its similarity to larvae of *Notacalles* near *multisetosus* from Mt Pirongia, North I. The unusual spiracles are outstanding features.

*Material examined.* AUCKLAND IS: Adams I, Magnetic Cove Stn, in litter sample 66/81, 27.I.1966, 1 larva (G. Kuschel).

Subfamily HYLOBIINAE

Gardner's (*loc. cit.*) summary of characters, based on one European and two Indian genera, is sufficiently wide to cover the New Zealand element, consisting of two genera, *Hadramphus* Broun and *Lyperobius* Pascoe. The large spiracles with pigmented annuli which are an outstanding feature occur similarly in Aterpinae and Cylydrorhininae.

The New Zealand genera (and the N. American *Pachylobius picivorus* Germar and *Hylobius pales* Herbst) are further characterised as follows:

Frontal suture narrow, not angulate before the apex. *des* 3 not in contact with frontal suture. *fs* 5 well developed. Thoracic segments with a V-shaped pocket medially between the 2 ventral folds (also evident in Aterpinae and Cylydrorhininae). Abd. VIII without prodorsal setae.

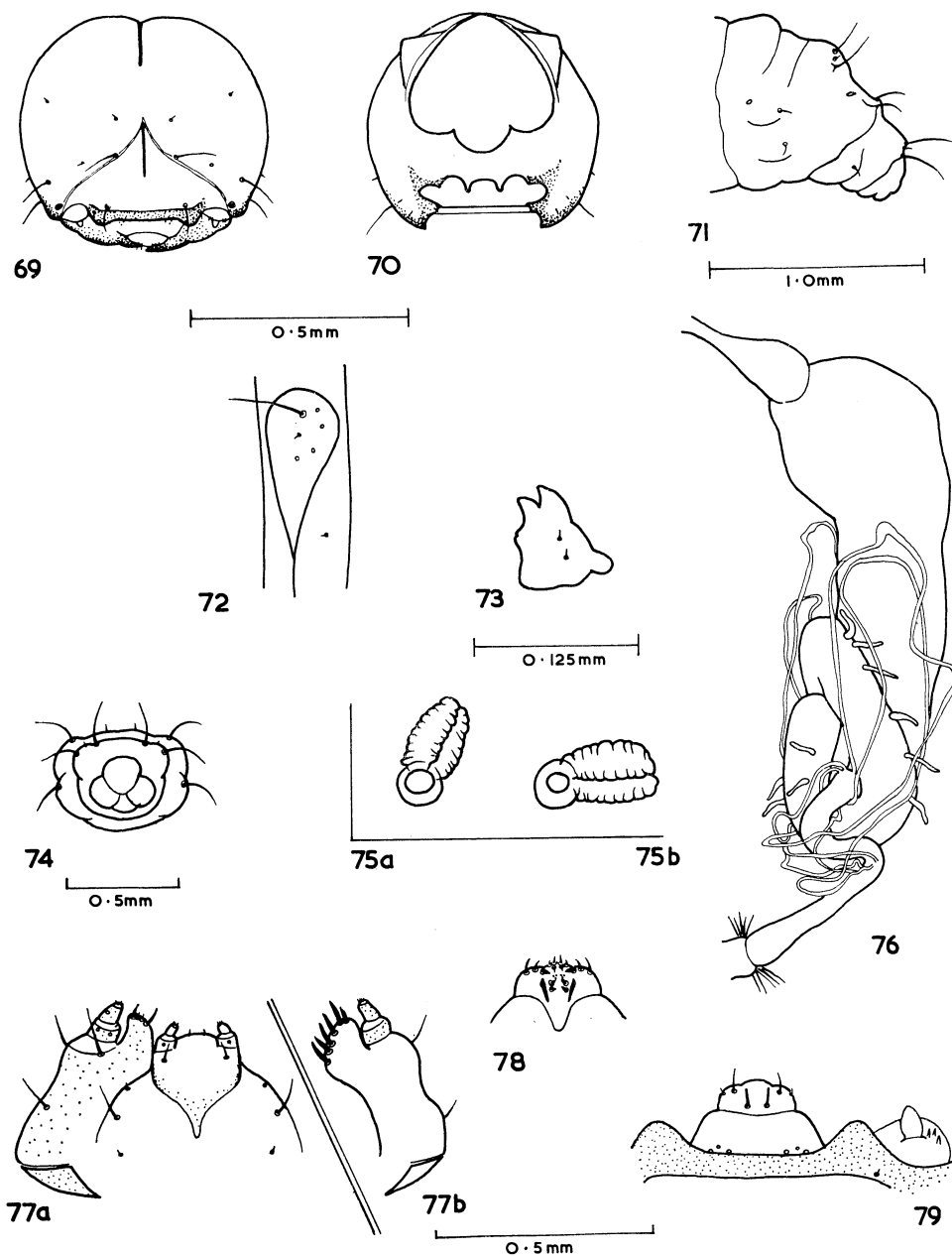


Fig. 69–79. Larva of *Peristoreus innocens* Kirsch, Adams I: 69, head, dorsal view; 70, head, ventral view; 71, abdominal segments VIII, IX, X, ventral view; 72, thoracic pedal and medio-sternal areas; 73, mandible, outer side; 74, abdominal segments VIII, IX, X, caudal view; 75, spiracles, showing alignment -a, thoracic; b, abdominal segment VIII.

### Genus **Hadramphus** Broun

Body very robust, dense creamy white owing to large deposits of fat body. Pronotum well pigmented. Head partially retracted, evenly rounded, depressed in front, slightly emarginate behind. Endocarinal line present. Postoccipital condyles obtuse angled. Hypopharyngeal bracon colorless. Antenna very small, acute, on raised cushion, directed laterad. Mandibles bifid, with a median projection but no accessory teeth; setae depressed, aligned longitudinally. Labrum 3-lobed, transverse, deeply pigmented except around lateral setae. Tormae bowed, lightly sclerotised. Epipharyngeal lining with sensilli between proximal pairs of *mes* and below tormae (Fig. 115). Posterior postlabial setae less widely separated than the median pair. Thoracic spiracle large with peritreme circular, lobate; airtubes conspicuous with fine, pigmented annuli; directed dorsad. Abdominal spiracles smaller, directed caudad; that of Abd. VIII as large as thoracic, placed on dorsum. Anus almost ventral, 4-lobed; lateral lobes largest, with 1 microseta.

Alimentary canal: Proventriculus simple. Anterior ventriculus smooth, bulky. Posterior ventriculus 0.5 width of anterior, arranged in 1-1/2 coils. Gastric caeca finger shaped. Malpighian tubules arising in 2 clusters, each with a thickened base, 4 + 2, rejoining hind gut after the final bend. Cryptonephridium well developed, evenly distributed. Rectal bracon a basal ring, unsclerotised.

#### **Hadramphus stilbocarpae** Kuschel      Fig. 107-118.

Maximum size 17.5 × 6.5 mm. Head width 3.25 mm. Setal index as in Table 2.

Cuticle closely spiculate. Head dark blackish brown. Anterior ocelli distinct, posterior faint. Endocarinal line short, not reaching *fs* 1. Ecdysial sulcus dark, 0.5 length of coronal suture. Epipharyngeal lining with all setae red-brown and with brown patches at each end of the tormae. Premental sclerite dark, with anterior median extension truncate; posterior acute. Maxilla dark greenish brown except around setae. Lacinia with 7 well spaced dorsal setae in a strongly curved row; 3 apicoventral setae. Gastric caeca of alimentary canal numerous, length 0.2 width of tube, clustered in a multiple row on each side of lower part of coil.

*Material examined.* SNARES I: On *Stilbocarpa* roots, 10.I.1967, 5 larvae (P. M. Johns).

*Remarks.* The larva of *Lyperobius* is scarcely different from that of *Hadramphus*.

*Biology.* The larvae feed in the thick, fleshy rhizomes of *Stilbocarpa robusta* (Kirk) Ckn.

### Subfamily PHRYNIXINAE

The subfamily Phrynixinae was erected by Kuschel (*loc. cit.*) to contain genera, for the most part, previously included in Rhyparosominae. Larvae of 3 genera from the decaying wood group (*Phrynixus* Pascoe, *Dolioceuthus* Broun, *Cuneopterus* Sharp) and 2 from the fern-inhabiting group (*Megacolabus* Broun, *Rystheus* Broun), determined by rearing, have been used as a basis for an interim definition of subfamily characters as follows:

Head free, or partially retracted, scarcely emarginate behind, convex or depressed. Post occipital condyles inconspicuous. *fs* 5 not shorter than *fs* 4, other frontal setae microscopic or absent. Antennae varying in length. Mandibles without accessory teeth but often with a distinct median shoulder; setae longitudinal but usually only 1 visible. Hypopharyngeal bracon pigmented or not. Labrum longer than wide or transverse; completely pigmented. Epipharyngeal lining with sensilli clusters between proximal pairs of median spines. Tormae subparallel. Posterior postlabial setae less widely separated than the median pair. Lacinia with 10 dorsal setae.

Terminal segments of abdomen with noticeably long setae. Abd. VIII often flattened, with spiracles on dorsal surface. Anus 4-lobed. Alimentary canal with proventriculus enlarged, as wide or wider than anterior part of mid-gut. Gastric caeca finger shaped or absent.

In a taxon containing two groups of weevils of such differing habits, it was heartening to discover a common character as unusual as the spherical proventriculus.

None of the subantarctic phrynixines has been found in the larval stage.

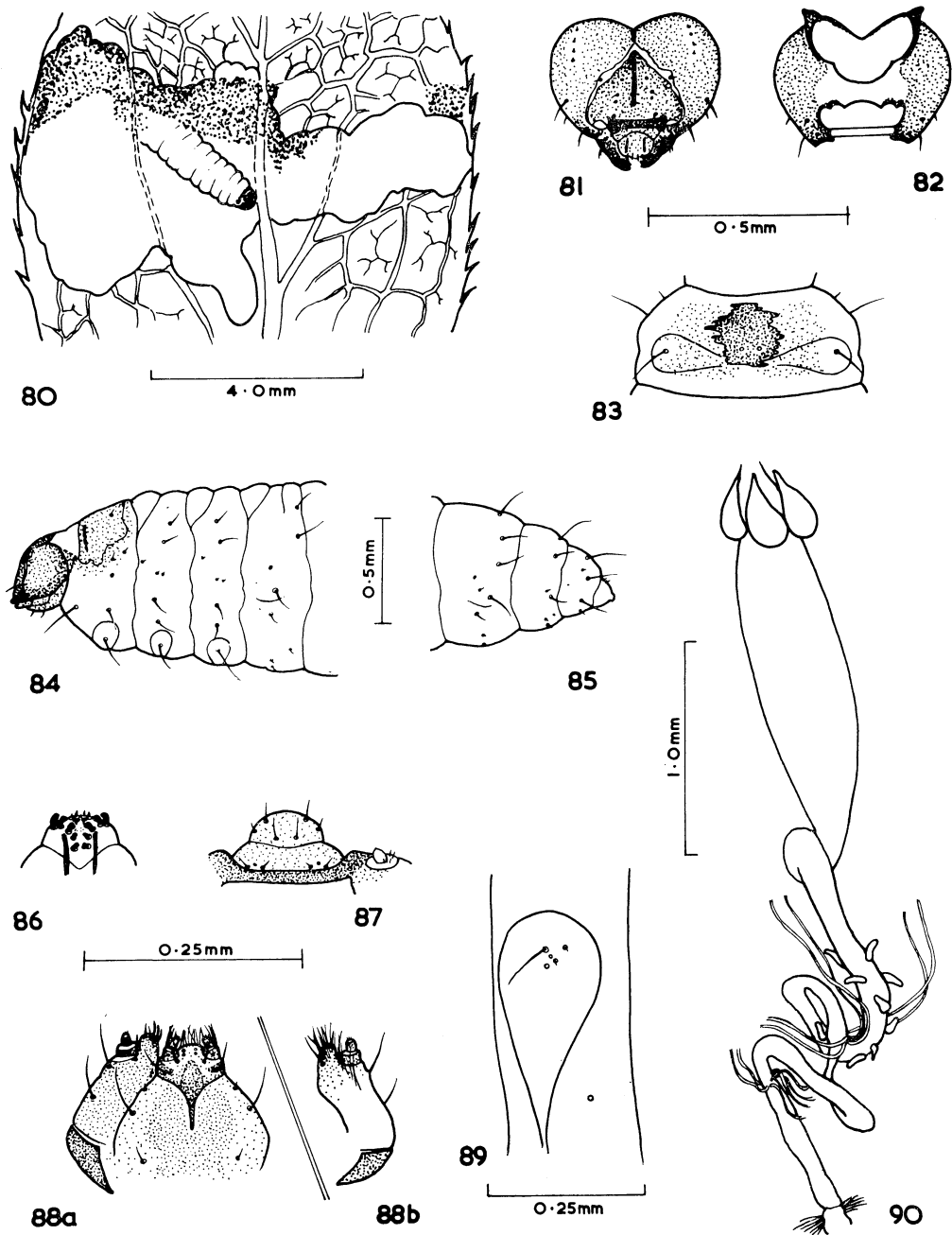


Fig. 80-90. Larva of *Notinus cordipennis aucklandicus* Kuschel, Adams I: 80, blotch mine in leaf of *Coprosma ciliata*; 81, head, dorsal view; 82, head, ventral view; 83, thoracic segment I, ventral view; 84, head, thorax and abdominal segment I; 85, abdominal segments VII, VIII, IX, X; 86, epi-pharyngeal lining; 87, epistoma, antenna, clypeus and labrum; 88, maxilla and labium -a, ventral view; b, dorsal side of maxilla.



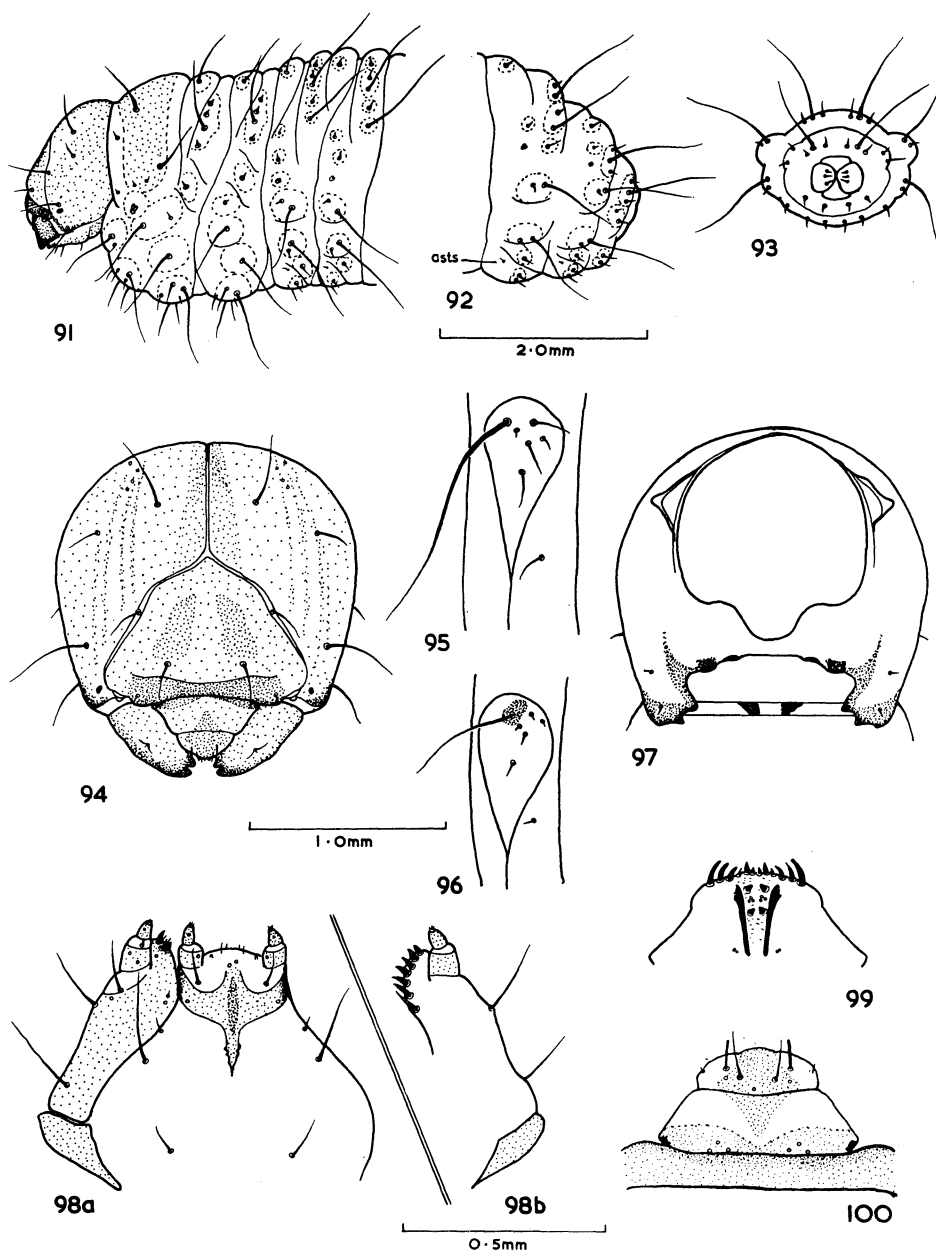


Fig. 91-100. Larvae of *Gromilus* spp. *G. exiguus* (Brookes), Lyall-Beeman Saddle, Campbell I: 91, head, thorax and abdominal segment I; 92, abdominal segments VII, VIII, IX, X, lateral view; 93, abdominal segments VIII, IX, X, caudal view; 94, head, dorsal view; 95, thoracic pedal and mediosternal areas; 97, head, ventral view; 98, maxilla and labium -a, ventral view; b, dorsal side of maxilla; 99, epipharyngeal lining; 100, epistoma, clypeus and labrum. *G. ?fallai* (Brookes), Adams I: 96, thoracic pedal and mediosternal areas.

Genus **Phrynixus** Broun

Setal index as in Table 2.

Body evenly curved, with thin cuticle. Pronotum not pigmented. Head free, evenly rounded, convex, colorless or very lightly pigmented, with mandibles, genae, epistoma, endocarinal line, ecdysial sulcus and hind margin dark. Ocelli faint. Antennae somewhat elongate. Mandibles with a raised, corrugated, grinding area. Hypopharyngeal bracon heavily pigmented. Labrum longer than wide, not lobed anteriorly. Palpifer with an additional, inner, seta. Epi- and hypopharynx thickly pubescent. Thoracic and typical abdominal segments with 1 postdorsal and 1 pleural seta outstanding; those on terminal segments much stronger. Anus almost ventral.

Alimentary canal (Fig. 106): Proventriculus dark, turnip shaped. Oesophageal valve usually surrounded by a collar of 8–10 white caeca, visible through cuticle. Cryptonephridium and rectal bracon developed as a cup-shaped structure ventral to the anus.

*Biology.* *Phrynixus* and its associates inhabit wet, rotting wood and the larvae feed on the tough,

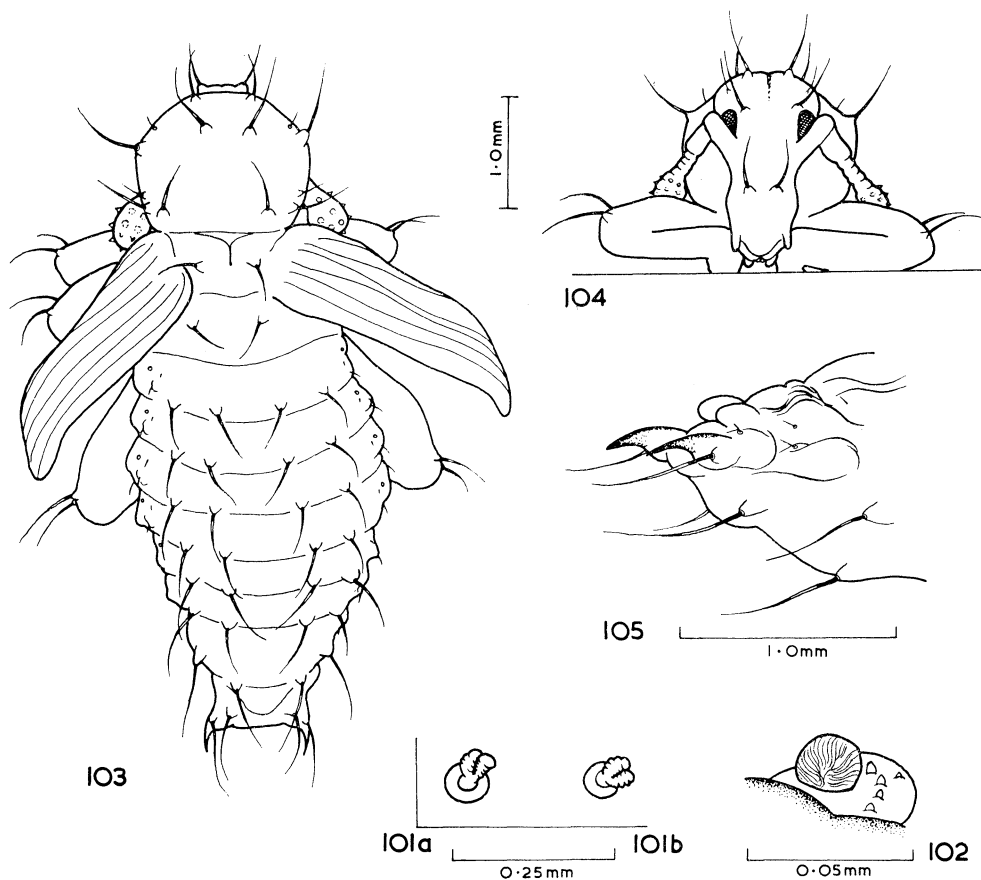


Fig. 101–105. Larva of *G. exiguus* (Brookes), Lyall-Beeman Saddle, Campbell I: 101, spiracles showing alignment -a, thoracic; b, abdominal segment VIII; 102, antenna. 103–105. Pupa of *Gromilus exiguus* (Brookes), Davis Point, Campbell I (distorted specimen): 103, dorsal view; 104, head; 105, abdominal segments VIII, IX, X.

resistant portions avoided by most other insects. This preference is reflected in the mouthparts and their heavily reinforced points of attachment to the head capsule.

***Phrynixus laqueorum* Kuschel**

*Pupa* (distorted specimen) Fig. 160-162.

Size  $5.0 \times 2.5$  mm. Setal index as in Table 3.

Setae blackish brown, mounted on tubercles of varying size; longer setae of pronotum and head weakly hooked. Pronotum with surface uneven. Mesonotum lacking setae. Scutellum absent. Abd. segments with 1

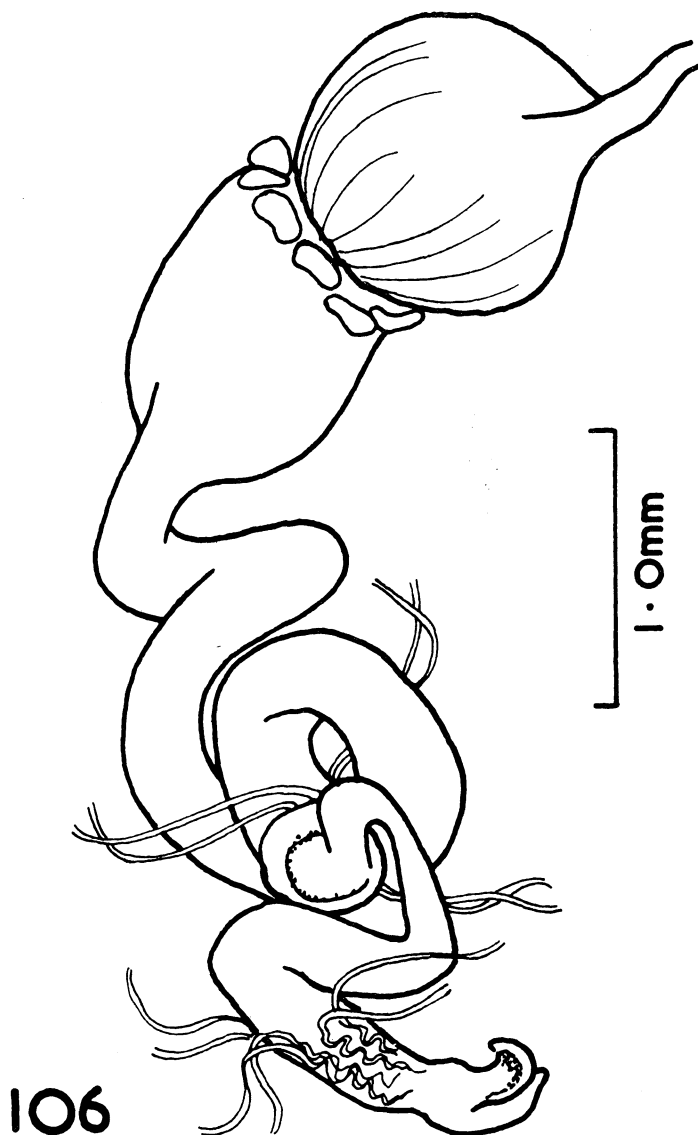


Fig. 106. Larva of *Phrynixus astutus* Pascoe, Huia, North Island. Alimentary canal.

visible dorsal seta, the remaining 4 microscopic. Abd. VI, VII, VIII with large tuberculate setae which are longer than the pseudocerci on Abd. IX. Pseudocerci short, stout, curved, lightly pigmented. Legs with 1 strong, 1 weak, femoral setae. Antennal club tuberculate. Spiracles inconspicuous. Secondary pterotheca absent.

*Material examined.* SNARES I: Station Point, in *Olearia* forest logs, 8.I.1967, 1 pupa (P. M. Johns).

#### Subfamily ERIRHININAE

Although no *Bryocatus* larvae were discovered in the Subantarctic Islands, I have reared three species, one of which is very close to the Campbell I *B. serripes* (Kuschel), from alpine mosses on the mainland. These larvae appear to differ in some important respects from the European Erirhininae as figured by Scherf (*loc. cit.*) but are extremely similar to the rice water weevil, *Lissorhoptrus oryzophilus* Kuschel, discounting the modified spiracles in that species. There is no doubt that, on larval characters, *Bryocatus* should be placed in Erirhininae rather than in Tychiinae. A definition which includes the New Zealand, European and N. American elements so far studied, follows:

Head free, often dark colored, deeply emarginate behind, with sides well rounded. Postoccipital condyles narrow, strongly produced. Anterior and posterior ocelli present. Frontal setae much reduced, often absent, *fs* 4 the most constant. Antennae short, either broadly conical or hemispherical. Mandible with apex bifid or simple, no accessory projections and usually only 1 visible seta. Labral tormae subparallel, approximate at base, often joined. Palpi reduced in size. Labial palpi 1- or 2-segmented. Spiracles reduced, absent or otherwise modified, bicameral when present, dorsal on Abd. VIII. Body setae variable, often reduced in size and number. Anus terminal, 4-lobed.

Alimentary canal relatively simple. Midgut with bends rather than coils. Gastric caeca absent. Malpighian tubules with origin and bases unthickened. Cryptonephridium and rectal bracon undeveloped.

According to Scherf (*loc. cit.*), the European genera *Hydronomus*, *Grypidius* and *Bagous* possess bidentate mandibles and conical antennae. In *Bagous* the head is longer than wide. The postoccipital condyles, an outstanding feature in *Bryocatus*, are not figured.

#### Genus *Bryocatus* Broun Fig. 63-68

Setal index as in Table 2.

Body moderately slender, evenly curved. Color dense white due to large deposits of fat body. Head small in relation to body, with conspicuous, triangular postoccipital condyles visible through prothoracic cuticle. Sutures distinct, ecdysial line almost reaching frontal apex. Antennae hemispherical, smooth. Mandible with simple apex. Hypopharyngeal bracon colorless. Clypeal and labral setae reduced or absent. Epipharyngeal setae in typical numbers but minute. Labral tormae obscurely joined at base. Labial palpi 1-segmented. Posterior postlabial setae closer together than the median, or absent. Body setae and spiracles variable.

*Biology.* Larvae have been found, on the mainland, where moss is growing in damp, but well drained, substrata such as rock or pumice sand. They were scattered amongst the subterranean parts of the stems and root system. Some just below the surface appeared to be feeding on the lower, dead leaves. Pupation takes place in early summer in the upper 2 cm of soil in cells thinly lined with a viscous fluid. Adults emerge from December onwards.

#### Subfamily EUGNOMINAE

Head free or partially retracted, emarginate behind, either quadrate-depressed in conformation, or almost spherical. Postoccipital condyles inconspicuous. Anterior and posterior ocelli present, with convex corneae. Frontal setae often reduced, *fs* 5 never shorter than *fs* 4. Antennae not overhung by a frontal projec-

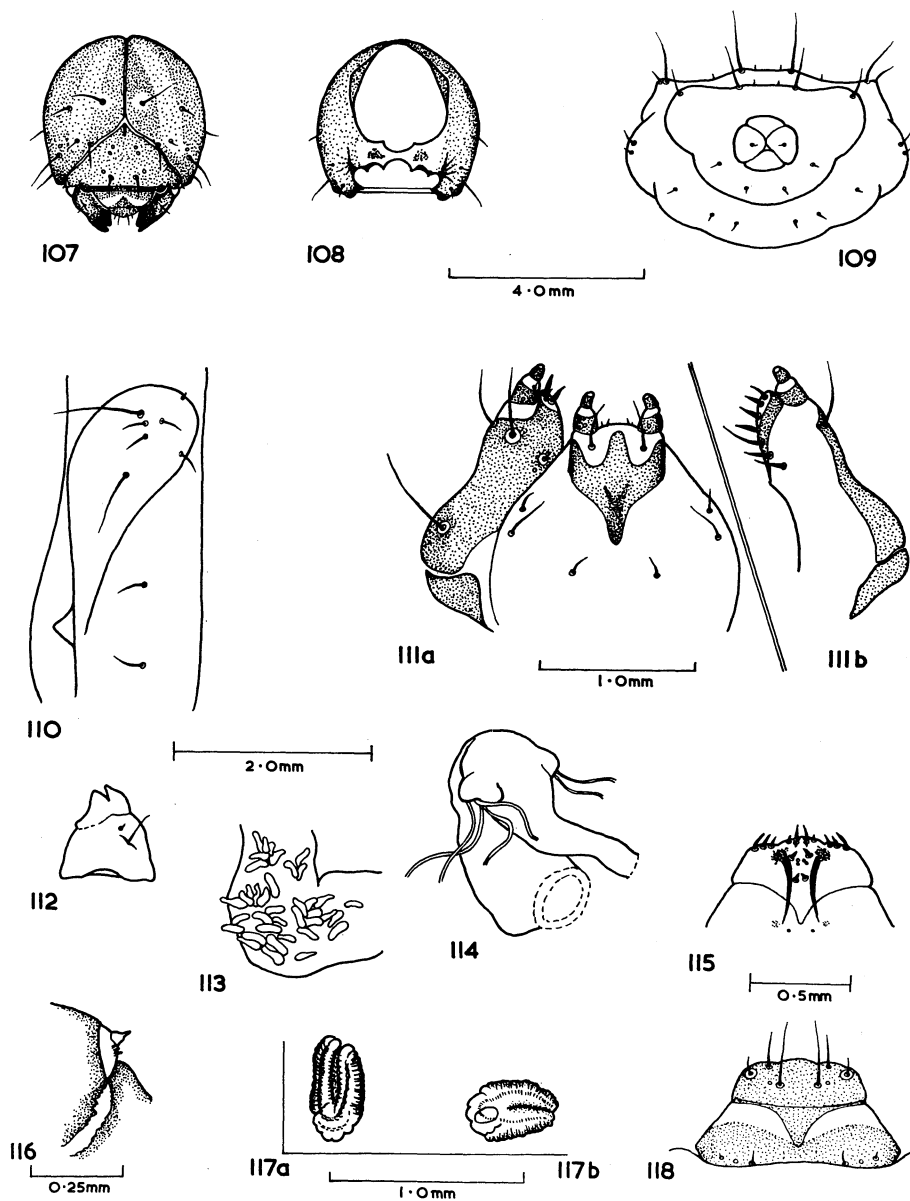


Fig. 107-118. Larva of *Hadramphus stilbocarpae* Kuschel, Snares I: 107, head, dorsal view; 108, head, ventral view; 109, abdominal segments VIII, IX, X, caudal view; 110, thoracic pedal and mediosternal areas showing median pocket; 111, maxilla and labium -a, ventral view; b, dorsal side of maxilla; 112, mandible, outer side; 113, gastric caeca of mid-gut; 114, origin of Malpighian tubules; 115, epipharyngeal lining; 116, antenna; 117, spiracles, showing alignment -a, thoracic; b, abdominal segment VIII; 118, clypeus and labrum.

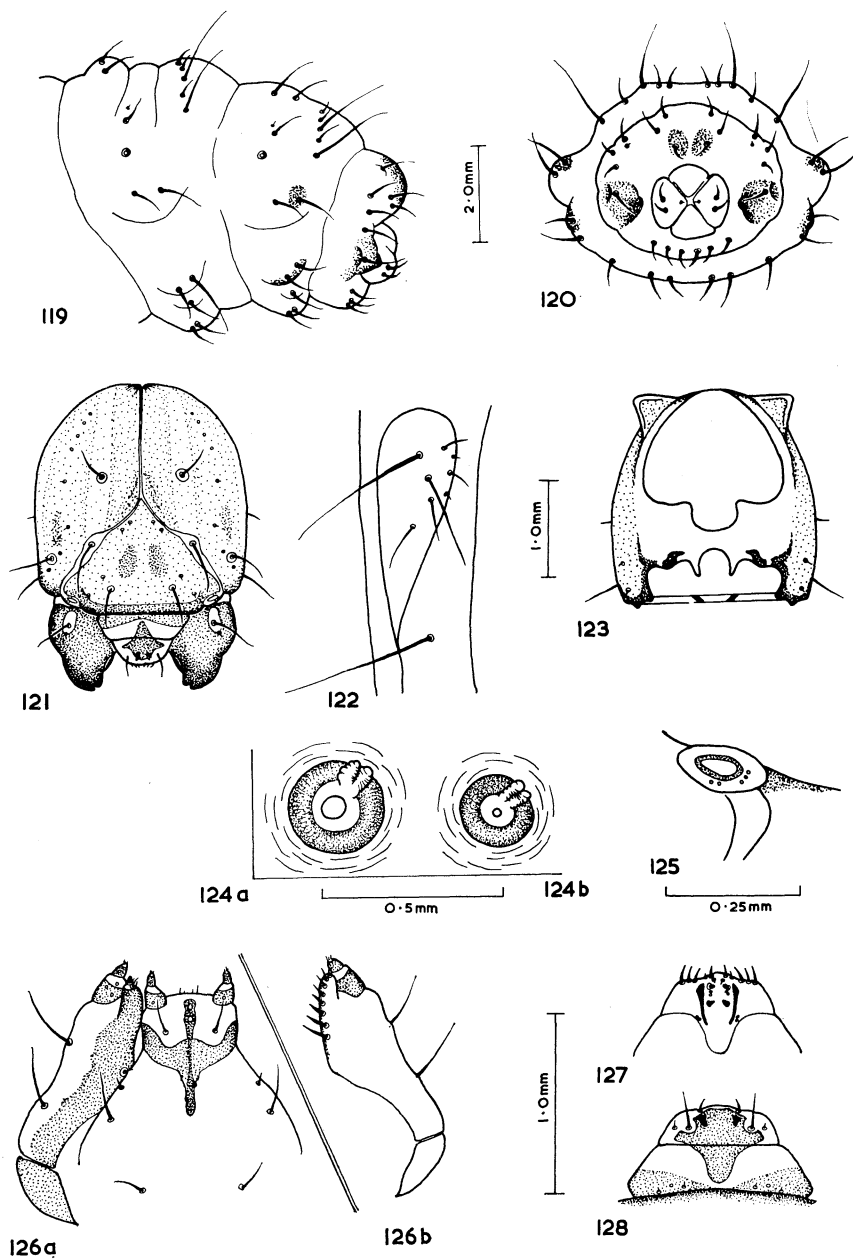


Fig. 119–128. Larva of *Heterexis sculptipennis* (Brookes), Adams I: 119, abdominal segments VII, VIII, IX, X, lateral view; 120, abdominal segments VIII, IX, X, caudal view; 121, head, dorsal view; 122, thoracic pedal and mediosternal areas; 123, head, ventral view; 124, spiracles, showing alignment -a, thoracic; b, abdominal segment VIII; 125, antenna; 126, maxilla and labium -a, ventral view; b, dorsal side of maxilla; 127, epipharyngeal lining; 128, clypeus and labrum.

tion. Mandibles with a median, but not a basal, tooth; setae aligned longitudinally. Labrum with lateral seta distinct, but shorter than the anterior. Tormae approximate at base but not always united. Posterior pair of postlabial setae less widely separated than the median pair. Premental sclerite very distinct. Spiracles circular, bicameral; those of Abd. VIII placed dorsad, subequal in size to thoracic spiracles; those of Abd. I–VII much smaller. Oenocyte clusters often visible laterally where they are more elongate than in Cryptorhynchinae or Cossoninae. Anus with 6–8 lobes, the ventral, and occasionally the dorsal, lobes being subdivided; lateral lobes with 3 setae.

Alimentary canal with globular caeca. Cryptonephridium cup-shaped caudoventrally. Rectal bracon a wide loop or lamina, pigmented or not.

*Remarks.* A cryptorhynchine relationship in this group of larvae is indicated by the convergent and often united tormae, the dark oenocyte clusters and the full assemblage of cephalic setae.

### Genus **Pactolotypus** Broun

Body slender, evenly curved. Cuticle minutely spiculate on folds and lobes. Head partially retracted, quadrate, depressed, emarginate behind. Only anterior ocelli distinct. Antennae broadly conical, pubescent. Hypopharyngeal bracon colorless. Epipharyngeal lining with cuticle spiculate below median spines. Dorsal lacinial setae in a straight line. Postdorsal setae on terminal segments long, curved. Abd. I and II with 3 dorsopleural setae. Anus terminal, 6-lobed.

Alimentary canal (Fig. 59): Proventriculus striated. Oesophageal caeca absent. Anterior ventriculus smooth, moderately bulky. Posterior ventriculus 0.5 width of anterior, arranged in 1 transverse, 1 longitudinal, coils. Malpighian tubules arising before ileocolic valve from simple bases, arranged 4 + 2, rejoining hind gut after the final bend. Cryptonephridium well developed. Rectal bracon colorless, extended in a broad lamina.

#### **Pactolotypus depressirostris** (Kirsch) Fig. 51–59.

Maximum size 4.0 × 1.5 mm. Head width 1.0 mm. Setal index as in Table 2.

Head yellow brown; epistoma and mandibles red-brown. Postoccipital condyles small, right-angled. Sutures moderately distinct, narrow. Endocarinal line faint. Mandible with distal seta minute. Antenna with one of the basal appendages unusually long, 0.7 length of cone. Abd. VIII and thoracic spiracles with 6–9 annuli; those of other abdominal segments microscopic with air tubes horizontal, 4–6 annuli.

Alimentary canal with gastric caeca blackish, 14–20 each side of posterior coil, in a single row, graduated in size, 0.25–0.5 width of tube.

*Biology.* The larvae feed both subcortically and in the pith of dead and dying shoots of *Hebe elliptica*. The biology of *Pactolotypus* is probably similar to that of other *Hebe*-inhabiting eugnomines where pupation takes place in the lumen of the stem. An exit hole is first chewed by the prepupal larva stopping short of the paper-thin cortex. The resulting frass is packed to form a pupal chamber. Adults emerge during spring and early summer.

*Material examined.* AUCKLAND IS: Adams I, In pith of thin branches, *Hebe elliptica*, I.1966, 2 larvae, exuviae of 1; subcortical in *H. elliptica*, 31.I.1966, 1 larva; Fairchild's Garden, in litter sample 66/77, 20.I.1966, 2 larvae; in litter sample 66/95, 2.II.1966, 7 larvae (G. Kuschel).

#### *Pupa* (distorted specimen) Fig. 60–62.

Size 2.5 × 1.25 mm. Setal index as in Table 3.

Setae colorless, tuberculate on head, moderately long on head, pronotum and femora, very short elsewhere. Antennal club minutely tuberculate. Pronotum abruptly narrowed in front. Thoracic spiracle oval, not protruding. Abdominal spiracles insignificant. Primary pterotheca with a tubercle near shoulder, otherwise smooth. Secondary pterotheca absent. Hind legs with large femoral tooth and strongly bowed tibiae. Pronotum with only 2 basal setae. Abdominal setae scarcely visible. Pseudocerci on Abd. IX in the form of tubercles with lightly sclerotised, bifurcate tips.

*Material examined.* AUCKLAND IS: Adams I, in pith, *Hebe elliptica*, I.1966, 1 pupa (G. Kuschel).

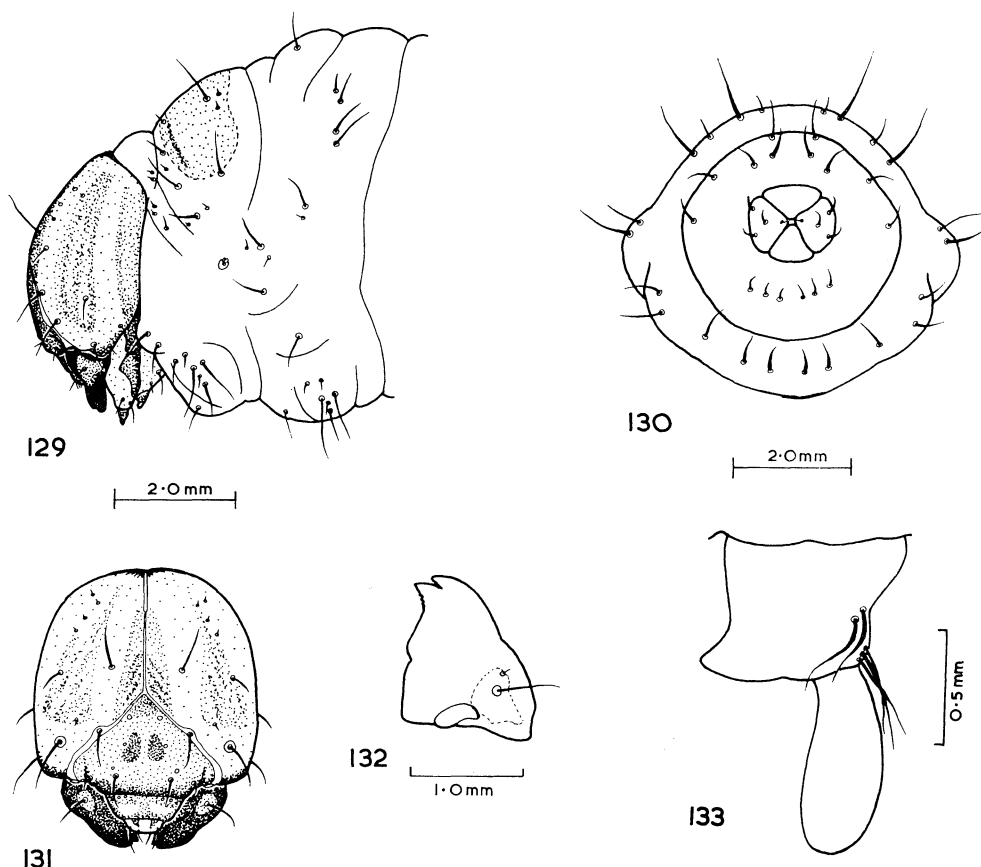


Fig. 129-133. Larva of *Oclandius* spp., Adams I. *O. laeviusculus* (Broun): 129, head, thoracic segments I, II; 130, abdominal segments VIII, IX, X, caudal view; 131, head, dorsal view; 132, mandible, outer side. *O. cinereus* (Blanchard): 133, mandibular cusp of teneral adult.

#### Subfamily TYCHIINAE

Head free, often deeply emarginate behind, convex, small in relation to body size. Anterior and posterior ocelli usually present. Postoccipital condyles small, but distinct, colored as head. Frontal setae reduced, *fs* 4 constant, longer than *fs* 5. Antennae broadly conical, smooth. Mandibles with 2 or 3 (*Notinus*) apical, but no median, teeth; 2 setae arranged longitudinally. Clypeal setae usually present, but microscopic. Epipharyngeal lining with sensilli between middle and anterior pairs of median spines; tormae well separated, usually parallel. Posterior pair of postlabial setae more widely separated than, or subequally spaced with, the median pair. Labial palpi 2-segmented. Body setae often reduced in response to environment. Spiracles circular, bicameral, those of the thorax and Abd. VIII of similar size, larger than the others; those of Abd. VIII placed towards or on the dorsum. Anus subterminal to ventral, retractile, used as a pseudopod, 4-6 lobed.

Alimentary canal with anterior ventriculus occupying most of the body cavity. Oesophageal caeca sometimes present. Posterior ventriculus with 1-2 elongate coils. Gastric caeca flask shaped to finger shaped, or absent. Malpighian tubules with origin and bases simple, arranged 4 + 2, of unequal thickness. Cryptonephridium and rectal bracon poorly developed.

The widely spaced tormae and relative positions of the postlabial setae suggest that this group



of larvae is separate from, though obviously close, to that which includes *Bryocatus*.

The ecology of tychiine weevils is extremely varied. The subfamily includes species which are leaf miners, ecto- and endophytic feeders on green seeds, subterranean feeders on roots and leaf bases, and some which feed in succulent or dying aerial stems. Nevertheless, the larvae are remarkably homogeneous.

#### Genus *Peristoreus* Kirsch

Body usually robust behind the small head, but narrowing posteriorly. Pronotum usually pigmented. Head evenly rounded at sides, emarginate behind to a greater or lesser degree. Sutures and postoccipital condyles distinct. Ocelli variable. Cephalic setae usually reduced, the most constant being *des* 3, 5, *les* 1, *fs* 4. Mandibles bifid. Hypopharyngeal bracon colorless. Labrum almost quadrate, with discal setae shorter than anterior setae which are acute and projecting. Lateral setae very small. Maxilla with lacinia apically flattened.

Alimentary canal (Fig. 76) with striated proventriculus. Oesophageal caeca absent. Anterior ventriculus smooth, elongate. Posterior ventriculus bending abruptly forward to lie against the anterior part. Gastric caeca not always present.

#### *Peristoreus innocens* Kirsch Fig. 69–79.

Maximum size  $4.5 \times 1.5$  mm. Head width 0.75 mm. Setal index as in Table 2.

Body robust, slightly curved, more so posteriorly. Pronotum colorless. Abd. VIII depressed on dorsum; Abd. IX small; anus 4-lobed, ventral. Body setae colorless; minor setae reduced to microsetae or sensilli; major setae longest on Abd. VII to IX. Cuticle almost smooth. Head and mandibles yellow with extremities blackish; hind margin slightly emarginate. Post occipital condyles right-angled. Anterior ocelli only, distinct. Endocarinal line 0.6 length of frons. Epipharyngeal setae squamose. Tormae short, indistinct. Premental sclerite faint. Pedal area with only 1 major seta. Thoracic spiracle with airtubes  $2.5 \times$  width of peritreme, 8 annuli. Spiracle of Abd. VIII similar, placed on dorsum.

Alimentary canal with anterior ventriculus  $3 \times$  longer than wide. Posterior ventriculus in 2 tight, elongate coils. Gastric caeca finger shaped, length 0.5 width of tube, sparsely arranged in a row on each side.

The larva of *P. innocens* shows a considerable degree of specialisation. The most positive separation between the *Peristoreus* species examined is in the gastric caeca.

*Material examined.* AUCKLAND IS: Adams I, Magnetic Cove, 2.II.1966, 13 larvae (G. Kuschel). CAMPBELL I: Beeman Pt, ex *Dracophyllum*, 25.I.1963, 3 larvae (K.A.J. Wise).

*Biology.* The larvae are in flowers of *Dracophyllum longifolium* (J. R. et G. Forst.). There was evidence that each larva required the contents of at least two flowers. They drop to the ground to pupate.

#### Genus *Notinus* Kuschel

Body creamy white to intense yellow. Pronotal shield, mediosternal and pedal areas pigmented. Head with posterior emargination almost reaching frontal apex; sides strongly rounded, narrowed in front. Postoccipital condyles small, acute. Anterior ocelli distinct, posterior faint. Cephalic setae reduced, with *des* 5, *les* 1, *fs* 4 constant. Mandibles with 3 teeth of equal size. Hypopharyngeal bracon colorless. Antennae relatively large, broadly conical, smooth. Labrum rounded. Premental sclerite with lateral arms enclosing a seta equal in length to prelabial seta. Posterior postlabial setae (minute) subequally spaced with the median ones (long). Maxilla with lacinia apically flattened; basal segment of palpus transverse; inner palpiferal seta microscopic.

Alimentary canal (Fig. 90) of typical erirhinine form.

The larva of *Notinus*, while sharing certain environmental modifications, such as reductions of setae and deeply emarginate head capsule, with leaf miners in the European subfamily Rhynchaeninae, differs from them quite strikingly in other respects. *Rhynchaenus* species lack a

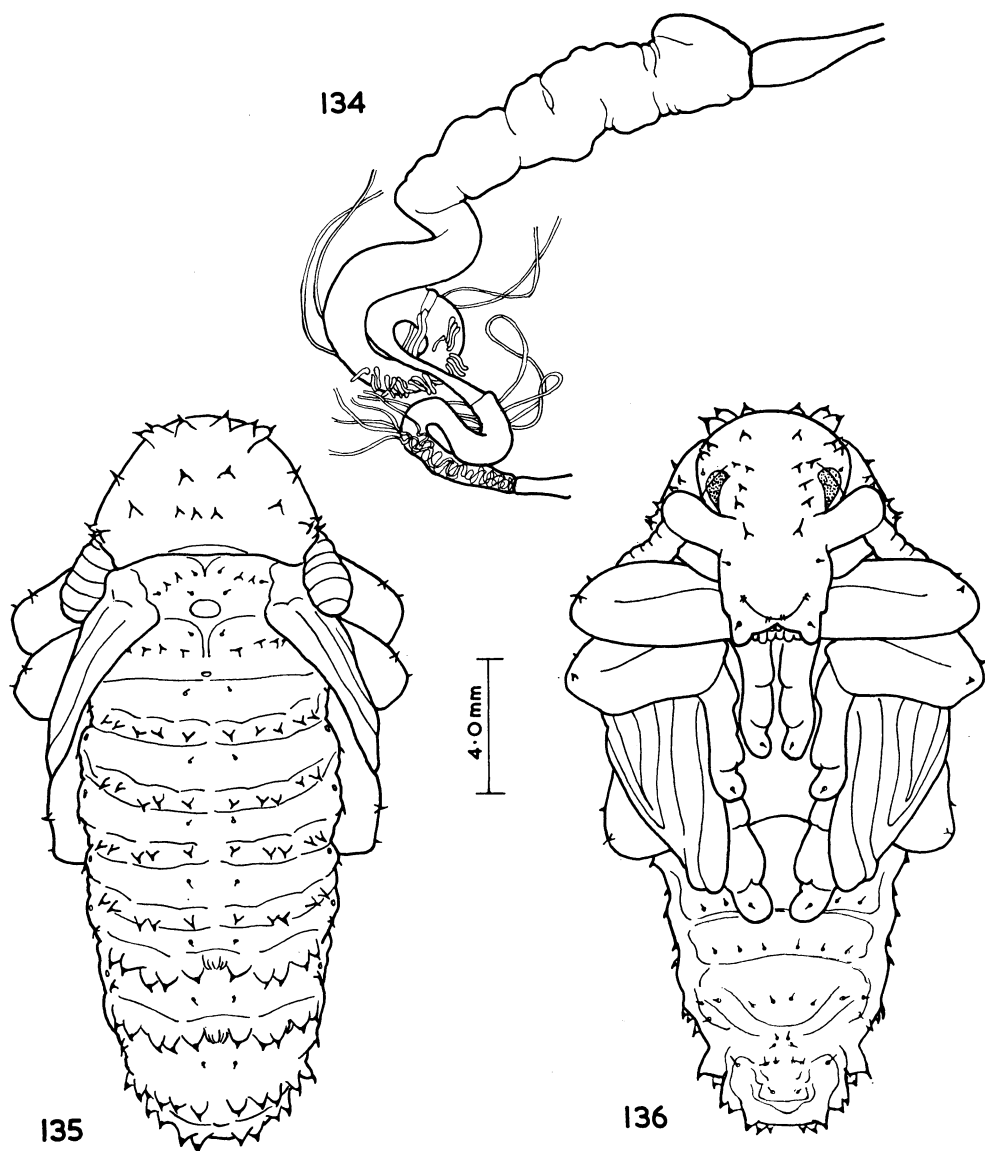


Fig. 134-136. Larva and pupa of *Oclandius laeviusculus* (Broun): 134, alimentary canal of larva; 135, pupa, dorsal view; 136, pupa, ventral view.

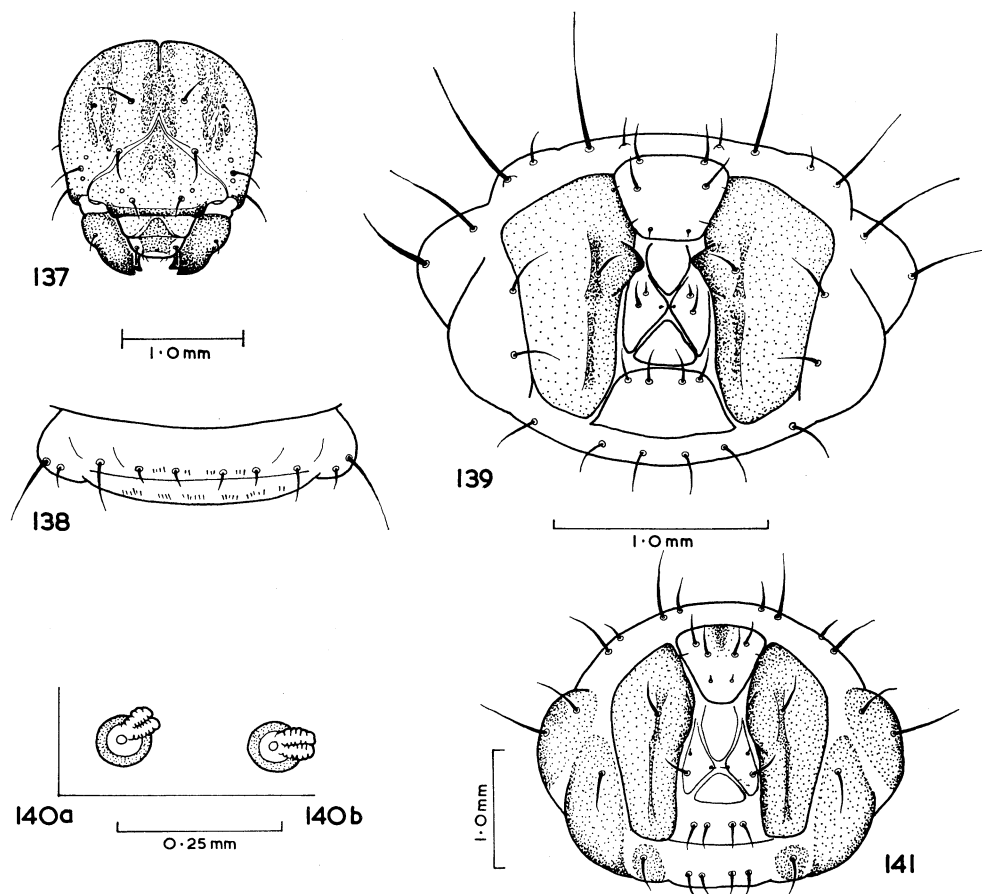


Fig. 137-141. Larvae of *Catodryobiolus antipoda* Brookes, Campbell I and *Catoptes brevicornis brevicornis* (Broun), Big South Cape I. *C. antipoda*: 137, head, dorsal view; 138, sternal areas of abdominal segment VI; 139, abdominal segments VIII, IX, X, caudal view; 140, spiracles, showing alignment -a, thoracic; b, abdominal segment VIII. *C. brevicornis brevicornis*: 141, abdominal segments VIII, IX, X, caudal view.

hypopharyngeal bracon (van Emden 1938); their mandibles are bifid and they have a distinctive series of transverse dorsal ridges on the abdomen (Scherf *loc. cit.*).

***Notinus cordipennis aucklandicus* Kuschel** Fig. 80-90.

Maximum size  $4.0 \times 1.0$  mm. Head width 0.5 mm. Setal index as in Table 2.

Body slender, tapering, scarcely curved. Setae colorless. Very few major setae, others reduced to microsetae or sensilli. Thoracic sclerotised areas light smoky brown, pronotum with a darker anterior line. Head dark brown with distinct endocarinal line extending 0.6 length of frons; frontal sutures wide and clear; *des* 5 and *les* 2 the only outstanding setae. Epipharyngeal setae squamose. Tormae slender, parallel. Lower mouthparts, including postlabium, well pigmented. Premental sclerite with posterior extension dark, slender; anterior extension faint. Lacinia and labium fringed, numbers of setae undetermined. Pedal lobes with only 1 major seta. Spiracles minute; thoracic and Abd. VIII with 6-8; Abd. I-VII with 4-6 annuli. Anus sub-terminal, retractile.

Alimentary canal with 3-4 large, white, pear-shaped caeca around oesophageal valve. Gastric caeca sparsely distributed on posterior mid gut coil; broadly finger shaped, length 0.5 width of tube. Rectal bracon not visible.

*Biology.* The larva is a blotch leaf-miner in *Coprosma foetidissima* J. R. et G. Forst. and *C. ciliata* Hook. f.

*Material examined.* AUCKLAND IS: Adams I, Magnetic Cove, in litter sample 66/92, 30.I. 1966, 1 larva; in leaves of *C. foetidissima*, 31.I.1966, 11 larvae; in leaves of *C. ciliata*, 1 larva (G. Kuschel).

#### Subfamily RHYTIRHININAE

The members of Rhytirhininae (=Rhyparosominae), as listed by Kuschel (*loc. cit.*), cover a wide range of habitats. Their larvae are free living above or below the soil surface or submerged in water. They feed upon green parts of plants, their crowns and roots, or on dead tissue.

Larvae of two endemic genera, *Gromilus* Blanchard, *Desiantha* Pascoe, and the exotic genera *Listroderes* Schönherr and *Hyperodes* Jekel, were available for study. While their diversity of feeding habits has produced modifications which should not be given taxonomic emphasis, they do possess many characters in common. The subfamily may be defined as follows:

Head usually free. Anterior and posterior ocelli present. Postoccipital condyles distinct, acute, colored as head. Endocarinal line often absent. Sutures distinct. Frontal setae reduced, with *fs* 4 constant, always longer than *fs* 5; *des* 2 well developed, *des* 3 placed within frontal suture, *des* 4 microscopic. Mandibles bifid, with an obtuse projection (an accessory tooth in *Listroderes*) medially; only 1 visible seta. Hypopharyngeal bracon colorless or with a pair of pigmented spots. Labrum never distinctly lobed, usually truncate, with lateral setae reduced or absent. Tormae convergent, contiguous or united at base. Posterior pair of postlabial setae less widely separated than the median pair. Lacinia with less than 8 dorsal setae. Anus 4-lobed; lateral lobes with 3 or 0 setae.

#### Genus **Gromilus** Blanchard

Setal index as in Table 2.

Body moderately robust, evenly curved; pronotum pigmented. Head scarcely emarginate behind; outline somewhat quadrate; endocarinal line absent; clypeal setae microscopic. Anterior ocelli distinct, posterior faint. Antennae hemispherical, with rounded apices. Mandibles wide and somewhat flattened. Hypopharyngeal bracon with 2 triangular pigmented patches. Labrum with lateral seta microscopic. Tormae not joined at base, slightly bowed. Epipharyngeal sensilli clusters between proximal pairs of median spines and on outer side of proximal ends of tormae. Typical abdominal segments with median fold reduced or absent; most minor setae coarse and spinelike. Anterosternal microseta (Fig. 91, 92) usually visible. Spiracles circular, bicameral. Anus terminal with 3 lateral setae.

Alimentary canal: Proventriculus striated internally, with or without oesophageal caeca. Posterior ventriculus approximately 0.5 width of anterior part; scarcely coiled, usually lacking gastric caeca. Malpighian tubules with simple bases arising from a slightly thickened ring, arranged 4 + 2. Cryptonephridium weakly developed. Rectal bracon ring-shaped, colorless.

Six of the nine species and subspecies are represented in the collection of larvae: three from the Auckland Is, two from Campbell I and one from the Antipodes Is. Four series, *exiguus* (Brookes), *insularis robustus* (Brookes) (Campbell I), *insularis insularis* Blanchard (Adams I) and *insularis antipodarum* Kuschel (Antipodes I) were identified through their associated adults. The remaining specimens were determined by comparison with these.

The position of the genus within the group Phanerognatha is discussed later in this paper.

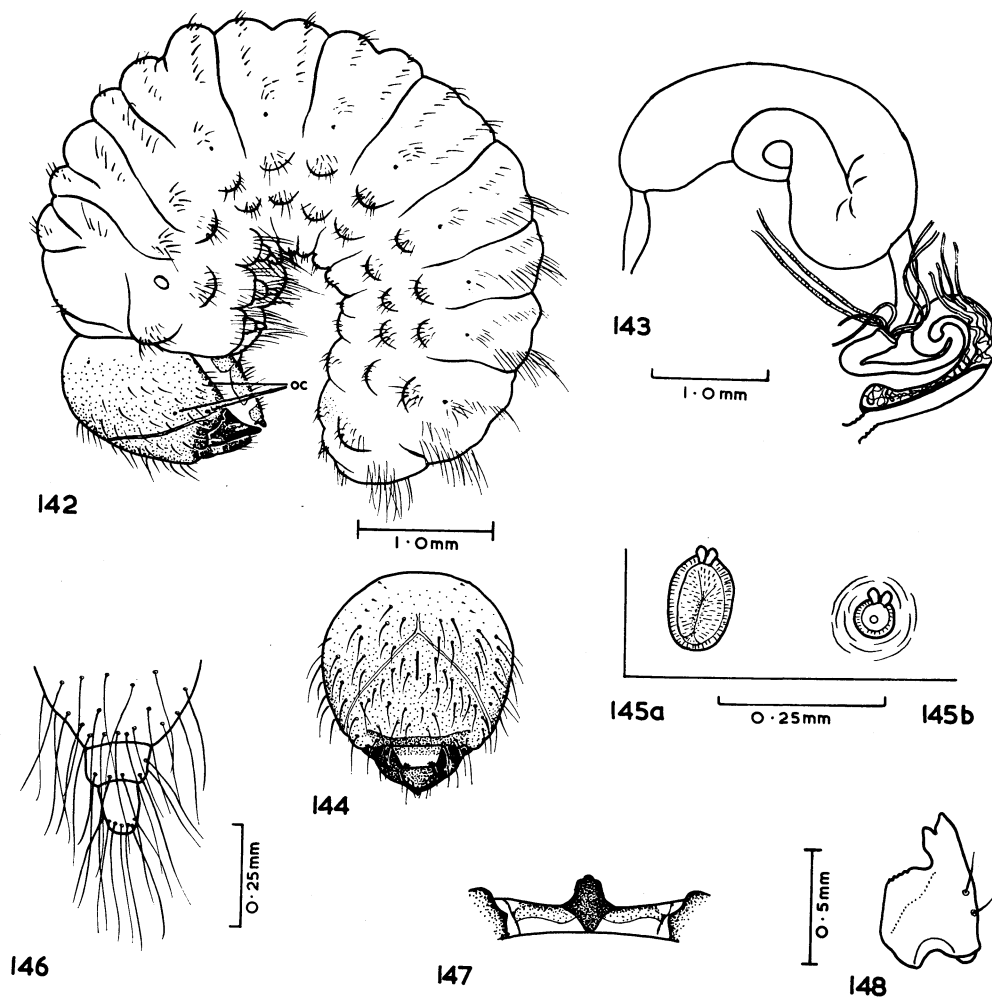


Fig. 142-148. Larva of *Cacephatus aucklandicus* (Brookes), Ewing I: 142, larva, lateral view; 143, alimentary canal; 144, head, dorsal view; 145, spiracles -a, thoracic; b, abdominal segment IV, 146, leg; 147, hypopharyngeal bracon and sclerome; 148, mandible, outer side.

**Gromilus exiguus** (Brookes) Fig. 91-95, 97-102.

Size of largest specimen  $6.5 \times 3.0$  mm. Head width 1.5 mm.

Head light red-brown with epistoma darker red, genae and mandibles blackish. Postoccipital condyles rather small, right-angled, with dark margins. Epipharyngeal setae short, stout, pigmented. Body setae rather pale with red-brown bases; minor setae thick, but finely tapered; major setae more slender, approximately  $10 \times$  longer. Cuticle closely spiculate on prodorsal and sternal folds; sclerotised and lightly pigmented around groups of setae. Dorsal median fold on typical abdominal segments extremely narrow.

*Material examined.* CAMPBELL I.: In roots of tussock, X.1961, 8 larvae (V. O'Neill); Mt Lyall, 200-400 m, in moss, 3, 5, 12.XII.1961, 6 larvae; Lyall-Beeman Saddle, 70 m, in *Poa* roots, 3, 5, 12.XII.1961, 4 larvae; Beeman Hill, 30-100 m, in *Poa* roots and moss, 2, 6.XII.1961, 1 larva;

Davis Point, 12.XII.1961, 2 larvae; Monument Harbor near beach, rocky shore, 10.XII.1961, 1 larva (J. L. Gressitt); Beeman Camp, 13.I.1969, 2 larvae (G. Kuschel). Immature larvae probably the same species: Lookout Bay, litter sample 69/8, 16.I.1969, 3 larvae (G. Kuschel); Yvon Villarceau, 330 m, litter sample 69/25, 24.I.1969, 2 larvae (G. Kuschel, R. W. Taylor). Monument Hill, in *Tillaea* on shore rocks, 9.II.1963, 8 larvae; Venus Bay, 0.2 m, in tussock, 2.II.1963, 1 larva (K. P. Rennell).

**Gromilus veneris setarius** (Broun)

Size of largest specimen  $7.0 \times 2.3$  mm. Head width 1.25 mm.

Similar to the preceding species except: Cuticle without spicules and not sclerotised around bases of setae. Major setae somewhat longer.

*Material examined.* CAMPBELL I: Lyall-Beeman Saddle, 70 m, in *Poa* roots, 3, 5, 12.XII.1961, 1 larva; Mt Puiseaux, 200–100 m, in moss, 17.XII.1961, 1 larva (J. L. Gressitt); Lookout Bay, litter sample 69/8, 16.I.1969, 2 larvae (G. Kuschel).

**Gromilus** prob. **fallai** (Brookes)

Size of specimen  $7.0 \times 2.25$  mm. Head width 1.25 mm.

Cuticle spiculate and sclerotised as in all other species except *veneris*, but distinct by reason of an irregularly shaped pigmented patch on each of the pedal lobes. Dorsal median fold on abdominal segments absent. The size of this larva suggests that it should belong to one of the larger species such as *fallai* rather than to *cockaynei*.

*Material examined.* AUCKLAND IS: Adams I, Mt Dick NE Ridge, 2.II.1966, 1 larva (G. Kuschel).

**Gromilus insularis** Blanchard

Characters are lacking to sharply distinguish this species from *exiguus*. The median dorsal fold of abdominal segments is more obsolete, usually absent. The body setae are somewhat shorter and paler. The head is yellow-brown rather than red-brown. Larvae of the subspecies can only be separated on locality.

**Gromilus insularis insularis** Blanchard

Size of largest specimen  $9.0 \times 2.8$  mm. Head width 1.5 mm.

*Material examined:* AUCKLAND IS: Auckland I, Hooker Hill, 1000 ft (330 m), under stones, 11.II.1963, 1 larva (K. A. J. Wise). Adams I, Mt Dick NE ridge, 1300 ft (430 m), 22.I.1966, 1 larva; Magnetic Cove, E. ridge, 27.I.1966, 1 larva; feeding on roots of *Tillaea moschata* (Forst. f.) DC, 4.II.1966, 5 larvae (G. Kuschel); Fairchild's Garden, fellfield, 20.I.1966, 1 larva (P. M. Johns); under stone among small plants, 24.I.1966, 1 larva; Magnetic Cove, *Dracophyllum* litter, 24.I.1966, 3 larvae (Wise). Rose I, N Coast, under rocks among *Poa litorosa*, 11.I.1963, 2 larvae (Johns).

**Gromilus insularis robustus** (Brookes)

Maximum size  $8.0 \times 3.0$  mm. Head width 1.5 mm.

This species is difficult to separate from *exiguus*.

*Material examined.* CAMPBELL I: Under *Stilbocarpa polaris* (Homb. et Jacq.), 3 m, 30.XII.1961, 1 larva in association with pupa and adults; Lookout Bay, roots of *Stilbocarpa*, 3.II.1963, 28 larvae; Rocky Bay, under *Tillaea* and cushion plants near penguin colony, 18.II.1963, 2 larvae; Mt Azimuth, 350 m, under stones, 12.II.1963, 1 larva (K. P. Rennell); Rocky Bay, 10 m, under *Tillaea* in penguin colony, 18.II.1963, 12 larvae (K. A. J. Wise).

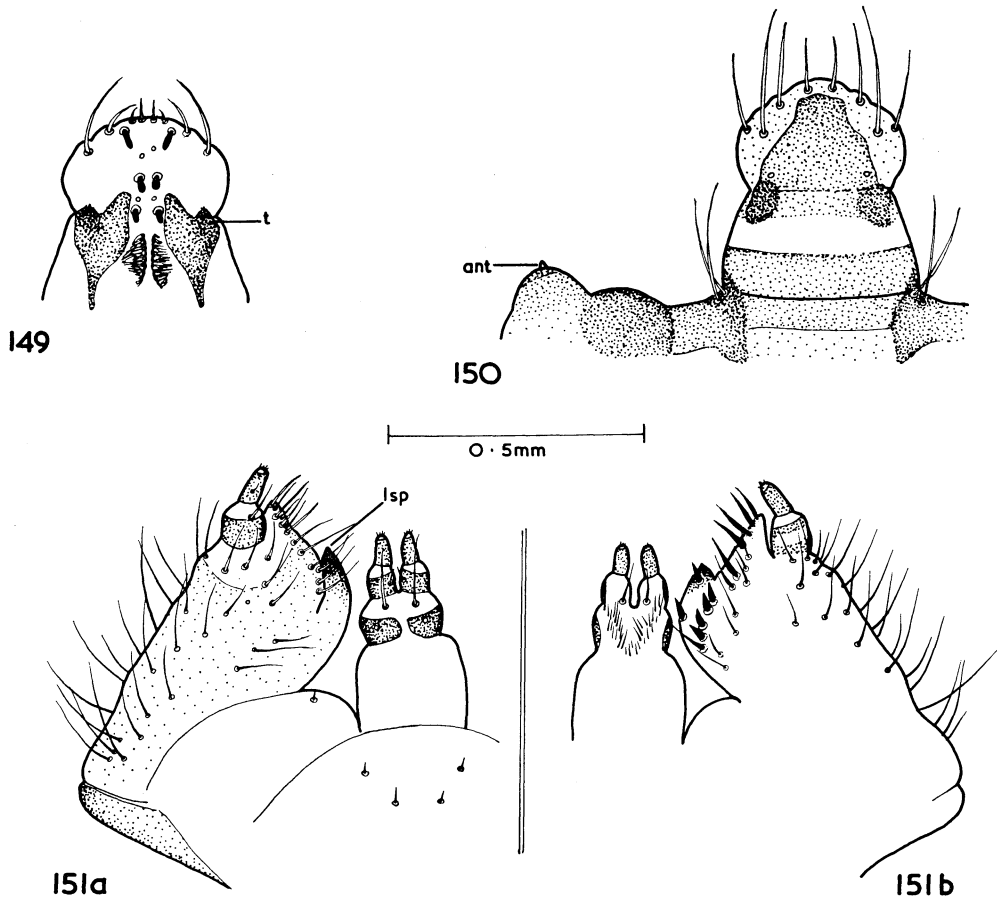


Fig. 149–151. Larva of *Cacephatus aucklandicus* (Brookes): 149, epipharyngeal lining; 150, epistoma, clypeus, labrum and antenna; 151, maxilla and labium -a, ventral view; b, dorsal view.

***Gromilus insularis antipodarum* Kuschel**

Size of largest specimen  $5.5 \times 2.0$  mm. Head width 1.0 mm.

*Material examined.* ANTIPODES I: North Plain, under *Pleurophyllum*, 6.II.1960, 3 larvae; 100 m, under *Acaena minor* (Hook. f.) Allan, 19.II.1969, 3 larvae; Central Valley, 300 m, in litter and moss, 25.II.1969, 1 larva; Mt Waterhouse, 380 m, litter sample 69/60, 23.II.1969, 1 larva (G. Kuschel).

*Remarks.* Larvae of *Gromilus* sp. from Big South Cape I show no differences from those of *insularis* beyond a lighter yellow head capsule.

**PUPAE**

***Gromilus exiguus* (Brookes) Fig. 103–105.**

Size of largest specimen  $6.25 \times 3.25$  mm. Setal index as in Table 3.

Setae long, finely tapering, dark black brown on proximal 1/2, paler distally, mounted on small tubercles. Antennal club tuberculate. Pronotum wider than long, sides rounded. Thoracic spiracle circular, inconspicuous.

cuous; those of the abdomen similar but smaller. Primary pterotheca smooth. Secondary pterotheca vestigial, 0.2 length of primary. Rostrum reaching apex of fore tibiae. Scape of antenna reaching upper margin of eye. Legs with 2 equal-sized femoral setae. Pronotum with 2 of the lateral setae weak. Meso- and metanotum each with 1 strong seta. Abdomen with minor setae absent and both spiracular setae very small. Abd. VIII with 1 strong dorsal, 1 weak lateral, setae. Pseudocerci on Abd. IX black, thornlike, directed caudad with dorsal seta longer than the spine.

*Material examined.* CAMPBELL I: Davis Point, shore rocks, 1-3 m, 12, 19.XII.1961, 3 pupae taken with adults; Courjolles Peninsula, 200 m, in moss, 14.XII.1961, 1 pupa (J. L. Gressitt); Monument Hill, in *Tillaea* on shore rocks, 9.II.1963, 1 pupa (K. P. Rennell).

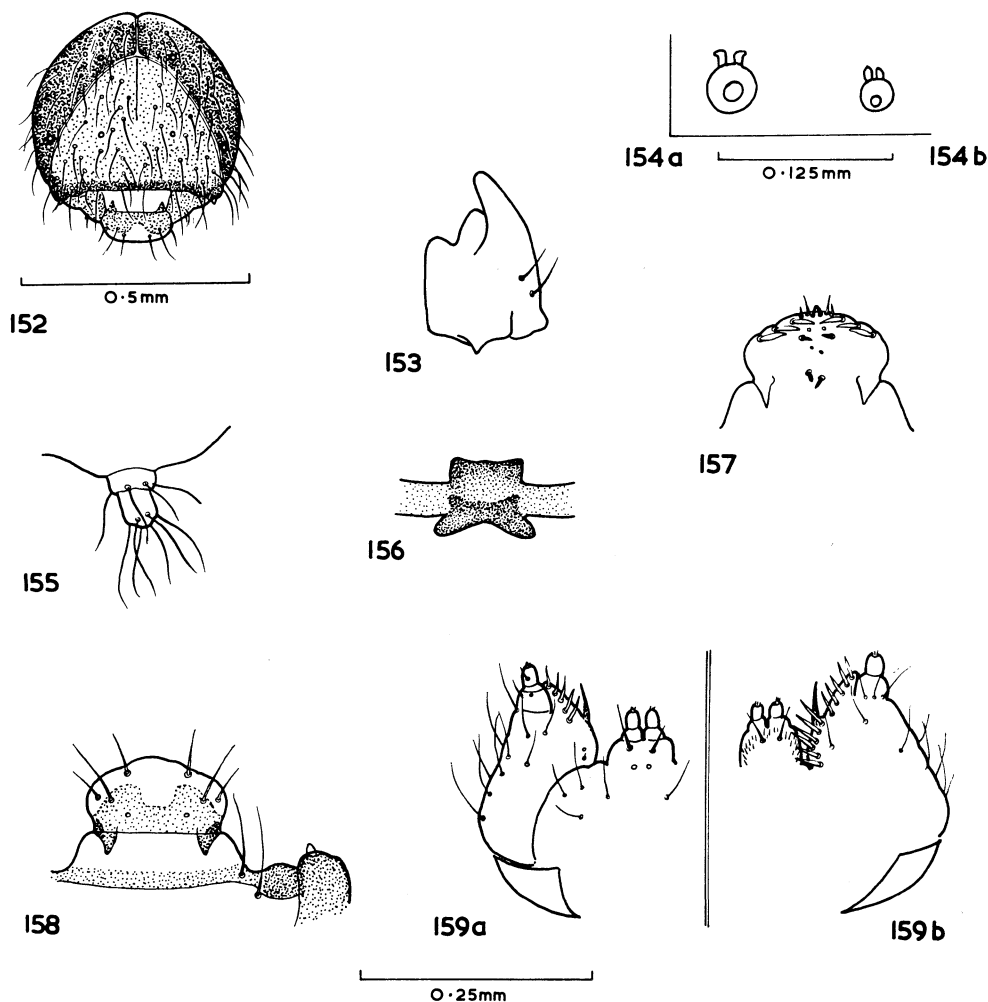


Fig. 152-159. Larva of *Lichenobius littoralis* Holloway, Big South Cape I: 152, head, dorsal view; 153, mandible; 154, spiracles -a, thoracic; b, abdominal segment IV; 155, leg; 156, hypopharyngeal sclerome; 157, epipharyngeal lining; 158, epistoma, clypeus, labrum and antenna; 159, maxilla and labium -a, ventral view; b, dorsal view.



**Gromilus insularis robustus** (Brookes)

Size of largest specimen  $5.0 \times 3.0$  mm.

Differs from *exiguus* as follows: Setae darker and thicker in basal 1/2 and tapering more abruptly. Major spiracular setae as long and dark as dorsal setae. Femoral setae of unequal size. Pseudocerci longer and more slender.

*Material examined.* CAMPBELL I: Beeman Camp, 2–50 m, under moss, 18–21.XII.1961, 1 pupa (J. L. Gressitt); under *Stilbocarpa polaris*, 3 m, 30.XII.1961, 1 pupa in association with adults; Lookout Bay, roots of *Stilbocarpa*, 3.II.1963, 4 pupae (K. P. Rennell); Rocky Bay, 10 m, under *Tillaea* in penguin colony, 18.II.1963, 8 pupae (K. A. J. Wise).

**Gromilus insularis antipodarum** Kuschel

Size of largest specimen  $5.0 \times 3.0$  mm.

Similar to *insularis robustus*.

*Material examined.* ANTIPODES I: North Plain, under *Pleurophyllum*, 6. II.1969, 2 pupae (G. Kuschel).

## Subfamily LEPTOPIINAE

The subfamily Leptopiinae is widespread throughout the world but apart from certain tribal groupings, the larvae are extremely homogeneous.

Emden's (1952) definition of the subfamily, as abstracted from his key to the genera of Adelognatha, is adequate to cover the New Zealand subantarctic element with only minimal amendments.

Head never retracted into prothorax; frontal sutures well developed; endocarinal line absent; *des* 1 behind middle of head capsule and subequal to *fs* 4. Mandibles with, at most, a rounded bend near middle of cutting edge; setae unequal. Lacinia usually with 8 dorsal setae in a straight row and 4 ventro-apical setae. Epipharyngeal lining with posterior and median spines more or less equally separated. Dorsolateral areas (Emden's alar area) of meso- and metathorax usually with 2 setae. Abd. VIII with 4 or 5 setae. Abd. IX with 2 or 3 sternal setae. Abdominal spiracles of older larvae ovate-fringed or annular, with 2 small airtubes.

In addition, the New Zealand subantarctic genera are characterised as follows:

Head capsule with *des* 3 enclosed by frontal suture; postoccipital condyles strong, right angled, pigmented but with a colorless border. Hypopharyngeal bracon with a dark patch on each side of middle. Mandibles apically bidentate but with the teeth rounded and often obscure; outer edge notched medially; setae set close together in the unpigmented scrobe. Antennae scarcely raised, oval, with a dark collar. Labrum with lateral setae very small, away from margin; anterior setae less than 0.5 length of discal setae. Stipites with lateral pigmentation lacking. Premental sclerite with anterior median extension approximately  $4 \times$  longer than the posterior. Spiracles subequal, small in relation to body size, circular, bicameral with airtubes less than  $2 \times$  width of peritreme. Median dorsal fold narrow on typical abdominal segments.

The largest larvae in this group and an associated pupa from Adams I were identified by their collector as *Oclandius laeviusculus* (Broun). Larvae and pupae from Campbell I, which are indistinguishable from *laeviusculus*, can only belong to *O. cinereus* (Blanchard). *Catodryobiolus antipoda* Brookes is the smallest species and occurs on both Auckland and Campbell Is. *Heterexis sculptipennis* (Brookes) larvae are separated from *Oclandius* by the sclerotised, tuberculate lobes of Abd. IX. *H. seticostatus* (Brookes) from Campbell I and *O. vestitus* (Broun) from Snares I were not represented.

*Biology.* All larvae of Leptopiinae are free-living in the soil, feeding upon roots.

Genus **Catoptes** Schönherr

Insufficient material is available for a generic definition.

Genus **Heterexis** Broun

Body very robust. Head somewhat depressed, with sides straight, slightly emarginate behind. Anterior and posterior ocelli visible as spots before and behind *des* 5. Hypopharyngeal bracon with oblique dark patches.

Epipharyngeal lining with anterior *mes* smaller and less widely separated than the median and posterior pairs which form a square enclosing sensilli clusters. Tormae dark, parallel, expanded anteriorly. Clypeus with sensillus in line with setae (micro). Lacinia cylindrical.

The alimentary canal was not dissected.

**Heterexis sculptipennis** Broun Fig. 119–128.

Maximum size 30.0 × 8.0 mm. Head width 4.0 mm. Setae as in Table 2.

Body cuticle coarsely spiculate on dorsal folds of Abd. I–IV. Setae thick, blackish brown, somewhat spinous. Head yellow brown with paler epicranial and lateral stripes and areas around bases of setae; frons with 2 reddish median patches. *des* 2, 4 and *fs* 5 microscopic; *fs* 1, 2 (both micro) close together near apex of frons. Abd. I–VIII with either 1, or 2, prodorsal setae and Abd. IX with either 2, or 3, sternal setae. Abd. IX with the middle pair of dorsal setae more widely separated than the hind pair, the 6 setae arranged in a circle enclosing a sclerotised area; ventro-pleural lobe strongly sclerotised and inwardly tuberculate. Anal lateral lobes with 2 major setae.

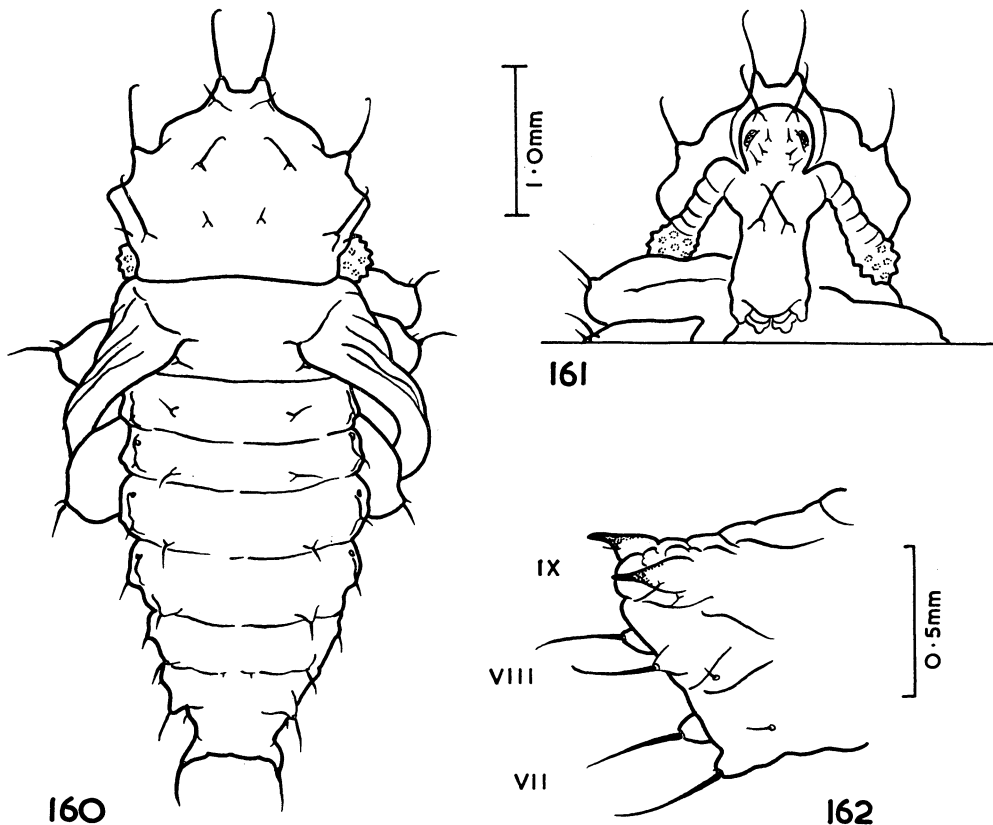


Fig. 160–162. Pupa of *Phrynixus laqueorum* Kuschel, Snares I: 160, dorsal view; 161, head; 162, abdominal segments VII, VIII, IX, lateral view.

*Material examined.* AUCKLAND IS: Adams I, Mt Dick, NE ridge 1800 ft (590 m), 2.II.1966, 3 larvae (G. Kuschel); E ridge above Magnetic Station Cove, 1000–1800 ft (330–590 m), fellfield, 17.I.1956, 4 immature larvae (P. M. Johns).

#### Genus **Oclandius** Blanchard

Facies very similar to that of *Heterexis*. Body cuticle smooth or minutely asperate. Ocelli faint. *fs* 1, 2 (both microscopic) well separated and removed from apex of frons. Clypeus with sensillus in advance of setae (micro). Hypopharyngeal bracon with triangular dark patches. Body segments with 1 prodorsal seta.

#### **Oclandius laeviusculus** (Broun) Fig. 129–132, 134.

Maximum size 35.0 × 11.0 mm. Head width 4.25 mm. Setae as Table 2.

Body cuticle smooth. Setae moderately slender, pale brown with darker bases. Head capsule similar to *Heterexis* in color and shape; *des* 2 and *fs* 5 easily visible. Spiracles with airtubes not extending beyond peritreme. Abd. IX unsclerotised; middle pair of dorsal setae less widely separated than the hind pair; 3 sternal setae. Anal lateral lobes usually with 3 major setae.

Alimentary canal (Fig. 134) with proventriculus simple, oesophageal caeca absent. Anterior ventriculus rather narrow, much folded; posterior ventriculus smooth, arranged in 1.5 loose coils. Gastric caeca finger shaped, length 0.5 width of tube, 20–30 in a single row each side immediately before the ileo-colic valve. Malpighian tubules 2 + 4, with simple bases arising from a slightly thickened ring. Hind gut short with cryptonephridium weakly developed. Rectal bracon not visible.

*Material examined.* AUCKLAND IS: Adams I, Magnetic Station Cove, south side, under *Dracophyllum*—rata, 18.I.1966, 1 larva (P. M. Johns); Magnetic Cove, 19.I.1966, 18 larvae (some mature); Mt Dick, NE ridge 1300 ft (430 m) 22.I.1966, 1 larva; 2.II.1966, 2 larvae (G. Kuschel); Magnetic Cove, *Dracophyllum* litter, 24.I.1966, 3 larvae (K. A. J. Wise). Ocean I, 1–18 m, among *Stilbocarpa*, 29.XII.1962, 1 larva (Wise).

#### *Pupa* Fig. 135, 136.

Size 20.0 × 11.0 mm. Setal index as in Table 3.

Cuticle smooth. Major setae short, dark, acute, mounted on large or small tubercles. Antennal club smooth. Pronotum transverse with a crest of seta-tipped tubercles. Mesothoracic spiracle circular, large, but hidden under fold of prothorax; those of the abdomen smaller, not protruding. Primary pterotheca ridged, with a tubercle at apex. Secondary pterotheca slightly longer. Rostrum reaching first tarsal segment of fore leg. Mandibular deciduous cusps, just visible in this specimen, only slightly curved and shorter than in many Adelognatha. The theca carries one seta which is associated with the cusp and not with the mandible (May 1970). All segments bearing minute prodorsal setae. Postdorsal folds enlarged, carrying a full complement of subequal tuberculate setae. Ventral side of abdomen with a row of slender sessile setae near posterior margin. Pseudocerci of Abd. IX very short, with black tips; associated setae small.

*Material examined.* AUCKLAND IS: Adams I, Magnetic Cove, 19.I.1966, 1 pupa (G. Kuschel).

#### **Oclandius cinereus** (Blanchard)

Size of largest specimen 22.0 × 7.0 mm. Head width 4.0 mm. Setal index as in Table 2.

No satisfactory characters have been found to separate this species from *laeviusculus*. It occurs alone on Campbell I, but both species are on Adams I.

*Material examined.* CAMPBELL I: Mt Dumas, NW slopes, 150 m, in soil under *Chrysobactron*, 20.II.1963, 13 larvae (K. A. J. Wise).

#### *Pupa*

Size range 15.0–19.0 × 8.0–10.0 mm.

Similar to pupae of *laeviusculus*.

*Material examined.* CAMPBELL I: Shoal Pt, 30 m, in peat under *Chrysobactron*, 7.II.1963, 9 pupae; Mt Dumas, NW slopes, 150 m, in soil under *Chrysobactron*, 20.II.1963, 2 pupae (K. A. J. Wise).

*Teneral adult* Fig. 133.

The deciduous mandibular cusp is approximately  $1.0 \times 0.5$  mm, laminate, with smooth surfaces, scarcely curved, obtusely rounded at the apex.

The cusps of adelognathous weevils are lost during, or soon after, emergence from the pupation chamber in the soil, leaving behind a characteristic scar on the mandibles.

*Material examined.* CAMPBELL I: Shoal Pt, 30 m, in peat under *Chrysobactron*, 7.II.1963, 4 specimens; Mt Dumas, NW slopes, 150 m, in soil under *Chrysobactron*, 20.II.1963, 2 specimens (K. A. J. Wise).

### Genus *Catodryobiolus* Brookes

Head more rounded than in the other subantarctic genera. Postoccipital condyles transverse. Hypopharyngeal bracon with triangular brown patches. Premental sclerite with posterior median extension notched at apex. Epipharyngeal lining with median and posterior pairs of median spines close together. Tormae dark, subparallel. Clypeus with median sensillus in advance of setae (or sensilli) and nearer the interior one. Lateral lobes of Abd. IX enlarged and strongly sclerotised.

***Catodryobiolus antipoda* Brookes** Fig. 137–140.

Size of largest specimen  $9.0 \times 4.0$  mm. Head width 1.75 mm. Setal index as in Table 2.

Cuticle of abdomen asperate on dorsal folds; a row of spinules on ventral folds, elsewhere smooth. Setae pale, slender. Head with epicranial stripe well defined, extending from frontal suture almost to hind margin; reddish frontal patches indistinct; *pes* unusually well developed; *des* 2 variable in length; *des* 4, *fs* 1, 2, 3, 5, clypeal setae, and 1 mandibular seta, reduced to sensilli; *fs* 1, 2, well separated. Spiracles with airtubes  $2 \times$  width of peritreme. Abd. IX distinctively modified (Fig. 139). The alimentary canal was not dissected.

*Material examined.* CAMPBELL I: Lyall-Beeman Saddle, 70 m, among *Poa* roots, XII.1961, 1 immature larva (J. L. Gressitt); Mt Lyall, 180 m, in mat plants, 10.I.1969, 1 immature larva; St Col Peak, 300 m, in mats and moss, sample 69/15, 21.I.1969, 1 immature larva; Lookout Bay, 23.I.1969, 2 larvae (G. Kuschel); Yvon Villardeau, 330 m, in litter sample 69/25, 24.I.1969, 1 immature larva (G. Kuschel, R. W. Taylor); Mt Dumas, NW slopes, 150 m, in soil under *Chrysobactron*, 20.II.1963, 2 larvae (K. A. J. Wise). AUCKLAND IS: Ocean I, 29.XII.1962, 1 immature larva (P. M. Johns); Adams I, Magnetic Station Cove, south side, under *Dracophyllum*, 18.I.1966, 1 larva (Johns); Fairchild's Garden, litter sample 66/78, 20.I.1966, 1 immature larva; Magnetic Station Cove, litter sample 66/84, 28.I.1966, 1 immature larva (Kuschel). Ewing I, 18.I.1966, 2 larvae (R. G. Ordish).

### DISCUSSION

It would appear that evolutionary trends in Curculionidae may, in some cases, be more evident in the immature stages than in the adult. Larvae of the genus *Gromilus* which are free-living in the soil, in the same manner as larvae of Adelognatha, show considerable morphological likeness to that group and also to the aberrant subfamily Ectemnorhininae of the Indian Ocean Subantarctic Islands.

The antennae of *Gromilus*, though lacking a sclerotised "collar," are close to those of *Canonopsis sericeus* Waterhouse (Ectemnorhininae) which are circular and convex. The unusual thick, spinelike body setae set in sclerotised areas of cuticle are common to both genera.

Sensilli clusters outside the proximal ends of the labral tormae are present in *Gromilus* and in Leptopiinae. Pigmentation of the hypopharyngeal bracon (usually colorless) is present as a rectangular block in some Cossoninae and Phrynixinae but appears in *Gromilus*, as in Leptopiinae and Ectemnorhininae, as two triangular patches.

The very small anterosternal setae, distinct in all the adelognathous larvae I have examined, are present as microchaetae in both *Gromilus* and *Canonopsis* but are apparently absent from phanerognathous larvae. These are situated one on each side of the mediosternal fold of each segment, anterior to the outer mediosternal seta and directed forward (Fig. 92). They would probably assist small backward movements of the larvae in the soil and may simply indicate parallel development. The other similarities, however, would have little functional significance.

It has been postulated that the Ectemnorhininae are less primitive than the bulk of Adelognatha (May 1970). It is here suggested that the genus *Gromilus* is not far in advance of Ectemnorhininae and is thus more primitive than most other Phanerognatha.

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I am indebted to Dr Charles F. Speers and Dr H. A. Thomas of Southeastern Forest Experiment Station, North Carolina, U.S.A. for sending me larvae of *Pachylobius picivorus* and *Hylobius pales*; to Mr C. C. Bowling of Texas Agricultural Experiment Station, Beaumont, Texas, U.S.A. for larvae of *Lissorhoptrus oryzophilus* and to Mr R. H. Milligan for larvae from the collection of the Forest Research Institute, Rotorua, New Zealand. These specimens have been invaluable for the assessment of subfamily characters.

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*List of abbreviations used in text and figures*

Abd, abdominal segment.	oc, ocelli.
als, anterolateral setae.	oev, oesophageal valve.
ams, anteromedian setae.	oMpt, origin of Malpighian tubules.
ans, anal setae.	pc, postoccipital condyle
ant, antenna	pda, pedal area.
as, alar setae.	pds, postdorsal setae.
asts, anterosternal seta.	pes, postepicranial setae.
av, anterior ventriculus.	plbs, postlabial setae.
cls, clypeal setae.	pmsc, premental sclerite.
cnp, cryptonephridium.	prn, pronotum.
des, dorsoepicranial setae.	prs, prodorsal setae.
dls, dorsolateral setae.	prv, proventriculus.
dppls, dorsopleural setae.	ps, pleural setae.
fs, frontal setae.	psc, pseudocerci.
gc, gastric caeca.	pv, posterior ventriculus.
hb, hypopharyngeal bracon.	rb, rectal bracon.
les, lateral epicranial setae	sc, sensilli clusters.
lrms, labral setae.	ss, spiracular setae.
ls, lacinial setae.	sts, sternal setae.
lsp, lacinial spine.	t, torma.
lsts, laterosternal setae.	Th, thoracic segment.
mes, median epipharyngeal spines or setae.	ves, ventral epicranial setae.
msts, mediosternal setae.	vppls, ventropleural setae.

*Note:* The host name *Chrysobactron* used in this paper is the same as *Bulbinella* (Liliaceae). (Ed.).