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Larvae of Curculionoidea
(Insecta: Coleoptera):
a systematic overview

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DEDICATION

This work is respectfully dedicated to the late
Dr J.C.M. Gardner
1894–1970
formerly of the Forest Research Institute, Dehra Dun, India
whose meticulous studies and perceptive comments first
led me to consider the potential of larval systematics

“lt is perhaps not yet unanimously agreed by students of the Coleoptera that
a description of a species, however detailed, based entirely on the adult can
only be a partial one. A natural classification should take all stages into con-
sideration, the structure of early stages being regarded as complementary
to conclusions based on the adults and probably of special value where
strong but opposed opinions occur, as in Scolytidae, as to the grouping of
certain genera” (Gardner 1934).

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Front cover The larva depicted is Mandalotus miricollis, feeding on a root of white clover. Artist: Brenda May.
Uhinga mua Ko Mandalotus miricollis, e kai ana i te pakiaka o te tarutaru e kiia ana ko ‘white clover’.
Kai-whakaahua: Brenda May.
Class / Karaaihe **Insecta**  
Order / Ota **Coleoptera**  

**Superfamily / Whaamere-nui**  
**Curculionoidea**  

**Weevil larvae**


The weevils are one of the largest groups of Coleoptera, and in New Zealand about 1500 species are endemic.

All weevils, or snout-beetles, feed on plant material, and are thus found in a wide range of habitats. Some live in the soil, feeding on roots; others live at soil level and feed on leaves or crowns. A group of mainly small species feed internally, boring into stems and mining between the upper and lower surfaces of leaves. Living trees may be attacked by bark beetles, and once a tree is dead many kinds of weevil enter to feed on the wood.

A very small proportion of species world-wide are pests of agriculture, forestry, commercial crops, and home gardens. Those that have been accidentally introduced into New Zealand have multiplied rapidly in the absence of population pressure and of their natural enemies.

Adult weevils, perhaps because of the relative ease with which many can be found, have always attracted the attention of collectors and are fairly well documented. Larvae, on the other hand, with their cryptic feeding habits and `look-alike white grub' image, have largely been neglected. It is now realised that the character states in each larva are diagnostic, and can be used to determine its identity and relationships. For this purpose it is essential to have correctly identified specimens, and a reference collection of over 300 species has been amassed through an on-going programme of rearing.

The search for larvae in their natural habitats, and subsequently their rearing through to the pupal and adult

(continued overleaf)
stages, have revealed details of their life history that were previously unknown. For instance, in the flower weevil group of about 100 very small native weevils each species was found to belong to its own particular host plant, where many larvae feed on the flowers and developing ovaries. *Aneuma compta* on lacebark waits until the seed capsules are fully expanded before inserting its single egg.

Some species are miners in green leaves. Most of them make individual burrows, but at least two species live communally, with up to 20 larvae in a single leaf. The minute adult of *Geochus*, with no wings and no claws on its feet, spends its whole life on the forest floor, where its larvae are miners in fallen leaves, feeding on the dead tissue.

*Rhinorhynchus* species are of particular interest in that they are the only representatives in New Zealand of the ancient family Nemonychidae. They develop on the male flowers of cone-bearing trees, where they feed on pollen; their mouthparts are modified for grinding pollen grains. About 3 weeks for larval growth is followed by a lengthy prepupal resting period in the soil, sometimes extending into a second season. This may be regarded as a strategy for survival, since at least some of the population will still be alive if the host tree fails to flower.

Wood-boring weevils of the genus *Platypus* are known as ambrosia beetles. They are gardeners, cultivating their food supply of fungus on the walls of their tunnels. The adult pair which start the colony bring in the first spores. Later, the garden is maintained and spread by the older progeny, which have mouthparts adapted for the purpose.

**Contributor Brenda M. May** was born and educated in England. She emigrated to New Zealand in 1952, and in 1956 joined the entomology section of the Plant Diseases Division of DSIR as a technical assistant. As a result of numerous enquiries for identification from growers and gardeners, Brenda became interested in rearing the immature stages of weevils. She has continued this work as a Research Associate since her retirement in 1980. Brenda sees her Fauna of New Zealand contribution on weevil larvae as the culmination of her efforts, and she now intends to relax into other pursuits.

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**Illustration:** Larvae of the wood-boring weevil *Platypus apicalis*: first stage, and mature larva at tunnel entrance. Artist: B.M. May.


He kai-keri rua i nga rau raaaku eetahi tutumomo. Enoho takitahi ana eetahi; e rua nga tutumomo e noho huhihi ana, ka tae ki te rua tekuanu e noho ana i te rua kotaia. Ko te pakeke o *Geochus* he mea iti rawa, kaahore kau anu parirau, kaahore kau nga matikutu o ana waewae; ka noho i te oneone o te ngahere mai i te whaanautanga tae noa ki te matenga; he kai-keri rua i roto i nga rau raaaku kua makere iho, aa, ka kai.

Nga tutumomo e huaina ana ko *Rhinorhynchus* he mea mihiaro. Ko raatou anakete uri o Nemonychidae i Niu Tiireni nei, he iwi no nehe noa atu nga tuupuna. Ka tupu raatou i runga i nga puawai taeanga o nga paaina, e kai punga-punga ana. Kua hangaia kee te waha hei orooro i te punga-punga. Etoru wiki i noho-a-i-roiro; i muri mai ka roa te noho hei ngaarara i roto i te oneone, tae noa pea ki te rua tau. Na reira, mehemea kaahore nga putiputi o te raaaku e hiakaitia ana i te teenei tau, ka ora teetahi moorere mo te tau e haere mai ana.

Ko nga wiwara wiri-raaaku, ko *Platypus*, e huaina ko nga piitara kai-atua. He ahuwhenua te mahi, e whakatupu ana i nga harore i runga i nga tahahaha o nga rua. Ka haria mai te kaakano harore e te tokorua naana i tiitama te whaanau. I muri mai ka mahia, ka whakanui te maara e aa raaua tamariki; kua hanga kee nga waha kia pai ai taua mahi.

**Ko Brenda M. May te kai-tuhi; no Ingarangi ia, aa, ka kuraina i reira. I haere mai ki Niu Tiireni i te tau 1952; i te tau 1956 ka uru ia hei kai-aawhina i te waahanga o te Tari Mata Raaaku o te DSIR e paa ana kiti Aitanga-a-pepeke. Na te maha o nga uiui a nga taangata ahu-whenua ka huri a Brenda ki te whaangai i nga kuwaio wiwara. Kei te haere tonu teenei mahi i muri i tana okiokonga i te tau 1980. E ai ki a ia ko tana taumata okiokonga eenei mahi e pa ana ki nga kuwaio wiwara. Inaianei ko tana hiahia he whakataa, he huri kee ki eetahi atu mahi.**
ABSTRACT

An overview is presented of the larvae of superfamily Curculionoidea. Their systematic arrangement follows a new 'scheme' (G. Kuschel, in press) wherein the number of families worldwide is reduced to 6 and the number of subfamilies to 21. The data matrix underpinning this scheme includes biological and morphological character-states of larvae as well as adult weevils. In the present study an annotated list of larval character-states is given. Representative genera of all families, and of the subfamilies of Curculionidae, the largest group, are diagnosed, keyed, and illustrated. Of the 107 species reviewed, 85 occur in New Zealand (60 endemic, 25 introduced) and 22 are exotic. These latter are included for the sake of continuity or because their position is transitional.

CHECKLIST OF TAXA

Note. This is not a comprehensive list of the Curculionoidea known as larvae from New Zealand. It covers only those species described in this work as representatives of family-group taxa; most of them (listed in bold type) occur in New Zealand.

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lepturoides (Fabricius, 1801) 26

Subfamily DOYDIRHYNCHINAE 26
Genus Cimberis des Gozis, 1881 26
comptus (LeConte, 1876) 26
pilosus (LeConte, 1876) 27

Subfamily RHINORHYNCHINAE 27
Tribe Rhinorhynchini 27
Genus Rhinorhynchus Sharp, 1882 27
rufulus (Broun, 1880) 28
sp. indet. 28

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Genus Rynchitomacer Voss, 1937 29
rufus Kuschel, 1954 29

Tribe Mecomacerini 29
Genus Mecomacer Kuschel, 1954 29
scambus Kuschel, 1954 30

Tribe Rynchitoplesiini 30
Genus Rynchitoplesinus Voss, 1952 30
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Family ANTHRIBIDAE 30
Subfamily URODONTINAE 31
Genus Bruchela Dejean, 1821 31
lili (Fåhraeus, 1839) 31

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Genus Areocopis Broun, 1893 32
spectabilis (Broun, 1880) 32

Genus Cacephatus Blackburn, 1900 33
inornatus (Sharpe, 1886) 33

Genus Dasyanthribus Holloway, 1982 33
purpureus (Broun, 1880) 33

Genus Garyus Holloway, 1982 33
altus (Sharpe, 1876) 33

Genus Helmoreus Holloway, 1982 34
sharp (Broun, 1880) 34

Genus Hoherius Holloway, 1982 34
meinertzhagenii (Broun, 1880) 34

Genus Phymatus Holloway, 1982 34
hetaera (Sharpe, 1876) 35

Genus Pleosporius Holloway, 1982 35
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Genus Sharpus Holloway, 1982 35
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inflatus (Sharpe, 1876) 37

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*mollis* Sharp, 1889 .................................................... 41

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*populi* (Linnaeus, 1758) ...................................... 44
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*betulae* (Linnaeus, 1758) ...................................... 44
Genus *Rynchites* Schneider, 1791 ................................ 44
*aenus* (Scopoli, 1763) ............................................. 45

Family BRENTIDAE 45
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*formicarius* (Fabricius, 1798) ................................ 47

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Genus Dendrotrupes Broun, 1881
costiceps Broun, 1881
Genus Hylastes Erichson, 1836
ater (Paykull, 1800)
Genus Pachycotes Sharp, 1877
peregrinus (Chapuis, 1869)
Genus Phloeosinus Chapuis, 1873
cupressi Hopkins, 1903
Genus Scolytus Geoffroy, 1762
multistriatus (Marsham, 1802)

Subfamily PLATYPODINAE

Genus Platypus Herbst, 1793
apicalis White, 1846
caviceps Broun, 1880
gracilis Broun, 1893

Subfamily RHYNCHOPHORINAE

Tribe Sphenophorini
Genus Sphenophorus Schoenherr, 1826
brunnipennis (Germar, 1824)

Tribe Dryophthorini
Genus Dryophthorus Germar, 1824
sp. indet.

Tribe Sitophilini
Genus Sitophilus Schoenherr, 1838
oryzae (Linnaeus, 1763)
granarius (Linnaeus, 1758)
zeamais Motschulsky, 1855

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Finally, I record with appreciation the practical help of my husband Vic on many field trips, and with typing and critical reading of draft text.

INTRODUCTION

"It is perhaps not yet unanimously agreed by students of the Coleoptera that a description of a species, however detailed, based entirely on the adult can only be a partial one. A natural classification should take all stages into consideration, the structure of early stages being regarded as complementary to conclusions based on the adults and probably of special value where strong but opposed opinions occur, as in Scolytidae, as to the grouping of certain genera" (Gardner 1934b).

The words quoted above, written nearly 60 years ago at Dehra Dun, India, are just as pertinent today. Many larval diagnoses have been published since that time, but there have been few attempts to give larval characters their full
weight in the context of a general classification. The larval form is simpler than that of the adult. There are about one-third the number of character states to be considered and therefore fewer to cause confusion when deciding which of them are diagnostic of primary divisions.

Emden (1938) established the position of the antennae relative to the termination of the frontal sutures as the main factor separating the so-called primitive (orthocerous) larvae from those of the more advanced (gonatocerous) weevils. Gardner (1934a) used antennal shape to delimit the traditional Adelognatha (broad-nosed weevils). Crowson (1955) employed larval characters to a limited extent in support of his classification system, which is widely accepted today. Kuschel (in press) has resorted to cladistic analysis in his attempt to reduce the unwieldy number of curculionid subfamilies. His data matrix includes biological as well as morphological character states of both adults and larvae.

In this study I have followed the lines of Kuschel’s new scheme, wherein the number of families is reduced to six and the subfamilies to twenty-one. Many previously designated subfamilies are reduced to tribes. Exotic taxa such as Oxy cyaninae and Attelabidae are included because they are important for continuity or, in the case of Ithycerus Schoenherr, hold a spectacularly transitional position.

**MORPHOLOGY**

**Diagnostic features.** Curculionoid larvae are cylindrical grubs with the typical abdominal segments (Abd II–VII) unsclerotised and traversed on the dorsum by from two to four plicae or folds. Abd IX lacks urogomphi. A hypopharyngeal bracon is present, except in some leaf-miners. The maxilla has the galea and lacinia united to form a mala. Legs are vestigial or absent, rarely three-segmented with a claw (*Nemonyx*).

Larvae of Lucanidae, Trogidae, and Scarabaeidae are superficially similar to those of Curculionoidea apart from their well-developed legs. The head capsule carries a hypopharyngeal bracon, their Abd segments are plicate and unsclerotised, and Abd IX lacks urogomphi. In Prinidae, Anobiidae, Lycitidae, Bruchidae, and Chrysomeloidae (the closest out-group) the hypopharyngeal bracon is absent, and legs are present except in some Cerambycidae.

The antennae of all Curculionoidea except Belidae and Attelabidae are regarded as being one-segmented. The antennal segment itself is a membranous cushion which may be plane, convex, or cylindrical. It carries a supplementary cone as well as a variety of sensoria in the form of hairs, pores, or papillae, but since the cone is the most diagnostic structure it has become known as the 'antenna'. Some Belidae have a basal retractile membrane as in Cerambycidae, but this is not regarded as an additional segment.

Despite their uniform appearance curculionid larvae present sharp character states, as detailed below, with the ancestral (plesiomorphic) state versus the derived (apomorphic) state. The modal numbers of setae for Curculionidae are used for comparison, and are listed in Table 3 (p. 50).

**Head**

1. Free vs. retractile (dorsoepicranial seta 1 level with apex of frons, or forward of it) (Fig. 463).
2. Extrusible vs. permanently retracted, held in position by strong musculature (as in Belidae, Fig. 197–199).
3. Frontal sutures reaching mandible (Fig. 310, 336) vs. delimited in front by a frontoepicranial bridge (Fig. 387, 398).
4. Endocarinal line present (Fig. 2) vs. absent.
5. Endocarinal line simple vs. divided (Fig. 209).
6. Dorsoepicranial seta 3 on epicranial half vs. in suture or on frontal plate (Fig. 474, 506).
7. Frontal setae exceeding 5 pairs vs. 5 pairs or fewer.
8. Frontal setae comprising 5 pairs of similar length vs. fs1, 2, 3, 5 short or absent (fs4 is the most constant).
9. Frontoclypeal suture distinct (Fig. 79) vs. effaced (Fig. 4).
10. Clypeal setae comprising 3 or more pairs vs. not more than 2 pairs.
11. Clypeolabral suture distinct vs. effaced.
12. Antennae concealed from above (Fig. 35) vs. exposed.
13. Antennae 2–segmented (Fig. 200) vs. 1–segmented (Fig. 26).
14. Mouthparts circular in cross-section vs. oval.
15. Antennae longer than wide vs. wider than long or subequal.
16. Ocelli (st mmata) 3 or more (Fig. 23, 387) vs. not more than 2.

**Mouthparts**

17. Mandibles with molar section undeveloped vs. developed (Fig. 29).
18. Mandibles with 3 or more teeth on incisor section (Fig. 144) vs. 1 or 2 teeth.
19. Labrum with 4 pairs of primary setae (Fig. 4) vs. not more than 3 pairs.
20. Labrum transverse or quadrate vs. longitudinal (Fig. 854).
21. Epipharyngeal lining with 4 or more pairs of anterolateral setae (Fig. 390, 400) vs. up to 3 pairs.
Hypopharyngeal bracon clear vs. variously sclerotised.

Hypopharyngeal bracon without a sclerome medially vs. with a complex medial sclerome (as in Anthribidae, Fig. 77).

Maxillary palps 3-segmented (Fig. 204) vs. 2-segmented.

Maxillary palps 2-segmented vs. 1-segmented (Fig. 351).

Maxilla with palpiger (Fig. 204) vs. without palpiger.

Maxillary mala bearing a lacinia (as in Anthribidae, Fig. 82) or an uncus (as in Nemonlychidae, Fig. 17) vs. without lacinia or uncus.

Articulatory lobes distinct (Fig. 7) vs. obsolete.

Buccal setae simple vs. some setae branched (Fig. 1068b).

Labial palps 2-segmented vs. 1-segmented (Fig. 360a).

Labral tormae absent vs. present.

Tormae represented by lateral scleromes (Fig. 80) vs. paired paramesal rods.

Tormae free vs. united at base (Fig. 615).

Thorax

Pronotal shield simple vs. variously modified (Fig. 196).

Spiracle on mesothorax or intersegmental vs. on prothorax.

Legs or papillae present vs. absent.

Abdomen

Spiracles 8 in number vs. fewer than 8.

Spiracles with 2 airtubes (bicameral) vs. with 1 (unicameral) (Fig. 194).

Spiracles with 1 airtube vs. none (Fig. 470).

Spiracles located on pleurum vs. on dorsum (Fig. 788, 797).

Dorsal transverse plicae (folds) 2 in number (Fig. 1) vs. 3 or 4 (Fig. 830, 949).

Ventral pleuroteral lobes entire vs. subdivided (as in Rynchophorinae, Fig. 1062).

Abd VIII/IX simple vs. modified (Fig. 427).

Abd X (anus) terminal vs. subdorsal (Fig. 611), subterminal (Fig. 558), or ventral (Fig. 548).

Abd X simple vs. modified (e.g., pygopod, Fig. 23).

Allimentary canal

Malpighian tubules 6 in number vs. 4.

Rectal bracon a ligamentous ring vs. a sclerotised loop (Fig. 938).

Divergence between species shows in features such as pigmentation of head and setae and relative lengths of setae, and in the type and relative abundance of cuticular vestiture.

EVOLUTION IN LARVAL MORPHOLOGY

The process of evolution as a result of cybernetics (Gk. kubernetes, steersman), or feedback from the environment, can be followed in various groups of organisms through sequences of morphological change when sufficient material is available. In weevils, evolution of the larvae has not necessarily proceeded at the same rate as in the adults. Because they usually live in sheltered situations, larvae are more likely to have remained constant, and can sometimes indicate a phylogenetic direction which has become uncertain in the adult, e.g., in the Australian Demyrsus Pascoe / Tranes Schoenherr complex (Molytini) (May, in press), and in the forest litter-inhabiting weevil Geochothus Broun (see p. 80).

A classification system is a man-made artefact for presenting the multitudinous array of insects in an orderly fashion. The taxa are placed in a series of discrete compartments from where, because evolution is continuous, there is considerable overlap, especially at the family or subfamily level. Such transitional taxa can be recognised in weevil larvae, and will be discussed in the sections where they occur. Before assigning larvae to any particular grouping, however, one must remember that certain biological conditions can initiate synapomorphies in taxa which are not otherwise closely related. The following characters are the result of such parallel development, and should therefore not be given phylogenetic significance.

Aquatic environments. Larvae which live in continuously wet surroundings have a modified respiratory system. The spiracles may be externally sclerotised and tipped with a scalpellum for plant piercing as in Cyrtobagous (Eriphinae), Steriphus (Rhytirhinini), and Donacia (Chrysomelidae). They may be arranged contiguously on the dorsum as in Cyrtobagous or laterally as in Neohydroponus (Eriphinae) and Steriphus. The number of functional spiracles may be reduced as in Neochetina (Eriphinae) and Donacia. The larvae of Notonesius (Phrynixini) living in wet peat have the pair of spiracles on the Abd VIII dorsum joined to form a telescopic siphon furnished with a float of aquifuge hairs to allow surface respiration. A similar strategy is employed by the maggots of Eristalis and other syrphid flies.

In watery habitats the respiratory system assumes major importance, and the hindgut is simplified so that Abd VIII,
carrying the caudal spiracles, is often developed at the expense of Abd IX, carrying the anal musculature. Several of the foregoing genera and some Indian larvae inhabiting succulent plants (Gardner 1934a, 1938) have Abd IX reduced in size and Abd X, sometimes forming a pygopod, displaced well forward ventrally by the enlargement of Abd VIII. Free-drifting larvae such as those of Cyrtoba-gous display various setal modifications. The long, slender pleural setae, especially on the terminal segments, probably function as balancers whereas the stout, hooked ventral setae are used as a holdfast while feeding.

(2) **Ectophytic feeding.** Larvae which feed externally are adapted for adhesion to plane surfaces by means of ventral ambulatory ampullae, as in *Listroderes* (Rhytirhinitini) and *Hypera* (Hyperineri); the anal lobes are developed as pygopods as in *Listroderes* and *Rhinorhynchus* (Nemopterygidae); and setation may be reduced or obsolete, and coloration is cryptic, as in *Gonipterus* and the previous genera.

(3) **Xylophagy.** Larvae which feed on the hard, resistant parts of dead wood show characteristic modifications to the mouthparts: labrum longer than wide, narrowed in front and heavily sclerotised (pigmented); epipharyngeal lining with *als* arranged longitudinal; mandibles with cutting edge raised medially and either ridged or knobbled to form a grinding surface; and the hypopharyngeal bract solidly pigmented for added strength. Examples of larvae with mouthparts adapted for xylophagy may be found in *Psepholax* and its allies (Cryptorhynchini), *Phrynixus* and its allies (Molytini), and *Ancistropterus* (Engonomini), all in Curculioninae, *Mesites* (Cossoninae), and in *Pachycotes* (Scolytinae).

(4) **Leaf-mining.** Larvae which feed in the constricted space between leaf surfaces are subject to considerable modification of the head capsule and labrum, the degree of which varies between genera in a well defined regressive cline. The head is retracted to bring the mandibles into a forward position, and depressed to fit between the upper and lower leaf cuticle. The posterior emargination of the head is increased dorsally so that the coronal suture is progressively eliminated. The endocarina becomes stronger, extended to the full length of the frons and then posteriorly as a rod between the open epicranial halves.

Cephalic setae become short and eventually obsolete in the following sequence: *des4, fs1; des2, fs2, 3; des1, fs5, les2, ves1, 2; des3, fs4*. Setae *des5 and les1* remain constant. Labral setae become short and acute, reducing to one pair only. The epipharyngeal setae, however, in a protected position, are well developed and in more or less modal numbers.

Of the seventeen endemic curculiones known to be leafminers, six have been examined in detail. *Phorostichus linearis* (Broun) in *Austelia and Collospermum* shows the least amount of modification, in comparison with *Peristroeus Kirsch*, followed by *Peristroeus* (pending revision) *flavitaris* (Broun) in *Podocarpus totara*, *Hypotagea concolor* (Broun) in *Nothofagus, Notinus aucklandicus* Kuschel in *Coprosma* and *Nertera, Neomyceta rubida* Broun in *Metrosideros*, and finally *Geochus tibialis* Broun in dead leaves of *Weinmannia* with only two cephalic setae remaining and with the endocarina extended posteriorly. The likeness of *Geochus*, in these respects, to the European *Rhamphus* Clairville and *Rhynchaenus* Clairville suggests that a similar cline may exist among leafminers in the Northern Hemisphere.

**MATERIALS AND METHODS**

**Preservation.** Larvae collected in the field should be kept temporarily in a substrate of damp soil or wood litter. Later, those not required for rearing or observation should be killed in a fixative solution such as PEA (petroleum ether, ethanol 95%, and glacial acetic acid in the proportions 1:10:2) or immersed for a few minutes in near-boiling water before storing in 75% ethanol.

**Choice of specimens.** Slide preparations of several larvae from each taxon need to be examined under high magnification before the mouthparts, spiracles, cuticle, and setae can be assessed. Submature larvae in the final instar are easier to work with than prepupal specimens in which the fat-body has accumulated.

**Measurement.** In any sample the body size of individuals shows variation and is subject to distortion in preservatives, so I have settled on maximum length and width as being the most meaningful statistic. The head capsule does not alter in size once hardened, and can be measured precisely across the widest part.

**Mounting procedures.** When possible, at least two specimens at a time are processed, as follows.

(1) Using a small, pointed scalpel (e.g., a mounted sliver of razor blade) the lower mouthparts are separated from the head but left attached to the prosternum.

(2) The head is removed, cutting through the oesophagus and taking care to retain the postoccipital condyles intact. The position of the ocelli should be noted since they will not be present after the clearing process (stage 6).
In sizeable specimens the lower mouthparts may now be separated from the body; in very small specimens (head width 1.0 mm or less) they can be left in position.

The mandibles are removed from the head capsule, helped if necessary by snipping the muscle attachments with corneal scissors through the occipital foramen. Heads less than 1.0 mm wide can be dissected in Euparal after clearing (May 1979c).

Using corneal scissors, one specimen is cut along mid-dorsum and mid-venter, and the second specimen along mid-pleural lines, clipping across the anus. The halves are then pulled apart and the alimentary canal is removed intact.

All parts except the alimentary canal are macerated in 10% potassium hydroxide solution until cleared, then washed in distilled water.

As much fat as possible is removed from the alimentary canal without losing mycetomes, gastric caeca, or Malpighian tubules. Drawings are made at this stage, and the labral tormae are joined at the base (Kangas 1959, Rosado-Neto 1980).

The key to subfamilies is constructed on a basis of 90% shared attributes. In general, the couplets will hold true for lower taxa except where alternatives are offered. The system of diagnosis is hierarchical. Characters defining a family are not repeated for lower taxa except where alternatives are offered. The system of nomenclature followed is substantially that of Thomas (1957).

The two-letter area codes used in collection data are as proposed by Crosby et al. (1976).

An asterisk means that some larvae in that particular collection were reared to the adult stage. Specimens are deposited in the New Zealand Arthropod Collection at Mount Albert Research Centre, Auckland, unless otherwise indicated.

Nomenclature of plants follows Flora of New Zealand vol. 4 (Webb et al. 1988) and the revised edition of Trees and shrubs of New Zealand (Poole & Adams 1980).
KEYS TO CURCULIOIDEA LARVAE

(A) Families of Curculionoidea

1 Frontal suture not extending to mandibular membrane; antennae contiguous with frontal suture (Fig. 387, 398); postoccipital condyles usually present (Fig. 443) .................................................... Curculionidae [→G]
   —Frontal suture extending to mandibular membrane; antennae separated from frontal suture (Fig. 313, 336); postoccipital condyles absent (Fig. 25, 77) ............ 2

2(1) Hypopharyngeal bracon with a complex median sclerome (Fig. 25); maxilla with articulatory lobes well developed (Fig. 30a); frons with more than 5 setae 3
   —Hypopharyngeal bracon with sclerome, if present, simple; maxilla without articulatory lobes; frons with 5 or fewer setae ................................................................. 4

3(2) Head with frontoclypeal suture effaced; frons produced forwards to form a pseudoclypeus (Fig. 24); mandible with a diagonal masticatory ridge (Fig. 15); maxillary mala with lacinial spine at apex (Fig. 7); tentorial bridge entire ............. Nemonychidae [→B]
   —Head with frontoclypeal suture complete or partially effaced; frons not produced forward; mandible without a diagonal masticatory ridge; maxillary mala with lacinial spine below apex (Fig. 113) or absent; tentorial bridge subdivided laterally (except in Bruchela, Fig. 77) .................................................. Anthribidae [→C]

4(2) Head retracted into thorax ........ Belidae [→D]
   —Head partially extrusible or free .............. 5

5(4) Head retracted, longer than wide, with a posterior hyaline extension (Fig. 263); labrum with 4 primary setae; antennae 2-segmented .... Attelabidae [→E]
   —Head free, subcircular, without posterior extension; labrum with 3 primary setae (except in Antliarhininae); antennae 1-segmented .......... Brentidae [→F]

2(1) Maxilla with a sclerotised palpiger (Fig. 17); pedal papilla 2-segmented Doydirhynchinae (Cimberis)
   —Maxilla lacking a sclerotised palpiger; pedal papilla 1-segmented or absent ............ Rhinorhynchinae .. 3

3(2) Antennae fully exposed (Fig. 24); labrum bearing 3 pairs of setae and a median, unpaired seta (Fig. 27); pedal papilla absent ............... Rhinorhynchini
   —Antennae partially overhung or ventral, completely hidden from above (Fig. 34, 35); labrum bearing 4 pairs of setae (Fig. 36); pedal papilla present or absent 4

4(3) Labial palps strongly divergent, with distal segment displaced mesolaterally (Fig. 39a); premental sclerite not trapeziform; 1 or 2 vestigial eyespots present, in addition to primary ocellus; pedal papilla present (Fig. 61); Abd X bearing large, blunt, pigmented spines (Fig. 42) .................................................. Rhynchitomacerini
   —Labial palps not divergent or only slightly so, with distal segment not displaced; premental sclerite trapeziform (Fig. 49a); 3 vestigial eyespots present, in addition to primary ocellus; pedal papilla present or absent; Abd X without pigmented spines .............. 5

5(4) Antennae ventral; Abd VIII spiracle lateral; Malpighian tubules 4 in number .................................................. Rhynchitoplesiini (Rhynchitomacerinus)
   —Antennae frontal; Abd VIII spiracle dorsal; Malpighian tubules 6 in number (Fig. 21) ......................... Mecomacerini (Neotropical element)
   ........................................................................... Mecomacerini (Australian element)

(B) Family Nemonychidae: larvae

1 Leg fully developed, 3- or 4-segmented, with a claw; articulatory lobe of maxilla bearing a major seta (Fig. 7a); epipharyngeal lining with 2 pairs of mes arranged longitudinally (Fig. 6) .......................................................... Nemonychinae (Nemonyx lepturoides)
   —Leg represented by a setose pedal papilla, or absent; articulatory lobe without setae; epipharyngeal lining with only the proximal pair of mes arranged longitudinally ............................................. 2

2(1) Abd spiracles bicameral (Fig. 84); Malpighian tubules 6 in number (Fig. 118) ............ Anthribinae .. 3
   —Abd spiracles unicameral (Fig. 180); Malpighian tubules 4 in number (Fig. 182) ....... Choraginae .. 13

3(2) Head compressed posterolaterally and produced behind to form a fulcrum (Fig. 75, 76) ............ 4
   —Head evenly rounded, not produced (Fig. 87, 88) ......... 8

4(3) Legs 2-segmented (Fig. 83) Arecopaius spectabilis

(C) Family Anthribidae: larvae

1 Labial palpi absent; tentorial bridge entire; ambulatory ampullae present on dorsum; Malpighian tubules purple .................................................. Urodontinae (Bruchela)
   —Labial palp present; tentorial bridge divided laterally (Fig. 77); ambulatory ampullae absent; Malpighian tubules pallid ................................................................. 2

2(1) Abd spiracles bicameral (Fig. 84); Malpighian tubules 6 in number (Fig. 118) ............ Anthribinae .. 3
   —Abd spiracles unicameral (Fig. 180); Malpighian tubules 4 in number (Fig. 182) ....... Choraginae .. 13

3(2) Head compressed posterolaterally and produced behind to form a fulcrum (Fig. 75, 76) ............ 4
   —Head evenly rounded, not produced (Fig. 87, 88) ......... 8

4(3) Legs 2-segmented (Fig. 83) Arecopaius spectabilis
5(4) Legs absent; lacinia and hypopharyngeal sclerome both absent. In grass culms ...... Euociodes suturalis
—Legs 1-segmented (Fig. 136); lacinia present (Fig. 134); hypopharyngeal sclerome present (Fig. 135). In bark or dead wood .............................................. 6

6(5) Mandible bearing 2 incisor teeth (Fig. 133); Abd IX bearing posteroventrally a single row of coarse spinules (Fig. 138) .......... Hoherius meinhertzhageni
—Mandible bearing 3 incisor teeth (Fig. 103); Abd IX either bearing several rows of coarse spinules or uniformly spiculate ......................... 7

7(6) Head bearing 2 vestigial eyespots in addition to primary ocellus (Fig. 98, 99); Abd IX sternal fold uniformly spiculate .............. Dasyanthribus purpureus
—Head bearing primary ocellus only (Fig. 140); Abd IX sternal fold bearing 3 or 4 rows of coarse spinules .... ........................................ Phymatus hetaera

8(3) Epipharyngeal lining with proximal pair of mes aligned transversely (Fig. 91) ......................................... 9
—Epipharyngeal lining with proximal pair of mes aligned longitudinally (Fig. 122) .............................................. 11

9(8) Head dusky, darker on epicranium than on frons. In crustose lichen on wave-splashed rocks Lichenobius
—Head pallid or yellow brown. In dead wood ...... 10

10(9) Mandibular mola raised to an acute tooth (Fig. 112); epipharyngeal lining without rows of dark setae between tormae; pronotal shield with a lateral, oblique band of thickening (Fig. 115); head bearing primary ocellus only ......................... Garyus alatus
—Mandibular mola raised to a ridged grinding surface (Fig. 92); epipharyngeal lining with paired, comb-like rows of dark setae between tormae (Fig. 91); pronotal shield simple; head bearing 2 vestigial eyespots in addition to primary ocellus (Fig. 88) .. Cacephatus

11(8) Maxillary palps 2-segmented; labial palps 1-segmented (Fig. 124) .................. Helmoreus sharpi
—Maxillary palps 3-segmented; labial palps 2-segmented ........................................ 12

12(11) Maxillary and labial palps with proximal segment distinct (Fig. 156); lacinial spine wider, medially twice as wide as a lamellate seta (Fig. 156a) .................. Pleosporius bullatus
—Maxillary and labial palps with proximal segment indistinctly defined; lacinial spine narrower, medially as wide as a lamellate seta (Fig. 167a) Sharpius brouni

13(2) Thoracic spiracle bicameral; legs absent; mandibles with 3 incisor teeth; Abd II–IV showing a row of plicae on prodorsal fold (Fig. 171) .......... Areecerius .. 14
—Thoracic spiracle unicameral; legs 1-segmented; mandibles with 2 incisor teeth; Abd II–IV showing a rugose ridge on prodorsal (and postdorsal) fold .............. 16

14(13) Head compressed posteroilaterally and produced behind; Abd I lacking a prodorsal, transverse row of plicae (present on Abd II–V) .......... A. vieillardi
—Head evenly rounded, not produced behind; Abd I with a prodorsal, transverse row of plicae (present on Abd I–V) .............................................. 15

15(14) Larger species, up to 10 mm long. A. palmaris
—Smaller species, up to 5 mm long .. A. fasciculatus

16(13) Head evenly rounded, not produced behind; thoracic spiracle on mesothorax; Abd IX bearing a single row of coarse spinules on sternum ............................................. Dysnocyrtus inflatus
—Head compressed posteroilaterally and produced behind; thoracic spiracle intersegmental; Abd IX lacking a row of spinules on sternum Notochoragus crassus

(D) Family Belidae: larvae
1 Spiracles bicameral (Fig. 206); maxillary mala bilobate (Fig. 204) ......................... Belinae .. 2
—Spiracles unicameral (Fig. 260); maxillary mala not bilobate ............................................. 3

2(1) Head capsule pallid; mandible bidentate apically (Fig. 203); labrum as long as wide, fringed (Fig. 202); occipital foramen closed behind (Fig. 199); pronotum pubescent on posterior half (Fig. 196); spiracles with short, non–annulate air tubes (Fig. 206) Agathinus
—Head capsule red-brown on anterior third; mandible tridentate apically (Fig. 214); labrum transverse, not fringed (Fig. 212); occipital foramen open behind (Fig. 210); pronotum not pubescent; spiracles with long, curved, strongly annulate air tubes (Fig. 217) ............... Pachyurinus

3(1) Occipital foramen closed behind (Fig. 253); endocarinal line indistinctly bifurcate (Fig. 252); antennae 2–segmented, with basal membrane retractile (Fig. 254) .......... Aglycyderinae
—Occipital foramen open behind (Fig. 243); endocarinal line very distinctly bifurcate (Fig. 242); antennae 1-segmented, with basal membrane not retractile ............ Oxyacoryninae .. 4

4(3) Abd I–V with dorsal ampullae; maxillary palps 3-segmented, with a palpiger (Fig. 227a); labrum with lateral tormae absent; hypopharyngeal bracon lacking a pear-shaped mesal sclerite (Fig. 225). Hydnorobius
—Abd I–V without dorsal ampullae; maxillary palps 2- or 3-segmented, without a palpiger; labrum with lateral tormae present; hypopharyngeal lining bearing a mesal pear-shaped sclerite .......................... 5

5(4) Head capsule with a curved, transverse ridge behind pigmented area (Fig. 232); endocarinal separation in front as wide as clypeus (Fig. 232); maxillary palps 3-segmented (Fig. 238) ..................... Parallocorynus
—Head capsule without a transverse ridge; endocarinal separation in front wider than clypeus (Fig. 242); maxillary palps 2-segmented (Fig. 248)............... Rhopalotria

(E) Family Attelabidae: larvae

1 Maxillary palps 2-segmented (Fig. 269); labium and postlabium fused (Fig. 269a); hypopharyngeal bracon absent. Living in box-shaped or thimble-shaped leaf rolls .................. Atelineinae .. 2
—Maxillary palps 3-segmented; labium and postlabium not fused, separately sclerotised; hypopharyngeal bracon present. Living in various habitats ........................................ Rhynchitinae .. 3

2(1) Anus subterminal, 4-lobed (1 large dorsal lobe, 3 smaller ventral lobes); spiracles with airtubes; body setae not mounted on tubercles ................. Attelabus
—Anus ventral, 2-lobed (with a simple, transverse cleft); spiracles without airtubes (but present in 1st instar); body setae mounted on small tubercles .. Apoderus

3(1) Head and body strongly depressed. Leafminers ...... ........................................... Eugnamptus
—Head and body convex. Living in other habitats .. 4

4(3) Head with endocarinal line entire (Fig. 300); occipital foramen open behind (Fig. 301); maxillary mala without a lacinial tooth; Abd I–V lacking dorsal ampullae ............................ Rynchites
—Head with endocarinal line forked (Fig. 277); occipital foramen closed; maxillary mala with a small lacinial tooth (Fig. 282); Abd I–V with paired dorsal ampullae ........................ 5

5(4) Head with hyaline posterior extension about one-third as long as epicranium (Fig. 288); epipharyngeal lining with als curving inwards away from margin (Fig. 292); thorax with prosternal sclerome present ........................................ Deporaus
—Head with hyaline posterior extension about one-twentieth as long as epicranium; epipharyngeal lining with als parallel to margin (Fig. 280); thorax without a prosternal sclerome ...................... Bytiscus

(F) Family Brentidae: larvae
(Carinae and Eurhynchinae omitted)

1 Head with 5 fs (Fig. 310); Abd II–VI with 3 or 4 dorsal folds (Fig. 309); Abd VIII spiracle present; legs 2-segmented (Fig. 317) or absent .... Brentinae .. 2
—Head with 2–4 fs (Fig. 335, 355); Abd II–VI with 2 dorsal folds (Fig. 334); Abd VIII spiracle absent (except in Nanodes); legs absent or represented by a sclerotised plate (Fig. 343) ......................................................... 3

2(1) Legs 2-segmented (Fig. 317); mesothorax dorso-laterally with a rugose tubercle (Fig. 320); head lacking both endocarinal line and ocelli; anal cleft Y-shaped. Lasiorhynchus barbicornis (Brentinae)
—Legs absent, represented by 2 concentric sclerites (Fig. 332); mesothorax without a rugose tubercle; head with endocarinal line and 2 ocelli present; anal cleft X-shaped .................. Cylas formicarius (Cyladinae)

3(1) Labrum bearing 4 setae or 1 seta (Fig. 339, 348); Abd II–VI with 7 pds (reduced in Antliarhis); anus 4-lobed .................................. Antliarhisinae .. 4
—Labrum usually bearing 3 setae (Fig. 367); Abd II–VI with 2 pds; anus 2-lobed ......................... Aploninae .. 5

4(2) Setae minute; Abd II–VI with 2 pds; labrum with 1 seta; ocelli absent; maxillary palp 1-segmented (Fig. 351); head truncate behind (Fig. 346) ..................... Antliarhis zamiae
—Setae well developed; Abd II–VI with 7 pds; labrum with 4 setae; 2 ocelli present; maxillary palp 2-segmented (Fig. 342); head rounded behind (Fig. 335) .. ........................................ Tanaos interstitialis

5(2) Abdominal spiracles bicameral (Fig. 372); labial palps cylindrical, extending above ligula (Fig. 370a) ................................................ Neocyba sp.
—Abdominal spiracles unicameral (Fig. 362); labial palps papilliform, not extending above ligula (Fig. 360a) ........................................ Exapion ulicis
G Family Curculionidae: larvae

1 Eggs placed ectophytically, in crevices, or in soil; larvae usually with des3 in frontal suture (as in Fig. 474) or on frons (Fig. 506) .... Brachycerinae 2

—Eggs placed endophytically in prepared pits; larvae usually with des3 on epicranial half (as in Fig. 644) 21

2(1) Legs present (Fig. 385, 393); head with 3 ocelli (Fig. 387); labrum with 4 l rms; alimentary canal with 4 Malpighian tubules ................................................. 3

—Labs absent; head with 2, 1, or 0 ocelli; labrum with 3 l rms or more than 4; alimentary canal with 6 Malpighian tubules ................................................. 3

3(2) Head with fs5 much longer than fs4 (Fig. 582); labial palps 1-segmented (Fig. 587a) ................................................. Hypera punctata (Hyperini)

—Head with fs5 subequal to or shorter than fs4; labial palps 2-segmented ................................................. 4

4(3) Head with des3 on epicranium (as in Fig. 572); pronotum deeply cleft medially and produced forwards to form a hood (Fig. 570); pleural intersegmental pockets present. Confined to Eucalyptus ...................... Gonipterus scutellatus (Gonipterini)

—Head with des3 in frontal suture or on frons; pronotum entire, not produced forwards; pleural pockets absent. Not found on Eucalyptus ................................................. 5

5(4) Antennal segment almost depressed (Fig. 398); Abd segments with prodorsal fold bearing as many setae as postdorsal fold (Fig. 395); epipharyngeal lining with setae in excess of modal numbers (Fig. 400); labrum with more than 4 setae ................................................. Brachycerus monachus (Brachycerini)

—Antennal segment upstanding; Abd segments with prodorsal fold bearing fewer setae than postdorsal fold; epipharyngeal lining with setae in modal numbers or fewer; labrum with 3 or fewer setae ............................... 6

6(5) Antennal segment oval in cross-section .............................. Entimini ................................. 7

—Antennal segment circular in cross-section ............................... 16

7(6) Antennal segment strongly asymmetrical, with outer side produced (Fig. 497); epipharyngeal lining with median ams conspicuous, fang-like, stronger than als (Fig. 499); mandibles tridentate, with shorter seta proximad of the longer one (Fig. 500) .............................. Sitona discoidea (Sitonia)

—Antennal segment more or less symmetrical; epipharyngeal lining with median ams inconspicuous, usually weaker than als; mandibles undentate or bidentate, the setae subequal or with shorter seta distal of the longer one ......................................................... 8

8(7) Head mainly pallid, deeply retracted into prothorax, with setae on anterior quarter only (Fig. 442, 463); thoracic spiracle ovate (Fig. 450, 470); mandibular setae subequal in length ............... Naupactina .......................... 10

—Head pigmented, free, with setae on at least anterior half (Fig. 407); thoracic spiracle subcircular (Fig. 426); mandibular setae of unequal length ................................................. 9

9(8) Th II/III with 2 dl s (“alar setae” of Emden 1952) (Fig. 418); epipharyngeal lining with posterior and median mes pairs more or less equally separated (Fig. 422); alimentary canal without a ring of mycetomes around cardiac valve (Fig. 429) ...................... Leptopina .......................... 13

—Th II/III with 1 dl s (Fig. 473); posterior mes pair closer together than median pair (Fig. 478); alimentary canal with a ring of globular mycetomes around cardiac valve (Fig. 483) .............................. Otiorhynchina .......................... 15

10(8) Abd segments with minor pd s pigmented, short, stout, spiny, particularly in younger larvae; mature larvae >10 mm long ....... Graphognathus leucoloma

—Abd segments with minor pd s pallid, slender; mature larvae <10 mm long ................................................. 11

11(10) Antennal segment with apex wider than base, sides divergent (Fig. 444); maxilla without a group of spinules proximad of dms row (Fig. 448b); Abd II–V with pd s1 twice as long as pd s2; anal lateral lobes without a strong seta ..................... Asynonychus cervinus

—Antennal segment with apex and base of similar width, sides parallel (Fig. 452, 457); maxilla with a group of hairlike spinules proximad of dms row (x100) (Fig. 453, 458); Abd II–V with pd s1 subequal to pd s2; anal lateral lobes with 1 strong seta (Fig. 456) ............................... 12

12(11) Abd VIII with pd s3 half as long as adjacent setae (Fig. 456); maxilla with numerous spinules on inner surface (Fig. 453); Abd I with asperities on cuticle of prodorsal fold (Fig. 455); Th II with asperities between and behind msts (x100) (Fig. 454) ................................................. Atrichonotus minimus

—Abd VIII with pd s3 about one-tenth as long as adjacent setae (Fig. 460); maxilla with few spinules on inner surface (Fig. 458); Abd I and Th II without asperities ......................................... Floresianus sordidus
13(9) Abd IX with pleural lobes elongate, forming heavily sclerotised plates ventrally (Type B of Emden 1952), and dorsum reduced to a narrow triangle (Fig. 416); Abd II–VII ventrally with 2 rows of coarse spinules.  
— Abd IX with pleural lobes enlarged and sclerotised but not elongate to form ventral plates (Type A of Emden 1952), and dorsum reduced to a broad triangle (Fig. 427, 439); Abd II–VII ventrally without rows of coarse spinules.  
...............Catoptes cuspidatus

14(13) Abd IX with pleural lobes rounded, and major seta in apical third (Fig. 427); anal lateral lobes with major seta strong.  
— Abd IX with pleural lobe sharply keeled dorsad, and major seta halfway between anterior margin and apex (Fig. 439); anal lateral lobes with both setae weak.  
........Mandolotus miricollis

15(9) Abd V–VII with major spiracular seta on posterior fold caudad of spiracle (Fig. 473); Abd I–V with asperities on dorsal folds; hypopharyngeal bracon with maculae not extending along posterior margin (Fig. 475).  
— Abd V–VII with major spiracular seta on middle fold, dorsad of spiracle (Fig. 484); Abd I–V without dorsal asperities; hypopharyngeal bracon with maculae extending along posterior margin (Fig. 486).  
........Phlyctinus callosus

16(6) Labrum with lateral lrms minute or absent (as in Fig. 508); antennae exposed.  
— Labrum with lateral lrms well developed (Fig. 551, 561); antennae concealed under frontal projection (except in Rhadinomus)  
...............Aterpini

17(16) Spiracles surrounded anterodorsally by a dark crescentic area (Fig. 536); head dark brown, with blackish maculae (Fig. 527); Abd IX and X forming a pygopod (Fig. 526).  
— Spiracles without an anterodorsal dark area; head reddish brown, without maculae; Abd IX and X not forming a pygopod.  
...............Listroderes difficilis

18(17) Spiracles with airtubes external, upstanding, acute (Fig. 516, 524); tormae joined in at least basal third (Fig. 520).  
— Spiracles with airtubes internal; tormae convergent, not joined basally.  
...............Steriphus diversipes lineata

19(18) Frons without endocarinal line; Abd with minor pds short, stout (Fig. 505); ventral folds simple.  
........Gromilus thoracicus
— Frons with an endocarinal line (Fig. 539); Abd with minor pds minute, slender; ventral folds developed as ambulatory ampullae.  
...............Listronotus bonariensis

20(16) Frons with 2 well developed fs, and endocarinal line vestigial or absent (Fig. 549); antennae partly concealed under frontal projection (Fig. 550); Abd VIII/IX with digitate projections (Fig. 548).  
— Frons with 5 well developed fs, and endocarinal line present (Fig. 559); antennae exposed (Fig. 560); Abd VIII/IX simple (Fig. 558).  
...............Rhadinosomus acuminatus

21(1) Antennae hemispherical (Fig. 593)  
— Antennae pointed, broadly conical (as in Fig. 656) or narrowly conical (as in Fig. 677).

22(21) Des3 in suture or on frons; larva often adapted for aquatic conditions.  
— Des3 on epicranium; larva not adapted for aquatic conditions  
...............Eriirhinini

23(21) Mouthparts with some setae branched (except in Sitophilini); tormae U-shaped, often joined (Fig. 1066) or quadrate (Fig. 1031) at base; pleural lobes subdivided (Fig. 1027, 1062).  
— Mouthparts with setae simple; tormae separate or, if joined, not as above; pleural lobes entire.  

24(23) Head with endocarinal line absent; antennae exposed; labial palps 1-segmented; pronotal shield and Abd IX modified to perform a 'holdfast' function (as in Fig. 1027).  
— Head with endocarinal line present, antennae hidden; labial palps 2-segmented; pronotal shield and Abd IX unmodified.  
...............Rhynchophorinae

25(23) Tormae joined or approximate at base or strongly convergent.  
— Tormae separate: subparallel, slightly convergent, bowed, or absent  

26(25) Tormae joined at base with a distinct stem, Y-shaped (as in Fig. 627); Abd VIII spiracle lateral; anus 4-lobed.  
— Tormae joined at base without a distinct stem, V-shaped, approximate or strongly convergent; anus 6-lobed.  
...............Curculioninae: Cryptorrhynchini
27(25) Abd II–V with 2 dorsal folds; labrum and clypeus fused (Fig. 738); tormae absent; Abd spiracles often unicameral (Fig. 743) Curculioninae: Gymnetrini
  —Abd II–V with 3 or 4 dorsal folds; labrum and clypeus not fused; tormae present; Abd spiracles bicameral 28

28(27) Abd I–VI with more than 5 pds ................................. Curculioninae: Cleonini
  —Abd I–VI with 5 or fewer pds ................................. 29

29(28) Abd VIII spiracle on dorsum ............................... Curculioninae: Curculionini, Molytini
  —Abd VIII spiracle lateral ..................................... 30

30(29) Ocelli 2 in number. Larvae inhabiting non-woody parts of angiosperms .... Curculioninae: Baridini
  —Ocelli absent, or only 1 present. Larvae inhabiting woody plants ................. 31

31(30) Frontal setae unequal in length (Fig. 899); endocarinal line absent ........................ Curculioninae: Magdalinini
  —Frontal setae subequal or unequal; endocarinal line usually present ............. 32

32(31) Head with 4 fs (except Araucariini); 1 ocellus usually present; Abd IX with 2 ds .... Cossoninae
  —Head with 5 fs; ocelli absent; Abd IX with 3 or 4 ds .......................... Scolytinae

Tribe Cryptorhynchini: larvae
1 Anus subdorsal (Fig. 411); mandibular mola raised, ridged for grinding (Fig. 416); head unpigmented except on margins ........................................ 2
  —Anus terminal; mandibular mola not raised or ridged; head pigmented or not ........................................ 3

2(1) Epipharyngeal lining with alms on labral surface; hypopharyngeal bracon pigmented; alimentary canal with cardiac mycetomes (Fig. 620); bases of Malpighian tubules floriate (Fig. 620) ... Psepholacina
  —Epipharyngeal lining with alms in situ; hypopharyngeal bracon clear; alimentary canal without cardiac mycetomes; bases of Malpighian tubules simple (Fig. 632) ........................................ Mirastethus baridioides

3(1) Thoracic spiracle subcircular .................................. 4
  —Thoracic spiracle ovate (longer than wide) ........ 8

4(3) Head pallid; Malpighian tubules thick (Fig. 673) ....... Sympedius testudo
  —Head pigmented; Malpighian tubules slender ...... 5

5(4) Head capsule oval in outline (sides straight); fs1,2,3 and des4 minute .......... Secolodolichus squamosus
  —Head capsule subcircular in outline (sides rounded); fs and des all well developed ........................................ 6

6(5) Epipharyngeal lining with 2 single sensilli between distal mes pairs; alimentary canal with cardiac mycetomes; gastric caeca lamelliform, in a cluster of 3 .... Paromalia vestita
  —Epipharyngeal lining with paired clusters of sensilli between proximal mes pairs; alimentary canal lacking cardiac mycetomes; gastric caeca absent ........................................ Microcryptorhynchus .. 7

7(6) Labral tormae with apex of stem rounded ................ Curculioninae: Baridini
  —Labral tormae with apex of stem bifurcate ................. subgenus Microcryptorhynchus
  ........................................ subgenus Notacalles

8(3) Epipharyngeal lining with clustered sensilli between proximal mes pairs; posterior ventriculus with 1+3 or 1+4 coils ........................................ 9
  —Epipharyngeal lining with clustered sensilli between distal mes pairs or level with middle pair; posterior ventriculus with 1+1 coils .......................... 12

9(8) Head unpigmented except on margins; endocarinal line very short or absent; hypopharyngeal bracon clear ........................................ 10
  —Head pigmented; endocarinal line at least one-third as long as frons; hypopharyngeal bracon maculate 11

10(9) Mandibles with an acute molar tooth; labral tormae with apex of stem bifurcate; epipharyngeal lining with outer als in line on margin, directed forwards .............. Pachyderris punctiventris
  —Mandibles without a molar tooth; labral tormae with apex of stem simple; epipharyngeal lining with outer als offset below margin, directed inwards ........................................ Didymus impexus

11(9) Mandibles with an acute molar tooth (Fig. 469); clypeal setae subequal in length; maxillary mala bearing 10+5 setae ................................. Tychanus gibbus
  —Mandibles without a molar tooth; clypeal setae unequal in length; maxillary mala bearing 7+5 setae ........................ Clypeolus lachrymosus

12(8) Maxillary mala bearing 9+5 setae; premental sclerite with posterior extension spatulate (Fig. 639a); lab-
eral tormae with stem as long as arms or longer (Fig. 637) ......................... **Rhyynchodes ursus**
—Maxillary mala bearing 7+5 setae; premental sclerite with posterior extension acute; labral tormae with stem shorter than arms (as in Fig. 658) ................. 13

**13(12) Pds1 shorter than pds3 and pds5 on Abd I–VIII.**

........................................... **Mecistostylus**
—Pds1 shorter than pds3 and pds5 on at least Abd I–V

........................................... 14

**14(13) Pds1 as long as pds3 and pds5 on Abd VIII only.**

........................................... **'Acalles' dolosus**
—Pds1 as long as pds3 and pds5 on at least Abd VII and VIII

........................................... 15

**15(14) Pds1 as long as pds3 and pds5 on Abd VII and VIII only.**

........................................... **Indecentia**
—Pds1 as long as pds3 and pds5 on Abd VI–VIII

........................................... 16

**Tribe Eugnominii: larvae**

**1** Th II/III pds arranged short, long, short, long ...... 2
—Th II/III pds arranged short, short, long, long ...... 8

**2(1) Epipharyngeal lining with 4 pairs of mes (as in Fig. 719).** ........................................ 3
—Epipharyngeal lining with 3 pairs of mes (as in Fig. 690)

........................................... 5

**3(2) Head convex, globose (Fig. 715); antennae narrowly conical; primary and secondary ocelli visible. Associated with *Hebe* ......................... **Oreocalus**
—Head depressed, with sides straight or rounded; antennae broadly conical; primary ocelli alone visible. Not associated with *Hebe* ................................. 4

**4(3) Head subquadrate. Associated with *Aciphylla* .........

........................................... **Eugnominus**
—Head subcircular. Associated with *Celmisia*

........................................... undescribed genus

**5(2) Labrum with sides straight, parallel (Fig. 708); maxilla with 12 dms (Fig. 711b) .......... **Nyctes**
—Labrum with sides rounded (Fig. 689); maxilla with 6 or 7 dms ................................. 6

**6(5) Head ovate (Fig. 687); labral tormae Y-shaped. Associated with *Nestegis* fruits .......... **Gonoropterus**
—Head subquadrate; labral tormae V-shaped if joined. Not associated with *Nestegis* ................................. 7

**7(6) Head weakly depressed; maxilla with 6 dms (Fig. 731b); alimentary canal with all gastric caeca globose (Fig. 734) ......................... **Scelopterus**
—Head strongly depressed; maxilla with 7 dms (Fig. 701b); alimentary canal with vermiform as well as globose gastric caeca (Fig. 704) ....... **Hoplocneme**

**8(1) Mandible ridged medially for grinding (Fig. 680); hypopharyngeal bracon block-pigmented; Abd I–VII spiracles unicameral (Fig. 684).** ............................... 9
—Mandible not ridged medially; hypopharyngeal bracon clear; Abd spiracles bicameral ............................. 10

**9(8) Primary ocelli distinct; hypopharyngeal bracon block-pigmented (Fig. 676); epipharyngeal lining with als arranged longitudinally (Fig. 679); distal mes pair proximad of ams pairs (Fig. 679).... **Ancistropterurus**
—Primary ocelli absent; hypopharyngeal bracon with paired maculae on posterior margin; epipharyngeal lining with als arranged in a cluster anteriorly; distal mes pair on margin between ams pairs

**10(8) Fs1,2,3 well developed ....... **Stephanorhynchus**
—Fs1,2,3 minute ........................................ 11

**11(10) Alimentary canal with all gastric caeca globose..** ........................................ **Pactolotypus**
—Alimentary canal with vermiform as well as globose gastric caeca ........................................ **Pactola**

**Tribe Curculionini: larvae**

**1** Head free, rounded behind; coronal suture as long as frons; des1 present (Fig. 746) ............................... 2
—Head partially retracted, excavate behind; coronal suture shorter than frons or absent; des1 obsolete 4

**2(1) Cuticle asperate in transverse, linear series (as in Fig. 784); pedal area with 1 major seta (Fig. 752) ............... 2

—Cuticle coarsely, randomly spiculate; pedal area with 2 major setae ................................. 3

**3(2) Head unpatterned; Th II/III with 4 pds; labrum with lateral setae one-third as long as anterior setae (Fig. 758) ......................................... **Aneuma compta**
—Head with pallid paramedian stripes; Th II/III with 3 pds; labrum with lateral setae subequal in length to anterior setae (Fig. 769) ....... **Phorostichus linearis**

**4(1) Coronal suture present (Fig. 778); labrum with 3 pairs of setae; endocarina not extended posteriorly ...**
Hypotagea concolor
—Coronal suture obliterated; labrum with 2 pairs of setae; endocarina extended posteriad

5(4) Head with des3 present; spiracles of Abd VIII on produced dorsal lobe (Fig. 788, 797); endocarinal extension short (Fig. 789) Neomycta rubida
—Head with des3 obsolete; spiracles of Abd VIII lateral; endocarinal extension elongate, reaching level with posterior angles of epicranium (Fig. 801)

Tribe Molytini: larvae

1 Abd VIII dorsum modified into a siphonate breathing tube Notonesius aucklandicus
—Abd VIII not as above

2(1) Head pallid; labrum ovate, longitudinal (Fig. 854); hypopharyngeal bracon totally pigmented (Fig. 852) Phronira
—Abd spiracles bicameral; Abd VIII spiracle dorsal; alimentary canal 1+3-coiled Exeiratus

3(2) Antennae broadly conical; maxilla with 2 setae on palpifer and 7 dorsal malar setae (dms) 4
—Antennae narrowly conical (Fig. 853); maxilla with 3 setae on palpifer and 10 dms (Fig. 857)

4(3) Abd spiracles bicameral; Abd VIII spiracle dorsal; alimentary canal 1+3-coiled Phronira
—Abd spiracles unicameral; Abd VIII spiracle lateral. Alimentary canal 1+4-coiled Exeiratus

5(3) Epicranium with des4 one-third as long as des2; labrum with lateral seta half as long as anterior seta; alimentary canal with 10–12 gastric caeca; cardiac mycetomes absent Cuneopterus
—Epicranium with des4 minute, less than one-third as long as des2; labrum with lateral seta one-third or less as long as anterior seta; alimentary canal with 5 or fewer gastric caeca; cardiac mycetomes present

6(5) Head with endocarinal line indistinct; both anterior and posterior ocelli distinct Dolioceuthus
—Head with endocarinal line distinct; posterior ocelli faint or absent

7(6) Alimentary canal 1+1-coiled, with 5 elongate gastric caeca and 6 cardiac mycetomes Astyplus
—Alimentary canal 1+2-coiled, with 1 or 2 elongate gastric caeca and 8–10 cardiac mycetomes (Fig. 860) Phrynixus

8(2) Head pallid, with fsi,2,3 well developed (Fig. 841); Abd VIII spiracle lateral; alimentary canal 1+3-coiled Paedarethus
—Head red-brown, with fsi,2,3 minute; Abd VIII spiracle dorsal; alimentary canal 1+1-coiled

9(8) Th II/III pds arranged short, short, long, short; Abd pds with 1 major seta; maxilla with 10 dms; Abd VII spiracle larger than Abd I–VI spiracles. Associated with ferns
—Th II/III pds arranged short, short, long, long (Fig. 820); Abd pds with 2 major setae (Fig. 820); maxilla with 7 dms; Abd VII spiracle subequal to Abd I–VI spiracles. Not associated with ferns

10(9) Head dark red-brown; des3 in suture Megacolabus
—Head yellow-brown; des3 on epicranium Rystheus

11(9) Head with fs4 shorter than fs5 (Fig. 821); endocarinal line distinct (Fig. 821); ocelli absent; antennae broadly rounded (Fig. 822) Arecophaga
—Head with fs4 subequal to or longer than fs5; endocarinal line short, faint (Fig. 831); anterior ocelli distinct; antennae acutely conical (Fig. 832)

12(11) Spiracles pear-shaped, with airtubes narrowed towards apex Lyperobius
—Spiracles ovate, with airtubes of even width Hadramphus, Karocolens

Subfamily Cossoninae: larvae

1 Frons with fsi absent (as in Fig. 940); Abd III–VI with 4 dorsal folds (as in Fig. 939); Th II/III with 3 pds; Abd I–VII with 4 pds 2
—Frons with fsi present or absent; Abd III–VI with 3 or 4 dorsal folds; Th II/III with 4 pds; Abd I–VII with 5 pds

2(1) Head partially retracted (as in Fig. 928); epicranial ridge indistinct or absent
—Head free; epicranial ridge distinct (Fig. 940)

3(2) Endocarinal line absent; hypopharyngeal bracon pigmented Pentarthrum
—Endocarinal line present or absent; hypopharyngeal bracon clear

4(3) Endocarinal line absent; maxillary and labial palps each with a large apical papilla; prosternum sclerotised
—Endocarinal line present; maxillary and labial palps without a large apical papilla; prosternum not sclerotised .......... Euophryum

5(2) Endocarinal line present; alimentary canal without gastric caeca .......... Proconus
—Endocarinal line absent; alimentary canal with gastric caeca present ............. 6

6(5) Hypopharyngeal bracon entirely pigmented .......... Torostoma
—Hypopharyngeal bracon clear .......... 7

7(6) Major setae very long; labral tormae bowed; alimentary canal with about 20 gastric caeca .......... 8
—Major setae moderate; labral tormae parallel; alimentary canal with 10 or fewer gastric caeca .......... 9

8(7) Head with des₃ in frontal suture (Fig. 940); frons with medially peaked colour pattern (Fig. 940); labrum evenly rounded (Fig. 942) .......... Areocryptus
—Head with des₃ on epicranium; frons unpatterned; labrum trilobate .......... Toura

9(7) Abd II–VI with dorsal folds 2 and 4 plicate; clypeal setae equal in length; labral tormae parallel, distally expanded .......... Tanyosoma
—Abd II–VI with dorsal folds 2 and 4 simple; clypeal setae unequal in length; labral tormae convergent, slender .......... Agastegnus

10(1) Abd III–VI with 3 dorsal folds .......... 11
—Abd III–VI with 4 dorsal folds .......... 13

11(10) Head pallid; hypopharyngeal bracon maculate .......... Inosomus
—Head pigmented; hypopharyngeal bracon clear .......... 12

12(11) Frons with fs₁ absent; clypeal setae unequal in length (Fig. 921); labral tormae meeting at base (Fig. 922); alimentary canal with gastric caeca few (around 5) (Fig. 927) .......... Eiratus
—Frons with fs₁ present; clypeal setae equal in length; labral tormae not meeting at base; alimentary canal with gastric caeca numerous (around 20) Xenocnema

13(10) Frons with fs₁ present; mouthparts modified for xylophagy (Fig. 911–913); postlabium with posterior plbs pair closer together than middle pair (Fig. 914a); Th spiracle ovate, larger than Abd spiracles (Fig. 916) .......... Mesites

—Frons with fs₁ absent; mouthparts (except mandible) not modified for xylophagy; postlabium with posterior plbs pair wider apart than middle pair; Th spiracle circular, similar in size to Abd spiracles .......... 14

14(13) Head pallid; hypopharyngeal bracon clear; spiracles without airtubes .......... Unas
—Head pigmented; hypopharyngeal bracon entirely pigmented; spiracles bicameral .......... 15

15(14) Head with epicranial ridge present; endocarinal line absent; Th II/III with 2 msts (Fig. 956); spiracular airtubes simple (Fig. 957) .......... Pachyops
—Head without an epicranial ridge; endocarinal line present, short; Th II/III with 1 msts; spiracular airtubes annulate .......... Phloeophagosoma

Subfamily Scolytinae: larvae

1 Postlabium with posterior pair of plbs closer together than middle pair (setae of each side forming a triangle, as in Fig. 975a) ................. 2
—Postlabium with posterior pair of plbs wider apart than middle pair (setae of each side in a straight line) .... 8

2(1) Frons with 6 fs (Fig. 1019); mandibles unidentate, with cutting edge chisel-shaped (Fig. 1023); hypopharyngeal lining with 1 group of sensilli, in front of proximal mes pair (Fig. 1022) Scolytus multistriatus
—Frons with 4 or 5 fs; mandibles with 2–4 teeth; hypopharyngeal lining with 2 groups of sensilli, in front of and behind proximal mes pair (Fig. 1003) .......... 3

3(2) Frons with 4 fs (fs₁ absent) (Fig. 970); Th I–III with 2 msts (Fig. 976); spiracles without airtubes (Fig. 977); anus subdorsal (Fig. 969) Chaetoptelius mundulus
—Frons with 5 fs; Th I–III with 1 msts; spiracles with or without airtubes; anus subdorsal or terminal .......... 4

4(3) Mouthparts adapted for xylophagy (Fig. 1002–1004); maxillary mala truncate, with 13 dns (Fig. 1005b); anus subdorsal (Fig. 999); gastric caeca absent .......... Pachycotes peregrinus
—Mouthparts not adapted for xylophagy; maxillary mala rounded, with 7 dns; anus terminal; gastric caeca present .......... 5

5(4) Labral tormae joined widely at base (Fig. 983); mandibles with 1 seta; gastric caeca flask-shaped, 3 or 4 on either side (Fig. 988) .......... Dendrotrupes costiceps
—Labral tormae separate or joined narrowly and tenuously at base; mandibles with 2 setae; gastric caeca vermiform, in excess of 20 arranged randomly .... 6

—Frons with fs₁ absent; mouthparts (except mandible) not modified for xylophagy; postlabium with posterior plbs pair wider apart than middle pair; Th spiracle circular, similar in size to Abd spiracles .......... 14

14(13) Head pallid; hypopharyngeal bracon clear; spiracles without airtubes .......... Unas
—Head pigmented; hypopharyngeal bracon entirely pigmented; spiracles bicameral .......... 15

15(14) Head with epicranial ridge present; endocarinal line absent; Th II/III with 2 msts (Fig. 956); spiracular airtubes simple (Fig. 957) .......... Pachyops
—Head without an epicranial ridge; endocarinal line present, short; Th II/III with 1 msts; spiracular airtubes annulate .......... Phloeophagosoma

Subfamily Scolytinae: larvae

1 Postlabium with posterior pair of plbs closer together than middle pair (setae of each side forming a triangle, as in Fig. 975a) ................. 2
—Postlabium with posterior pair of plbs wider apart than middle pair (setae of each side in a straight line) .... 8

2(1) Frons with 6 fs (Fig. 1019); mandibles unidentate, with cutting edge chisel-shaped (Fig. 1023); hypopharyngeal lining with 1 group of sensilli, in front of proximal mes pair (Fig. 1022) Scolytus multistriatus
—Frons with 4 or 5 fs; mandibles with 2–4 teeth; hypopharyngeal lining with 2 groups of sensilli, in front of and behind proximal mes pair (Fig. 1003) .......... 3

3(2) Frons with 4 fs (fs₁ absent) (Fig. 970); Th I–III with 2 msts (Fig. 976); spiracles without airtubes (Fig. 977); anus subdorsal (Fig. 969) Chaetoptelius mundulus
—Frons with 5 fs; Th I–III with 1 msts; spiracles with or without airtubes; anus subdorsal or terminal .......... 4

4(3) Mouthparts adapted for xylophagy (Fig. 1002–1004); maxillary mala truncate, with 13 dns (Fig. 1005b); anus subdorsal (Fig. 999); gastric caeca absent .......... Pachycotes peregrinus
—Mouthparts not adapted for xylophagy; maxillary mala rounded, with 7 dns; anus terminal; gastric caeca present .......... 5

5(4) Labral tormae joined widely at base (Fig. 983); mandibles with 1 seta; gastric caeca flask-shaped, 3 or 4 on either side (Fig. 988) .......... Dendrotrupes costiceps
—Labral tormae separate or joined narrowly and tenuously at base; mandibles with 2 setae; gastric caeca vermiform, in excess of 20 arranged randomly .... 6
6(5) Head partially retracted, longer than wide (Fig. 1008); epistoma simple; Th II/III with 3 pds; Abd I–VIII with 4 pds ........................... *Phloeoisinus cupressi*
—Head free, subglobose; epistoma with a distinct, medially situated tubercle; Th II/III with 4 pds; Abd I–VIII with 5 pds ................................................................. 7

7(6) Frons bearing a pair of dark, low tubercles paramedially; labral tormae subparallel ............................... *Hylurgus ligniperda*
—Frons without paramedial tubercles; labral tormae in older larvae curving to meet tenuously at base (Fig. 993) ......................... *Hylastes ater*

8(1) Head partially retracted, longer than wide; antennae differentiated into stem and club *Cryphalus wapleri*
—Head free, subglobose; antennae not differentiated 9

9(8) Epipharyngeal lining with 6–10 mes pairs; cuticle of frons sculptured ......................... *Ips grandicollis*
—Epipharyngeal lining with 2 or 3 mes pairs; cuticle of frons simple ............................. *Xyleborinus saxeseni*

Subfamily Platypodinae: larvae

1 Abd IX without mediobasal armature (Fig. 1058); pronotal pattern of incomplete circles not joined by a posterior line (Fig. 1056); labral lobes separated by shallow notches (Fig. 1053); spiracles of Abd VI/VII without an airtube (Fig. 1059) ......... *Platypus gracilis*
—Abd IX with mediobasal armature (Fig. 1042, 1047); pronotal pattern of incomplete circles joined by a posterior line (Fig. 1034, 1046); labral lobes separated by narrow incisions (Fig. 1031, 1045); all spiracles with a single airtube ................................................................. 2

2(1) Abd IX declivity pigmented and with a blunt, rugose keel mediobasally (Fig. 1047); pronotal pattern with posterior line extended mesad (Fig. 1046); head capsule with cuticle nodulate; proventriculus asymmetrical (Fig. 1049) .................. *P. caviceps*
—Abd IX declivity pallid, with a hooked tubercle mediobasally (Fig. 1042); pronotal pattern with posterior line not extended mesad (Fig. 1034); head capsule smooth; proventriculus symmetrical ...... *P. apicalis*

Subfamily Rhynchophorinae: larvae

1 Postlabium with posterior pair of plbs as far apart as middle pair; Th II/III with 2 pds; labial palps 1-segmented ......................... *Dryophthorus*
—Postlabium with posterior pair of plbs closer together than middle pair; Th II/III with 3 or 4 pds; labial palps 2-segmented ................................................................. 2

2(1) Th II/III with 4 pds; maxillary mala with dms branched (Fig. 1068b); Abd VIII/IX depressed on dorsum (Fig. 1062) ........................... *Sphenophorus brunnipennis*
—Th II/III with 3 pds; all setae on mouthparts simple; Abd VIII/IX convex on dorsum (Fig. 1074) ................................. *Sitophilus .. 3*

3(2) Hypopharyngeal bracon clear; Abd segments lacking a distinct seta on ventropleural lobe ........ *S. oryzae*
—Hypopharyngeal bracon with paramedian maculae on posterior margin; Abd segments with vpls present or absent ................................................................. 4

4(3) Abd segments each with 1 ventropleural seta distinct .............................................. *S. granarius*
—Abd segments lacking ventropleural setae *S. zeamais*

**DESCRIPTIONS**

**Family NEMONYCHIDAE**

Body usually slender, less than 10.0 mm long, with 2 dorsal folds on abdominal segments often rendered indistinct by the presence of ambulatory ampullae. Head free or partially retracted, depressed, subtruncate behind; ecdyssial line effaced; coronal suture shorter than endocarinal line or effaced; frontal suture narrow, open in front, reaching articulatory membrane of mandibles; clypeus fused with frons, forming a pseudocypleus; 1 primary ocellus and up to 3 vestigial eyespots present on either side (absent in *Nemonyx*). Antennae 1-segmented, broadly conical, on a basal membranous cushion. Mandibles with incisor section 2- or 3-dentate, molar section expanded, sometimes produced proximally and provided with a diagonal masticatory ridge; inner surface concave; 2 setae aligned longitudinally. Labrum transverse, subtruncate, with either 4 paired setae or (Rhinorhynchini) 3 paired setae and a median unpaired seta; a basal sensillus on either side. Tormae visible as lateral thickenings, or absent. Epipharyngeal lining with proximal pair of median setae always arranged longitudinally. Hypopharyngeal bracon bearing a complex median sclerome. Maxilla with or without a sclerotised palpiger; palps 3-segmented, with median and distal segments each bearing a small seta; mala subtruncate, its inner angle minutely spined or rounded. Labial palpi 2-segmented. Articulatory lobes present between submentum and stipes.
A functional spiracle on mesothorax and a vestigial one on metathorax. All spiracles circular, with paired, annulate airtubes. Legs well developed in Nemonyx, otherwise represented by 1- or 2-segmented papillae, or absent.

Alimentary canal with proventriculus short; mycetomes lacking around cardiac valve; anterior ventriculus occupying three-quarters of body length, the narrower posterior section not coiled below Z-bend; gastric caeca absent; Malpighian tubules 4 or 6 in number, usually coloured purple and visible through cuticle; cryptonephridium weakly developed; rectal bract not visible.

Remarks. The diagnosis is based on larvae of Rhinorhynchus Sharp from New Zealand and Mecomacer Kuschel and Rhynchitomacer Voss from Chile, described herein; plus Nemonyx Redtenbacher from Europe and Cimberis des Gozis from North America, which are redescribed. Two other Chilean genera, three from Brazil, and six from Australia have also been taken into account.

The family Nemonychidae comprises a group of primitive weevils, most nearly allied to Anthribidae, whose world distribution follows the natural occurrence of the plants with which its members are associated. The majority of species are pollen-feeders, the larvae developing in the male inflorescences of Araucariaceae, Pinaceae, Podocarpaceae, and Fagaceae. Exceptions are Cimberis elongatus (Leconte), reported to be a secondary invader of damaged jack pine (Pinus banksiana) shoots (Thomas & Herdy 1961), and Nemonyx lepturoides (Fabricius), which is named as a pest of fodder crops in north-eastern Europe, feeding on Delphinium (Ranunculaceae) (Ter-Minassian 1984).

The earliest information on larvae comes from Perris (1856), who studied "Diodyrhyynchus" attelaboides Fabricius and D. australicus Schoenherr from maritime pine (Pinus pinaster) in Europe. Perris discussed the head and mouthparts in some detail but the body only in general terms. He made some perceptive observations on oviposition, feeding, and pupation.

Later systematic work on nemonychid larvae was based on Anderson's (1947b) description of Cimberis pilosus (Leconte) from North America. The genus is included in 'Larvae of some genera in Anthribidae', where Anderson erected a provisional subfamily, Cimberinae, to receive it. Crowson (1955) based the secondary portions (referring to larvae) of couplets 1 and 2 of his 'Key to the families of Curculionoidea' on this same species.

In 1984 Ter-Minassian described the larva of Nemonyx lepturoides (Fabricius) from the Ukraine. Crowson (1985) questioned the systematic position of Nemonyx alongside the other genera in Nemonychidae on the basis, as regards larvae, of Ter-Minassian's figures. My own observations do not support any such sharp divergence. Thoracic legs throughout the family are highly variable. Those of Nemonyx certainly show the most complete development, but others range through two-segmented papillae in Cimberis, one-segmented papillae in Notomacer Kuschel, and a condition indicated by sensilli only as in Rhinorhynchus Sharp.

The structure of the Nemonyx head capsule is autopomorphic for Nemonychidae, in which the clypeus is not separated from the frons by a suture as it is in Anthribidae and in all other Curculionoidea. Instead, the frons, along with its epistoma, is extended forwards to form a 'pseudo-clypeus'. This character is mentioned in Ter-Minassian's text (in Russian) but is not clear in the accompanying fig. 11. The labrum, with four setae on either side and with basal sensilli (not shown in fig. 9), is characteristic of all groups except tribe Rhinorhynchini.

Pollen-feeding in Nemonychidae. The mouthparts of nemonychid larvae are adapted to feeding on pollen. The mechanics of ingesting the grains are similar in principle to those displayed by Palophagus Kuschel, a chrysomeloid beetle associated with Araucaria in Australia (Kuschel & May 1990). The sporangia of the male strobili are pierced by the acutely tipped mandibles, then the maxilla is used to sweep in the pollen. The well-developed articulatory lobe between labium and maxilla allows considerable flexibility for this purpose. Most of the pollen grains in the gut have been split open, and since the proventriculus lacks armature, the crushing process must be performed between the mandibular mola and the hypopharyngeal sclerome. The mola is provided with a 'masticatory ridge' (a term used by Ter-Minassian 1984), which is toothed or crenate in varying degree according to the type of pollen consumed. Cimberis feeding on the soft-walled pollen of Pinus, for instance, has a more or less simple ridge, whereas species of Rhynchitomacerinus Voss feeding on Nothofagus pollen are provided with well-developed denticles.

Subfamily NEMONYCHINAE

Genus Nemonyx Redtenbacher

Nemonyx Redtenbacher, 1845: 96.
Type species Rhinomacer lepturoides Fabricius.

Body robust, strongly curved, widest at thorax, tapering; abdominal segments with 2 distinct dorsal folds; thoracic segments bearing 3-segmented, clawed legs. Setae exceeding modal numbers for Curculionidae.
Head free; coronal suture distinct; ocelli apparently absent; endocarinal line present; frontoclypeal suture effaced, forming a pseudoclypeus of typical form for the family. Antennae placed ventrally, beneath a frontal projection. Mandibles acutely bifid; masticatory ridge slightly crenate. Labrum indistinctly joined to clypeus, rounded, bearing 4 paired setae and paired basal sensilli. Tormae absent. Maxilla lacking a sclerotised palpiger; mala bearing strong setae and, on its inner angle, a short, robust spine. Premental sclerite narrow, with simple margins.

Legs on Th I/II consisting of basal lobe, femur, and tibiotarsus tipped by a sclerotised, non-setose claw; legs of Th III equipped with a narrow additional segment between basal lobe and femur.

Spiracle of Abd VIII lateral. Abd IX unmodified, bearing strong dorsal setae. Anus ventral. Alimentary canal not examined.

Nemonyx lepturoides (Fabricius)

lepturoides Fabricius, 1801: 429 (Rhinomacer).

Fig. 1–10

Maximum dimensions 6.0×2.0 mm; head width 1.0 mm. Body creamy yellow, widest at thorax. Cuticle smooth. Setae fine, pallid, short. Head yellow-brown, unpatterned; articulation points and mandibles red-brown; sides rounded, almost truncate behind; frontal suture indistinct; coronal suture shorter than endocarinal line, in ratio of 5:8; ocelli absent. Epipharyngeal lining with als and ams moderately long; 2 pairs of mes, arranged longitudinally. Postlabium with a minute seta on margin of sclerite, a large seta on mentum, and a seta laterally displaced on articulatory lobe.


Biology (from P. Svácha, pers. comm.). The adults of N. lepturoides are found on Consolida regalis (larkspur, previously in genus Delphinium) in summer, mainly June and July, flying around, copulating, and feeding on the host plant. They were chewing into the anthers rather destructively to eat the pollen. They also punctured the ventral spur of the corolla, to imbib a nectar. The eggs are inserted into the young capsules and the larvae feed on the developing seeds. There is absolutely no connection with pollen. The larvae must grow in the same time - from 2 to 3 weeks - that it takes the seeds to mature. When the capsule splits open they fall to the ground, where their legs are used for clasping and locomotion. They burrow in the soil to make a spherical cocoon in which to overwinter as prepupae. There appears to be only one generation a year.

Subfamily DOYDIRHYNCHINAE

Any diagnosis for this subfamily must remain limited until representatives of other genera are known. Key characters emerging from Cimberis are (1) the presence of a sclerotised palpiger on the maxilla (Fig. 16), and (2) the two-segmented pedal papillae (Fig. 18).

Genus Cimberis des Gozis

Cimberis des Gozis, 1881: 150.

Type species Rhinomacer attelaboides Fabricius.

Body slender, of even width. Abdominal segments with 2 dorsal folds, and with small ampullae on prodorsal fold of Abd I–VI; legs represented by 2-segmented papillae. Abd VIII/IX bristled ventrally. Setae exceeding modal numbers for Curculionidae.

Head free, widest behind middle; coronal and frontal sutures distinct; ocelli comprising 1 primary unit and 3 vestigial, one of them lateral near des5, one dorsal, and one ventral to this. Antennae partially hidden, projecting forwards. Mandibles acutely bifid, with a median lobe; molar section expanded ventrad as well as mesad; masticatory ridge simple. Labrum rounded. Tormae absent. Maxilla bearing a sclerotised palpiger below the 3 palpal segments; inner angle of mala minutely bispinose. Premental sclerite narrow, obsolete medially.

Abd IX convex; dorsum and venter of equal length. Anus terminal, 4-lobed. Alimentary canal with 6 Mpts, coloured purple but fading in alcohol.

Cimberis comptus (LeConte)

comptus LeConte, 1876: 2 (Rhinomacer).

Fig. 11–20

Maximum dimensions 4.5×1.0 mm; head width 0.7 mm. Setae pallid, moderately long. Pronotal shield pale yellow. Head yellow-brown, unpatterned, more reddish in front; endocarinal line one-third as long as frons; vestigial ocelli indistinct.

Material examined. U.S.A.: California, Napa Co., 3 km NNE of Angwin, ex male cones of Pinus sabiniana, 20 May 1981, 42 larvae, HBL.
Remarks. Larvae taken by H.B. Leech from *Pinus ponderosa* at the same locality in California, although very similar to *C. comptus*, may represent *Lecontellus* Kuschel or *Acromacer* Kuschel. Their larger size (7.0×1.5 mm, head width 1.0 mm) and host plant preference accord with the adults of either genus. By comparison with *C. comptus* larvae, the head and setae are more reddish and the anal lateral lobes are somewhat expanded.

These larvae were observed by the collector to crawl in the usual position, on the venter. Approximately 50% of the specimens were parasitised by a solitary hymenopterous larva, visible through the cuticle.

*Cimberis pilosus* (LeConte)

*pilosus* LeConte, 1876: 2 (*Rhinomacer*).

Fig. 21, 22

Maximum dimensions 4.5×0.85 mm; head width – 3rd instar 0.65 mm, 2nd 0.45 mm, 1st 0.30 mm. Setae pallid, slender; bristles reddish. Pronotal shield pale yellow. Head yellow, with articulation points blackish; endocarinal line one-third as long as frons; vestigial ocelli faint, the dorsal one often obsolete. Alimentary canal of typical form, with 6 Malpighian tubules coloured pink, pallid at base.

Egg dimensions 0.78×0.38 mm.


Biology. In Ottawa, oviposition was observed during May when *Pinus banksiana* (jack pine) was beginning to shod pollen. The eggs were placed beneath the cone scales (Fig. 22). By mid June the cones were supporting an abundance of larvae feeding on the pollen (A.T. Howden, pers. comm.).

*Cimberis elongatus* (LeConte) on *P. banksiana* in the Lake Nipigon area of Ontario display a somewhat different biology, according to Thomas & Herdy (1961). Although the adults feed on the male cones, the eggs are deposited in shoots damaged by bark beetles and in old staminate clusters in such shoots. Newly hatched larvae feed first in the needles enclosed in the fascicle sheath or in the buds, hollowing them out. They then bore into the stem, working downwards. Mature larvae drop from the shoots in mid August to overwinter in the soil as prepupae. Pupation, taking 15–20 days, begins almost a year later, in July, but the adults remain in the soil for another winter to emerge in early spring. The authors state that, in general, the larva of *C. elongatus* agrees with Anderson’s (1947b) generic description based on *C. pilosus*.

*Cimberis attelaboides* (Fabricius) in Europe was reared in May 1992 from eggs laid by females beaten from male strobili of *Pinus sylvestris*. The larvae reached maturity in a glass vial, feeding on pollen (P. Svácha, pers. comm.). The larvae I examined (2× 1st-instar, 2× 2nd, 3× 3rd) have a more deeply pigmented head capsule than *C. comptus* or *C. pilosus* but are similar in other respects, including dimensions.

Remarks. The collection from Virginia, loaned to me by the British Museum (Nat. Hist.), bears the same data as that given by Anderson (1947b) in the original description except for the date, 9 May 1933.

*Doydirhynchus austriacus* Olivier is sympatric with *C. attelaboides* on *Pinus* in Europe. The one mature specimen I have examined has similar pedal papillae and general conformation to *Cimberis*, but is distinguished from *C. attelaboides* by its paler head and by having fewer and paler setae.

Subfamily RHINORHYNCHINAE

Head capsule bearing 1–3 vestigial eyespots, in addition to primary ocellus. Antennae dorsal, frontal (fully exposed or partially overhung), or ventral (completely hidden from above). Maxilla lacking a sclerotised palpiger. Articulatory lobe of maxilla without a seta. Epipharyngeal lining with proximal pair of *mes* arranged longitudinally. Postlabium with 2 pairs of setae. Legs represented by a 1-segmented papilla, or absent. Malpighian tubules 4 or 6 in number.

Remarks. The Rhinorhynchinae represent the Gondwana element of family Nemonychidae. As indicated by the diagnosis, the larvae show considerable diversity. Nevertheless they are all pollen-feeders, *Rhynchitomacer* Voss on *Nothofagus*, the others on *Araucaria* or various podocarps. A larva of each of the four tribes is described.

Tribe Rhinorhynchini

Genus *Rhinorhynchus* Sharp


Type species *Rhinomacer rufulus* Broun.

Body slender, conspicuously segmented; pedal papillae absent; Abd segments with 2 dorsal folds distinct; ambulatory ampullae developed mediosternally; body terminating in a pygopod. Setae inconspicuous, fewer than modal numbers for Curculionidae.
Head partially retracted; coronal and frontal sutures distinct; primary ocellus large, with a raised cornea; 1 or 2 minute, vestigial eyespots present. Antennae fully exposed, frontal. Mandibles bifid, with margin of incisor section serrate; mola produced ventrally; masticatory ridge minutely crenate. Labrum with 2 pairs of setae and, medially on margin, an unpaired seta. Postlabium with 2 pairs of setae. Mala with inner angle rounded, bearing a strong, short seta.

Abd IX convex, much longer dorsally than ventrally. Anus ventral, 3-lobed; lateral lobes expanded to form a pygopod; dorsal lobe small. Alimentary canal of typical form, with 4 Malpighian tubules.

**Rhinorhynchus rufulus** (Broun)

*rufulus* Broun, 1880: 467 (Rhinomacer). Fig. 23-32

Maximum dimensions 3.5×0.75 mm; head width 0.3 mm. Body orange-pink when mature (fading in ethanol). Cuticle minutely shagreened. Setae short, slender, pallid. Pronotal shield dusky brown. Head pale red-brown; endocarinal line half as long as frons. Labrum unpigmented; lateral seta much shorter than discal seta. Alimentary canal with Malpighian tubules dull purple, pallid at base.

**Material examined.** NEW ZEALAND: AK – Huia, on male cones of *Dacrycarpus dacrydioides*, 4 Oct 1973, 80 larvae*, BMM; Lynfield, 5 Oct 1930, 13 larvae, GK. WI – Pohangina Valley, in litter, 19 larvae, MS. NN – Wairoa Gorge, on *Podocarpus totara* and *Dacrydium cupressinum*, 22 Oct 1971, 28 larvae, GK.

**Rhinorhynchus sp. indet.**

Maximum dimensions 3.0×0.6 mm; head width 0.25 mm. Body yellowish, becoming bright green with maturity (fading in ethanol). Pronotal shield dark dusky brown. Head dusky brown, with anterior half of frons pallid. Mandibles reddish. Malpighian tubules coarse, bright purple. Similar in other respects to *R. rufulus*.

**Material examined.** NEW ZEALAND: AK – Huia, on *Phyllocladus trichomanoides*, 2 Oct 1986, 42 larvae*, BMM. TO – Mt Ruapehu, 1000 m, on *Phyllocladus alpinus*, 5 Dec 1978, 52 larvae*, GK.

**Biology.** The biological pattern of *Rhinorhynchus* sp. indet., abundant throughout New Zealand on Podocarpaceae, is probably typical for most pollen-feeding Nemochiidae. The life cycle was studied at Huia during 1973–74 (see Table 1).

In spring (October) the eggs are inserted between the sporophylls of well developed but unripe male flowers. Newly hatched larvae enter the sporangia and feed on the pollen. When fully fed the larvae drop to the ground, where they migrate beneath surface litter and almost immediately prepare a cell in which to pupate. A period spent within the cell as a prepupa is followed by a moulting to pupa and then to teneral adult. The perfect insect emerges from the cell when hardened. Emergence does not usually coincide with the next flowering time, which means that adults must maintain themselves for several months before the cycle can begin again. The periods of incubation, feeding, pupation, and hardening are relatively short, but the prepupal stage is of variable duration, and may be quite prolonged. It is during this phase of the life cycle that adjustments can occur which allow some larvae to remain quiescent for a whole year or more.

In the Australian species *Notomacer araucariae* Kuschel diapause induced by cooling lasted for 33 months (May, in press). Such an arrangement would overcome the hazard of irregular flowerings in the host plant.

*Rhinorhynchus* feeds within the small, pendant cones of *Dacrycarpus* by gripping with the pygopod to maintain position while thrusting forward into the pollen sacs. It progresses mainly by simple contraction and expansion. The pygopod becomes especially useful in the later stages of feeding when larvae migrate to other cones. On a flat surface *Rhinorhynchus* crawls in the 'normal' position, on its venter.

**Remarks.** The closest known ally to *Rhinorhynchus* on larval characteristics is without doubt *Nannomacer* Kuschel in Chile, which is also associated with Podocarpaceae. Larvae of *N. wittmeri* Kuschel, taken with adults on male cones of *Saxegothaea conspicua*, have a simple terminal segment instead of a pygopod but are separated otherwise only by small differences in setation.

**Table 1** Life cycles of *Rhinorhynchus* species, showing duration of stages (days).

<table>
<thead>
<tr>
<th></th>
<th><em>rufulus</em></th>
<th>sp. indet.</th>
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<tr>
<td>Cones gathered</td>
<td>4 Oct 1973</td>
<td>7 Dec 1978</td>
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<tr>
<td>Incubation of eggs</td>
<td>14</td>
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<tr>
<td>Larval feeding</td>
<td>23</td>
<td>14–21</td>
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<tr>
<td>Prepupal period</td>
<td>174–192</td>
<td>126–133</td>
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<tr>
<td>Pupation</td>
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<td>30–35</td>
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<td>Teneral adult</td>
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<td>28–29</td>
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<td>Egg to adult</td>
<td>249–267</td>
<td>219–239</td>
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<tr>
<td>Adults reared (n)</td>
<td>3</td>
<td>3</td>
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</table>
Tribe Rhynchitomacerini
Genus Rhynchitomacer Voss

*Rhynchitomacer* Voss, 1937: 201.

Type species *Rhynchitomacer flavus* Voss.

Body slender; ventral ambulatory ampullae pronounced, less so on dorsum; pedal papilli present; abdomen terminating in a pygopod. Setae moderately long, fine, slightly in excess of modal numbers for Curculionidae.

Head more or less free, truncate behind; coronal suture very short; frontal suture distinct; ocelli distinct, with corneae; vestigial eyespot sometimes divided into two beneath a single cornea. Antennae lateroventral, hidden from above. Mandibles bifid, with incisor margin serrate, almost pluridentate; mola slightly produced ventrally; masticatory ridge armed with 3 or 4 acute teeth. Labrum bearing 4 pairs of setae and a pair of sensilli. Tormae absent. Hypopharyngeal sclerome with median and lateral projections on anterior margin. Labial palps with basal segments elongate and widely divergent, setose at apex; distal segment much smaller, placed laterally, midway along inner margin. Premental sclerite widest at middle. Articulatory lobes rugose. Mala with inner angle bispinous.

Legs represented by relatively large, hemispherical papillae.

Abd IX convex, longer dorsally than ventrally. Anus ventral, with lateral lobes enlarged to form a pygopod, armed on anterior margin with 1–3 short, stout, pigmented spines. Alimentary canal of typical form; 4 Malpighian tubules.

**Biology.** *Rhynchitomacer* larvae feed on pollen of *Nothofagus* growing in southern parts of Chile and Argentina. There are thirteen described species, several of which can be found at any one time on the same tree. Larvae were collected during September to December by G. Kuschel while visiting Chile in 1983. Two species were later reared in Auckland from material kept in quarantine. In the laboratory, fully fed larvae migrating from the male flowers during December were placed in tubes of fine Perlite mixed with peat. Four of these pupated during March 1984. Pupation occupied 3 weeks, after which the two surviving teneral adults remained in the cell for a further 13 weeks and 15 weeks respectively.

On a flat surface, *Rhynchitomacer* larvae crawl on the venter.

**Remarks.** Species can be separated by differences in the number, colour, and relative size of the anal spines and to some extent by the shape of the hypopharyngeal sclerome.

*Rhynchitomacer rufus* Kuschel


Fig. 33–42

Maximum dimensions 5.0×1.0 mm; head width 0.5 mm. Cuticle smooth, but coarsely spiculate dorsally on Abd VII–IX and anal lobe. Setae red-brown. Pronotal shield and head dusky red. Primary and vestigial ocelli of similar size. Anal spines 2 larger, 1 smaller, red. Malpighian tubules dark purple, pallid at base.

**Material examined.** CHILE: Frutillar, ex male flowers of *Nothofagus dombeyi*, 16 Dec 1984, 3 larvae, OK, 2 larval exuviae, pupae, adults, BMM*.

**Tribe Mecomacerini
Genus Mecomacer Kuschel


Type species *Mecomacer scambus* Kuschel.

Body of even width, with ambulatory ampullae on dorsum only of Abd II–VII; pedal papilli absent; abdomen tapering, bristled ventrally on Abd IX. Major setae long, fine, exceeding modal numbers for Curculionidae.

Head free; sutures distinct; endocarinal line two-thirds as long as frons; primary ocellus and 3 vestigial eyespots present, each beneath a separate cornea. Antennae ventral. Mandible acutely bifid, with a median projection; mola bearing a simple masticatory ridge, extended inwards but not proximad. Labrum with 4 pairs of setae, 1 pair of sensilli. Tormae present laterally. Labial membranes pubescent. Premental sclerite trapeziform, notched medially on anterior margin; a pair of minute setae at base. Mala with inner angle bispinous.

Anus with 2 lobes only, lateral, slightly expanded; Malpighian tubules 4, dull purple, pallid at base.

**Biology.** Several species of *Mecomacer* feed together with *Rhynchitomacerinus kuscheli* (Voss) in male cones of *Araucaria araucana* in the Chilean/Argentine cordilleras. The life cycle, as observed in a quarantine laboratory in Auckland, follows the pattern of other Nemonychidae, i.e., pollen-feeding for 2–3 weeks, then prepupal migration and cell construction on the ground, followed by pupation either in 2–3 weeks or after a diapause lasting until the next season. The pupal stage is invariably short (14–21 days), but the adult teneral period may be extended, probably depending on suitable conditions for emergence.

*Mecomacer* larvae appeared to crawl on the venter for preference, but were able to perform equally well when turned to the dorsal position.
**Mecomacer scambus Kuschel**


Fig. 43–52

Maximum dimensions 7.0×1.3 mm; head width 1.0 mm. Cuticle smooth. Setae red-brown, very long, finely tapering or short and stiff. Pronotal shield and head red-brown. Head with sides slightly convergent. Thoracic pedal papillae absent, but position indicated by a close group of 4 setae, and 4 sensilli; major pedal seta set amongst this group. Abd IX with short, stiff setae intermixed with long setae on dorsum and pleural lobe. Anus subterminal; lateral lobes minutely spiculate anteriorly.

**Material examined.** CHILE: Parque National de los Paraguas, 1480 m, ex male cones of *Araucaria araucana*, 13 Dec 1983, 9 larvae, RR, 4 larval exuviae, pupae, adults, BMM*.

**Tribe Rhynchitoplesiini**

**Genus Rhynchitomacerinus Voss**


Type species *Rhynchitomacerinus kuscheli* Voss.

The generic diagnosis differs only slightly from that of *Mecomacer*, as follows. Pedal papilli present. Head subquadrate, its sides not convergent; endocarinal line half as long as frons. Cardo inwardly explanate.

**Rhynchitomacerinus kuscheli (Voss)**

*kuscheli* Voss, 1952: 177 (*Rhynchitomacer*).

Fig. 53–63

Maximum dimensions 4.5×1.0 mm; head width 0.65 mm. Cuticle smooth. Setae pale brown, tapering finely or short and stiff. Pronotal shield and head red-brown. Thoracic pedal papillae minute, overreached by 4 microsetae and well separated from major pedal seta. Abd IX with bristle-like setae at apex of dorsum. Anus subterminal.

**Material examined.** CHILE: Parque National de los Paraguas, 1480 m, ex male cones of *Araucaria araucana*, 13 Dec 1983, 23 larvae, RR, 2 larval exuviae, pupae, adults, BMM*.

**Remarks.** I was able to examine the specimen, impeccably prepared as a slide mount, mentioned by Anderson (1947b, p. 516) as collected in Chile on a bromeliad, *Fascicularia bicolor*. The slide label gives “San Fran No. 6887, 1 Feb 1936”. Although I have been unable to assign the larva to a species, it undoubtedly belongs in the *Mecomacer/Rynchitomacerinus* complex. There still remains a mystery, since *F. bicolor* grows as an epiphyte on trees in the Central Valley of Valdivia but does not extend into the mountains of the Andes where *Araucaria* grows (Kuschel 1954). The salient features of the larvae are compared in Table 2.

*R. kuscheli* crawls on the dorsum in an ‘upside-down’ position (Fig. 53) similar to that adopted by the rhinorhynchine larvae associated with *Araucaria* in the Australian Region (May, in press).

### Table 2 Comparison of a rhinorhynchine larva from a bromeliad with species from *Araucaria* male cones

<table>
<thead>
<tr>
<th>Fascicularia specimen</th>
<th>Mecomacer</th>
<th>R'macerinus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedal papilla present</td>
<td>absent</td>
<td>present</td>
</tr>
<tr>
<td>Group of 4 minisetae</td>
<td>associated with papilla</td>
<td>present</td>
</tr>
<tr>
<td>Major pedal seta within group of minisetae</td>
<td>within</td>
<td>separate</td>
</tr>
<tr>
<td>Labral tormae narrow, bifid</td>
<td>wide, bifid</td>
<td>narrow, simple</td>
</tr>
<tr>
<td>Pramental scierite notched</td>
<td>not notched</td>
<td>notched</td>
</tr>
<tr>
<td>Labial membranes pubescent</td>
<td>pubescent</td>
<td>pubescent</td>
</tr>
<tr>
<td>Antennae ventral</td>
<td>ventral</td>
<td>ventral</td>
</tr>
</tbody>
</table>

**Family ANTHRIBIDAE**

Body with 2–4 dorsal folds, lacking ampullae (Urodontinae excepted), usually C-shaped (terminal segments recurved ventrally in situ). Setae fine, abundant on thorax, more scanty elsewhere. Head either free and subcircular in outline or partially retracted, compressed posterolaterally for cuticle and muscle attachment and narrowed behind to a downturned point or fulcrum (Fig. 76); postoccipital condyles absent; coronal suture half as long as head, joined to an internal apodeme protruding below epicranial halves; ec dysial line obsolete; frontal suture narrow, complete in front; endocarinal line present or absent; frontoclypeal suture often indistinct; primary ocellus present, plus up to 2 vestigial eyespots. Antennae 1-segmented, conical, enclosed within anterior angle of frons. Mandibles with mola developed or not, each bearing 2 setae aligned longitudinally. 

Labrum spatulate, bearing 4 pairs of primary setae and paired basal sensilli. Tormae lateral or mediolateral. Epipharyngeal lining having as primary setae 3 als, 2 amys, and usually only 2 mes, the distal pair being replaced by sensilli; proximal mes pair arranged either transversely or longitudinally; additional secondary setae often present. Hypopharyngeal bracon usually provided with a strong, complex, median sclerome. Tentorial bridge subdivided...
latterly (except in *Bruchela*). Maxilla occasionally with a sclerotised palpiger; palps 2- or 3-segmented, with both segments (or median and distal segments) bearing a small seta; mala convex to conical, nearly always bearing a lacinial spine. Labial palps more or less contiguous, 1- or 2-segmented or absent; articulatory area well developed.

Thoracic spiracle intersegmental or on mesothorax. Spiracles with 0, 1, or 2 airtubes. Legs vestigial, represented by a 1- or 2-segmented papilla, or absent.

Alimentary canal lacking gastric caeca; Malpighian tubules 4 or 6 in number, distributed evenly around iléo-colic valve, pallid (purple in *Bruchela*); cryptonephridium asymmetrical; rectal bracon a pigmented loop.

**Remarks.** So many of the features which characterise Nemonychidae in the larval stage are held in common with Anthribidae that there has been uncertainty as to whether they are indeed separate families (Anderson 1947b, p. 516). Speculation regarding the placement of *Bruchela* (= Urodon) has been even greater. The genus was attributed to Bruchidae until Böving (cited in Bridwell 1932) pointed out the larval characters which show its very close relationship to Anthribidae and it was excluded from that family. Emden (1938, p. 5) did not agree with this finding on the grounds that a hypopharyngeal bracon and median sclerome were lacking. His specimens, however, may have been teneral, not fully hardened, because Anderson (1947b) found the sclerome to be faintly indicated, and in my specimen of *B. lilii* (Fåhraeus) it is distinct. In 1943 Anderson stressed reasons for including both *Bruchela* and *Holostilpna nitens* (LeConte)* in Anthribidae, and in 1947b called attention to the presence of air sacs in the tracheal system of the latter and their absence in *Bruchela* and in any other curculionoid larvae that he had examined. Crowson (1984) recognised a separate family, Urodonidae, after Lacordaire & Chapuis (1866), a name retained for the present subfamily. In the following assemblage of family characters, the diagnoses published by Gardner (1936), Anderson (1947b), and Lee & Morimoto (1987) have been taken into account.

### Subfamily URODONTINAE

Two genera at present constitute this unit: *Bruchela* from Europe and South Africa, with larvae of two species described; and Cercomorpha Perris from Spain and North Africa, larva unknown. The following features set *Bruchela* apart from the bulk of Anthribidae, the first four linking the genus with Nemonychidae: (1) frons indistinctly separated from clypeus; (2) tentorial bridge entire; (3) setae present on articulatory lobe of maxilla; (4) ambulatory ampullae present; (5) labial palpi absent.

**Genus Bruchela Dejean**

*Bruchela* Dejean, 1821: 78.

Type species *Urodon rufipes* Olivier.

Body moderately slender, widest at thorax, tapering gradually; dorsal ampullae prominent on Th II and Abd I-VII; legs absent.

Head deeply retracted, longer than wide, with varied colour pattern; endocarinal line present; clypeus indistinctly separated from frons; primary ocellus alone present, with a cornea. Mandibular mola undeveloped. Labral tormae present. Epipharyngeal lining lacking sensilli or asperities; proximal pair of mes transverse. Hypopharyngeal sclerome present. Tentorial bridge laterally entire, joined medially or not. Maxillary palps 2-segmented; mala with or without a basal lacinia. Labial palps absent. Premental sclerite reduced or obsolete.

Thoracic spiracles unicameral or bicameral; Abd spiracles unicameral; all airtubes simple. Anus terminal.

**Remarks.** The diagnosis above is based partly on those of Urban (1913) and Anderson (1947b). I have not seen the larva of *B. rufipes*, which is divergent in many respects from that of *B. lilii*.

*Bruchela lilii* (Fåhraeus)

*lilii* Fåhraeus in Schoenherr, 1839: 147(*Urodon*).

Fig. 64–73

Dimensions of specimen 5.0×1.7 mm. Head width 0.65 mm. Cuticle smooth, but anal lobes coarsely spiculate. Red-brown maculae present on Abd IX dorsum, and scimitar-shaped paired maculae on anal ventral lobe. Setae fine, pallid, moderately long, numerous (approximately 20 on pleural and pedal lobes). Pronotal shield pallid. Head dusky, red-brown anteriorly, with lateral, posterior, and wide sutural areas pallid; endocarinal half as long as frons; clypeus almost entirely pigmented. Labrum rounded, pigmented in proximal half, bearing 4 setae and a sensillus. Tormae short, spine-shaped, mediolateral. Epipharyngeal lining with 2 als, 2 amns on margin; 2 pairs of mes equally spaced between tormae. Hypopharyngeal sclerome concave in front. Tentorial bridge entire. Maxilla
bearing 5 stipital, 6 palpiferal, and 6 malar setae; lacinia prominent; articulatory lobe with 2 or 3 setae. Labium pubescent. Premental sclerite visible at sides only. Alimentary canal with 4 Malpighian tubules, purple; rectal bracon a short, pigmented loop.

**Material examined.** NEW ZEALAND: GB — Gisborne, port quarantine, ex seed of Watsonia (Gladiolus) hybrid from South Africa, 27 Mar 1986, 1 larva, PRB.

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**Subfamily ANTHRIBINAE**

Legs 1- or 2-segmented, occasionally absent. Maxillary palps often 3-segmented. Abd spiracles with 2 airtubes (absent in Phloeobius Schoenherr). Malpighian tubules 6 in number.

**Remarks.** The New Zealand element is superficially homologous in appearance, but shows individual character combinations which are distinctive enough to provide good separation. Euclodes suturalis Pascoe, an Australian adventive, and Lichenobius Holloway (May 1981) are included in the key. The following features are held in common, and require no repetition in the descriptions.

1. Body robust, recurved and tapered in posterior third (Fig. 74).
2. Head and pronotum usually unpigmented; points of articulation red-brown or darker.
3. Coronal and frontal sutures indistinct; endocarinal line unsclerotised except on pigmented head capsules.
4. Antennae mounted on ventral surface of produced frontal angle (Fig. 78).
5. Mandibular mola raised to form a stout tooth or ridged grinding surface (Fig. 92, 112).
6. Hypopharyngeal sclerome produced in front of bracon, emarginate except in Cacephatus (Fig. 77, 94).
7. Epipharyngeal lining bearing 3 als, 2 ames, and 2 mes pairs, the distal mes pair replaced by sensilli (Fig. 80).
8. Labrum lacking setae other than the 4 primaries (Fig. 79).
9. Maxillary palps, when 2-segmented, carrying a miniseta on each segment; when 3-segmented, lacking a miniseta on basal segment (Fig. 82a, 113a).
10. Stipes randomly clothed with long, fine setae.
11. Maxillary mala invested on dorsal surface with a few slender, straight setae, some fine, curled setae, and usually a single, stiff, pigmented seta as well as significant numbers of lamellate setae.
12. Postlabium and articulatory lobe bearing a small number of setae.
13. Labium bearing 1 prls pair, usually 1 miniseta mesad on palps (Fig. 82a).
14. Ligula bearing 1 pair of strong dorsal setae (Fig. 82b).
15. Thoracic spiracle approximately twice as large as Abd spiracles; that of Abd VIII not larger than the other Abd spiracles; airtubes dorsad.
16. Abd IX sternum usually invested with coarse spines.

**Genus Arecopais Broun**

_Arecopais_ Broun, 1893: 1267.

Type species _Exilis spectabilis_ Broun.


**Arecopais spectabilis Broun**

_spectabilis_ Broun, 1880: 558 (Exilis).

'Nikau anthribid'

Fig. 74–85

Maximum dimensions 6.5×2.0 mm; head width 1.25 mm. Cuticle minutely asperate; a double row of coarse spinules posteroventrally on Abd IX. Labrum and clypeus unpigmented. Tormae narrow, red-brown. Maxillary mala bearing 7 dorsal and 10 ventral lamellate setae. Ligula pubescent, with a pair of short, strong setae.


**Biology.** Larvae of _Arecopais spectabilis_ are found in dead sheathing bases of fallen nikau leaves when they are brown but not decayed and in the rachides of previous season’s inflorescences. They feed on the pith between the rather widely spaced fibres, in association with larvae of cossonine weevils such as _Arecocryptus bellus_ Broun, _Eu-sirossus comptus_ Broun, and _Stenotrupis_ spp. Pupation takes place in situ.
Genus *Cacephatus* Blackburn

*Cacephatus* Blackburn, 1900: 143.

Type species *Cacephatus sericeus* Blackburn.

Head free, with 2 vestigial eyespots in addition to primary ocellus. Antennae narrow, acutely conical, with 2 slender papilli on basal cushion. Mandibles with 2 apical teeth on elongate incisor; mola raised to a serrate grinding surface. Epipharyngeal lining with proximal pair of mes transverse; a paired, longitudinal, comb-like series of dark squamae below mes, between tormae. Hypopharyngeal sclerome convex in front, straight-sided. Maxillary and labial palps 2-segmented. Premental sclerite distinct.

Thorax with pedal papillae 2-segmented; spiracles on mesothorax.

Remarks. The generic diagnosis is based on larvae of *C. aucklandicus* (Brookes) (May 1971), *C. huttoni* (Sharp) (May, in press), and *C. inornatus* (Sharp), which is described below. The following features of *Cacephatus* larval mouthparts are unique among the New Zealand Anthribidae that I have studied, and may be taken to indicate a somewhat divergent type of alimentation. (1) Mandibular mola adapted for grinding wood fibres instead of tearing them apart. (2) Tormae wider than usual and forked anteriorly, giving greater support to the labrum. (3) Hypopharyngeal sclerome convex rather than emarginate in front. (4) The clusters of squamae on the epipharyngeal lining in front of the oesophagus must in some way assist ingestion. *Cacephatus* larvae are found in hard, dead wood rather than in soft, decaying branchlets.

*Cacephatus inornatus* (Sharp)

*inornatus* Sharp, 1886: 434 (*Anthribus*).

Fig. 86–97

Maximum dimensions 5.0×2.0 mm; head width 1.5 mm. Cuticle asperate; coarse, red-brown spinules present on Abd IX sternum. Clypeus pigmented on proximal half. Labrum completely pigmented. Labial palps with distal segment longer than proximal one; associated setae as long as palps. Maxillary mala bearing on dorsal surface 6–8 laminate setae apically and 7 shorter, lamellate setae basally; ventral surface lacking lamellate setae; lacinia short, broad. Premental sclerite a complete band.

Material examined. NEW ZEALAND: AK — Waitakere Ra., ex dead wood of *Agathis australis*, 5 Jul 1966, 26 larvae*, BMM.

Genus *Dasyanthribus* Holloway

*Dasyanthribus* Holloway, 1982: 133.

Type species *Anthribus purpureus* Broun.

Thorax with pedal papilla 1-segmented. Head partially retracted, with 2 vestigial eyespots in addition to primary ocellus. Mandibles with an apical tooth and 2 subapical teeth; molar tooth curved inwards. Premental sclerite a thin line. Articulatory lobe devoid of setae.

*Dasyanthribus purpureus* (Broun)

*purpureus* Broun, 1880: 559–563 (*Anthribus*). Fig. 98–107

Maximum dimensions 2.25×1.0 mm; head width 0.5 mm. Cuticle smooth, but spiculate on Abd IX sternum. Labrum slightly pigmented. Maxillary mala bearing 5 dorsal and 8 ventral lamellate setae. Ligular setae stronger than prelabial setae.

Material examined. NEW ZEALAND: AK — Huia, under bark of live *Olearia furfuracea*, Oct 1967, 12 larvae*, BMM.

Biology. The presence of *D. purpureus* larvae in *Olearia furfuracea* is indicated by fairly numerous, very small (1.5 mm) exit holes in the thin, flaky bark. The workings meander in no particular pattern between the bark and the cambium layer. Pupation cells are shallowly excavated at the end of a tunnel.

Genus *Garyus* Holloway

*Garyus* Holloway, 1982: 82.

Type species *Anthribus altus* Sharp.

Thorax with pedal papillae 2-segmented. Pronotum with a lateral, oblique band of thickening. Head free, with a primary ocellus only. Mandibles with 2 subequal incisor teeth; molar tooth as large as these. Epipharyngeal lining with proximal mes pair transverse. Maxillary palps 3-segmented; lacinia short, acute. Labial palps 2-segmented. Premental sclerite obsolete.

*Garyus altus* (Sharp)

*altus* Sharp, 1876a: 431 (*Anthribus*). Fig. 108–118

Maximum dimensions 5.0×2.0 mm; head width 1.5 mm. Cuticle densely spiculate in linear series on dorsum and
dorsopleuron of metathorax and Abd I–IV, with coarse spinules on Abd IX laterosternal lobe, and a double row caudad on sternal fold; otherwise smooth. Labrum lightly pigmented. Maxillary mala bearing 7 dorsal and 4 ventral lamellate setae.

Material examined. NEW ZEALAND: WO—Hamilton, in dead wood of hawthorn, Crataegus monogyna, 5 Oct 1971, 22 larvae*, BMM.

Biology. G. altus is associated with dead wood of various kinds. The workings are in branchlets which have reached the stage of soft, dry decay. Larvae commence feeding at a node or broken twig; their tunnels are elliptical in cross-section. The characteristically granular frass is loosely packed.

Genus Helmoreus Holloway

Type species Anthribus sharpi Broun.


Helmoreus sharpi (Broun)

sharpi Broun, 1880: 546 (Anthribus).

Fig. 119–127
Maximum dimensions 3.3×1.25 mm; head width 0.75 mm. Cuticle very finely spiculate; a single row of coarse spinules caudoventrally on Abd IX. Labrum pigmented mesally; anterior pair of setae short, stiff. Maxillary mala bearing 7 lamellate setae on ventral surface; dorsal surface without lamellate setae, but with a stiff, pigmented seta. Labial palpal segment as long as distal segment of maxillary palp.

Material examined. NEW ZEALAND: AK—Huia, subcortical in dead bark of Agathis australis, 23 Sep 1974, 7 larvae*, BMM.

Biology. H. sharpi is recorded from various conifers, including the wood, bark, and cones of Pinus radiata, and from beech (Nothofagus) and willow (Salix) (Holloway 1982). For many Anthribidae the type of fungus and the state of its growth in dead woody material is of more importance than the species of tree. At Huia on 16 December 1973 a damaged kauri tree was dying, the leaves turning brown. Numerous adults were on the trunk, ovipositing. The eggs were inserted singly into the bark. The resulting larvae fed subcortically, and by September 1974 the trunk was pitted with emergence holes. There were still larvae working in it, and a good many pupae in simple, unlined cells near the surface.

Hoherius meinertzhageni (Broun)

meinertzhageni Broun, 1880: 563 (Anthribus).

Fig. 128–138
Dimensions of specimen 4.5×.5 mm; head width 1.25 mm. Cuticle smooth to very finely asperate; a row of coarse spinules caudoventrally on Abd IX. Labrum pigmented at base. Maxillary mala bearing 8 lamellate setae on both dorsal and ventral surfaces. Stipes clothed laterally and dorsally with golden, curled setae.

Material examined. NEW ZEALAND: NN—Nelson, Rough I., cx dead Plagianthus divaricatus, 17 Nov 1972, 1 larva, GK.

Biology. Hoherius is unusual in being restricted as adult and larva to a single plant family, Malvaceae. Host plants mentioned by Holloway (1982) are Hoheria glabrata, Plagianthus betulinus, and P. divaricatus.

Genus Phymatus Holloway

Phymatus Holloway, 1982: 117.
Type species Anthribus phymatodes Redtenbacher.
Head partially retracted; ocellus only moderately distinct. Mandibles with 3 incisor teeth and a molar tooth; apical tooth largest. Epipharyngeal lining with proximal pair of mes transverse. Maxillary and labial palps 2-segmented. Premental sclerite a thin line. Thorax with pedal papillae 1-segmented. Spiracles with airtubes faintly annulate. 

Phymatus hetaera (Sharp)

hetaera Sharp, 1876a: 429 (Anthribus).

Fig. 139–149

Maximum dimensions 5.0×2.0 mm; head width 1.25 mm. Cuticle mainly smooth; coarse spinules on laterosternal lobes of Abd VIII/IX and in 3 or 4 rows caudoventrally on Abd IX. Labrum pigmented at base. Maxillary mala bearing 6 lamellate setae dorsally; remaining dorsal and ventral setae (approximately 20) stiff, slender; lacinia moderately broad, compressed.

Material examined. NEW ZEALAND: AK – Whatipu Beach, in dead bark of Lupinus arboreus, 20 Jul 1969, 52 larvae*, BMM.

Biology. Members of genus Phymatus are polyphagous (Holloway 1982). In the Auckland area I have reared P. hetaera from Agathis australis (Araucariaceae) dead bark and wood, Clematis sp. (Ranunculaceae) dead vine, Pseudopanax lessonii (Araliaceae) dead branch, Scheflera digitata (Araliaceae) dead twigs, and Tetrapathaea tetrandra (Passifloraceae) dead vine. The larvae were working subcortically and pupating in a shallow excavation or a subsurface cell. On Scheflera, first-instar larvae and a few second instars were found 4 months after branches were cut and hung; 8 months later there were many emergence holes, but with larvae and prepupae still present.

Some older larvae were harbouring the solitary larva of a proctotrupid parasite (Hymenoptera).

Pleosporius bullatus (Sharp)

bullatus Sharp, 1876a: 427 (Anthribus).

Fig. 150–160

Maximum dimensions 4.5×1.75 mm; head width 1.0 mm. Cuticle smooth to minutely asperate; coarse spinules scattered randomly ventrocaudally on Abd IX. Labrum pigmented at base. Maxillary mala bearing 5 dorsal and 7 ventral lamellate setae; lacinia broad, compressed.


Biology. In both the host plants from which I have reared P. bullatus, the workings were in small (about 10 mm diameter) dead branchlets. The Crataegus (Rosaceae) wood was dry and rather soft, but no fungal fruiting bodies were evident. The Nothofagus (Fagaceae) wood, however, bore fructations of Rosellinia (Ascomycetes) (H.J. Boesewinkel det.) under which the larvae were feeding, ventral side uppermost, in company with larvae of Notochoragus crassus (Sharp). The latter were distinguished by their paler, retracted head and one-segmented legs.

Genus Pleosporius Holloway


Type species Anthribus bullatus Sharp.

Thorax with pedal papillae 2-segmented. Head free; frontal suture visible anteriorly; primary ocellus alone present. Mandibles with 2 incisor teeth; molar tooth as large as apical tooth. Clypeus indistinctly separated from frons. Epipharyngeal lining with proximal pair of mes arranged longitudinally. Maxillary palps 3-segmented. Labial palps 2-segmented. Premental sclerite obsolete. Spiracles with airtubes faintly annulate. Alimentary canal with basal section of each Malpighian tube expanded to 4× diameter of anterior part, and having a grainy appearance.

Genus Sharpius Holloway

Sharpius Holloway, 1982: 52.

Type species Anthribus brouni Sharp.


Sharpius brouni (Sharp)

brouni Sharp, 1876a: 426 (Anthribus).

Fig. 161–170
Maximum dimensions 3.25×1.5 mm; head width 1.0 mm. Cuticle smooth to minutely asperate; coarse spinules present lateroventrally on Abd IX. Labrum lightly pigmented away from margin. Labium devoid of pubescence. Maxillary mala bearing 4 dorsal and 6 ventral lamellate setae; lacinia more slender than in *P. bullatus*.

**Material examined.** NEWZEALAND: AK—Auckland, Mt Smart, in dead wood of *Alectryon excelsa*, 13 Mar 1966, 46 larvae*, BMM; Wellsford, in dead twigs of *Olearia furfuracea*, 2 Aug 1966, 20 larvae*, BMM; Piha, in fungus galls (*Endothia* sp.) on *Pittosporum tenuifolium*, 14 Aug 1974, 10 larvae*, JSD.

**Biology.** The habits of *S. brouni* are very much the same as those of *P. bullatus*. In dead wood the eggs were inserted just below the surface of thin bark. Feeding was subcortical in mines 20–30 mm long. The workings were rather wide (up to 10 mm) because larvae doubled back every so often. In the galls of *Endothia* fungus (Ascomycetes) (J.M. Dingley det.) larvae were feeding among the perithecia. A hymenopteran parasite, *Proctotrupes* sp. (E.W. Valentine det.), emerged from some individuals. These harboured a solitary parasitic larva which pupated outside its host while remaining attached posteriorly.

**Subfamily CHORAGINAE**

Legs 1-segmented or absent. Maxillary palpi 2-segmented; labial palpi 1-segmented. Thoracic spiracles bicameral or unicameral; Abd spiracles unicameral. Malpighian tubules 4 in number. Similar in other respects to Anthribinae.

**Remarks.** Of the five choragine genera recorded from New Zealand by Holloway (1982), larval representatives of three are described here.

**Genus Araecerus Schoenherr**

*Araecerus* Schoenherr, 1823: 1135.

Type species *Anthribus coffeae* Fabricius.


**Remarks.** In the generic diagnosis, work by Cotton (1921), Gardner (1932a, 1936), and Anderson (1947b) has been taken into account.

Specimens of *A. fasciculatus* (DeGeer), *A. palmaris* (Pascoe), and *A. vieillardi* Montrouzier have been examined, and are included in the key (p. 16). A description is given of *A. palmaris*, the only species to have become established in New Zealand.

**Araecerus palmaris** (Pascoe)

*palmaris* Pascoe, 1882: 27 (*Doticus*).

‘Dried apple beetle’, ‘jumping anthribid’

Fig. 171–182

Maximum dimensions 10.0×3.0 mm; head width – 1st instar 0.26 mm, 2nd instar 0.38 mm, 3rd (final) instar 0.58–1.30 mm. Cuticle minutely spiculate; coarse spinules scattered randomly ventrocaudad on Abd IX. Abd I–V with a row of pliciae across prodorsal fold. Pronotum and head yellow-brown; oral margins and mandibles dark; sutures distinct; endocarinal line absent. Labrum pigmented. Maxillary mala bearing 11 dorsal and 6 ventral lamellate setae. Labium densely pubescent. Pedal lobes bearing a minute, sclerotised, circular area (undeveloped papilla) invested with fine setae, denser and shorter than on surrounding cuticle. Alimentary canal with posterior ventriculus as wide as anterior section; cryptonephridium strongly developed, terminating in 2 ventral lobes.

First instar (Fig. 181). Spiracles proportionately larger than in mature larvae. Egg-bursting spines present above spiracle on at least Abd I–III.

**Material examined.** NEWZEALAND: AK—Mt Albert, ex mummified fruits of loquat (*Eriobotrya japonica*), 21 Mar 1974, 17 larvae*, BMM. NN—Nelson, ex dry *Uromycladium* galls on *Acacia*, 1 Oct 1972, 1 larva, GK; Appleby Research Orchard, Dec 1972, 5 larvae, WPT.

**Biology.** Previously known as *Doticus pestilens* Olliff, the dried apple beetle originates from Australia, where it was recorded by Froggatt (1902) on wattle trees and in shrivelled apples. It was discovered in Wellington (WN) by Kirk (1895). Gourlay (1929) recorded its activities on *Acacia*, where larvae and adults were found inside the galls caused by the basidiomycete rust fungus *Uromycladium*. He also noted that mummified lemons kept in the laboratory supported continuous generations of the weevil until —36—
the pulp was exhausted. On loquat, eggs were inserted under the wrinkled skin. First-instar larvae worked in the pith before entering the nuts, where they stayed until fully fed and then pupated in situ. The fungus causing mummification was Botryosphaeria sp. (H.J. Boesewinkel det.). Other host fruits are listed by Kuschel (1972).

Genus Dysnocyrtus Broun

Dysnocyrtus Broun, 1893: 1258.
Type species Dysnocyrtus pallidus Broun.

Body with Abd III and IV showing a rugose ridge across prodorsal and postdorsal folds. Pedal papillae 1-segmented. Pronotum simple. Head free; primary ocellus alone present. Antennae longer than usual, elongate conical, with stem as long as cone; base carrying a slender papilla and a seta overtopping cone. Mandibles with 2 incisor teeth. Clypeofrontal suture indistinct. Thoracic spiracle unicamerall, situated on mesothorax.

Remarks. The position of the proximal pair of mes on the epipharyngeal lining and details of the lower mouthparts are uncertain owing to the small size of my specimens.

Dysnocyrtus inflatus (Sharp)

inflatus Sharp, 1876a: 434 (Anthribus).

Fig. 183–186

Largest specimen examined 2.5x0.75 mm; head width 0.5 mm. Cuticle minutely asperate; coarse spinules in a single row present caudoventrally on Abd IX. Head with a narrow epistomal band as well as articulation points and mandibles blackish. Labrum lightly pigmented away from margin.

Material examined. NEW ZEALAND: ND — Hen and Chickens Is., Lady Alice I., ex dead wood of Meryta sinclairii, 17 Oct 1971, 4 larvae, 1 pupa*, BMN. TO — Ohakune, 700 m, subcortical under Rosellinia fungus on Nothofagus solandri, 30 Oct 1970, 6 larvae*, BMN.

Biology. The larvae were feeding in a similar way to those of Pleosporius bullatus, in a recurved position, ventral surface uppermost, under patches of Rosellinia (Ascomycetes). They pupated at the end of the working.

Genus Notochoragus Holloway

Notochoragus Holloway, 1982: 159.
Type species Anthribus crassus Sharp.


Notochoragus crassus (Sharp)

crassus Sharp, 1876a: 432 (Anthribus).

Fig. 187–195

Maximum dimensions 3.0x1.25 mm; head width 0.75 mm. Cuticle minutely asperate; spicules (smaller than spinules) on Abd IX sternum randomly arranged. Head with a narrow epistomal band as well as articulation points and mandibles red-brown. Labrum lightly pigmented. Maxillary mala bearing 9 dorsal and 7 ventral lamellate setae; lacinia broad. Labium devoid of pubescence.

Material examined. NEW ZEALAND: AK – Glorit, Mt Auckland, under Rosellinia fungus in dead branchlets of Carmichaelia algiera, 10 Jan 1974, 7 larvae*, BMN. TO – Ohakune, 700 m, subcortical under Rosellinia fungus on Nothofagus solandri, 30 Oct 1970, 6 larvae*, BMN.

Biology. The larvae were feeding in a similar way to those of Pleosporius bullatus, in a recurved position, ventral surface uppermost, under patches of Rosellinia (Ascomycetes). They pupated at the end of the working.

Family BELIDAE

In the classification envisaged by Kuschel (in press), the family Belidae includes two small groups, Oxycoryninae and Aglycyderinae (= Proterhininae), previously standing on their own, as well as the much larger subfamily Belinae. This amalgamation is endorsed by characters of the larvae, in which there are no fewer than seven synapomorphies: (1) head deeply retracted; (2) head not extrusible, attached to prothoracic shield by heavy musculature (Fig. 198); (3) endocarinal line bifid (sometimes indistinctly); (4) frontal sutures obsolete; (5) labrum bearing 4 primary setae; (6) thoracic spiracle situated on mesothorax; (7) body setae more numerous than in Curculionidae.

In addition, the following characteristics possessed by one or another of the belid groups are shared with Ceram-
bycidae (Somatidia sp. examined, but see Duffy 1952) and hence with Chrysomeloidea, the closest outgroup: (1) head permanently retracted, with a similar type of cuticle and muscle attachment; (2) frontal sutures obsolete (Fig. 197); (3) antennae 2-segmented, retractile (Fig. 200); (4) maxilla with 3-segmented palps and a sclerotised palpiger (Fig. 204); (5) anus 3-lobed, T-shaped.

A hypopharyngeal bracon, the absence of which in Chrysomeloidea separates them from Curculionoidea, is present in Belidae and as a rule is strongly developed.

Subfamily BELINAE

Body form variable; abdominal segments each with 2 or 3 dorsal folds, often modified to form ambulatory ampullae. Setae variable in number, usually prolific. Spiracles ovate, with airtubes lateral; thoracic spiracle on mesothorax. Head deeply retracted into prothorax, held in place by mid-epicranial and posterior ligaments; occipital foramen open or closed behind; 1–6 ocelli present; endocarinal line bifurcate or absent; frontal sutures obsolete. Mandibles 1–3-segmented, with 2 setae aligned longitudinally. Labrum with 4 primary setae and 1 sensillus (anterior primary seta usually hidden amongst additional setae); basal sclerotisation extended laterally. Tormae variable in position, often absent. Maxillary palps 3-segmented, with a sclerotised palpiger; medial and distal segments each bearing a seta. Postlabium with a sclerotised strut, or bracon (Snodgrass 1935, p. 293) basolaterally. Pronotal shield declivous, lacking a median suture, densely pubescent in posterior third. Head longer than wide, with 3 oblique, parallel ridges postero-laterally for attachment of muscles; posterior margin entire; occipital foramen closed behind; 1 ocellus visible, under convex cornea; endocarinal line absent. Antennae with basal segment elongate, cylindrical; apical segment narrow, tubular, accompanied by a stout, conical process, as in many Cerambycidae (Duffy 1952, fig. 13a). Mandibles bidentate, with a prominent basal shoulder. Labrum evenly rounded, of subequal length and width. Tormae horizontal, attached laterally. Epipharyngeal setae numerous. Maxilla with mala densely setose. Labial bracon curved, rounded apically. Ligula pubescent. Premental sclerite wide, with anterior extension obsolete, posterior margin rounded. Spiracles ovate, bicameral; airtubes caudad. Anus terminal.

Remarks. The diagnosis is based on the endemic genera Agathinus Broun and Pachyurinus Kuschel and on three Australian genera, Rhinotia Kirby, Brachybelus Zimmerman, and Sphinctobelus Zimmerman. Larvae of the two New Zealand genera differ from each other in many respects, as shown in the key. They represent separate tribes.

Genus Agathinus Broun

Agathinus Broun, 1880: 471.
Type species Curculio tridens Fabricius.
Body robust, of even width, with very strong musculature; abdominal segments without ampullae. Pronotal shield declivous, lacking a median suture, densely pubescent in posterior third. Head longer than wide, with 3 oblique, parallel ridges postero-laterally for attachment of muscles; posterior margin entire; occipital foramen closed behind; 1 ocellus visible, under convex cornea; endocarinal line absent. Antennae with basal segment elongate, cylindrical; apical segment narrow, tubular, accompanied by a stout, conical process, as in many Cerambycidae (Duffy 1952, fig. 13a). Mandibles bidentate, with a prominent basal shoulder. Labrum evenly rounded, of subequal length and width. Tormae horizontal, attached laterally. Epipharyngeal setae numerous. Maxilla with mala densely setose. Labial bracon curved, rounded apically. Ligula pubescent. Premental sclerite wide, with anterior extension obsolete, posterior margin rounded. Spiracles ovate, bicameral; airtubes caudad. Anus terminal.

Remarks (on cephalic musculature). Head capsules that are retracted into the prothorax to a greater or lesser degree occur in many curculionoid groups. In Agathinus the cuticle is attached midway along the parietalia and at mid-cranium, providing a space between the epicranium and pronotum for the reception of complex musculature. The short parietal muscles, attached to three obliquely parallel ridges, are directed forwards to join the pronotal shield. The dorsal muscles attached to the frontal apex and coronal suture are longer, directed posteriad, and spread fanwise. The ventral muscles are joined to a foraminal ridge. There are no postoccipital condyles. In effect, the head is held in position inextrusibly with only the frontal portion protruding. Other members of Belinae, Oxycoryninae, and Aglycyderinae that I have examined show variations on this type of musculature.

By contrast, in Naupactini (Entiminae) the cervical cuticle is attached at the epicranial margin, continuing dorsally as a fold under the pronotum. Muscles are attached ventrally to a ridge around the occipital foramen and to apodemes known as postoccipital condyles. This allows the head to come forward and downward, so that considerable vertical movement can be achieved while feeding.

Agathinus tridens (Fabricius)

tridens Fabricius, 1787: 122 (Curculio). Fig. 196–207
Maximum dimensions 17.1×5.0 mm; head width 3.0 mm. Cuticle minutely spiculate. Setae fine, hair-like, rather short, numerous. Pronotal shield yellow; pubescence golden. Head pallid, but oral margins and mandibles dark
brown. Labrum with anterior setae obscured by fringe hairs. Epipharyngeal lining bearing multiple submarginal rows of setae, forming a dense fringe; 12–18 mes in front of and between tormae; 2 groups of sensilli present. Tormae flared at apex. Alimentary canal with gastric caeca short, slender, numerous, scattered irregularly on middle portion of posterior ventriculus.

**Material examined.** NEW ZEALAND: AK – Piha, dead wood of *Corokia buddleioides*, 10 Nov 1965, 2 larvae*, BMM. TO – Purcora, in *Coprosma* sp., 19 Jun 1963, 5 larvae, JSD. NN – Mt Arthur, 1100 m, dead wood of *Dracophyllum traversii*, 23 Nov 1969, 5 larvae, BMM.

**Biology.** Although *Agathinus* adults are usually found in association with Podocarpaceae, they utilise sound, dead wood of many kinds for oviposition and larval development. Pupation occurs in situ. *Cyrotyphus* Pascoe of Australia is closely allied to *Agathinus*, and the larvae have likewise been reared from dead wood (May, in press).

**Genus Pachyurinus Kuschel**


Type species *Pachyura stictica* Broun.

Body somewhat depressed, straight, cerambycid-like, widest at thorax; abdomen distinctly segmented, with dorsal ampullae on Abd I–VI. Pronotum slightly declivous, bearing scattered setae and a posterior fringe but no pubescence; median suture present.

Head of subequal width and length; a strong mid-dorsal muscle spreading fanwise from apex of frons; posterior margin of epicranium deeply excavate; occipital foramen open behind; 2 ocelli present, the anterior unit beside antenna, under convex cornea, the posterior one smaller; endocarinal line bifurcate. Antennae as in *Agathinus*. Mandibles tridentate apically. Labrum transverse, subtruncate. Tormae short, divergent. Epipharyngeal lining with a row of marginal and submarginal setae, 2 mes, and 2 clusters of sensilli. Maxillary galea with a curved row of setae. Ligula not pubescent. Premental sclerite wide, with short median extensions. Spiracles ovate, with airtubes lateral, elongate, curved ventrad, distinctly annulate; vestigial spiracle distinct on metathorax. Anus terminal.

**Remarks.** *Pachyurinus* larvae scarcely differ from those of *Pachyurella* of Australia, despite the frontal horn of the latter. *Brachybelus* is more divergent, but both genera have the open occipital foramen of *Pachyurinus*.

**Pachyurinus rubicundus** (Broun)

*rubicunda* Broun, 1880: 469 (*Pachyura*).

Fig. 208–218

Maximum dimensions 9.8×2.0 mm; head width 1.3 mm. Cuticle smooth. Setae fine, short, pallid, more scanty than in *Agathinus*. Prothorax with pronotal shield bright yellow-brown; prothorax densely clothed with short, golden setae. Head red-brown on anterior third; hind portion pallid. Antennae bearing a stout, conical, supplementary process as long as apical segment, a narrow cone of similar length, and 2 much shorter sensillae. Epipharyngeal lining invested with 9 or 10 submarginal setae and, between tormae, a median unpaired mes and an mes pair with clusters of 3 or 4 sensilli above and below it. Spiracles with airtubes having up to 21 annuli. Alimentary canal with gastric caeca in a cluster of 3–5 on either side, midway along posterior ventriculus.

**Material examined.** NEW ZEALAND: AK – Huia, under dead bark of *Toronia toru*, 21 Oct 1975, 10 larvae*, BMM.

**Biology.** *P. rubicundus* larvae were discovered on *Toronia toru* (Proteaceae) under the bark of a dead branch, of which they were evidently the primary invaders. The branch was fairly thick, about 100 mm diameter with bark 5 mm. The larvae were abundant, but each maintained an individual blotch-shaped feeding area wherein the frass was tightly packed. Submature larvae, pupae, and emergent adults were present together in October, but no young larvae were seen. Pupation took place in situ in a shallow depression surrounded by fibres scraped from the cambium layer. Part of the branch was placed in a rearing tin; many adults emerged, leaving the bark peppered with exit holes.

Larvae of the small cossonine weevil *Proconus asperirostris* Broun were found feeding amongst the frass. Adults were also present, and eggs had been deposited randomly between the bark and frass layer.

**Pachyurinus sticticus** (Broun)

*stictica* Broun, 1893: 1379 (*Pachyura*).

Fig. 219

Maximum dimensions 10.0×3.1 mm; head width 1.5 mm.

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Differing from *P. rubicundus* in having prosternal setae more scanty; epipharyngeal lining with 12–16 submarginal setae, and anterior *mes* paired and set close together; and spiracles with airtubes longer, more strongly curved, having up to 25 annuli. Alimentary canal with gastric caeca numbering up to 16 in each cluster.

**Material examined.** NEW ZEALAND: MB – Upper Waírau Vly, in dead branch of *Nothofagus cliffortioides*, 7 Sep 1966, 25 larvae, JCW.

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**Subfamily OXYCORYNINAE**

In addition to the synapomorphic characters given for Belidae, the following features are shared by the three genera examined, all of which feed in live tissue of primitive plants (larvae of *Oxycorynus* Chevrolat from South America and *Metrioxena* Pascoe from palm fruits in the East Indies were not available for study):

1. head longer than wide;
2. head pigmented on anterior portion only (Fig. 221);
3. endocarinal line widely bifurcate (Fig. 221);
4. epicranium deeply emarginate;
5. occipital foramen open behind (Fig. 222);
6. antennae 1−segmented;
7. postlabial bracon absent;
8. spiracles unicameral, with simple airtube (Fig. 229);
9. body recurved terminally, with anus ventral.

Crowson (1955) posited that Oxycoryninae, unless given family status, about which he had reservations, would fit in somewhere amongst Belidae, Attelabidae, and Proterhinidae (=Aglycyderinae) on adult characters. Larval characters show greater divergence from Attelabidae than from the other groups, especially in the head capsule and spiracles, although the permanently retracted head, a tendency to forking in the endocarina, and the three−segmented maxillary palps maintain a close affinity.

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**Genus Hydnorobius Kuschel**

Type species *Oxycorynus hydnorae* Pascoe.

Body sturdy, tapering abruptly, widest at mid−abdomen; ambulatory ampullae present dorsally on Abd I–V. Pronotal shield declivous, lacking a median suture. Head with dorsal excavation occupying approximately one−third of distance from hind margin to front; 1 ocellus visible beside antenna; endocarinal line with distance between apices as wide as clypeus. Antennae with basal cushion deeply convex, as long as wide and twice as long as antennal cone, bearing 3 slender sensoria. Mandibles tridentate. Labrum transverse, pigmented in proximal two−thirds. Tormae mesal, short, slender, convergent. Epipharyngeal setae scanty. Maxilla bearing a distinct, sclerotised palpiger; palps 3−segmented; mala bilobate. Premental sclerite wide, poorly defined. Postlabium sclerotised. Thoracic pedal areas bearing numerous setae surrounding a few sensilli. Alimentary canal not examined.

**Hydnorobius sp. indet.**

Fig. 220–230  
Maximum dimensions 6.0×2.0 mm; head width 1.0 mm. Cuticle minutely spiculate. Setae pallid, inconspicuous, longer and more numerous on Th I than elsewhere. Pronotum dark red−brown. Head dark red−brown in front, pallid beneath pronotal fold. Labrum with 5 setae. Epipharyngeal lining with 3 aIs, 1 ams + a sensillum, and below tormae 1 unpaired mes, 1 paired mes, and 1 paired cluster of 3 sensilli. Hypopharyngeal bracon pigmented.

**Material examined.** ARGENTINA: La Rioje, in *Prosopanche*, 1987, 4 larvae (associated with adult), ALT.

**Remarks.** *Prosopanche* (Hydnoraceae) is parasitic on plant roots.

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**Genus Parallocorynus Voss**

*Parallocorynus* Voss, 1943: 59.  
Type species *Allocorynus bicolor* Voss.

Body very stout, with a dense white fat body, widest at mid−abdomen; dorsal ampullae absent. Pronotal shield declivous, with a median suture. Head with dorsal excavation occupying approximately one−third of distance from hind margin to front; pigmented anterior portion terminating behind in a curved ridge at cuticle attachment; 2 ocelli present, the posterior one faint; endocarinal line with distance between apices as wide as clypeus. Antennae not visible (in these specimens). Mandibles tridentate. Labrum transverse, truncate. Tormae short, lateral. Epipharyngeal lining with a mesal, pear−shaped sclerite; setae as long as labral setae. Maxillary palps 3−segmented, without a palpiger; mala simple, narrow. Premental sclerite broad, V−shaped posteriorty. Postlabial sclerotised. Thoracic pedal areas scantily setose; sensilli absent. Alimentary canal with numerous short caeca scattered over lower coil of posterior ventriculus.
Parallocorynus sp. indet.

Fig. 231–240
Maximum dimensions 5.0×2.0 mm; head width 0.7 mm. Cuticle minutely spiculate on dorsum, otherwise smooth. Setae very short, pallid, fewer than on Hydnorobius. Pronotum pale red-brown. Head red-brown on anterior half, otherwise pallid. Epipharyngeal lining with 3 als, 2 ams, 2 long mes, and a cluster of 4 sensilli.

Material examined. MEXICO: 16 miles W of Linares, 800 m, in male cone of Dioon (Cycadaceae), 11 Sep 1958, 2 larvae (associated with adult), CO'B.

Genus Rhopalotria Chevrolat

Rhopalotria Chevrolat, 1878: 130. Type species Rhopalotria dimidiata Chevrolat.

Body robust, sharply curved; dorsal ampullae absent; anus ventral. Head retracted, longer than wide, with occipital foramen open behind; epicranium deeply emarginate; 1 ocellus present; endocarinal line bifurcate, with distance between apices wider than clypeus. Antennae small, conical, on a convex basal cushion. Mandibles bifid, with a small subapical projection; 1 seta present. Labrum transverse, subtruncate. Tormae lateral and short, or absent. Epipharyngeal lining with a mesal, pear-shaped sclerite; setae reduced in number. Maxilla with palps 2-segmented; mala narrow, parallel-sided, with apex rounded. Premental sclerite indistinct. Postlabium lightly sclerotised. Spiracles unicameral, minute; airtube simple, caudal on Abd segments. Abd VIII spiracle lateral.

Remarks. The genus Rhopalotria (=Allocorynus), endemic to Mexico and Cuba, is associated with the cycad genus Zamia. The weevils were transported along with their host plants to Florida (Fairchild Tropical Gardens), where one species has been shown (Norstog & Fawcett 1989) to play an important role in pollination. Of the three known Rhopalotria species, R. dimidiata is treated by Muniz & Barrera (1969) and R. slossoni (Schaeffer) is included in Emden’s key (1938, p. 9).

Rhopalotria mollis Sharp

mollis Sharp, 1889: 3. Fig. 241–250
Maximum dimensions 3.5×1.3 mm; head width 0.5 mm. Cuticle minutely asperate. Setae inconspicuous. Pronotum pallid. Head pale red-brown in front, pallid under pronotal fold. Labrum with 4 lrms; epipharyngeal lining with 3 als, 1 ams, and 1 mes, all of similar size to lrms; maxilla with 2 stps, 5 dms, and 3 vms. Setae of mouthparts otherwise in modal numbers.

Material examined. U.S.A. Florida, Fairchild Tropical Gardens, ex male cones of Zamia furfuracea, 8 Aug 1987, 6 larvae (associated with adults), WT.

Biology (after Norstog & Fawcett 1989). R. mollis and probably the other Rhopalotria species are considered to be host-specific to cycads in genus Zamia. The adults congregate on the male cones, where mating, feeding, and oviposition occur. Pollination is effected when the pollen-dusted weevils are attracted to the female cones, which grow on separate plants. Eggs are laid into holes chewed in the outer ends of the sporophylls, and the larvae feed on the parenchymatous tissue inside. They do not damage the sporangia, which are ranged on the outer surface, closely appressed within the cone. Although several larvae may hatch and start feeding in the same sporophyll, only one individual survives to pupate in a cell constructed at the axial end. When hardened, the adult emerges through a hole bored in the outer wall of the sporophyll. The cycle from egg to adult is short, probably taking only 7–9 days, and thus allowing time for up to six generations in a season. Late larvae have a thicker, more opaque cuticle, and as prepupae build a thick-walled cell where they overwinter, to pupate and emerge in April or May the following year.

Subfamily AGLYCYDERINAE

Body slender; dorsal ampullae weakly developed on Abd II–VI. Pronotum declivous. Head longer than wide, with occipital foramen closed; 1 ocellus present; endocarinal line indistinctly bifurcate. Antennae retracted, 1-segmented, cylindrical; apical cone narrow. Mandibles bifid, with one tooth or both bearing a lamellate projection. Labrum transverse. Tormae lateral, extended from labral sclerite. Maxillary palps 2-segmented, without a palpiger; mala entire. Labial palps 2-segmented. Postlabium unpigmented. Spiracles all of similar size, circular, unicameral; airtube oval, simple. Anus 3-lobed, terminal.

Remarks. This subfamily comprises three genera, of which Proterhinus Sharp is by far the most prolific, with over 150 known species, mostly in Hawaii. Aglycyderes Westwood occurs in the Canary Islands and Morocco. The third genus, Aralia Kuschel, is represented in New Zealand and New Caledonia. Differences between the genera
appear to be minimal. The diagnosis is based on larvae of *P. anthracicus* Perkins, figured in Böving & Craighead (1931), and the Hawaiian species treated by Anderson (1941), as well as on the endemic species *Aralius wollastoni* (Sharp).

The larval habitats of Aglycyderinae are remarkably diverse, varying from living tissue of leaf mines to the degraded or dead tissue of fern stems, pith of dead twigs, and the bark of dead or dying branchlets.

**Genus Aralius Kuschel**


Type species *Platycephala olivieri* Montrouzier.

*Aralius wollastoni* (Sharp)

wollastoni Sharp, 1876a: 28 (*Platycephala*).

Fig. 251–261

Maximum dimensions 3.0×0.75 mm; head width 0.5 mm. Cuticle smooth to minutely asperate. Setae pallid, slender, moderately short. Pronotum and exposed portion of head pale red-brown. Pronotum clothed with evenly scattered setae; cephalic setae greatly reduced in number. Epipharyngeal lining with 3 als, 2 ans, and 1 mes; sensilli not visible. Maxillary palps with distal segment twice as long as proximal segment; mala rounded, bearing 11 lamellate setae. Pedal lobe with about 10 setae; sensilli absent. Alimentary canal with gastric caeca minute, globular, numbering about 6 on either side of lower coil; Malpighian tubules 4 in number, arising from a thickened ring; cryptonephridium weakly developed; rectal bracon not visible.

**Material examined.** NEW ZEALAND: CL – Cuvier I., in dead bark of *Pseudopanax lessonii*, 22 Jan 1972, 14 larvae*, BMM. NN – Whangamoa, 230 m, in dead *Pseudopanax*, 29 Nov 1963, 8 larvae, JIT.

**Biology.** The larvae were working in recently dead branchlets of the coastal araliad *Pseudopanax lessonii*, where the thin bark layer had not yet become dry. Pupation took place *in situ*. Larvae of *Eiratus parvulus* Pascoe (Cossoninae) and *Pactola variabilis* Pascoe (Eugnomini) were working in the same branchlet.

**Family ATTELABIDAE**

Body with 2 dorsal folds, often with ampullae. Setae in excess of modal numbers for Curculionidae. Head retracted, with a striated, hyaline posterior extension (apodeme); postoccipital condyles absent; frontal sutures complete in front; endocarinal line divided or not; primary ocellus present, and usually 2 secondary units, with 3 vestigial eyespots. Antennae 2-segmented, enclosed within anterior angles of frons. Mandibles apically bifid, with supplementary teeth and with 2 setae aligned longitudinally. Labrum bearing 4 pairs of setae and paired basal sensilli. Tormae subparallel, elongate, extended proximally beyond epistoma. Epipharyngeal lining with 3 als; ans and mes variable. Hypopharyngeal bracon thin or obsolete. Maxilla with 2- or 3-segmented palps; mala usually bearing a small lacinial tooth. Labial palps 2-segmented. Spiracles circular, bicaudal or without air tubes. Thoracic spiracle intersegmental. Legs absent. Anus 4-lobed, with a large dorsal lobe and 3 smaller ventral lobes.

**Biology.** Members of the Attelabidae are predominantly leafrollers. The type of roll is to a large extent diagnostic; for instance, *Attelabus* and *Apoderus* species make box-shaped or thimble-shaped rolls fashioned from the folded distal part of the leaf, which is separated from the base by a transverse incision and left to hang by a narrow strip. *Bytiscus* species make cigar-shaped rolls without cutting the leaf, whereas *Deporus* species make funnel-shaped leaf rolls characterised by two curved lines of incision and the unfolded condition of the rolled distal portion of the leaf (Prell 1924, Emden 1938, Scherf 1964). Typically one or two eggs are placed in the leaf roll, which soon falls to the ground. The larvae feed inside, and either pupate in the soil or overwinter in the roll to emerge next spring. Usually only one generation a year is produced, but *A. bipustulatus* Fabricius in North America is reported to be bivoltine (Blatchley & Leng 1916). The larval feeding sites of *Rhynchites* species are commonly in young fruit, but some utilise flower buds, shoot buds, stems, and roots. Larvae of *Euagnaptus* Schoenherr are leaf miners (Emden 1938).

**Remarks.** The Attelabidae are well represented in the Northern Hemisphere, especially in Europe through to Asia Minor and in North America. One genus has reached Japan. There are no representatives in New Zealand. I have therefore relied heavily on Emden (1938), where tribes and genera are covered in the keys, and on specimens of the European element loaned from the British Museum (Natural History). I have included *Apoderus* and *Euagnaptus* in the key but have not described them. The phylogenetic position of Attelabidae as now placed between Belidae and Brentidae seems logical in view of the transitional nature of certain larval characters. For example:

(1) The head capsule, although retracted as in Belidae, is restricted by a posterior apodeme and can probably be
exserted to a limited extent. In Brentidae, the head capsule is free.

(2) In Rhynchites the occipital foramen is open behind, as in certain Belidae.

(3) The segments of the maxillary palps vary in number between the tribes of Attelabidae. There are two segments in Attelabinae and three in Rhynchitinae. The number for Belidae is three, and for Brentidae two.

(4) The endocarinal line is divided in some attelabine genera but not in others. In Belidae it is usually forked, but never so in Brentidae.

(5) The antennae in both Attelabidae and Belidae are two-segmented, but the character is not obvious in Attelabidae, where the basal segment is hidden. Brentidae have one-segmented antennae.

Subfamily ATTELABINAE
Genus Attelabus Linnaeus

Attelabus Linnaeus, 1758: 387.

Type species Curculio nitens Scopoli.

`Box-rolling weevils`

Body robust, abruptly curved before middle, tapering; dorsal ampullae absent. Head capsule longer than wide; sides divergent; posterior extension one-third as long as epicranium, undulate, with margin trilobate; endocarinal line obsolete; 3 primary ocelli close together in a line beside antenna, and 3 vestigial eyespots further back, well separated. Labrum trilobate. Tormae thick, slightly bowed. Epipharyngeal lining with als curving away from margin, 1 am s pair, and proximal mes pair longitudinal. Maxillary mala subtruncate, bilobed, with dorsal setae in a curved line; lacinial tooth present; palps 2-segmented, with a small seta on each segment. Labial palps bearing a seta on basal segment. Labium and postlabium (premental and mentum of Emden 1938) fused, sclerotised medially and at sides. Spiracles bicameral, caudal. Anus subterminal.

Attelabus nitens (Scopoli)
nitens Scopoli, 1763: 25 (Curculio).
Fig. 262–275

Maximum dimensions 6.0×1.8 mm; head width 0.85 mm. Cuticle minutely asperate. Setae golden, moderately long on prothorax, short elsewhere. Pronotum pale brown. Head pallid, but frons red-brown, and oral margins and mandibles black. Pedal area with 3 long setae, lacking sensilli. Spiracles 12–14–annulate.

First instar (Fig. 272–274). Differing from mature larva as follows. Head width 0.52 mm. Setae proportionately longer. Postlabium strongly pigmented, bearing "a curious sclerotised process" (Emden 1938) consisting of a horn-like projection basally on each side contiguous with a transverse sclerome on prothoracic sternum terminated at each extremity by a mammiliform, setose tubercle. Egg-bursting spines present above spiracle on Abd V/VI (Emden 1946, Cox 1988).


Remarks. This species has previously been described and figured by Emden (1938) and Fenili (1952).

Subfamily RHYNCHITINAE

Differing from Attelabinae, as represented by Attelabus, in having posterior extension of head capsule evenly rounded, maxillary palps 3-segmented, with a small seta on each of 2 distalmost segments, labium and postlabium separately sclerotised, hypopharyngeal bracoon present but tenuous, and spiracles with airtubes dorsad or slightly oblique.

Genus Byctiscus Thomson

Byctiscus Thomson, 1859: 130.

Type species Curculio betulae Linnaeus.

`Cone-rolling weevils`

Body robust, strongly curved; dorsal ampullae present on Abd I–V. Head capsule longer than wide; sides subparallel; posterior extension reduced to a narrow plate; endocarinal line indistinctly, narrowly forked; ocelli not visible (in specimens to hand). Mandibles with apical tooth chisel-shaped. Labrum trilobate. Tormae very long, slender, subparallel. Epipharyngeal lining with als at margin, 1 am s pair, and proximal mes pair as long as als, longitudinal. Maxillary mala bilobate, with dorsal setae in 2 separate groups; lacinial tooth present. Labium with premental sclerite poorly defined. Postlabium strongly pigmented. Spiracles with airtubes dorsad. Anus subterminal.

Byctiscus betulae (Linnaeus)
betulae Linnaeus, 1758: 381 (Curculio).

Fig. 276–285

Maximum dimensions 6.0×2.0 mm; head width 0.85 mm.
Cuticle coarsely spiculate on dorsum, smooth below. Setae fine, pallid, moderately long. Pronotum pale brown. Head pallid, but frons red-brown, sharply defined, expanded anteriorly. Pedal area with 8 long and 3 short setae; 3 or 4 sensilli within a small, defined circle. Abd I–VII with 7 long pd and 7 shorter setae anterior to them. Spiracles 11- or 12-annulate.

First instar. Head width 0.5 mm. Setae fewer than in mature larva; anterior row of pd absent. Egg-bursting spines absent.

Material examined. DENMARK: Frerslev Hegn, ex Corylus, Jul–Aug 1939, 24 larvae including 2 1st instar, JPK (BM 1939-607).

Byctiscus populi (Linnaeus)

populi Linnaeus, 1758: 381 (Curculio).

Fig. 286

Maximum dimensions 4.3×1.5 mm; head width 0.7 mm. Scarcely differing from B. betulae except in its smaller size.


Deporaus betulae (Linnaeus)

betulae Linnaeus, 1758: 387 (Attelabus).

Fig. 287–298

Maximum dimensions 4.5×1.5 mm; head width 0.6 mm. Cuticle coarsely spiculate. Setae pale red-brown, short. Pronotal shield pale brown, slightly declivous. Head pallid, but frons red-brown, darker on epistoma, suffuse behind, expanded anteriorly. Pedal area with 5 long and 6 short setae; sensilli absent. Spiracles with 9 or 10 annuli.

First instar (Fig. 298). Head width 0.3 mm. Egg-bursting spines present above spiracles on Abd I–V (Emden 1946, Cox 1988). Spiracles with airtubes external. Prothoracic sternum simple.

Material examined. GERMANY: Dresden, Hosterwitz, ex Carpinus and Fagus, Jun 1935, 6 larvae including 2 1st instar, FIE (BM 1937-405).

Remarks (on aquatic modification). After the leaf rolls have fallen, humidity or wetness is essential for Deporaus larvae to prevent the leaf roll from desiccating (Scherf 1964). This requirement may have initiated the modification shown by the spiracles. In D. betulae the adaptation is slight: the airtubes are of normal form but are external, lying outside the body cuticle. However, in D. nidificus the pair of airtubes form a spine upstanding well beyond the peritreme (Sawada & Lee 1986). A similar but more extended progression can be observed in Steriphus Erichson (=Desiantha Pascoe) (Rhytirhinini), ranging from the external but rounded airtubes of S. variabilis (Broun) through the lateral, spinous airtubes of S. diversipes lineata (Pascoe), which are comparable with those of D. nidificus, to the dorsally arranged, spinous airtubes of the totally aquatic S. asciata (Pascoe) (May 1977). A detailed account of the leaf-rolling activities of Deporaus betulae is given by Buck (1952).

Genus Rhynchites Schneider

Rhynchites Schneider, 1791: 82.

Type species Platyrynchus nebulosus Thunberg.

Body stout, strongly curved, tapering; dorsal ampullae present on prodorsal fold of Abd I–V. Head capsule longer than wide; sides subparallel; posterior extension narrower than epicranium, tapering; endocarinal line distinct, widely bifurcate in front; 3 primary ocelli close together beside antenna, and 3 vestigial eyespots further back, well separated. Antennae with basal segment having a sclerotised collar and bearing 2 slender sensoria, one of which overtops apical cone. Labrum trilobate. Tormae elongate, bowed mesad below sensilli. Epipharyngeal lining with als curving away from margin, 1 am pair, and 2 mes pairs close together. Maxillary mala bilobate, with dorsal setae in 2 separate groups; labial tooth present. Labium with premental sclerite weakly defined. Postlabium unpigmented. Prothoracic sternum sclerotised. Spiracles with airtubes prominent, external, rounded at apex, dorsad.

Genus Deporaus Leach

Deporaus Leach, 1819: 201.

Type species Attelabus betulae Linnaeus.

‘Funnel-winding weevils’

Body slightly curved, scarcely tapering; weakly developed ampullae present on prodorsal fold of Abd I–V. Head capsule longer than wide; sides subparallel; posterior extension narrower than epicranium, tapering; endocarinal line distinct, widely bifurcate in front; 3 primary ocelli close together beside antenna, and 3 vestigial eyespots further back, well separated. Antennae with basal segment having a sclerotised collar and bearing 2 slender sensoria, one of which overtops apical cone. Labrum trilobate. Tormae elongate, bowed mesad below sensilli. Epipharyngeal lining with als curving away from margin, 1 am pair, and 2 mes pairs close together. Maxillary mala bilobate, with dorsal setae in 2 separate groups; labial tooth present. Labium with premental sclerite weakly defined. Postlabium unpigmented. Prothoracic sternum sclerotised. Spiracles with airtubes prominent, external, rounded at apex, dorsad.
Premental sclerite broad, arrow-shaped. Postlabium with a pigmented sclerite. Thoracic spiracle with air tubes cephalad; Abd spiracles smaller than thoracic ones, with air tubes dorsad. Anus terminal.

**Rhynchites auratus** (Scopoli)

*auratus* Scopoli, 1763: 26 (Curculio).

Fig. 299–308

Maximum dimensions 14.0×4.0 mm; head width 1.3 mm. Cuticle coarsely spiculate on dorsum, more or less smooth below. Setae pallid, rather short. Pronotum pale brown, slightly rugose, coarsely spiculate behind, declivous. Head pallid, but frons red-brown, sharply defined, foveate anteriorly; oral margins black; genae quadrate, prominent. Pedal area with 4 long and 2 shorter setae; 5 or 6 sensilli in a small, defined semicircle. Abd I–VII with 6–8 long *pds* preceded by 6–8 shorter setae.

**Material examined.** IRAQ: Sulaimania, Penjwin, in kernels of yellow plums, 25 Jun 1928, 9 larvae, HS.

GERMANY: Meissen, ex fruit of *Prunus spinosa*, 3 Aug 1936, 2 larvae, HW (BMNH).

**Remarks.** The general habitus of *R. auratus* closely resembles that of *Curculio* Linnaeus, which occupies a similar niche in the enclosed space of fruit kernels. These genera are readily separated by the free, completely pigmented head of *Curculio* as well as by the absence there of the less obvious, but very significant, primitive features of *Rhynchites*. First-instar specimens of *R. auratus* were not available to me, but egg-bursting spines are recorded on Abd II–VIII of *R. aequatus* (Linnaeus) and on Abd IV–VII of *R. germanicus* Herbst (Cox 1988).

**Subfamily BRENTINAE**

Body elongate, cylindrical, with 2–4 dorsal abdominal folds, usually expanded at metathorax and Abd IX, truncate posteriorly; 2-segmented legs present except in Calodromini. Head free, subglobose. Antennae 1-segmented. Mandibles apically bifid, with sharp incisor edge. Tormae short, strong, convergent. Epipharyngeal setae variable in number. Hypopharyngeal bracon clear or pigmented. Tentorial bridge sometimes subdivided laterally. Maxillary palps 2-segmented, with a small seta on proximal segment only. Labial palps well separated, 1- or 2-segmented. Premental sclerite with median extensions weak or absent. Pronotum strongly transverse. Mesothorax dorsolaterally with a triangular area which is rugose and often pigmented (absent in Calodromini). Spiracles variable in shape, with or without air tubes.

**Remarks.** Relative to the number of adults described in Brentiniae (over 100 genera), only a few of the larvae have been identified. Previous work has mostly been confined to Dehra Dun, India, where Gardner (1935) provided diagnoses and keys to Indian brentines in thirteen genera. Sanborne (1981) described the first-instar larva of *Arrhenodes minutus* (Drury) from Ontario. These studies have been taken into account in the above assemblage of characters. The subfamily, which is mainly of tropical and subtropical distribution, is represented in New Zealand by only one species, *Lasiorhynchus barbicornis* Fabricius.

Brentiniae have proliferated in the warmer forested regions of the world, where they are primary wood-borers in dead and dying trees before the timber has started to decompose, and often when it is very hard. As far as is known all species live on fungi, and most are xylomycetophagous, with habits resembling those of the ambrosia beetles (Milligan 1970). Some species in the tribe Calodromini have become myrmecophilous, either as ant-guests or ant-robbers, while others utilise the galleries of Scolytinae and Platypodinae, which may be killed or ejected in the process (Beeson 1925). The larvae of Calodromini are peculiar among Brentiniae in lacking any trace of segmented legs (Gardner 1935).
Genus Lasiorhynchus Lacordaire

Lasiorhynchus Lacordaire, 1866: 469.
Type species Brenthus barbicornis Fabricius.

Body and head of typical shape. Thoracic legs 2-segmented. Head with ecdysial line and sutures distinct; frontal suture narrow, angled at des3 and fs3, its apex almost straight across; tentorial bridge divided laterally. Antennae very small, lateral. Clypeus transverse. Labrum two-thirds as wide as clypeus, evenly rounded, densely fringed. Mentum depressed, more or less free laterally. Labial palps 2-segmented, not reaching level of maxillary palpifer. Maxillary mala narrow, conical, with setae in a curved row, the basal ones rather long; stipes slender, elongate. Thoracic spiracles intersegmental, ovate-fringed, with 2 minute airtubes ventrocaudally on margin of peritreme; vestigial spiracle distinct on Th III. Abdominal spiracles one-quarter as large as that of thorax, subcircular, with 2 minute airtubes on posterior margin. Abd VIII spiracle positioned subdorsally. Abd IX with dorsum expanded and curved downwards, truncate. Anus 3-lobed; cleavage U-shaped, with a short ventral slit. Alimentary canal with proventriculus globose; gastric cardycomes absent; anterior ventriculus relatively short; posterior section narrow, proceeding in 2 or 3 loose coils; gastric caeca absent; Malpighian tubules 4 in number; cryptonephridium symmetrical; rectal bracon not visible.

Lasiorhynchus barbicornis (Fabricius)

barbicornis Fabricius, 1792: 491 (Brenthus).
‘Giraffe weevil’

Fig. 309–322

Maximum dimensions 25.0×5.0 mm; head width 3.1 mm. Cuticle shagreened or smooth; Th II with prodorsal cupola, and with a pigmented, rugose tubercle dorso-laterally; Th III with a similar but smaller tubercle. Setae short, slender, pallid, longer on head and Abd IX, differing in modal numbers from Curculionidae as follows. Maxilla 18 dms, 3 vms; epipharyngeal lining 2 als; pronotum 6 setae; Th II/III 2+2 prs, 2 dls, 3 ss, pedal area 5, 4, 6 respectively on corax and leg segments; Abd I 2+2 prs; Abd II–VII 2 prs; Abd VIII 1 long prs; Abd IX 6 ds, 2+2 ps. Pronotal shield red-brown in front and at sides, pallid behind. Head red-brown; sides paler and with a pallid stripe; oral margins and mandibles black; endoecarinal line absent. Labrum with 3 setae and a basal sensillus. Epipharyngeal lining with 2 als close together, 6 evenly spaced submarginal setae (interpreted as 2 ams pairs and an anterior mes pair), 1 mes pair and sensilli clusters between toromae, and 1 short, contiguous mes pair amongst coarse pubescence at base of tormae. Hypopharyngeal bracon pigmented. Premental sclerite a narrow, arcuate band.

First instar (Fig. 321). Maximum dimensions 4.1×1.0 mm; head width 3.75 mm. Antennae more cylindrical than in mature larva. Egg-bursting spines present on Abd I–V above spiracle and well separated from it.

Material examined. NEW ZEALAND: AK–Waitakere Range, in recently dead wood of Olearia rani, 5 Jul 1966, 5 larvae, BMM; Te Henga (Bethells), in sound stump of Corynocarpus laevis (karaka), 14 Nov 1967, 15 larvae, emergent adults, BMM; Matuku Reserve, in dead, standing Corynocarpus laevis, 13 Jan 1985, 23 larvae, pupae, RCC, GK*. NN – Aorere Vly, Kaituna, in Hedycarya stump, 6 May 1965, 4 larvae, GK; Pelorus Bridge, in 1-year felled Prumnopitys taxifolia (matai), 25 Jul 1967, 10 larvae including 7× 1st instar, JSD.

Biology. Oviposition sites of L. barbicornis are prepared by the female weevil chewing a cavity in the bark of dying or suppressed trees and in freshly felled logs. The newly hatched larva bores radially into the wood. The diameter of the tunnel is enlarged as the larva grows, except in the short initial section, which remains narrow. ‘Ambrosia’ fungi and yeasts grow in the larval tunnels (Milligan 1970). The gut contents of submature larvae from Te Henga contained fungal material including coelomycete spores (Seimatosporium or Monochaeta; E. McKenzie det.) but no wood fragments. Pupation occurs in a cell along the axis of a tunnel near the exit, which has been enlarged but not extended through the original entry tunnel in the bark. It is left for the emergent adults, when hardened, to chew through the final section. Some of them perish at this time with the rostrum protruding (observed at Te Henga in 1967), having apparently failed to make sufficient space to clear their rather wide shoulders.

Remarks. L. barbicornis is close to Prophthalimus heikertingeri Klein from Bengal (Bangla Desh), according to Gardner’s (1935) description of the larva. In the male pupa the antennae (Fig. 322) are held erect beside the head as in Cylas formicarius (Fabricius) (Fig. 323). The shorter antennae of the female are curved dorsad behind the pronotal tubercles.

Subfamily CYLADINAE
Genus Cylas Latreille

Cylas Latreille, 1802: 196.
Type species Brentus brunneus Fabricius.

Body weakly curved; dorsal abdominal folds indistinct.
Head small in relation to body; 2 ocelli of similar size present. Labrum bearing 3 setae and a basal sensillus. Epipharyngeal lining with 2 proximal pairs of mes arranged in a line across, and 3 als on anterior margin. Labial palpi 2 segmented. Premental sclerite broadly V-shaped. Postlabium with an additional median pair of pds. Spiracle present on Abd VIII; all spiracles circular, bicameral with annulated air tubes, ventrocaudal. Pedal lobes with 2 concentric seta-bearing sclerites. Anus terminal, 4-lobed.

**Remarks.** *Cylas* has been placed variously in Brentidae (Fabricius 1798), Eurhynchinae (Crowson 1955), and Apioninae (Edmen 1938). Both subfamilies are included in Brentidae in Kuschel’s new scheme, but *Cylas* and its allies (three genera) are now placed in a separate subfamily. The following characters show the *Cylas* larva, represented by *C. formicarius*, as relating rather more closely to the true brentines than to the apionines. The abdomen has more than two dorsal folds (except on Abd I), eight pairs of spiracles are present, and the anus is four-lobed. The pedal lobes show two concentric sclerites, a disc within a ring, corresponding to the two-segmented legs of Brentinae, and the frons has a full complement of five setae. In addition, the pupal antennae (Fig. 323) are held erect beside the head as in *Lasiorhynchus* (Fig. 322), whereas in Apioninae they are curved dorsad.

**Cylas formicarius** (Fabricius)

*formicarius* Fabricius, 1798: 174 (*Brentus*).

‘Sweet potato weevil’

Fig. 323–333

Maximum dimensions 8.1×1.5 mm; head width 0.9 mm. Body elongate, slender; Abd I with 2 dorsal folds; Abd II–VI with paired ampullae in front of the row of pds. Cuticle coarsely spiculate. Setae short, fine, pallid, differing in modal numbers from Curculionidae as follows. Maxilla 14 dms, 5 vms; postlabium 4 plds; pedal lobe 3+5 setae; pronotum 13 setae; Th II/III 3 ss; Abd VIII 6 pds; Abd IX 3 ds. Pronotal shield weakly pigmented. Head pale brown; oral margins dark; endocarinal line half as long as frons. Labrum rounded, with lateral seta well developed. Tormae short, strong, fringed on outer margin.

**Material examined.** NIUE: Paliati, ex kumara, 29 Sep 1964, 15 larvae, 5 pupae, ACE. NEW ZEALAND: Auckland, ex kumara shipment, 8 Dec 1971, 2 larvae, 3 pupae, Port Quarantine Authority.

**Biology.** *C. formicarius*, thought to have originated in Indonesia, has become a serious pest of sweet potato (*Ipomoea batatas*) throughout the Pacific and in Australia. It is found on wild species of *Ipomoea* such as *I. brasiliensis* as well as on the cultivated varieties. Although frequently intercepted, *C. formicarius* has not become established in New Zealand. Up to 250 eggs per female are inserted separately into the tubers, where they hatch within a week. Larvae tunnel into the flesh where, after three moults, they pupate in the roots or lower stems. The life cycle occupies 40–44 days. The tissue turns brown around the larval workings, and general decay follows (Dammerman 1929, Sherman & Tamashiro 1954).

*C. formicarius* is distinguishable from another pest of sweet potato, *Euscepes postfasciatus* (Cryptorhynchini), as follows. Larva: Abd I with 2 dorsal folds (cf. 3); Abd II–VI with conspicuous ambulatory ampullae on anterior fold (cf. no ampullae); labral tormae subparallel, separate (Fig. 00) (cf. convergent, united into a short basal stem); maxillary mala with a dorsal row of 13–15 setae (cf. 7 setae). Pupa: antennae straight, directed anteriorly (cf. elbowed, directed dorsocaudally).

**Subfamily ANTLIARHININAE**


**Remarks.** Members of this group are associated with the reproductive parts of plants in southern Africa, *Tanaos* Schoenherr on *Protea* and *Antliarhis* Billberg on cycads. The acquisition of larvae in *Tanaos* has facilitated a diagnosis of the subfamily, since larvae of *Antliarhis zamiae* (Thunberg) (cf. no ampullae); labral tormae subparallel, separate (Fig. 00) (cf. convergent, united into a short basal stem); maxillary mala with a dorsal row of 13–15 setae (cf. 7 setae). Pupa: antennae straight, directed anteriorly (cf. elbowed, directed dorsocaudally).
suture not angled before apex; des3 in suture; primary ocellus and a faint eyespot present. Antennae very small, lateral, with 4 sensorial papillae at base. Clypeus transverse. Labrum two-thirds as wide as clypeus, trilobate, with 4 setae and a basal sensillus. Maxillary palps 2-segmented; mala with dms in a curved row. Labial palps cylindrical. Premental sclerite complete. Thoracic pedal areas well defined, circular, sclerotised. Spiracles of thorax and abdomen similar in size. Alimentary canal of modal form, lacking cardiac mycetomes; gastric caeca vermiform; 4 Malpighian tubules present; cryptonephridium symmetrical, joined by only 2 Malpighian tubules.

_Tanaos interstitialis_ Fåhraeus

_Interstitialis_ Fåhraeus, 1871: 241.

Fig. 334-344

Maximum dimensions 6.0×2.5 mm; head width 1.3 mm. Cuticle coarsely spiculate. Setae moderately long, slender, tapering, differing in modal numbers from Curculionidae as follows. Head 3/fs; maxilla 10 dms, 4 vms; labrum 4 lrms; pronotum 13 setae; Th II/III 7 pds, 2 dls, 3 ss, 2 vpls; pedal area 5 setae and 5 sensilli; Abd I 9 pds; Abd II–VII 7 pds; Abd VIII 6 pds; Abd IX 2 ds, 1 ps, 1 sts. Pronotal shield pale brown. Head red-brown, darker in front. Ocellus under a convex cornea. Epipharyngeal lining with anterior mes pair submarginal, median mes wider apart between tormae, posterior mes pair slender, curved, between tormal bases, with sensilli clusters above and below. Labial palps as long as basal segment of maxillary palps. Premental sclerite a broad trident with anterior and posterior median extensions acute. Postlabium coarsely asperate at sides. Spiracles 7–9 annulate, caudad. Alimentary canal with gastric caeca arranged in 2 rows of 8 in a tight cluster near ileo-colic valve.

Material examined. SOUTH AFRICA: Pretoria, ex flower heads of _Protea caffra_, 28 Feb 1988, 3 larvae associated with adults, RO.

**Genus Antliarhis** Billberg

_Antliarhis_ Billberg, 1820: 43.

Type species _Curculio zamiae_ Thunberg.

Body of typical shape. Setae reduced in size and number. Head small in relation to body, widest behind middle, truncate posteriorly, sides convergent; endocarinal line faint; frontal suture indistinct; ocelli absent. Antenna fully exposed, minute with 4 sensorial papillae. Labrum as wide as clypeus, truncate in front. Maxillary palps 1-segmented; mala with dms at apex only. Labial palps papilliform. Premental sclerite medially obsolescent. Thoracic pedal areas unsclerotised. Spiracles of similar size; thoracic spiracle on mesothorax.

**Antliarhis zamiae** (Thunberg)

_zamiae_ Thunberg, 1784: 28 (_Curculio_).

Fig. 345–353

Maximum dimensions 8.0×2.5 mm; head width 0.5 mm. Cuticle covered with minute, asperate pimples. Setae minute, mostly reduced to sensilli. Pronotal shield un-sclerotised, invested with skin-points as for other cuticle. Head pale red-brown. Labrum with a minute discal seta. Epipharyngeal lining with 3 als of moderate length, 2 amns, and 1 mes pair below and wider apart than the amns pairs. Tormae short, broad, widest distally. Spiracles 5- or 6-annulate, obliquely dorsad.

Material examined. SOUTH AFRICA: Grahamstown, ex seeds of _Encephalartos altensteinii_, 29 Nov 1983, 2 larvae, 2 exuviae, RO.

**Subfamily APIONINAE**

Body strongly convex, abruptly tapered; abdominal segments with 2 distinct dorsal folds (except in leaf-miners, e.g., _Apion columbinum_ Germar, figured in Scherf 1964); legs absent. Setae reduced in size and number. Head free, subglobose; endocarinal line and either 1 or 2 ocelli present. Antennae 1-segmented. Mandibles apically bifid, with mola undeveloped. Labrum bearing 1–3 setae. Tormae short, subparallel. Premental sclerite broadly V-shaped. Postlabium with posterior pair of plbs as far apart as median pair. Maxillary palps 2-segmented; mala narrow, parallel-sided. Labial palps 1-segmented. Spiracles circular, unicameral or bicameral; thoracic spiracle intersegmental; Abd VIII spiracle vestigial or absent. Anus a terminal, transverse cleft. Alimentary canal with 4 Malpighian tubules.

Remarks. The Apioninae are small to very small weevils comprising numerous species and with a worldwide distribution. Their larvae are more or less sedentary, feeding in live plant tissue: stems and roots (where galls may be formed), seeds, or leaves. The restricted space of their habitat is reflected in their characteristically convex body shape. Those that are leaf-miners are more depressed and elongate. Apioninae are usually host-specific to a particular plant or plant group. _Nanodes_ Schoenherr (=_Nanophyes_
Schoenherr), with the Abd VIII spiracle entire and the anal cleft four-lobed, is linked as closely to Cylas as it is to Apion. The subfamily diagnosis is based on the genus Apion Herbst as treated by Emden (1938), Scherf (1964), Parnell (1964), and Williams (1968) as well as on the New Zealand element represented by Neocyba Kissinger and the introduced gorse seed weevil Exapion ulicis (Forster).

**Genus Exapion Bedel**

Exapion Bedel, 1887: 360.
Type species Atte1abius fuscirostris Fabricius.

Exapion is characterised by having seven abdominal spiracles (Podapion Riley six; Nanodes eight). In other respects Exapion conforms to the subfamily diagnosis.

**Exapion ulicis (Forster)**

ulicis Forster, 1771: 31 (Curculio).
‘Gorse seed weevil’
Fig. 354–363
Maximum dimensions 3.0×1.3 mm; head width 0.5 mm. Body of typical shape. Cuticle sparsely and minutely spiculate. Setae minute, reduced from modal numbers for Curculionidae as follows: head 2fs, 4 des, 1 les, 0 ves, 1 cls; maxilla 5 dms-vms; labrum 1 lrm; epipharyngeal lining 1 mes; pronotum 6 setae; Th II/III 1 prs, 2 pds, 3 ss; pedal area 2 setae; Abd I–VII 0 prs, 2 pds, 1 dpl, 1 vpl, 3 lsts, 1 msts; Abd IX 2 ds, 1 ps, 1 sts. Pronotal shield unpigmented. Head pale yellow, with oral margins and mandibles red-brown; ocelli obsolete; endocarinal line short, indistinct. Antennae narrowly conical, with 2 basal, hair-like sensoria. Labrum bearing 1 discal seta. Labial palps short, papilliform. Thoracic spiracle bicameral, with airtubes 6–8-annulate, caudad; Abd spiracles unicameral, with airtubes 5-annulate, caudad.

Material examined. NEW ZEALAND: AK – Huia, 15 Dec 1968, 20 larvae*, BMM.

**Biology.** Exapionulicis was introduced into New Zealand from Britain in 1927 and released generally during 1931–41, in an attempt to control the spread of gorse (Ulex europaeus). In the early flowering period, September to October, the female oviposits in the green pods, placing a cluster of eggs in each one. Larvae feed on the developing seeds, pupate within the pod, and are ejected as adults when the dry pod bursts open. The weevils have become well established, and may destroy up to 100% of seed from the spring flowering. However, their effectiveness is limited by their failure to attack pods produced at other times of the year (Miller 1971, Hill 1986, Gourlay 1989).

**Genus Neocyba Kissinger**

Type species Apion metrosideros Broun.


**Neocyba metrosideros (Broun)**

metrosideros Broun, 1880: 466 (Apion).
Fig. 364–372
Maximum dimensions 3.0×1.25 mm; head width 0.5 mm. Cuticle shagreened or almost smooth. Setae very fine, short, pallid, reduced from modal numbers for Curculionidae as follows. Head 3 fs; 1 cls; maxilla 9 dms, 4 vms; pronotum 5 setae; Th II/III 2 pds, 1 dis; pedal area 1+1 setae; Abd I–VII 2 pds, 3 ss, 1 dps, 1 vpl, 0 lsts; Abd VIII 3 pds, 1 dpl, 1 vpl, 0 lsts; Abd IX 2 ds, 0 ps. Pronotal shield unpigmented. Head pallid, with oral margins and mandibles red-brown; sutures indistinct; fs4 longer than fs5, fs3 minute, fs1 and fs2 absent; anterior ocellus dark; posterior eyespot faint; endocarinal line two-thirds as long as frons. Epipharyngeal lining with 2 pairs of mes arranged quadrately between tormae. Premental sclerite a thin, V-shaped line. Pedal areas smooth, not sclerotised.

Material examined. NEW ZEALAND: ND – Coopers Beach, ex Metrosideros excelsa, 25 Feb 1966, 30 larvae*, BMM. AK – Wenderholm, 18 larvae*, BMM. CL – Te Hope Beach, 32 larvae, JST.

**Biology.** Larvae of N. metrosideros are found in small subcortical mines in the green cambium layer of pohutukawa trees on 1–5-year-old growth. The workings are short and compact. Pupation occurs in situ. Exit holes were found in the thickened epidermis of second-year growth, suggesting that development must take at least one season. The weevil shows a preference for trees in exposed coastal situations. Possibly as a result, the bark of such trees is noticeably more cracked and rugged than on trees planted inland or growing around the Manukau Harbour (AK), where the weevil does not seem to be present.
Some Neocyba larvae were harbouring solitary hymenopteron larvae, one of which pupated to produce a pteromalid wasp. The larva of a melurid beetle was discovered feeding on a Neocyba larva within its mine.

Neocyba species A

Fig. 373

Dimensions of largest specimen 3.5×1.5 mm; head width 0.75 mm. Cuticle smooth. Setae minute, in numbers as for N. metrosideros except head with fs4 only. Head colour pattern distinctive: frons, parietal areas, oral margins and mandibles bright red-brown, epistoma darker; frontal sutures wide with irregular margins, pallid, as is epicranium. Endocarinal line short. Labrum membranous. Premental sclerite obsolete. Pedal areas sclerotised. Similar in other respects to N. metrosideros.

Material examined. NEW ZEALAND: NN—Mt Arthur, 1000 m, Flora Track, ex galls on live stems of Nothofagus menziesii, 4 Feb 1965, 10 larvae associated with adults, GK.

Neocyba species B

Fig. 374–384

Maximum dimensions 3.0×1.5 mm; head width 0.5 mm. Cuticle spiculate. Setae inconspicuous, but longer than on larvae of sp. A, in numbers as for N. metrosideros except pedal lobe with 3 setae. Head pale red-brown, darker in front; ocellus large; endocarinal line half as long as frons. Labrum rounded, with discal seta long, tapering, anterior seta strong, blunt, and lateral seta well developed. Premental sclerite broadly V-shaped. Postlabium with scattered spicules at base. Pedal areas sclerotised.

Material examined. NEW ZEALAND: TO—Mt Ruapehu, Turoa, in fruits of Libocedrus bidwillii, 14 Apr 1989, 5 larvae, SP & RF.

Biology. The larvae were feeding on developing seeds within the green capsule. One of them pupated in October, inside the capsule (S. Pilkington, pers. comm.).

Family CURCULIONIDAE

The family Curculionidae comprises the bulk of the weevil fauna, the non-orthocerous species whose frontal sutures do not meet the mandibular membrane and whose antennae are not completely enclosed by the frontal plate. Other family characters are as follows.

Typical abdominal segments (Abd II–VI) with 3 or 4 dorsal folds. Legs absent except in Ithycerus (2-segmented) and Gymnetron (expanded pedal lobes). Head with postoccipital condyles usually present and often conspicuous; 1 primary ocellus and 1 secondary (one or both of these may be obsolete; 1+2 ocelli in Ithycerus). Antennae 1-segmented, on a basal membranous cushion. Mandibles with mola undeveloped except in certain lignivorous genera. Labrum with 3 setae (4 in Ithycerus, 5 or 6 in Brachycerus). Mandibles without a sclerotised palpiger; maxillae lacking a lacinia or lacinial spine; palps 2-segmented. Articulatory lobe between stipes and postlabium absent.

Subfamily BRACHYCERINAE

The subfamily Brachycerinae as now envisaged comprises the broad-nosed weevil tribes Ithycerini, Brachycerini, and Entimini (Adelognatha of authors) together with Rhytirhinini, Amycterini, Aterpini, Gonipterini, Hyperini, and some Neocyba larvae were harbouring solitary hymenopteron larvae, one of which pupated to produce a pteromalid wasp. The larva of a melurid beetle was discovered feeding on a Neocyba larva within its mine.

Neocyba species A

Fig. 373

Dimensions of largest specimen 3.5×1.5 mm; head width 0.75 mm. Cuticle smooth. Setae minute, in numbers as for N. metrosideros except head with fs4 only. Head colour pattern distinctive: frons, parietal areas, oral margins and mandibles bright red-brown, epistoma darker; frontal sutures wide with irregular margins, pallid, as is epicranium. Endocarinal line short. Labrum membranous. Premental sclerite obsolete. Pedal areas sclerotised. Similar in other respects to N. metrosideros.

Material examined. NEW ZEALAND: NN—Mt Arthur, 1000 m, Flora Track, ex galls on live stems of Nothofagus menziesii, 4 Feb 1965, 10 larvae associated with adults, GK.

Neocyba species B

Fig. 374–384

Maximum dimensions 3.0×1.5 mm; head width 0.5 mm. Cuticle spiculate. Setae inconspicuous, but longer than on larvae of sp. A, in numbers as for N. metrosideros except pedal lobe with 3 setae. Head pale red-brown, darker in front; ocellus large; endocarinal line half as long as frons. Labrum rounded, with discal seta long, tapering, anterior seta strong, blunt, and lateral seta well developed. Premental sclerite broadly V-shaped. Postlabium with scattered spicules at base. Pedal areas sclerotised.

Material examined. NEW ZEALAND: TO—Mt Ruapehu, Turoa, in fruits of Libocedrus bidwillii, 14 Apr 1989, 5 larvae, SP & RF.

Biology. The larvae were feeding on developing seeds within the green capsule. One of them pupated in October, inside the capsule (S. Pilkington, pers. comm.).

Family CURCULIONIDAE

The family Curculionidae comprises the bulk of the weevil fauna, the non-orthocerous species whose frontal sutures do not meet the mandibular membrane and whose antennae are not completely enclosed by the frontal plate. Other family characters are as follows.
and other family-groups (G. Kuschel, in press). Although these groups show considerable divergence in appearance and lifestyle, they are linked together by a shared mode of oviposition. Eggs are laid randomly, either singly or in clusters, in the soil or cemented to foliage. The site is not prepared in plant tissue by the mandibles. Morphologically Ithycerus phy since it also occurs in Erirhirhini and in plate. However, the feature cannot stand as an autapomorphy since it also occurs in Erirhirhini and in Sitophilus Schoenherr but not in Ithycerini, Gonipterini, and Hyperini. In Brachycerini, Enümini, and Aterpini the antennae are apically rounded or almost plane, and tend to be oval in cross-section.

**Tribe Ithycerini**

The tribe Ithycerini is represented by a single genus, *Ithycerus* Schoenherr, in North America. *I. noveboracensis* (Forster) in its larval form as treated by Sanborne (1981) shows closer affinities with Brentidae and Attelabidae than with Curculionidae. However, I cannot agree with Sanborne's interpretation of the character states around the anterior termination of the frontal sutures, and hence the antennal position in the frons. The two together are crucial in determining (from the larva) whether the systematic position of a taxon should be among the primitive (orthocerous) families or among the more advanced Curculionidae (Emden 1938).

In the mature specimen of *I. noveboracensis* I have examined, with the head capsule in frontal view (Fig. 387), a sclerotised frontocranial bridge can be seen connecting the frons to the epicranium and separating the sutures from the mandibular membrane. Above the bracon the sutures merge with the antennal cushion, so that the antenna is not completely enclosed within the frons. This is a derived character state by comparison with the out-group Chrysomeloidea.

*Ithycerus* has thus been restored to Curculionidae, where it was originally placed (as *Curculio*) by Schoenherr in 1823, but is now in a separate tribe among the broad-nosed Brachycerinae. It is truly transitional, having two-segmented thoracic legs, three ocelli, four labral setae, and four Malpighian tubules, features which occur in Brentidae and other orthocerous families but not otherwise in Curculionidae. Its affinity with Brachycerinae is shown firstly by the habits of oviposition in the soil and of feeding on roots instead of performing these functions arboresally, as in the preceding families; and secondly by the presence in the pupa of mandibular setae (Sanborne 1981, fig. 89), which are thought to be associated with the deciduous cusps present on the teneral mandibles of most broad-nosed weevils (May 1978).

**Genus Ithycerus Schoenherr**

*Ithycerus* Schoenherr, 1829: 55.

Type species *Curculio noveboracensis* Forster.

*Ithycerus noveboracensis* (Forster)

*noveboracensis* Forster, 1771: 35 (*Curculio*). ‘New York weevil’

Fig. 385–394

Maximum dimensions: length 24.8 mm; head width 5.1 mm. Body robust, convex, strongly curved; abdominal segments with 2 or 3 dorsal folds; pedal areas bearing 2-segmented legs. Cuticle coarsely spiculate. Major setae moderately long. Pronotal shield lightly sclerotised. Setae differing from modal numbers as follows: head 3 clas, 4 lrm; epipharyngeal lining 7 als, 1 mes; maxilla 17 or 18 dms, 4 vms; pronotum 9 setae; Th II/III 2 dls, 4 ss, 2 dpls; pedal area 9+6+5 setae respectively on coxa and leg segments; Abd I–VIII 4 pds, 4 ss, 3 dpls; Abd IX 1 pds, 4 ds, 2 dpls, 4 vps; anal lateral lobes 3 setae.

Head yellow, grading to brown at oral margins; 3 ocelli present; endocarinal line half as long as frons; antennal cone as wide as long, with a large papilla and several smaller basal papillae. Mandibles somewhat elongate, weakly bifid, with 3 median incisor projections; molar area undeveloped; 2 setae of equal length, arranged transversely. Clypeus and labrum transverse. Labrum with 4 strong setae. Epipharyngeal lining with als in excess of modal number; mes reduced to 1 (3 in 1st instar). Tormae elongate, subparallel. Maxilla with 2-segmented palp; mala with a curved line of 17 or 18 lamellate setae. Labial palps 2-segmented. Premental sclerite distinct, with a postmedian extension. Spiracles circular, bicameral in 1st instar, becoming progressively more elliptical in later instars and with airtubes smaller relative to orifice. Thoracic spiracle intersegmental. Alimentary canal with proventriculus ridged internally; anterior ventriculus bulky; posterior ventriculus much narrower, 2-coiled, carrying numerous vermiform gastric caeca randomly around lower coil; 4 Malpighian tubules arising from simple bases posterior to caeca; cryptonephridium symmetrical (Sanborne 1981, fig. 48). Anus terminal, 4-lobed.

**Material examined.** CANADA: Ontario, 1978, 1 mature
larva, 10 1st-instar larvae, ex eggs in soil, reared on roots of *Quercus alba*, MS.

**Biology** (after Sanborne 1981). The eggs of *Ithyurus* are laid singly in small depressions in the soil during summer (June, July). Each is covered with faecal matter by the female drawing the tip of her abdomen back and forth across it. The eggs hatch after 3–6 weeks. Larvae feed on tree roots, and in captivity were reared on roots of *Quercus alba* (white oak) and *Q. macrocarpa* (bur oak). Feeding is primarily on the lower surfaces of lateral roots, where the external bark is removed, exposing the inner xylem layer. Larvae travel on their backs in the tunnels thus formed. Ecdysis to new instars takes place in expanded tunnel endings.

Larval development under laboratory conditions passed through a minimum of seven instars, with adults emerging about two years after oviposition. The second winter was spent as seventh-instar larva.

Host plants are restricted for the most part to trees in Betulaceae, Juglandaceae, and Fagaceae, but adults have developed a liking for apple, plum, and peach trees (Rosaceae).

**Tribe Brachycerini**

**Genus Brachycerus Olivier**

*Brachycerus* Olivier, 1790: 181.

Type species *Brachycerus barbarus* Linnaeus.

Body very robust; abdomen with 3 dorsal folds, the prodomal fold more prominent than the postdorsal one and bearing as many setae. Setae tending to proliferate, especially on mouthparts. Head more or less free; postoccipital condyles very narrow; coronal and frontal sutures distinct; endocarinal line vestigial; 2 ocelli present, beneath raised cornaeae. Antennae oval, almost plane, surrounded by a pigmented band. Mandibles bifid, with a prominent median tooth. Labrum evenly rounded. Tormae short, parallel. Spiracles ovate-fringed, lacking airtubes in mature larvae, unicameral in 1st-instar larva.

**Remarks.** *Brachycerus* is included in Emden’s (1952) key to the genera of Adelognatha. The characters used and discussed in his text are based on *B. albidentatus* Gyllenhal from Italy. Brachycerinae larvae are associated with the bulbs and stems of succulent liliaceous plants.

The Australian Amycterinae (May, in press) are close to *Brachycerus* in several respects: the lower malar setae for instance are upswept; *Dialeptopus* Pascoe has increased numbers of setae; and the type of oviposition is similar.

**Brachycerus monachus** Fåhraeus

*monachus* Fåhraeus, 1871: 52.

Fig. 395–405

Maximum dimensions 22.0×6.0 mm; head width 3.25 mm. Cuticle coarsely spicate on dorsum. Setae dark, rather short on older larvae, very long on 1st instar, differing from modal numbers as follows. Maxilla 24–30 dms, 4 vms; labrum 5 or 6 dms; epipharyngeal lining 20 als, 27 mes; pronotum 6 setae; Th II/III 2+2prs, 2 dls, 3 ss, vpsls 2, pedal lobe 7 setae, msts 3–5; Abd I–VI 6–8 prs; Abd VII 4 prs; Abd VIII 2 prs; Abd IX 5 ds, 3+3 ps. Pronotal shield pale red-brown. Head red-brown, with median epicranium pallid; des4 and fs1,2,3 well developed. Clypeus transverse, with lower half pigmented. Labrum completely pigmented. Maxillary and labial palps cone-shaped. Labial palps bearing a small seta. Ligula densely pubescent. Premental sclerite broad, with posterior margin rounded; anterior median extension elongate. Spiracles conspicuous; Abd VIII spiracle lateral. Anus subterminal, 4-lobed.

**Material examined.** SOUTH AFRICA: Transvaal, Nylstroom, in rotting stem of *Aloe davyana*, 15 Nov 1984, 3 larvae; Pretoria, on underground stem of *A. davyana* and in soil, 20 Dec 1984, 4 eggs, 2× 1st-instar larvae, ATH.

**Biology.** In the Transvaal (A.T. Howden, pers. comm.) the large (3.5×2.5 mm) eggs of *B. monachus* were found in December, on an underground stem of *Aloe davyana* and in the soil beside it. The eggs are extremely hard, pearly white to pinkish, and were mostly encased in soil. When damp, the texture becomes leathery. In captivity, two larvae emerged the day after the eggs were moistened, the chorion having become soft enough for the larvae to free themselves using their very impressive mandibles. Large, well grown larvae were cut out of the rotting stem of another plant which had been dislodged by machinery and damaged by fire. Under the leaves on the ground was a mating pair of freshly emerged *B. monachus*. An adult and a larva of *B. fortunatus* Haaf were discovered in a clump of lilies nearby.

**Tribe Entimini**

The tribe Entimini embraces those groups, now subtribes, previously known collectively as Adelognatha or ‘broad-nosed weevils’. It contains most of the species with root-consuming larvae which are of concern to the agricultural and horticultural industries. Entimine larvae are characterised by their transverse antennae, which are much shorter than wide and oval in cross-section. The Abd VIII spiracles are lateral.

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-52-
Subtribe Leptopiina

Head free; endocarinal line absent. Mandibles bifid (unless eroded), with a median projection at base of incisor lobe; scrobe usually conspicuous; setae unequal in length, close together within scrobe. Maxillary mala usually with 8 dorsal and 4 ventrosapral setae. Epipharyngeal lining with posterior and median pairs of mes more or less equally spaced, and with clusters of sensilli in between. Th II/III with 2 dorsolateral setae (“alar setae” of Anderson 1947a). Terminal segments often strongly modified. Alimentary canal of modal form, lacking cardiac mycetomes; gastric caeca vermiform, occasionally absent; cryptonephridium weakly developed, symmetrical; rectal bracon membranous.

Remarks. All the New Zealand endemic broad-nosed weevils and a large proportion of those in Australia belong in this subtribe, which ranges southwards to Campbell Island (latitude 53°S). A few native species are regarded as pests when they occur in pasture on light soils. The remainder either do not occur in cultivated areas or do not inhibit plant growth to any significant extent (May 1977).

Genus Catoptes Schoenherr

Type species Catoptes obliquesignatus Boheman.

Body robust, with coarse musculature, widest behind thorax. Cuticle sclerotised around setal groups and on all lobes of Abd VIII and IX. Head slightly depressed, evenly rounded in outline, emarginate behind; des4 and fs1,2,3 reduced to sensilli. Mandibles wide, smooth, with inner surface concave. Hypopharyngeal bracon maculate. Labrum with a 5-pointed median colour pattern; lateral and anterior setae of similar length. Tormae subparallel or slightly convergent. Maxilla with apical malar seta broad, blunt. Abd I–VIII with major spiracular seta on middle fold, above spiracle; ventral folds each with a transverse row of coarse spinules. Spiracles circular, bicameral. Terminal segments strongly modified (type B of Emden 1952). Anal segment longitudinally compressed, 4-lobed, ventral. Alimentary canal with gastric caeca tapering, flask-shaped.

Catoptes cuspidatus (Broun)

cuspidatus Broun, 1881: 694 (Tigones).
Fig. 406–417

Maximum dimensions 7.0×3.0 mm; head width 1.25 mm. Cuticle without asperities on dorsum or pleural lobes. Setae red-brown; dorsal setae fusiform, finely tapering; ventral setae stronger. Setae differing from modal numbers as follows: maxilla 8 dms, 4 vns; pronotum 8 setae; Th II/III 2 dls, pedal lobe 6+1 setae; Abd VIII 2+2 pd; Abd IX 1+1 ds. The median peak bifid; epistoma and mandibles red-black; fs5 weaker than fs4; sutures indistinct; ocelli faint. Clypeus membranous. Labrum weakly lobed, with posterior extension reaching epistoma. Maxilla with proximal palpal segment twice as long as distal segment. Premental sclerite broken before middle; posterior extension truncate. Postlabium at base 4× wider than labium. Terminal segments modified as follows. Abd VIII with dorsum and pleural lobes expanded; ventropleural lobe sclerotised, showing an internal apodeme for muscle attachment. Abd IX dorsum reduced to a small triangle with apex caudad; sternal area a larger, equilateral triangle with apex cephalad; pleural lobes heavily sclerotised, grossly expanded, with a longitudinal furrow (internal apodeme).

Material examined. NEW ZEALAND: CO, Otago, Millers Flat, 500 m, under tussock and oversown pasture, 31 Oct 1978, 17 larvae, 4 pupae*.

Biology. C. cuspidatus occurred in considerable numbers in the complex of weevil species sampled on improved pasture in the Central Otago hill country in 1978. The pasture consisted of the original tussock grasses Chionochloa rubra and Festuca novae-zelandiae oversown with more palatable introduced grasses. The larvae were associated with larvae of Nicaeana cervina Broun. Both species had previously been recorded from C. rubra (May 1977). At Millers Flat they showed a preference for the introduced grasses, especially on the drier north-facing slopes. The modified terminal segments are an adaptation for root-feeding, the soft anal lobes grasping the root while the sclerotised area is used as a rocking base to balance the movements of the head.

Genus Irenimus Pascoe

Irenimus Pascoe, 1876: 54.
Type species Irenimus parilis Pascoe.

Irenimus compressus (Broun)  

compressus Broun, 1880: 429 (Catoptes).  
‘Compressed weevil’  

Fig. 418-429  

Maximum dimensions 9.0×2.75 mm; head width 1.5 mm. Cuticle finely spiculate. Setae pallid, slender; ventral setae as long as major dorsal setae. Setae differing from modal numbers as follows: maxilla 8 dns, 4 vms; pronotum 9 setae; Th II/III 2 dls, pedal lobe 6+2 setae; Abd VIII 4 pds; Abd IX 3 ds. Pronotal shield pale yellow. Head pallid, with a pale red, medially peaked frontal band; epistoma, genae, and mandibles dark red-brown; fs5 as long as fs4; des2 weak, des4 minute; sutures not visible; ocelli faint. Labrum trilobate, with posterior extension reaching epistoma. Maxilla weakly pigmented. Premental sclerite a complete trident. Spiracles bicameral; airtubes on Th II twice as wide as peritreme, annulate; airtubes on Abd I–VIII shorter, reaching peritreme margin, non-annulate. Terminal segments modified as follows. Abd VIII with pleural lobes slightly expanded. Abd IX with dorsal area trapezoidal, ventral area rectangular; pleural lobe grossly expanded, angled at apex, not extended ventrad; major seta in apical third. Anus 4-lobed, retractile. Alimentary canal bearing 3 gastric caeca on each side; Malpighian tubules rather wide.


Irenimus compressus

M. miricollis (Broun)

miricollis Broun, 1917: 418 (Bryodrassus).

Fig. 430-440  

Maximum dimensions 7.0×2.5 mm; head width 1.5 mm. Differing from Irenimus compressus most obviously in the profile of Abd IX and in other respects as follows. Head pale yellow, with reddish paramedian stripes; lacking a frontal colour band above epistoma; des2 as strong as des1, des4 absent; ocelli absent. Labrum with median area pigmented but not proximal extension. Premental sclerite broken before middle. Thoracic spiracle bicameral, with airtubes 2–4-annulate. Spiracles of Abd I/II unicameral, with airtubes simple. Spiracles of Abd III–VIII lacking airtubes. Terminal segments modified as in Type A of Emden (1952). Abd VIII with dorsopleural lobes 4× larger than those of Abd VII; Abd IX with pleural lobes abruptly angled; caudal face almost plane; a major seta midway between apex and anterior margin; dorsal triangle; ventral area trapezoidal. Anal lateral lobes bearing a strong seta. Alimentary canal with 2 gastric caeca.

Material examined. NEW ZEALAND: AK – Kaipara South Head, in pasture, 17 Sep 1962, 11 larvae*, BMM; Mt Albert, in ryegrass/clover sward, 2 Aug 1963, 64 larvae*, BMM.

Biology. M. miricollis is distributed only in the North Island, north of latitude 37° 30’S. As with many other soil weevils, it thrives in grassland which includes white clover (Trifolium repens). Mating occurs during summer and autumn, but oviposition (in captivity) continued throughout the year, with a peak period in March–April. Eggs are inserted into the hollow stems of clover, pressed tightly in a double row, or deposited in clusters of 15–25. Incubation time varied between 28 days in September and 7 days in March. First-instar larvae move downwards soon after hatching, and older larvae were found at a depth of 250 mm. They appeared to feed exclusively on clover roots. Pupation takes place nearer the surface, adults emerging during summer. Reproduction is sexual.

Genus Mandalotus Erichson  

Mandalotus Erichson, 1842: 193.  

Type species Mandalotus crudus Erichson.  

Mandalotus is an Australian genus of well over 100 species. It is represented in New Zealand by one endemic species, M. miricollis (Broun). Since only this species has been examined, I have made no generic statement.

Subtribe Naupactina  

Body robust, slightly curved, widest at thorax; terminal segments simple. Dorsal setae pds1, 2.4 much shorter than pds3, 5; Abd V–VIII with major spiracular seta on posterior fold. Setal numbers differing from the modal pattern as follows: maxilla 8 dns, 4 vms; pronotum 8 or 9 setae; Th II/III 2 dls, 3 ss, pedal lobe 8 setae; Abd VIII 4 pds; Abd IX 4 ds; Abd X 3 or 4 setae. Pronotal shield pallid. Head
usually colourless, deeply retracted into prothorax, much longer than wide; genae and mandibles dark; postoccipital condyles subtriangular; des3,5, fs4,5, and les2 long, sub-equal; other setae minute; ocelli small; sutures not visible. Mandibles rather wide, concave inwardly, with 2 setae set transversely in scrobe. Hypharyngeal bracon maculate. Labrum with a 5-pointed median colour pattern; lateral setae as long as discal and anterior setae. Tormae short, broad, bifurcate distally. Epipharyngeal lining with median mes1 pair much wider apart than posterior mes1 pair. Premental sclerite broken before middle; posterior extension truncate. Abd V—VIII with major spiracular seta on postdorsal fold. Thoracic spiracles ovate-fringed; Abd spiracles much smaller, subcircular, with airtubes vestigial or lacking. Abd VIII and IX with a sclerotised posterodorsal ridge; terminal segments not otherwise modified. Anus terminal, 4-lobed. Alimentary canal without mycetomes around cardiac valve; gastric caeca in a row of 4—10 on either side of lower coil, and a single pair further cephalad.

Remarks. Originating in Argentina and Uruguay, four naupactine species have found their way to New Zealand. Three of them, Asynonychus cervinus (Boheman), Atrichonotus minimus (Blanchard), and Floresianus sordidus Hustache, probably arrived via Australia, in any convenient crevices on shrubs and vines as well as on the ground. They can survive long periods of desiccation. Newly hatched larvae in aerial situations drop to the soil before feeding. Oviposition peaks in autumn; larvae are most numerous during winter and spring. Prepupal larvae move upwards after July to pupate in a smooth-walled cell during summer. There is only one, extended generation each year. The larvae appear to be unselective in their choice of roots.

Genus Asynonychus Crotch

Asynonychus Crotch, 1867: 388.

Type species Asynonychus godmanni Crotch (= cervinus Boheman).

Asynonychus cervinus (Boheman)

cervinus Boheman, 1840: 17 (Naupactus).

‘Fuller’s rose weevil’

Fig. 441—451

Maximum dimensions 9.0×4.0 mm; head width 1.5 mm. Cuticle smooth except ventrally on Abd I—V. Setae red-brown, evenly tapered; minor dorsal setae fine in all instars. Antennae slightly asymmetrical, with sides strongly rounded. Maxilla with a group of spinules on inner surface below palpus; no spinules below malar setae. Anal lateral lobes with 3 minute setae.

Material examined. NEWZEALAND: AK—Mt Albert, in soil under clover, 8 Nov 1962, 14 larvae*, BMM. NN—Nelson, 22 Aug 1965, 10 larvae, GK.

Biology (after May 1979a). The golden-yellow eggs are deposited in clusters of up to 60, cemented together, in any convenient crevices on shrubs and vines as well as on the ground. They can survive long periods of desiccation. Newly hatched larvae in aerial situations drop to the soil before feeding. Oviposition peaks in autumn; larvae are most numerous during winter and spring. Prepupal larvae move upwards after July to pupate in a smooth-walled cell during summer. There is only one, extended generation each year. The larvae appear to be unselective in their choice of roots.

Genus Atrichonotus Buchanan

Atrichonotus Buchanan 1939: 15.

Type species Naupactus laeniatulus Berg.

Atrichonotus minimus (Blanchard)

minimus Blanchard, 1851: 317 (Naupactus).

‘Little fringed weevil’

Fig. 452—456

Maximum dimensions 7.0×3.0 mm; head width 1.25 mm. Cuticle asperate on prodorsal fold of Abd I and on sternal folds of thorax and Abd I—VII. Setae pallid, fine, coarser on ventral folds. Abd VIII with a strongly sclerotised postdorsal ridge; pd3s3 half as long as adjacent setae. Antennae with sides subparallel. Maxilla with more than 10 spinules in clusters on inner surface at base of palpus and below malar setae. Anal lateral lobes with 1 strong seta and 3 minute setae. Similar in other respects to the larva of A. cervinus.

Material examined. NEWZEALAND: HB—Bridge Pa, under lucerne, 28 Nov 1974, 3 larvae, MJE; 17 Jun 1975,
15 larvae, MJE, PJW, BMM. Not reared, but associated with adults and compared with slide preparations from Alabama, U.S.A., determined by W.H. Anderson.

Remarks. A. minimus is one of the complex of weevils that are becoming a threat to lucerne. Discovered at Napier in 1970, it is at present confined to Hawkes Bay. It may be significant that Napier airport is involved in the transport of racehorses, and their attendant fodder, across the Tasman from Australia.

**Genus Floresianus Hustache**

Type species *Floresianus sordidus* Hustache.

*Floresianus sordidus* Hustache

*sordidus* Hustache, 1939: 39.
‘Flores weevil’

Fig. 457–460

Maximum dimensions 5.0×2.0 mm; head width 1.0 mm. Cuticle smooth except for a row of spinules between setae on sternal Abd folds. Abd VIII with *pds3* minute, about one-tenth as long as adjacent setae. Antennae with sides subparallel. Maxilla with 4–6 long spinules on inner surface at base of palpus and 3 or 4 spinules below malar setae. Spiracles conspicuously pigmented in fresh specimens. Anal lateral lobes with 1 strong seta and 3 minute setae. Similar in other respects to larvae of *A. cervinus*.


Biology. At Hatuma in 1973 larvae of *F. sordidus* were fully fed in late June, and were three times more plentiful under clover than under ryegrass (*Lolium perenne*). In the laboratory one of them pupated after 124 days, to emerge as a hardened adult after 40 days.

Remarks. *F. sordidus* is at present confined to Hawkes Bay, where it was discovered in 1973.

**Genus Graphognathus Buchanan**

*Graphognathus* Buchanan, 1939: 11.
Type species *Naupactus leucoloma* Boheman.

*Graphognathus leucoloma* (Boheman)

*leucoloma* Boheman, 1840: 62 (*Naupactus*).
‘White-fringed weevil’

Fig. 461–472

Maximum dimensions 15.0×5.0 mm; head width 2.5 mm. Cuticle smooth except for a row of spinules between setae on sternal folds of Abd I–V. Setae pale red with dark bases; minor dorsal setae of younger larvae short, stout. Head of mature larvae yellowish in front. Antennae slightly asymmetrical; sides strongly rounded. Maxilla with a group of long spinules on inner surface below palpus and below malar setae. Anal lateral lobes without a strong seta. Similar in other respects to larvae of *A. cervinus*.

Material examined. NEW ZEALAND: AK – Mt Albert, under ryegrass/clover, 3 Dec 1962, 10 larvae*, BMM. MC – Fairton, in potatoes, 5 Apr 1972, 13 larvae, HGH.

Biology. The life history differs in several respects from that of Fuller’s rose weevil. Larvae are present year-round, but the peak of oviposition (in Auckland) is in summer rather than autumn. The eggs, white rather than yellow, are cemented together in drought-resistant clusters and pushed between adjoining surfaces on or near the ground. They can hatch 8 days after being moistened. Mature larvae are stout and vigorous, unmistakable by their size, but younger individuals are difficult to separate from other naupactines present at the same time. Pupation occurs during the warmer months. The overlapping generations span a minimum of 10 months, but may approach 2 years in adverse conditions. *G. leucoloma* consumes the taproots, tubers, and crowns as well as the finer roots of a wide variety of horticultural and pastoral plants (May 1975).

Remarks. *G. leucoloma* is established in the eastern U.S.A., south-eastern Australia, and the southern part of South Africa. It was first recorded in New Zealand in 1944, since when it has become widespread in both islands.

**Subtribe Otiorhynchina**

Body robust, evenly curved. Cuticle sclerotised around setal groups. Dorsal setae *pds1,2,4* much shorter than *pds3,5*. Th II/III with 1 *dls*. Head free, pigmented, with sutures distinct; *des4* and *fsl1,2,3* minute or reduced to sensilli. Antennae oval, symmetrical. Mandibles with double, serrate cutting edges; setae unequal. Labrum medially pigmented. Epipharyngeal lining with median *mes* pair wider apart than posterior *mes* pair. Hypopharyngeal bracon maculate. Premental sclerite a complete trident
shape, with posterior extension expanded before apex; anterior extension of similar length.

Remarks. *Otiorhynchus* Germar (three species) and *Phlyctinus* Schoenherr of this subtribe are represented in New Zealand. Rosenstiel (1987) made a detailed taxonomic study of five genera (as Polydrosinae) present in Oregon: *Nemocestes* Van Dyke, *Peritelinus* Casey, *Sciophites* Horn, *Trachyphloeus* Germar, and *Otiorhynchus*. These are taken into account in the diagnosis.

**Genus *Otiorhynchus* Germar**

*Otiorhynchus* Germar, 1824: 343.

Type species *Curculio sulcatus* Fabricius.

Body widest near thorax, tapered; terminal segments well sclerotised but not otherwise modified. Cuticle of dorsal folds on Abd I–V asperate. Setal numbers differing from the modal pattern as follows: head 4 des, 2 fs; maxilla 8 dms, 4 vms; pronotum 8–10 setae; Th II/III 1 dls, 3 ss, pedal lobe 7 setae; Abd VIII 4 or 5 pds; Abd IX 3 ds; Abd X 3 setae. Abd V–VIII with major spiracular seta on postdorsal fold. Head subcircular in outline, widest behind middle, emarginate behind; postoccipital condyles conspicuous. Labral tormae moderately long, convergent, tapering. Spiracles circular, those of older larvae usually bicameral with simple airtubes, those of 1st-instar larvae with longer, annulate airtubes. Terminal segments unmodified. Anus terminal, 4-lobed. Alimentary canal with globular mycetomes around cardiac valve; gastric caeca tapering; cryptonephridium elongate, slender; rectal bracon membranous.

**Genus *Otiorhynchus* sulcatus** (Fabricius)

*sulcatus* Fabricius, 1775: 155 (*Curculio*).

‘Black vine weevil’

Fig. 473–483

Maximum dimensions 10.0×4.0 mm; head width 1.75 mm. Body with dorsopleural lobes angularly produced, especially on Abd VIII. Cuticle finely spiculate, pigmented at setal bases. Setae red-brown, strong, finely tapered. Pronotum yellow-brown, with darker fascia in front. Head bright yellow-brown, with reddish parietal stripes, pallid at setal bases; oral margins and mandibles blackish; ecdysial line dark. Ocelli distinct under raised cornea. Labrum with lateral seta half as long as anterior seta. Premental sclerite with angle between lateral and posterior arms emarginate. Spiracles with a broad, pigmented peritreme; airtubes not reaching margin. Abd ventropleural lobes with major vpls 10x as long as minor vpls. Anal setae strong. Alimentary canal with 6–8 gastric caeca on either side of lower coil.


Biology. The flightless adults reproduce parthenogenetically, and each may produce over 1000 eggs. The spherical, translucent eggs are laid on or near the soil, in plant crevices, or beneath litter. The larvae are strong and very active. The effects of their feeding become most noticeable during winter and early spring. Larvae recovered from blackcurrant roots in Christchurch became adult in October, but larvae feeding in cyclamen corms in an Auckland glasshouse matured somewhat earlier. Fully fed in June, they pupated and emerged during August.

Remarks. *O. sulcatus* is a European species now established in most cool-temperate parts of the world. It was first recorded in New Zealand in 1866 at Mt Eden, Auckland, but has become more common in southern parts of the North Island and in the South Island, where it is a persistent pest of berryfruits and nursery plants.

**Genus *Phlyctinus* Schoenherr**

*Phlyctinus* Schoenherr, 1826: 196.

Type species *Phlyctinus callosus* Boheman.

The generic diagnosis differs from that for *Otiorhynchus* as follows. Cuticle smooth on dorsum, asperate on venter. Head widest at middle. Hypopharyngeal bracon with maculae extending along posterior margin. Premental sclerite with anterior median extension longer than the posterior one. Abd I–VII with major spiracular setae on middle fold above spiracle. Terminal segments strongly sclerotised, often pigmented, unmodified except Abd IX with pleural lobe expanded.

**Phlyctinus callosus** Boheman

*callosus* Boheman, 1834: 523.

‘Garden weevil’, ‘banded fruit weevil’

Fig. 484–494

Maximum dimensions 9.0×3.0 mm; head width 1.75 mm. Cuticle sclerotised around setal groups, strongly so on dorsopleural lobes. Setae bright red-brown, moderately long. Pronotum yellowish. Head red-brown, with paler...
paramedian area and darker parietal stripes, smaller in proportion to thorax than that of *O. sulcatus*; ocelli faint. Labrum with lateral setae as long as anterior seta. Abd ventropleural lobes with major *vpls* twice as long as minor *vpls*. Anal setae minute. Alimentary canal with 5 gastric caeca.

**Material examined.** NEW ZEALAND: AK – Mt Albert, under clover, 28 Jun 1967, 19 larvae*, BMM. CO – Invermay, in nursery soil, Jun 1986, 9 larvae, TW.

**Biology.** Although the parthenogenetic adults of *P. callosus*, along with those of *Asynonychus cervinus*, have a habit of climbing, the eggs are most often found among weeds and litter at ground level. They are cigar-shaped, measure 0.9×0.4 mm, and are laid in batches of up to 70, not cemented together, at intervals of about 7 days. Captive weevils pushed them into the hollow petioles of clover leaves. Barnes (1989) reported oviposition sites in *Cyperus esculentus* (nut sedge), where the slit through which the eggs had been deposited had clearly been made by the ovipositor and not the mandibles. In Auckland, eggs were laid throughout summer and winter. Larvae were present in all months, but pupation peaked in spring and early summer. Adult wings are not functional even though pterothecae (wing covers) are visible in the pupa.

**Remarks.** *P. callosus* has been known in New Zealand since 1893. It is indigenous to South Africa, where the adult stage is a major problem in orchards and vineyards. It is also present in southern Australia and Tasmania, and on Norfolk Island and the Kermadecs.

**Subtribe Sitonina**

**Genus Sitona Germar**

*Sitona* Germar, 1817: 341.

Type species *Curculio gressorius* Fabricius.

Body slender. Head free, pigmented; *des4* small but distinct; *fs4rs and fs5* of similar length; ocelli faint or absent; endocarinal line present; sutures distinct. Antennae strongly asymmetrical, angulate on outer aspect. Mandibles often pluridentate; setae of unequal length. Labrum trilobate, with a single median sensillus. Epipharyngeal lining with inner *ans* pair strong; either 2 or 3 *als* pairs present. Premental sclerite complete, with posteromedian extension acute at apex. Th II/III with 1 *dls*. All spiracles bicameral; airtubes annulate. Terminal segments unmodified. Anus subterminal, 4-lobed.

**Remarks.** This genus is of economic importance in Europe, and is treated in considerable detail by Emden (1952). Eight species are described and keyed.

**Sitona discoidea** Gyllenhal

discoidea Gyllenhal, 1834: 112.

*Sitona weevil*, `lucerne weevil`

Fig. 495–504

Maximum dimensions 6.0×2.0 mm; head width 1.0 mm. Body of even width, bent medially rather than curved. Cuticle minutely asperate ventrally, smooth elsewhere. Setae pallid, slender, moderately long; numbers differing from the modal pattern as follows: head 2+2 *fs*; epipharyngeal lining 2 *als*; maxilla 7 *dms*, 4 *vms*; pronotum 8 setae; Th II/III 1 *dls*, 1 ss; pedal area 5+1 setae; Abd VIII 3 *pds*; Abd IX 3+1 *ds*; anal lateral lobes 3 setae. Head pale reddish-brown, with pallid, convergent paramedian stripes; endocarinal line short, one-quarter as long as frons. Antennae partially overhung. Mandibles tridentate; smaller seta proximad of the larger one. Clypeus pigmented at base. Labrum with a strong V-shaped colour pattern; lateral setae half as long as anterior setae. Epipharyngeal lining with inner *ans* conspicuously fang-like; 2 *als* present; proximal *mes* hairlike. Tormae vestigial. Hypopharyngeal bracon clear. Thoracic spiracle with airtubes 6- or 7-annulate, obliquely dorsad, those of Abd 4- or 5-annulate, caudad. Alimentary canal lacking mycetomes around cardiac valve; gastric caeca lamelliform, 1 on either side of lower coil. Malpighian tubules unusually thick; cryptonephridium weakly developed; rectal bracon membranous.

**Material examined.** NEW ZEALAND: HB – Napier, Awatoto foreshore, under burr clover (*Medicago polymorpha*), 15 Sep 1974, 3 larvae, MJE; Tangoio to Clifton, 8–9 Oct 1974, 23 larvae*, MJE, PJW, BMM.

**Biology** (after Wightman 1981). The small, seed-like, spherical eggs are dropped randomly wherever the female happens to be feeding. She can produce up to 2000 eggs between April and December. Larvae burrow into the soil in search of the roots of *Medicago* and *Trifolium*, where they hollow out the nitrogen nodules. In lucerne the life cycle is governed by the growth period of roots and nodules, hence larvae are present only during spring and summer. Adults migrate in autumn before overwintering. They are strong fliers, and are capable of dispersing widely. There is one generation a year. Reproduction is sexual. The combined effects of adult and larval feeding can be devastating to a lucerne crop. An infestation can be recognised
by scalloped or skeletonised leaves, followed by stunting and yellowing caused by nitrogen deficiency. Several other species of *Sitona* are reported to feed as larvae within nitrogen-fixing nodules of leguminous crop plants in the U.S.A. (Manglitz *et al.* 1963).

**Remarks.** Originating in Europe, *S. discoidea* adults were first intercepted at Napier in 1970, but it was not until 1974, when live larvae were identified and reared, that the species was known to be established in New Zealand. The larvae were present beneath weeds on the Napier foreshore (May 1977, as *S. humeralis* Stephens). Later that year sitona weevils were found on lucerne in mid Canterbury in numbers suggesting that this locality may have been an earlier focus of invasion. The species has been recognised as a pest of lucerne in southern Australia since 1954 (Chadwick 1978).

**Tribe Rhytirhinini**

Body shape and vestiture variously modified. Th II/III with 1 or 2 dls. Head free, pigmented; postoccipital condyles triangular; des3 in suture or on frontal plate; fs4 constant, stronger than fs5; other fs minute or absent; 2 pairs of ocelli present. Antennae circular, subglobose to conical. Mandibles bifid, with a small median tooth; setae unequal. Labrum with lateral seta reduced in length. Epipharyngeal lining with 2–4 als; proximal 2 pairs of mes equidistant, with clusters of sensilli in between. Spiracles circular, bicameral, with airtubes on Abd caudad (dorsad in water-saturated or subantarctic group). Other Ectemnorhinini in having the short Abd dorsal setae stout and spine-like, and the airtubes of Abd spiracles dorsocaudad (May 1970b). These features and others, including antennal shape, are in agreement with a diagnosis of *Gromilus* based on seven southern species and one from the North Island. However, *Gromilus* pupae do not have the important setae on the mandibular theca which are present on *Canonopsis* pupae.

**Remarks.** The endemic *Gromilus* complex of more than forty species has a focus of speciation in the south, particularly on oceanic islands. Only four species are known from the North Island. Some larvae feed on roots of low-growing dicotyledonous plants and others on fern roots (Kuschel 1964, 1971; May 1971, 1981).

*Gromilus* larvae are close to those of *Canonopsis* Waterhouse (Ectemnorhinini) from Heard Island, one of the Indian Ocean subantarctic group. *Canonopsis* differs from other Ectemnorhinini in having the short Abd dorsal setae stout and spine-like, and the airtubes of Abd spiracles dorsocaudad (May 1970b). These features and others, including antennal shape, are in agreement with a diagnosis of *Gromilus* based on seven southern species and one from the North Island. However, *Gromilus* pupae do not have the important setae on the mandibular theca which are present on *Canonopsis* pupae.

**Genus Gromilus** Blanchard

*Gromilus* Blanchard, 1853: 208.

Type species *Gromilus insularis* Blanchard.

Body evenly curved, slightly tapering. Cuticle sclerotised around setal bases. Major pds very long, slender; minor pds short, spine-like. Setal numbers differing from the modal pattern as follows: head 4 dex, 1+1 fs; maxilla 7 dms, 5 sms; pronotum 8 setae; Th II/III 1 dls, 1 ss, pedal lobe 6 setae; Abd VI/VII 4 pds, Abd VIII 3 pds, Abd IX 3 ds; anal lateral lobes 3 setae. Head widest at middle, with sides slightly convergent; endocarinal line absent; fs4 long, fs5 variable; anterior ocelli large. Antennae hemispherical. Clypeal setae minute. Labrum pigmented medially. Tormae strong, convergent, not joined at base. Hypopharyngeal bracon maculate. Anus 4-lobed. Alimentary canal with prominent internally striate; mycetomes usually present around cardiac valve; gastric caeca vermiform; cryptonephridium symmetrical; rectal bracon membranous.

**Remarks.** The endemic *Gromilus* complex of more than forty species has a focus of speciation in the south, particularly on oceanic islands. Only four species are known from the North Island. Some larvae feed on roots of low-growing dicotyledonous plants and others on fern roots (Kuschel 1964, 1971; May 1971, 1981).

*Gromilus* larvae are close to those of *Canonopsis* Waterhouse (Ectemnorhinini) from Heard Island, one of the Indian Ocean subantarctic group. *Canonopsis* differs from other Ectemnorhinini in having the short Abd dorsal setae stout and spine-like, and the airtubes of Abd spiracles dorsocaudad (May 1970b). These features and others, including antennal shape, are in agreement with a diagnosis of *Gromilus* based on seven southern species and one from the North Island. However, *Gromilus* pupae do not have the important setae on the mandibular theca which are present on *Canonopsis* pupae.

**Gromilus thoracicus** (Broun)

*thoracicus* Broun, 1893: 1211 (*Clypeorrhynchus*).

Fig. 505–515

Maximum dimensions 7.0×2.5 mm; head width 1.5 mm. Cuticle sparsely asperate on folds. Setae red-brown. Head bright red-brown, with oral margins and mandibles blackish; fs4 and fs5 subequal; sutures narrow but distinct; posterior ocelli obsolete. Tormae contiguous at base. Premental sclerite with posterior extension arrow-shaped. Thoracic spiracle with airtubes 5–7-annulate, dorsad; airtubes of Abd spiracles 3–5-annulate, caudad; Abd VIII spiracle on dorsum. Alimentary canal with 13 small, globu-
lar mycetomes at cardiac valve; anterior ventriculus rugose; gastric caeca long, slender, with 2–6 widely spaced on either side of lower coil.

Material examined. NEW ZEALAND: ND – Tutamoe, 12 Oct 1968, 11 larvae*, BMM.

Biology. Adults of G. thoracicus were beaten after dark, with Megacolabus Broun, from fronds of Blechnum sp. Larvae were found among fern roots on roadside verges bordering farmland with some forest remnants. They pupated in November, and emerged 3 weeks later.

Genus Steriphus Erichson

Steriphus Erichson, 1842: 193.
Type species Steriphus solidus Erichson.

Body moderately robust, evenly curved (except S. ascita); Abd I–VII with major ss progressively further caudad. Setal numbers differing from the modal pattern as follows: head 4 des, 1+1 fs, maxilla 7 dms, 5 vms; pronotum 7–10 setae; Th II/III 1 dls, 1 ss; pedal area 6 setae; Abd VII 4 pds, Abd VIII 3 pds; Abd IX 3 ds, anal lateral lobes 3 setae. Head evenly rounded; ocelli without raised corneae; endocarinal line absent. Antennae broadly conical. Clypeal setae and labral lateral setae minute. Tormae joined in proximal third. Premental sclerite with posteromedian extension longer than the anterior one, arrow-shaped. Spiracles with paired airtubes external, usually joined to form a spine. Alimentary canal of modal form.

Remarks. Steriphus (previously known as Desiantha Pascoe) has a focus of speciation in southern Australia. S. variabilis (Broun) and S. ascita (Pascoe) are endemic to New Zealand, and the subspecies S. diversipes lineata (Pascoe) occurs in both countries. The larvae are characterised by their spiracles, which are of the plant-piercing type, modified for an aquatic environment. S. ascita, however, is the only species known to be truly aquatic (May 1977). S. variabilis prefers well watered places such as marshy ground and cotula bowling greens. The S. diversipes complex and S. caudata (Pascoe) have adapted to the drier soil conditions of pasture and crops while retaining their aquatic spiracles.

Steriphus diversipes lineata (Pascoe)

lineata Pascoe, 1873: 196 (Brexius).
‘Victoria weevil’
Fig. 516–525

Maximum dimensions 7.0×2.0 mm; head width 1.0 mm. Body widest behind middle. Cuticle asperate on sternal folds only. Setae red-brown, short, fusiform. Head pale red-brown, with pallid paramedian stripes and circular areas at base of des5 and fs4; oral margins and mandibles red-black; fs4 long, fs5 and other fs minute; sutures of uneven width. Hypopharyngeal bracon clear. Thoracic spiracle with airtubes short, rounded at apex; Abd I–VII spiracles with airtubes elongate, 5× longer than width of peritreme, lateral, and with scalpellum present at apex; Abd VIII spiracle shorter, less acute, lateral. Alimentary canal with 8 globular mycetomes around cardiac valve; 4 gastric caeca in a row on either side of lower coil.

Material examined. NEW ZEALAND: AK – Pukekawa, in pasture, 5 Sep 1962, 9 larvae*, JGB. MC – Dorie, roots of lucerne, 12 Sep 1972, 3 larvae, DMM; Christchurch, strawberry roots, 22 Sep 1972, 52 larvae*, BMM, KGS.

Biology. S. d. lineata was first found in New Zealand near Auckland in 1933. The larvae are polyphagous, recorded as feeding on roots of pine seedlings, strawberry (Fragaria sp. cult.), lucerne, pasture grasses, and roadside weeds. They seem to prefer light, friable soils. The life cycle follows a pattern close to that of S. caudata in South Australia (Allen 1973). A regimen of adult emergence in spring, summer quiescence, and mating and oviposition in the soil in autumn is found also in the related pest species Listroderes difficilis Germain (May & Ferguson 1979). There is one generation a year.

Genus Listroderes Schoenherr

Listroderes Schoenherr, 1826: 158.
Type species Listroderes costirostris Schoenherr.

Body cuticle shagreened, without asperities; terminal segments tapering, with acutely expanded pleural lobes; pedal and sternal lobes developed as ampullae, with setae obsolete. All dorsal setae very short, peg-like. Setal numbers differing from the modal pattern as follows: maxilla 6 dms, 4 vms; pronotum 10 setae; Th II/III 3 or 4 pds, 2 dls, 2 ss, pedal area 0; Abd VIII 3 pds; Abd IX 3 ds; anal lateral lobes 0. Head small in proportion to body width, wider than long; fs5 minute; ocelli distinct under raised corneae; endocarinal line absent. Antennae conical, with hairlike sensoria. Mandibles short, wide, with a serrate cutting edge and 2 acute median teeth. Labrum completely pigmented, with anterior margin depressed. Tormae obsolete. Epipharyngeal lining with 2 or 3 als. Hypopharyngeal bracon fragile. Premental sclerite obsolete except at sides. Spir-
acle of Abd VIII lateral. Anal lobes forming a pygopod. Alimentary canal with proventriculus expanded, as large as ventriculus or larger; mycetomes absent; anterior ventriculus short, 4-lobed; posterior ventriculus with coils ill defined and lacking gastric caeca. Malpighian tubules evenly distributed. Cryptonephridium symmetrical; rectal bracon membranous; rectum as long as cryptonephridium.

Remarks. Larvae of *Listrodeses* are modified for ectophytic feeding in the open. Their coloration is cryptic, and setae are reduced or obsolete. Pedal and sternal lobes are developed as ambulatory ampullae, and the anal lobes as a pygopod for adhesion to leaf surfaces. Three species have become pests in both Australia and New Zealand. *L. difficilis* Germain, treated below, is the most commonly encountered. *L. foveatus* (Lea), of similar adult appearance, is probably indistinguishable in the larval form. The subterranean clover weevil *L. delaiguei* Germain, found mainly in pastures, is separated on antennal proportions (May 1977). The Australian *Ethemaia* Pascoe and *Ophryota* Pascoe are very close.

*Listrodeses difficilis* Germain

dificilis Germain, 1895: 64, 63.
‘Vegetable weevil’

Fig. 526–537

Maximum dimensions 11.5×3.5 mm; head width 1.75 mm. Body greenish cream to bright green, according to food plant. Pronotum dull brown with darker maculae. Head dull brown with well defined, darker maculate pattern; fs5 minute; des all of similar length, des3 on frontal plate; sutures distinct. Antennae with cone one-fifth as long as thorax, caudad on Abd I–VIII. All spiracles of similar size, surrounded anterodorsally by a dark crescentic area; airtubes 5–7-annulate, dorsad on thorax, caudad on Abd I–VIII.

Material examined. NEW ZEALAND: AK – Karaka, beneath *Stellaria* sp., 4 Jun 1964, 15 larvae*, JGB; Mt Albert, 1 May 1967, 20 larvae reared from eggs*, BMM.

Biology (after May & Ferguson 1979). The vegetable weevil is widely distributed in Australia, Pacific islands, the southern United States, and South Africa. It has been known in New Zealand since the 1920s. Both males and females are present in its native South America, but elsewhere reproduction is parthenogenetic. The eggs of *L. difficilis* are very similar to those of *Sitona discoidea*, being spherical, free, and deposited randomly. The larvae pass through four instars, feeding and sheltering in new, low growth while young. Older larvae, like the adults, are more inclined to be nocturnal and burrow into the soil by day. The pupal cell is made just below ground level. As with *Steriphus* species, pre-adult development is restricted to the cooler, moister months and the life cycle is relatively short. Adults emerge in spring, aestivate during hot, dry weather, and do not produce eggs until late summer. There is one generation a year. Food plants include most vegetables; brassicas are especially favoured. Weeds such as hog cress (*Coronopus didymus*), chickweed (*Stellaria* sp.), and cat’s ear (*Crepis* sp.) provide shelter and sustenance.

**Genus Listronotus** Jekel

*Listronotus* Jekel, 1865: 566.

Type species *Rhynchaenus caudatus* Say.

Body slender, tapering; terminal segments depressed, with pleural lobes prominent; Abd I–VI with ventral lobes developed as ambulatory ampullae. Head subglobose, with distinct sutures; endocarinal line and 2 pairs of ocelli present. Antennae broadly conical. Labrum with lateral setae minute or absent. Tormae slender, convergent. Premental sclerite with posterior margin arrow-shaped. Spiracles bicameral; airtubes of Abd I–VII lateral, caudad, those of Abd VIII on dorsum. Anus ventral, extended as a pygopod. Alimentary canal with cardiac mycetomes; gastric caeca absent; cryptonephridium weak, symmetrical.

Remarks. Genus *Listronotus* comprises numerous species native to South America. Apparently only *L. bonariensis* Kuschel, present in both New Zealand and Australia, has extended its range to become a threat to pasture grasses. The larva of another species, *L. cinnamoni* (Hustache), mines in the floating leaves of *Limnobium stoloniferum* and is modified in the same way as *L. bonariensis* and *Listrodeses* species, for mobility on leaf surfaces.

*Listronotus bonariensis* (Kuschel)

bonariensis Kuschel, 1955: 289 (*Hyperodes*).

‘Stem weevil’, ‘Argentine stem weevil’, ‘ryegrass stem weevil’

Fig. 538–547

Maximum dimensions 5.0×1.5 mm; head width 3.75 mm. Cuticle finely asperate. Setae pallid; body setae reduced in size except 1 pds and 1 vpls on Abd I–VIII and 2 trailing ds on Abd IX. Setai numbers differing from the modal pattern as follows: head 4 des, 1 fs; mandible 1 seta; maxilla 6 dms, 4 vms; pronotum 3+4 setae; Th II/III 1 dls, 2 ss; pedal area...
4 setae; Abd VIII 1+2*ds; Abd IX 2 ds. Head orange, with pallid paramedian stripes; frontal suture angulate above des3; endocarinal line short. Epipharyngeal lining with als unusually long. Hypopharyngeal bracon maculate.

**Material examined.** NEW ZEALAND: AK - Mangere, in ryegrass, 2 Nov 1959, 23 larvae*, BMM. BP - Te Aroha, in seedling maize, 9 Dec 1961, 3 larvae, PFIC. MC - Ashburton, in ryegrass, 11 Apr 1958, 12 larvae, JMK.

**Biology** (after May 1961, Power 1974). *L. bonariensis* was discovered in New Zealand in 1927, since when it has spread to high-fertility pastures throughout the country. Until 1960 it was recorded as *Hyperodes griseus* Hustache. Overwintered females start egg-laying in very early spring, when the first new growth appears, usually the annual meadow grass *Poa annua*. The cylindrical eggs are pushed into leaf sheath tissue, where the larvae feed as stem miners. They migrate readily in search of fresh tillers. Three moults occur before the larvae are full-grown and ready to pupate in the soil. First-generation adults emerge in November. Oviposition and larval activity reach a peak during December and January, 2 or 3 weeks earlier in Auckland than in Canterbury. There are two generations a year. Italian ryegrass (*Lolium perenne*), cocksfoot (*Dactylis glomerata*), and the meadow grasses (*Poa* spp.) are preferred hosts, but seedling cereals and maize are also utilised.

**Tribe Aterpini**

Th II/III with 1 or 2 ds. Head free or partially retracted, pigmented; postocipital condyles prominent; frontal sutures distinct, angled before apex; fs3 in suture or on frontal plate; fs4 constant, usually stronger than fs5; 2 pairs of ocelli present. Antennae circular, hemispherical, or conical, usually overhung. Mandibles usually unidentate at apex, with 1 or 2 setae. Labrum with lateral seta well developed. Epipharyngeal lining with setae in modal numbers; proximal 2 pairs of mes more or less equidistant. Spiracles circular or pear-shaped; airtubes strongly annulate, dorsad on Th, caudad on Abd segments. Abd VIII spiracle dorsal. Anus terminal or ventral.

**Remarks.** The larvae of Aterpini for the most part are associated with live plant tissue: roots, leaf bases, green wood, and stems. One species is a leaf-miner in its early stages. Many are host-specific at the plant generic level. Some larvae work in recently dead trees, a habit evolved perhaps from feeding on dead tissue, which is the end result of root and crown feeding. Although the general appearance of the adults is more rugged than those in Rhytirhinini, and they tend to be larger, the larval characters differ only slightly. In Aterpini the antennae are usually concealed beneath a frontal projection (overhung), mandibles are unidentate (except in *Rhadinosomus*) and the spiracle of Abd VIII is unequivocally dorsal. Five Australian genera as well as *Anagotus* Sharp, *Heterotyles* Broun, *Lyperopais* Broun, and *Rhadinosomus* Schoenherr from New Zealand are considered in the following summary of tribal characters. *Rhadinosomus* is clearly in a different category (perhaps subtribe) from *Anagotus* and its allies.

**Genus Anagotus Sharp**

*Anagotus* Sharp, 1882: 90.

Type species *Anagotus helmsi* Sharp.

Body sturdy, with heavy musculature and fat-body; terminal segments depressed, often with pleural lobes protruding. Th II/III with 1 ds, 6 pedal setae; Abd VIII with 3 ds; Abd IX with 2 ds; setae otherwise in modal numbers. Head free, evenly rounded, slightly emarginate behind; fs5 small or minute; endocarinal line often vestigial. Mandibles with 1 seta. Epipharyngeal lining with sensilli clusters between proximal mes pairs (in *Heterotyles* and *Lyperopais* between distal mes pairs). Anus ventral, 4-lobed. Alimentary canal without cardiac mycetomes; gastric caeca present.

**Remarks.** *Anagotus* is endemic to New Zealand, with close relations in Australia, e.g., *Aesiotus leucurus* Pascoe feeding in wood, *Chrysothophus spectabilis* Fabricius on woody roots, and *Pelororhinus* sp. on herbaceous stems. The genus contains at least 25 species, medium-sized to large, with an offshore (rat-free) island distribution as well as a predominantly southern element extending into the subalpine zone. Food preferences range from leaf bases of *Phormium, Astelia, Chionochloa*, and *Celmisia* through green woody stems of *Coprosma* to sound, dead wood of *Nothofagus* and the introduced *Pinus radiata*.

**Anagotus helmsi** Sharp

*helmsi* Sharp, 1882: 90.

`Helms’s beech weevil`

Fig. 548–557

Maximum dimensions 20.0×8.0 mm; head width 3.5 mm. Body with thorax not much wider than head, widest between Abd IV and Abd VI, with pleural lobes subdivided (as in Rhyeophorinae); Abd VIII and Abd IX depressed, with dorsoventral lobes extended into finger-like projections each bearing a long seta. Cuticle invested with minute,
seriate skin-points; all segments with a mid-sternal, triangular pocket on caudal margin, decreasing in size from Th I. Setae pallid, mostly minute; major setae present as follows: head 4 des, 2 fs, 1 les; maxilla 11 dms, 2 vms, 2 pfs, 1 stps; labium 1 prls, 1 plbs; pronotum 4 setae; Th II/III 1 pds, 1 dpls, 1 vpls, 1 pedal seta; Abd I–V 1 dpls, 1 vpls; Abd VI/VII 2 pds, 1 dpls; Abd VIII 1 pds, 1 ss, 1 dpls; Abd IX 2 ds, 1 ps. Head red-brown, with paramedian, mid-cranial, and lateral pallid stripes; oral margins and mandibles darker; postoccipital condyles large, rounded; endocarinal line vestigial; ocelli faint; edysial valve dark. Labrum strongly trilobate, completely pigmented. Tormae dark, convergent. Premental sclerite a full trident, with anterior extension as long as posterior one. Ligula pubescent. Hypopharyngeal bracon maculate. Thoracic spiracle 12–15-annulate, twice as large as spiracles on Abd I–VII, of similar size to Abd VIII spiracle. Anus ventral. Alimentary canal with 12–15 vermiform caeca in a row on either side of lower coil.


Biology (after McBurney 1976). A. helmsi is an example of a native insect previously existing in low numbers and increasing to pest proportions when a new and acceptable food plant was introduced. The species is recorded by Hudson (1934) in beech forests (Nothofagus species) of both the North and South islands, but when areas of Westland and Nelson beech forest were converted into exotic conifer plantations A. helmsi became a threat to the timber. It will enter trees, logs, or stumps of Pinus radiata which have been dead or felled for not less than 4 months. Between August and November the eggs (1.5×1.0 mm) are placed singly in furrows on the bark, hatching in 7–14 days. The larva bores through to the cambium layer of the wood, moulting on the way and having blocked the entry tunnel with frass. It works with the grain for about 25 mm before tunnelling into sapwood. From this burrow it travels to and from the bark layer, where it feeds. The cambium working is enlarged to become a pupal chamber where, after sealing it off with shredded wood, the fully fed larva spends up to 32 months as a prepupa; 2 weeks as a pupa, and another 2 weeks as a tenural adult before chewing its way out to the surface. The circular exit hole is 10.0 mm in diameter. Pupation and emergence occur from mid November to mid March. Adult activity is nocturnal. A. helmsi is distributed from Te Aroha (latitude 37°30'S) southwards to Stewart Island. Larval food plants include all five species of Nothofagus and the exotic conifers Pseudotsuga menziesii and Pinus ponderosa as well as Pinus radiata.

Genus Rhadinosomus Schoenherr

Rhadinosomus Schoenherr, 1840: 473.
Type species Curculio acuminatus Fabricius.

Body slender, elongate. All setae well developed. Head free, subspherical; endocarinal line present; ocelli with raised cornea. Antennae exposed. Mandibles bifid, with a median projection; 1 or 2 setae present. Labrum transverse, trilobate, with lateral seta as long as anterior seta. Tormae contiguous or joined at base. Epipharyngeal lining with clusters of sensilli between proximal mes pairs. Premental sclerite a complete trident. Spiracles of typical form for the tribe. Anus subterminal.

Remarks. The genus Rhadinosomus is present in both Australia and New Zealand, with one species in each country. R. lacordairei Pascoe extends southwards to Tasmania, and like R. acuminatus is herbivorous. Rhadinosomus has hitherto stood in a monophyletic subfamily, but is now more rationally accommodated in Aterpini. Its larval diagnosis agrees broadly with that of the tribe, and in particular it carries the brachycerine feature of des3 situated within the frontal suture.

Rhadinosomus acuminatus (Fabricius)

acuminatus Fabricius, 1775: 152 (Curculio).

Fig. 558–568

Maximum dimensions 8.0×2.0 mm; head width 1.0 mm. Body pale yellow, darkening with age, evenly cylindrical; ventral lobes ampulliform. Cuticle minutely spiculate. Setae pallid, fine, moderately long on head and terminal segments. Setal numbers differing from modal pattern as follows: maxilla 7 dms, 5 vms; pronotum 10 setae; Th II/III 2 ds, 3 ss, pedal lobe 5 setae; Abd VIII 3 pds; Abd IX 3 ds; anal lateral lobes 1 seta. Pronotum pale yellow. Head yellow-brown, with frons dusky, oral margins and mandibles dark brown; epistoma narrow; frontal suture not angled before apex; endocarinal line half as long as frons; all setae well developed, but des4 and fs1,2,3 slightly shorter than the others. Airtubes of thoracic and Abd VIII spiracles with 5 or 6 evenly spaced annuli; Abd I–VII spiracles smaller, with 4 or 5 annuli. Alimentary canal with...
gastric caeca subequal to diameter of adjacent tube, 4–6 on either side of lower coil.


**Biology.** *R. acuminatus* is host specific to the widespread endemic herb *Haloragis erecta.* Its life history was studied at Huia, Auckland, where at any time of the year adults can be collected from the plants and larvae can be found in the hollowed-out stems.

The cycle observed began with a mating pair in late September. The eggs, only slightly convex, were laid singly on unprepared sites on the underside (abaxial) of young leaves. They were cemented in position with anal mucus and then covered with green, liquid excreta which, when dry, made them almost invisible. Newly hatched larvae were free-living, some feeding in developing flower clusters before boring into the stem, others chewing leaf tissue around the egg site, penetrating both surfaces, to reach the main stem via the midrib and petiole. A 30 cm length of stem could accommodate up to four larvae working separately along its length. Pupation occurred *in situ.* Development from egg to adult took about 3 months in early summer, but the second, overwintering generation was much more extended.

The habit among leaf-dwelling weevils of protecting their eggs with excrement may not be uncommon. It is reported by Read (1985) for *Phytobius comari* (Herbst) (Cerambycidae) when ovipositing on *Potentilla palustris,* and the egg capsule of *Gonipterus scutellatus* Gyllenhal is composed of excremental material (Tooke 1953).

The parasites *Xanthocryptus novozealandicus* Dalla Torre (Ichneumonidae) and an undetermined species of Pteromalidae emerged from the sample material.

**Remarks.** The tribe Gonipterini has its centre in Australia, where *Eucalyptus* trees are host to a number of genera, including *Gonipterus* Schoenherr, *Bryachus* Pascoe, and *Oxyops* Schoenherr. The arboreal larvae are strongly modified in their morphology and cryptic coloration for ectophytic feeding. The eggs are deposited on the surface of leaves or bark, enclosed in a capsule formed from anal secretion. The mouthparts are not used for modelling or to prepare a site, hence the inclusion of this tribe in Brachycerinae.

**Genus Gonipterus Schoenherr**

*Gonipterus* Schoenherr, 1833: 456.

Type species *Gonipterus lepidotus* Gyllenhal.

Species of *Gonipterus* have been introduced into many warmer parts of the world with their eucalypt host plants. *G. scutellatus* Gyllenhal is the only one to have reached New Zealand, where it has been known since 1893. The larva of *G. gibberus* Boisduval in Brazil, as described and figured by Rosado-Neto & de Freitas (1982), can be separated from it only by minor differences in cephalic and labial setae. The caudad Abd air tubes and mandible with a single seta indicate an affinity with Rhytirhinini. A general diagnosis follows, under *G. scutellatus.*

**Gonipterus scutellatus** Gyllenhal

*scutellatus* Gyllenhal, 1833: 458.

‘Gum tree weevil’

Fig. 569–580

Maximum dimensions 12.0×5.0 mm; head width 1.3 mm. Body convex above, almost plane below, with shallow ampullae, coloured yellow-green with a wide, dark, lateral stripe; Abd segments with 2 dorsal folds. Setae short, curved, with raised, shining, brown, circular bases. Seta numbers differing from the modal pattern as follows: head 4 des, 1+3 fs, 0 les, 0 ves; mandible 1 seta; labrum with lrms minute or obsolete; epipharyngeal lining 2 mes; maxilla 7 dms, 5 vms; pronotum 12–14 setae; Th II/III 1 dls, 3 ss; pedal lobe with sensilli only; Abd VIII 4 pds; Abd IX 3 ds; anal lateral lobes 3 or 4 setae. Head dark brown, retracted halfway into prothorax and declined ventrad when at rest, longer than wide, emarginate behind; des 1, 3, 4, 5 in line beside frontal suture; endocarinal line absent; ocelli close together, both with raised corneae. Antennae minute, concealed. Mandibles short, broad, bidentate, with a small subapical projection. Labrum pigmented. Epipharyngeal lining with proximal mes pair represented by sensilli.
Tormae dark, thick, bowed inwardly. Pronotum produced forwards to form a hood, deeply cleft medially. Spiracles with peritreme dark; air tubes large, 14-annulate, caudad, all of similar size. Anus 6-lobed, terminal. Alimentary canal with proventriculus expanded; irregular-shaped metacomes present around cardiac valve; anterior ventriculus transversely ridged, with dorsal and ventral longitudinal sulci; about 30 gastric caeca present in a single row on either side of lower coil; Malpighian tubules arising from a thickened ring, arranged 3+3.

Material examined. NEW ZEALAND: NN-Nelson, ex Eucalyptus globulus, 1 Dec 1929, 8 larvae, AFC; ex blue gum, 5 Nov 1946, 3 egg cases, 6 larvae*, JMK.

Biology (after Tooke 1953, Bain 1977a). During the winter months adults shelter under loose strands of bark on the trunk. In early spring, after feeding and mating, they move to the young growth, where the female lays up to 16 eggs in a capsule which she attaches to the leaf with a black trail of frass. Their development occupies 4-5 weeks; they undergo four moults, after which they fall to the ground to pupate in a cell lined with mucus. Adults of the new generation emerge during December and January to produce a second, overwintering generation by March or April. In cooler areas of the South Island there is only one generation a year.

Patasson nitens (Girault), an introduced mymarid egg parasite, appears to exercise effective control.

The pentatomid shield bug Cermatulus nasalis Westwood attacks both larvae and adults.

Tribe Hyperini

The tribe Hyperini, included in Brachycerinae on account of the oviposition habits of its members, holds little in common with Entimini, for instance, or Sionina, but can be regarded as transitional between the aerial-feeding element of Rhytirhini (Listroderes, Listronotus) and the almost wholly aerial-living tribe Curculionini in subfamily Curculioninae. Moreover, Hyperini appear to be transitional in the matter of oviposition also, since Hypera nigrirostris (Fabricius) is reported as using its mandibles when preparing egg sites in the leaf blades of red clover (Schriest & Treece 1963). Hypera species are remarkably similar in general morphology to Listroderes and its allies.

Genus Hypera Germar

Hypera Germar, 1821: 335.
Type species Curculio arator Linnaeus. = Phytonomus Schoenherr, 1823: 143.

Body slender, with terminal segments tapering to a pygopod and ventral lobes developed as ambulatory amputae. Setae pallid, shorter, differing from modal numbers as follows: head 3 or 4 fs; mandible 1 or 2 setae; maxilla 6 dms, 5 vms; palp 0; pronotum 8 setae; Th II/III 2 dls, 2 ss, pedal area 2-5 setae; Abd I-VIII 1 msts; Abd IX 3 ds. Head free, subquadrate, often darkly pigmented; frontal suture distinct, narrow; 2 ocelli distinct beneath raised cornea; endocarinal line absent; des 3 on epicranium; fs 5 much longer than fs 4. Antennae exposed, acutely conical, with hairlike sensoria. Mandibles short, wide, with 2-4 teeth. Labrum transverse, emarginate in front. Tormae indistinct. Epipharyngeal lining with reduced number of ams and mes. Hypopharyngeal braco obsolete. Labial palpus 1-segmented. Premental sclerite a narrow semicircle without median extensions. Postlabium with posterior plbs pairs much closer together than median pair. Spiracles bicameral; spiracle of Abd VIII dorsal. Alimentary canal without gastric caeca; Malpighian tubules grossly thickened; cryptonephridium symmetrical; anal tube retractile.

Remarks. Hypera is a Northern Hemisphere genus with several species native to North America; those which have become pests of leguminous fodder crops were accidentally introduced from Europe in the mid 1800s. The diagnosis is based on specimens of H. postica Gyllenhal and H. punctata (Fabricius) and on the work of Anderson (1948b).

Hypera punctata (Fabricius)

punctata Fabricius, 1775: 150 (Curculio). 'Clover leaf weevil'
Fig. 581-590
Maximum dimensions 12.0×4.0 mm; head width 1.25 mm. Body yellowish or pinkish green; cuticle shagreened. Pronotum pale dusky brown, speckled with dark setal bases. Head pale dusky brown, with a maculate pattern and a dark fleck above posterior ocellus; frons with a broad median projection; epistoma rather wide; fs 3 twice as long as fs 4, fs 3 absent; des all well developed. Mandibles with an apical tooth, a smaller subapical tooth, and a larger median projection; 2 setae present. Thoracic pedal areas with a well defined circular lobe bearing 3 setae. Spiracles all of similar size, with dark peritreme and annuli; air tubes short, obliquely dorsal. Anus 3-lobed, with dorsal lobe twice as large as laterodorsal lobes.
Material examined. CANADA: Quebec, Beauharnois, 1979, 3 larvae, BB.

Biology (after Herrick & Hadley 1922). The life cycle of the clover weevil, allowing for a colder climate, is comparable with that of Listroderes difficilis. Oviposition takes place mainly in autumn, with both eggs and adults overwintering. Larval development occupies 4-6 weeks during summer, with late larvae overwintering under surface debris. Pupation and emergence occur in spring and early summer. There is considerable overlap of generations. The eggs are laid in loose clusters or are pushed into hollow stems. Pupation takes place above ground in a cocoon spun to form an open meshwork, and usually attached to a plant. Host plants include alfalfa, lucerne (Medicago sativa), red clover (Trifolium pratense), crimson clover (T. incarnatum), and Jerusalem artichoke (Helianthus tuberosus).

Subfamily CURCULIONINAE

The subfamily Curculioninae as proposed by Kuschel (in press) encompasses almost half of the described species in Curculionidae. Its members are even more diverse than the Brachycerinae, and are best treated at the tribal or subtribal level. For the most part the larvae feed endophytically on living plants, and tend to be host-specific. Some, such as Cryptorrhynchini and Cossonini, which feed on degrading or dead tissues, are less selective. Oviposition sites are prepared by the female using her mandibles. In the tribe Erirhinini the rounded antennae, absence of an endocarinal line, and the siting of des3 in the frontal suture suggest that its systematic position is transitional between Brachycerinae and the tribe Curculionini.

Tribe Erirhinini

Outstanding features are as follows. Head small in relation to body, with prominent postocciptal conyles, and with a reduced number of setae, des3 in frontal suture, and endocarinal line absent. Antennae rounded, mushroom-shaped. Labral tormae contiguous or joined at base. Spiracles either dorsal, acute, adapted to obtain oxygen by plant-piercing, or minute, with simple airtubes.

Remarks. The tribe Erirhinini (Bagoinae of authors) is a group of aquatic or semiaquatic weevils with larvae that are host-specific in water plants, horsetails, and mosses. In recent years some species have been introduced from South America to control weeds which threaten to choke inland waters in southern Africa and Australia (May & Sands 1986). The larvae of two Cyrtobagous species, Echinocnemis sp., Neochetina eichhorniae Warner, and Neohydronomus pulchellus Hustache have been described in this context (May, in press). Another South American weevil, Lissorhoptrus oryzophilus Kuschel, of which a diagnosis is included here, has become a pest in rice plantations. The major endemic erirhinine genus in New Zealand, Bryocatus Broun, is associated with mosses and mat plants and contains over 100 species.

Genus Bryocatus Broun

Bryocatus Broun, 1915: 218.
Type species Bryocatus alternans Broun.

Body dense white due to deposits of fat. Head free, deeply emarginate behind; small relative to body size; postocciptal conyles acute, conspicuous through cuticle; sutures distinct; 2 pairs of ocelli present. Clypeal and labral setae reduced or absent. Labral tormae convergent, approximate at base. Epipharyngeal setae in modal numbers but minute. Labial palps 1- or 2-segmented. All spiracles minute with Abd airtubes caudad. Alimentary canal simple, without mycetomes or gastric caeca.

Remarks. The water weevils of New Zealand are poorly known as a group, through being largely confined to the subaquatic environment of alpine mosses and cushion plants. Of the five species which have been reared, four were feeding as larvae on mosses and one in leaf bases of a bog cushion, Oreobolus pectinatus (Cyperaceae). The spiracles in Bryocatus larvae are inconspicuous and reduced, unlike the upstanding spiracles characteristic of Lissorhoptrus LeConte and other water weevils living among aquatic plants.

Bryocatus amplus Broun

amplus Broun, 1915: 221.

Fig. 591–599

Maximum dimensions 5.5×1.75 mm; head width 0.5 mm. Body slender, evenly curved, tapering. Cuticle almost smooth. Setae very small, pale, with setal numbers differing from modal pattern as follows: head 3+1 des, 1 fs, 0 cfs, 2 lrms; maxilla 3 pfs, 5 dms, 4 vms; pronotum 8 setae; Th II/III 1 dls, pedal area 5 setae; Abd I-VIII 4 pds, Abd IX 2 ds. Head pale yellow; mandibles and epistoma reddish. Antennae subspherical. Mandibles triangular, unidentate, with 1 seta. Labrum evenly rounded. Tormae elongate, subparallel, indistinctly joined at base. Maxilla somewhat elongate, with stipes narrow. Labial palps 2-segmented.
Premental sclerite with anterior and posterior median extensions subequal.


Biology. Larvae of Bryocatus amplus have been found from sea level to 1400 m, at the base of moss mats, where they appeared to be feeding on rhizoids and old leaves. Young larvae were nearer the surface eating fresh material, and prepupae were found amongst the mass of roots. Pupal cells (in a rearing vial) were thinly lined with a viscous fluid. Adults emerged after about 3 weeks.

Genus Lissorhoptrus LeConte

Lissorhoptrus LeConte, 1876: 181, 183.
Type species Bagous simplex Say.

Genus Lissorhoptrus contains about fifteen species, among which L. oryzophilus Kuschel is well documented as a pest in rice paddies (Isely & Schwardt 1934, as L. simplex). It is included here as an example of erirhinine adaptation to the true aquatic environment. The South American genera introduced into Australia to control invasive water weeds show modifications ranging from elongate, trailing hairs and ventral hooks to a terminal dorsal plate (May, in press). The most noticeable features held in common are the upstanding, plant-piercing spiracles, similar in appearance to those of Steriphus ascita (Pascoe) (Rhytihrhini) but of different construction (May 1970a). A general description is given for L. oryzophilus, the only species for which larvae are available.

Lissorhoptrus oryzophilus Kuschel

oryzophilus Kuschel, 1951: 44.
‘Rice water weevil’

Fig. 600–610

Maximum dimensions 8.0×1.5 mm; head width 0.4 mm. Body slender, tapered, slightly curved, semitransparent, with tracheal trunks visible through cuticle; 6 pairs of spiracles upstanding on dorsum. Cuticle smooth. Setae palillid, minute; setal numbers differing from modal pattern as follows: head 2 des, 1 fs, 3 clps; 1 brms; mandible 1 seta; maxilla 5 dms, 3 vms; pronotum 5 setae; Th II/III 3 pds, 2 dls, 1 ss, pedal area 5 setae; Abd II–VII 1 pds; Abd VIII 4 pds; Abd IX 2 ds. Head partially retracted, deeply emarginate behind, pale yellow, with epistoma and mandibles reddish; ocelli indistinct. Antennae subspherical. Labrum concave in front, with only 1 seta visible. Tormae slender, convergent but not joined at base. Maxilla with both palpal segments short; stipital seta near inner margin. Labial palps 1-segmented, with apex bulbous. Premental sclerite V-shaped, tenuous. Spiracles of Th II minute, circular, with air tubes non-annulate, cephalad; those of Abd I and Abd VIII similar, with air tubes caudad. Spiracles of Abd II–VII in contiguous pairs on dorsum, directed forwards; scalpelum present at apex; retractile section apparently not developed. Abd VIII spiracles on depressed dorsum. Anus subterminal, 4-lobed, pubescent. Alimentary canal with proventriculus internally striate; cardiac valve surrounded by a thickened ring bearing 2 slender tubules; ventriculus smooth, slender; posterior section slightly narrower but not coiled, lacking gastric caeca; Malpighian tubules 4+2, arising at ileo-colic valve, rejoining hind gut at anal end of rectum; cryptonephridium undeveloped.


Biology (after Isely & Schwardt 1934, as L. simplex). The rice water weevil extends from Mexico to as far north as Canada, but it assumes importance only where the natural range of rice, which is a tropical plant, and that of L. oryzophilus, a temperate insect, overlap. The weevil can survive on several other aquatic grasses. In Arkansas the rice fields are invaded by swarms of adult weevils soon after flooding. The eggs are deposited in submerged roots. Newly hatched larvae feed within the roots and later live in the mud, feeding ectophytically. When larvae are abundant, nearly all roots are lost. Pupation takes place in a watertight cocoon attached to a rootlet. Development from egg to adult takes 32–77 days. The adults overwinter. The life habit of L. oryzophilus in the substrate is in sharp contrast to that of Cyrtobagous species on the floating fern Salvinia (May & Sands 1986). These latter larvae are free-drifting, using their long pleural setae as balancers and their hooked sternal setae for attachment when feeding and aerating.

Tribe Cryptorhynchini

Head usually carrying a full complement of setae (5 fs, 5 des, 4 pes, 2 les, 2 ves); fs4 and fs5 subequal; des3 on epicranium; endocarinal line usually present. Labrum with lateral seta well developed. Tormae joined for part of their
length, Y-shaped. Premental sclerite usually a distinct trident. Maxillary and labial palps 2-segmented. Thoracic spiracles ovate, occasionally circular; Abd spiracles circular, much smaller; Abd VIII spiracle lateral. Anus terminal or subdorsal, 4- or 6-lobed, the dorsal lobe hemispherical.

Remarks. Cryptorhynchine larvae are always endophytic. Many of them, perhaps the majority, are primary invaders working initially in live tissue. This degrades as feeding progresses, and by the time of pupation and adult emergence the substrate is decayed. Larvae developing late are often overtaken by fungus. Some species of *Microcryptorhynchus* are leaf miners in healthy monocots (May 1987).

The characters listed above are held in common by the New Zealand element. The alimentary canal varies considerably, and is thus useful diagnostically at the generic level. A key is given (p. 20) to thirteen genera and generic groups, of which six representative species are described and figured. *Notacalles* Kuschel and *Pachyderris* Broun are treated in May (1971), and eight Australian genera in May (in press).

**Subtribe Psepholacina**

Body robust, dense white, terminating abruptly, with Abd VIII expanded ventrally and anus subdorsal. Abd I–VI usually with 4 dorsal folds. Setal numbers differing from modal pattern as follows: maxilla 7 *dms*, 5 *vms*; pronotum 8–11 setae; Th II/III 1 *dls*, 2 *ss*, pedal area 7 setae; Abd VIII 4 *pds*; Abd IX 4 *ds*. Head free, entire behind, subcircular in outline, pallid, with oral margins, mandibles, and epicranial apex red-black; endocarinal line present; ocelli faint or absent. Antennae minute, narrowly conical, with a few basal papillae. Mandibles bidentate, with a raised median grinding surface, ridged longitudinally. Labrum produced forwards, pigmented, bisulate. Tormae strong, united at base, with or without a short stem. Epipharyngeal lining pubescent, with *ams* on labral surface; *mes* pairs evenly spaced. Premental sclerite a distinct trident. Hypopharyngeal bracon pigmented. Thoracic spiracle ovate-fringed, with small airtubes; Abd spiracles circular, diminishing in size retrogressively. Alimentary canal with proventriculus narrow; cardiac mycetomes present or absent; anterior ventriculus bulky; posterior ventriculus 1+1-coiled, with gastric caeca globose, numerous; origin of Malpighian tubules swollen, floriate; cryptophosphridium asymmetrical; rectal bracon a short, unpigmented loop.

Remarks. The subtribe Psepholacina, collectively known as the pit weevils, is a well defined group in which larval morphology is distinctive and extremely homogeneous. Genus *Psepholax* Broun accounts for the greatest number of species (ten). *Mesoreda* Broun contains three species, and *Strongylopterus* Schoenherr and *Homoreda* Broun two species each; *Oreda* White and *Nothaldonus* Broun are monotypic (Lyal, in press). All the psepholacines live in trunks and branches of mature native trees, entering when the wood is either alive or recently dead but still sound. The larval mouthparts and alimentary canal show characteristic modification for xylophagy. The diagnosis above applies to all genera (except possibly *Nothaldonus*, larvae of which are still unknown).

**Genus Psepholax** *White*, 1843: 275.

*Type species* *Psepholax sulcatus* White.

Genus *Psepholax* occurs in Chile and Australia as well as New Zealand.

**Psepholax tibialis** Broun

tibialis Broun, 1880: 482.

Fig. 611–622

Maximum dimensions 18.0×5.5 mm; head widths – 1st instar 0.8–1.0 mm, 2nd instar 1.3–1.8 mm, 3rd instar 2.4–3.0 mm. Abd I–VI with 3 dorsal folds; Abd VII and VIII with 2 folds. Cuticle coarsely spicate on dorsal folds of Abd I–V and ventrally on Abd VIII. Setae dark, moderately long. Labral tormae joined, but lacking a basal stem. Epipharyngeal lining with distal *mes* pair immediately behind middle *ams* pair on opposing surface (therefore indistinct on a slide preparation). Maxillary mala with apical margin serrate. Similar in other respects to subtribal diagnosis.

Egg dimensions 2.0×1.3 mm.


**Biology.** Some of the pit-boring weevils, such as *Psepholax sulcatus*, initiate their workings in live timber which for
one reason or another has begun to degrade. Others, e.g., *P. coronatus* White, use wood that is already dead. *P. tibialis* however selects healthy trees, and its activities appear not to result in decay. A tall, slender manuka (*Leptospermum scoparium*) studied at Huia, near Auckland, contained nine entry holes within a 2.5-m length of trunk, comprising one mature, abandoned working, three abortive sites, one active colony, and four newly initiated sites in various stages of development. In the same way as other pit-borers, *P. tibialis* places its eggs at the end of a short tunnel. The female, having chewed about twelve depressions, re-enters backwards to oviposit. The tunnels of newly hatched larvae radiate from this point before proceeding separately along the grain.

The largest tunnel observed was 65 mm long and 6.0–10.0 mm wide throughout its length. The very robust larva must have developed within this relatively small space. Detritus is pushed out through the entry hole, where a characteristic dribble of frass is the sign of a viable colony. Pupation occurs *in situ*, and emerging adults exit through the original aperture, unlike those of *P. sulcatus*, which leave the trunk peppered with individual exit holes. Two kinds of symbiotic organism are present in the alimentary canal of *Psepholacina* (Grinbergs 1962, on the Chilean species *Empleurodes dentipes* Boheman). The mycetomes surrounding the cardiac valve, frequent in Curculionidae, contain thread-like forms, and the expanded Malpighian tubule bases characteristic of *Psepholacina* and a few cossonines, e.g., *Mesites pallidipennis* Boheman, carry rod-shaped organisms. Apparently some unusual process of food assimilation may be at work.

**Subtribe Cryptorhynchina**

**Genus Mitrastethus** Redtenbacher

Type species *Mitrastethus baridioides* Redtenbacher.

Similar in general appearance to larvae of *Psepholacina*, with head creamy white and anus subdorsal, but terminal segments slightly less truncate. Head widest behind middle. Labrum trilobate. Epipharyngeal lining with *ams* at margin, not on labral surface; middle *mes* pair nearer the proximal than the distal *mes* pair. Premental sclerite medially obsolete. Hypopharyngeal bracon clear. Alimentary canal with cardiac mycetomes absent; gastric caeca ovate, not numerous; bases of Malpighian tubules simple.

Remarks. Genus *Mitrastethus* is present only in the Australian Region, with one species each in New Caledonia, Norfolk Island, Australia, and New Zealand.

**Genus Rhynchodes** White

*Rhynchodes* White, 1846: 16.
Type species *Rhynchodes ursus* White.

*Rhynchodes* is a monotypic genus not closely allied to other New Zealand cryptorhynchines. The larva of *R. ursus* stands apart by reason of its size and its spatulate premental sclerite. A general diagnosis is given below.

*Rhynchodes ursus* White

*ursus* White, 1846: 16.
‘Elephant weevil’

Fig. 633–642

Maximum dimensions 25.0×10.0 mm; head width 4.0 mm.
Body thick, sturdy, strongly curved, tapering. Cuticle finely spiculate. Setae pallid, very short except those on head and pronotum, and major pds of thorax and Abd V–IX. Setal numbers differing from modal pattern as follows: maxilla 9 dms, 5 vms; pronotum 8 setae; Th II/III 1 dls, 2 ss, pedal area 5+2 setae; Abd VIII 0 prs, 5 pds; Abd IX 4 ds. Head partially retracted, longer than wide, red-brown with pallid paramedian and lateral stripes; frons darker; oral margins, epistoma, and mandibles reddish black; endocarinal line half as long as frons; ocelli not visible. Antennae acutely conical, with 1 rod-like papilla, partially overhung. Mandibles apically bifid, with a supplementary tooth and a blunt molar projection. Labrum trilobate, pigmented medially. Tormae strong with stem as long as arms or longer. Epipharyngeal lining modally arranged, with clusters of sensilli between distal mes pairs. Premental sclerite quadrate at sides, with anterior median extension narrow, and posterior extension spatulate at apex. Hypopharyngeal bracon clear. Thoracic spiracle elongate-ovate, 3× as long as Abd VIII spiracle, with airtubes minute, simple, dorsal; Abd spiracles progressively smaller and more circular. Anus terminal, 4-lobed. Aimentary canal with anterior ventriculus occupying two-thirds of body space, folded laterally and puckered into a median longitudinal sulus; posterior section 1+1-coiled, with about 10 vermiform caeca on either side of lower coil; Malpighian tubules unusually thick; cryptonephridium symmetrical; rectal bracon membranous.

Material examined. NEW ZEALAND: BP – Mamaku, ex Dacrydium cupressinum, 26 Nov 1948, 3 larvae, 1 pupa, adults, NMW. TO – Erua, 16 Dec 1961, 4 larvae, 1 pupa, GK; Mt Ruapehu, 1100 m, ex dead trunk of Nothofagus solandri var. cliffortioides, 1 Dec 1965, 1 larva, 2 pupae, adults*, BMM. NN – Mt Arthur, 1350 m, ex dead trunk of Dracophyllum traversii, 16 Dec 1961, 9 larvae, 1 pupa, JIT, GFW.

Biology. Rhynchodes ursus oviposits in the trunk and branches of dead forest trees while the wood is still sound. By the time a generation has developed the sapwood is riddled with tunnels made by the large larvae, other invaders have followed, and fungus has entered.

Larvae of R. ursus are parasitised by the giant ichneumon wasp Ceronotus fractionervis (Vollenhoven). The emergence holes of the wasps measure 3.0–4.0 mm in diameter, whereas those of the elephant weevil measure 6.0–9.0 mm.

Remarks. In Australia the name 'elephant weevil' refers to Orthorhinus cylindrirostris (Fabricius) in Molytini.

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wood, their activity is not necessarily instrumental in the demise of the plant. *Olearia furfuracea*, for instance, often assumes a stunted, gnarled appearance when the workings and exit holes have enlarged with age and growth has continued round them. *Coprosma arborea*, *C. australis*, and *Phebalium nudum* are also recorded as host plants.

**Genus Crisius Pascoe**

*Crisius* Pascoe, 1876: 66.

Type species *Crisius binotatus* Pascoe.

Body of even width, with anus terminal; Abd I–VII with 3 dorsal folds. Setation differing from modal numbers as follows: maxilla 7 dms, 5 vms; pronotum 10 setae; Th II/III 1 dls, 2 ss, pedal area 5+2 setae; Abd I–V 2+3 pds; Abd VI–VIII 3+2 pds; Abd IX 2+2 ds. Head free, pigmented, more or less evenly rounded; postoccipital condyles right-angled; endocarinal line present; secondary ocelli absent. Antennae minute, partially overhung. Mandibles apically bifid, with cutting edge flanged; molar area bearing a small, acute tooth. Labrum rounded, pigmented mesally. Antennae strong, joined into a basal stem. Epipharyngeal lining with sensillae between distal mes pairs; proximal mes pairs arranged quadrately. Premental sclerite a distinct trident. Hypopharyngeal bracon clear. Thoracic spiracle ovate, with dorsal airtubes; Abd spiracles much smaller, circular. Alimentary canal with proventriculus simple; mycetomes present at cardiac valve; posterior ventriculus 2-coiled, with gastric caeca ovate or vermiform; Malpighian tubules arranged 4+2, slender, with bases simple; cryptonephridium asymmetrical near apex; rectal bracon a short loop.

**Remarks.** The generic diagnosis is assembled from reared larvae of *C. variegatus* Broun,*C. binotatus* Pascoe,*C. fasciculatus* Broun, and an undescribed species from the Chatham Islands. Diagnoses for *Omoecacalles Broun, Indecentia* Broun, *Mecistostylus* Lacordaire, and *Hadracalles* Broun are similar to the foregoing. *Hadracalles* (a monotypic genus from the Poor Knights islands) is distinguished from the others by its thick Malpighian tubules and lack of gastric caeca.

*Crisius variegatus* Broun

*variegatus* Broun, 1880: 501.

Fig. 654–663

Maximum dimensions 11.3×3.5 mm; head width 2.5 mm. Cuticle coarsely spiculate. Setae red-brown, tapering, of moderate length. Pronotum lightly pigmented. Head slightly produced behind, bright red-brown with darker paramedian streaks; frontal suture narrow, angled before acute apex; fs1,2,3 half as long as fs4,5; des4 half as long as des1,2,3,5. Clypeal setae subequal. Alimentary canal with about 40 gastric caeca in a multiple row on either side of lower ventricular coil.


**Biology.** Larvae of *Crisius* species are usually discovered working in dead tissue, either bark or phloem, with adult exit holes as an indication of their presence. *C. fasciculatus* on *Freycinetia baueriana* (Pandanaceae) provided a clue to the feeding pattern for the genus. Its eggs are laid in live stems and aerial roots, and the larvae feed initially in the green tissue. As the workings are extended the tissue degrades, so that older larvae are feeding on dead material. *C. variegatus* on the native passion vine *Tetrapathaea tetrandra* was in a partly dead section of a thick (70 mm diameter) stem, feeding beneath the bark. Pupae were in unlined pits chewed in the sapwood. The colony was in deep shade. This species was also found on yellow lupin (*Lupinus arboreus*) in an open sand dune situation, where older larvae were feeding subcortically in dry, dead stems. Many *Crisius* species inhabit subalpine plants, feeding in older leaves and pupating amongst their shredded remains.

**Genus Sympedius Pascoe**

*Sympedius* Pascoe, 1876: 65.

Type species *Sympedius testudo* Pascoe.

Body stout, strongly curved, of even width, with anus terminal. Setae pallid, very short or minute. Setation differing from modal numbers as follows: maxilla 7 dms, 5 vms; pronotum 10 setae; Th II/III 1 dls, 2 ss, pedal area 5+2 setae; Abd I–V 2+3 pds; Abd VI–VIII 3+2 pds; Abd IX 2+2 ds. Head free, pigmented, more or less evenly rounded; postoccipital condyles right-angled; endocarinal line present; secondary ocelli absent. Antennae exposed, broadly conical, with basal papillae.
Mandibles bidentate, apically with a small median tooth. Labrum with a 5-pointed red-brown pattern. Tormae with stem acute at apex. Epipharyngeal lining with clusters of sensilli between distal mes pairs. Premental sclerite a distinct trident. Hypopharyngeal bracon clear. All spiracles circular, with short, annulate airtubes. Abd spiracles all of similar size, smaller than Th spiracle. Alimentary canal with proventriculus 6-striated; cardiac mycetomes present; posterior ventriculus 1+1-coiled, without gastric caeca; Malpighian tubules with 2 forward-looping pairs twice as thick as the caudal pair; cryptonephridium asymmetrical near apex; rectal bracon a short loop.

**Sympedius testudo** Pascoe  
*testudo* Pascoe, 1876: 65.  
Fig. 664–673

Maximum dimensions 4.0×2.5 mm; head width 1.5 mm. Cuticle almost smooth. Setae minute except for 2 major setae on Abd VI–IX dorsum and 1 on each pedal lobe. Pronotum and head pallid; epistoma rather wide; endocarinal line one-third as long as frons; fs1,2,3 and des4 very short. Clypeal setae of unequal length. Epipharyngeal lining with mes as long as als. Tormae with stem as long as arms.


**Biology.** *Sympedius* larvae pass their entire cycle in dead small wood which has been invaded by fungus. The eggs are inserted through the thin cortex or into the sides of adult emergence tunnels. The larval workings are tightly packed with frass, and are often lined with fungus. The pupal cell is constructed near the surface, at a right angle to the working. The adult exit hole is not prepared by the larva before pupating. The thickened Malpighian tubules may contain symbiotic organisms (Stammer 1934).

**Remarks.** *Tychanus vexatus* has tormae with the stem shorter than the arms, but is similar in other respects.

**Tribe Eugnominii**

Head free, variable in shape, usually emarginate behind; frontal suture distinct, not angulate before apex; endocarinal line short and indistinct, or absent; fs1,2,3 usually minute; antennae exposed; postoccipital condyles inconspicuous or absent. Mandibles apically bifid, with a median tooth or a ridged grinding area; setae aligned longitudinally. Segmentation differing from modal numbers as follows: head 4+1 des, 2+3 fs; maxilla 6,7, or 12 dms, 5 vms; pronotum 4–8 setae; Th II/III 1 dls, 1 ss, pedal area 2+5 setae; Abd VIII 1+2 pds; Abd IX 1+1 ds; anal lateral lobe 3 setae. Labral tormae convergent, often joined in a V-shape. Epipharyngeal lining with clusters of sensilli between distal mes pairs. Premental sclerite a complete trident. Hypopharyngeal bracon usually clear. Labial palp 2-segmented. Spiracles subcircular, bicameral or unicameral, those of Th and Abd VIII subequal in size, larger than the others; Abd VIII spiracles on dorsum in front of pds; airtubes of Th dorsad, others caudad. Abd IX much narrower than Abd VIII. Anus subterminal, 6-lobed. Alimentary canal with proventriculus narrow; cardiac mycetomes absent; posterior ventriculus with 1+1 coils; gastric caeca globular, occasionally with a few vermiform caeca, or absent; cryptonephridium asymmetrical, ending in a cup-shaped membrane; rectal bracon a loop, often pigmented.

**Remarks.** The Eugnominii show a Gondwanic pattern of distribution focused in New Zealand (15-plus endemic genera) and with representatives in South America, Australia, and New Caledonia (Cawthra 1966). Habitats are as varied as those of the Cryptorhynchini. Many species develop host-specifically in live plants; the remainder are attracted to degrading tissues. Two genera have mouthparts adapted for masticating wood fibres. Adults feed on pollen of various native flowers. Females have a sclerotised ovipositor, so it is unlikely that their mandibles are used to prepare sites for the eggs. The following tribal diagnosis, based on reared larvae, refers to the New Zealand element (subtribe Eugnominina) but diverges in some respects from the Australian *Myossita* Pascoe (Meriphenia).

Twelve genera are keyed, six of which are treated in detail and figured. *Pactolotypus depressirostris* (Kirsch) from Campbell Island is diagnosed in May (1971).

**Genus Ancistropterus** White

*Ancistropterus* White, 1846: 15.  
Type species *Ancistropterus quadrispinosus* White.  
This monotypic genus is present in the North Island only. It is a representative of the xylophagous section of the tribe.
Ancistropterus quadrispinosus White

*quadrispinosus* White, 1846: 15.

Fig. 674-685

Maximum dimensions 5.5×1.5 mm; head width 1.0 mm. Body slender, of even width, strongly curved and tapering abruptly. Cuticle finely asperate dorsally on Th and Abd I–V, and ventrally on Th and Abd VIII/IX, elsewhere smooth. Setae pallid; major setae moderately long. Head subquadrate, bright red, unpatterned, with oral margins and mandibles blackish; anterior ocelli distinct. Antennae narrowly conical, pubescent. Mandibles with a ridged grinding surface. Labrum somewhat elongate, sclerotised. Tormae convergent, approximate at base. Epipharyngeal lining with *als* arranged longitudinally, parallel to tormae. Hypopharyngeal bracon completely pigmented. Maxillary mala with setal bases quadrate. Th spiracle 6- or 7-annulate. Abd spiracles unicameral, 3- or 4-annulate. Alimentary canal lacking gastric caeca.

Material examined. NEW ZEALAND: AK – Huia, in old log, 15 Aug 1971, 50 larvae, 2 pupae, 6 adults*, BMM. RI – Mt Ruapehu, 830 m, in dead stump of *Nothofagus fusca*, 31 Oct 1970, 15 larvae, 1 pupa, BMM.

Biology. Larvae of *Ancistropterus* were feeding in the undecayed parts of trunk wood, where their workings were filled with soft, buttery frass. Their mouthparts, as in *Psepholacina*, are modified for chewing hard, woody fibres. Pupation occurs in situ. In October, adults were found feeding on pollen of *Leptospermum* flowers.

Remarks. *Ancistropterus* is closely resembled by *Rhopalomerus* Blanchard (*R. nobilis* (Broun) examined), larvae of which are found in soft, dead wood. Although the mandible has a median grinding surface and the hypopharyngeal bracon is partially pigmented, the modifications do not extend to the labrum. This genus likewise has unicameral Abd spiracles.

Genus Gonoropterus Broun

*Gonoropterus* Broun, 1904: 122.

Type species *Gonoropterus spinicollis* Broun.

The monotypic genus *Gonoropterus* is endemic in the North Island. It is linked by biology and larval conformation with *Curculio* Linnaeus, which is represented in Australia and has larvae which feed in fruits and nuts of various kinds.

Gonoropterus spinicollis Broun

*spinicollis* Broun, 1904: 122.

‘Nestegis weevil’

Fig. 686–694

Maximum dimensions 7.0×3.0 mm; head width 1.0 mm, length 1.3 mm. Body sturdy, convex, widest behind middle, slightly recurved. Cuticle minutely asperate. Setae pallid, short to minute. Head ovate, longer than wide, slightly produced behind, red-brown, unpatterned, with oral margins and mandibles blackish; postoccipital condyles conspicuous; anterior ocelli distinct. Antennae narrowly conical, pubescent. Mandibles bifid, with a small median projection. Labrum evenly rounded. Tormae Y-shaped, with stem half as long as arms. Epipharyngeal lining with all setae strong. Th spiracles 7- or 8-annulate; Abd spiracles 3- or 4-annulate. Alimentary canal with proventriculus slightly expanded; anterior ventriculus transversely rugose; posterior ventriculus with 12–15 glosse gastric caeca.


Biology. *Gonoropterus spinicollis* is host-specific to *Nestegis* (Oleaceae). It probably breeds on all four species, but I have found larvae on only *N. cunninghamii* and *N. lanceolata*. Its biology was followed through irregular sampling of *N. lanceolata* fruits from Destruction Gully, Huia. Young larvae were found in early January in prematurely yellowed fruit. Up to four oviposition sites were visible on the cuticle. The workings showed that first-instar larvae had fed in the fleshy mesocarp before approaching the nut, where several had died while chewing through the tough shell (endocarp). In May, first- and second-stage larvae were still present, often two together in the same kernel. By July the ripening fruits were becoming juicy. Mature larvae, one survivor to a fruit, were occupying the eaten-out cavities. Two weeks later some prepupae had made incomplete exit holes at the stem end. The prepupal period can be prolonged, and pupation was not observed until early December. Adults emerged during summer.

The weevil *Peristoreus rufirostris* (Broun) was utilising *Nestegis cunninghamii* fruits at the same time (December) as *Gonoropterus*. The larvae fed only in the mesocarp, and left the fruit to pupate in the soil.

Remarks. *Gonoropterus* is distinguished from Curculionini by its glosse gastric caeca and united labral tormae.
Genus *Hoplocneme* White

*Hoplocneme* White, 1846: 14.
Type species *Hoplocneme hookeri* White.

*Hoplocneme* is distributed throughout New Zealand, occupying along with *Pactola* Pascoe and *Pactolotyphus* Broun dead or degrading twigs and small branches.

*Hoplocneme inaequale* Broun

*inaequale* Broun, 1893: 1229.

Fig. 695–704

Maximum dimensions 6.0×1.3 mm; head width 0.9 mm. Body slender, of even width, gently curved. Cuticle mostly smooth, but minutely asperate on dorsum. Setae pallid; major setae moderately long, others minute. Head subquadrate, strongly depressed, emarginate behind, yellow-brown, unpatterned, with oral margins and mandibles blackish; ocelli indistinct. Antennae narrowly conical, pubescent. Mandibles apically bifid, with 2 median incisor teeth. Labrum slightly lobed, unpigmented. Tormae slender, almost contiguous at base. Epipharyngeal sensilli in clusters of 2. Maxilla with 7 dms. Th spiracles 10- or 11-anulate; Abd spiracles 6- or 7-anulate. Alimentary canal with 2 sets of gastric caeca, 4 vermiform followed by 12–14 globular on lower coil.

Material examined. NEW ZEALAND: AK – Huia, from galls in live vines of *Clematis paniculata*, 6 Jul 1968, 10 larvae*, BMM; Whatipu, from gall in live trunk of *Hoheria populnea*, 12 Aug 1968, 3 larvae, 1 pupa, BMM; Whanganui, from galls in live branches of *Nestegis lanceolata*, 29 Feb 1972, 12 larvae*, BMM. TO – Taihape, from *Clematis paniculata*, 12 Nov 1968, 23 larvae, 1 pupa, 2 adults*, BMM.

Biology. Larvae of *H. inaequale* were found in withered shoots of *Coprosma serrulata*, a low-growing shrub in the fell-fields of Arthurs Pass. Eggs are inserted beneath the leaf bracts, and the larvae tunnel in the pith, working towards the tips. They pupate in the workings.

Remarks. Genus *Pactola* is similar to *Hoplocneme* in most respects, including the pattern of gastric caeca.

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Genus *Nyxetes* Pascoe

*Nyxetes* Pascoe, 1870: 456.
Type species *Cricotus bidens* Fabricius.

*Nyxetes* is a monotypic genus from the North Island and the Nelson region. It develops in live tissue on a limited range of host plants. Two autapomorphies distinguish the larva from all other eugnemies: (1) the labrum is subquadrate, with parallel sides; (2) the maxillary mala bears 11–13 dms, by comparison with 6 or 7 dms in other genera.

*Nyxetes bidens* (Fabricius)

*bidens* Fabricius, 1792: 420 (*Curculio*).

Fig. 705–714

Maximum dimensions 8.0×2.5 mm; head width 1.25 mm. Body very robust, widest behind middle, recurved. Cuticle coarsely spiculate on dorsum of Th II to Abd VII. Setae red-brown; major setae strong. Head small relative to body size, subquadrate, depressed, emarginate behind, bright red-brown, unpatterned, with oral margins and mandibles red-black; postoccipital condyles acute, dark at apex; both primary and secondary ocelli with cornea. Antennae broadly conical, pubescent. Mandibles bifid, with small median projections. Labrum completely sclerotised, narrow, half as wide as clypeus, with sides straight, parallel; front margin evenly rounded. Tormae approximate at base. Epipharyngeal lining with distal mes pair on margin between an's pairs; sensilli in clusters of 2. Maxillary mala with 11–13 dms, 6 vms. Th spiracles 11- or 12-anulaute; Abd I–VII spiracles 6–8-anulate. Alimentary canal with 8 or 9 globular gastric caeca; rectal bracan a pigmented loop; cryptonephridium undeveloped; Malpighian tubules rejoining at rectum.

Material examined. NEW ZEALAND: AK – Huia, from galls in live vines of *Clematis paniculata*, 6 Jul 1968, 10 larvae*, BMM; Whatipu, from gall in live trunk of *Hoheria populnea*, 12 Aug 1968, 3 larvae, 1 pupa, BMM; Whanganui, from galls in live branches of *Nestegis lanceolata*, 29 Feb 1972, 12 larvae*, BMM. TO – Taihape, from *Clematis paniculata*, 12 Nov 1968, 23 larvae, 1 pupa, 2 adults*, BMM.

Biology. Developing larvae of *Nyxetes* live in an apparently symbiotic relationship with mealybugs: *Paracoccus deboerae* on *Clematis* and *Cricococcus comatus* on *Nestegis*. Young larvae feed on green tissue such as new callus growth around cicada wounds. As the workings enlarge, they become lined with a black fungoid substance, and mealybugs are present. A small hole is made for the extrusion of frass. Final-stage larvae inhabit a subspherical cavity, usually visible on the surface as a gall. It is still lined with black fungus and shared with mealybugs, which are often pressed behind the recurved end of the larva so that their flocculence becomes abraded. Comparatively little plant tissue is removed, and the larvae appear to feed by scraping the inner surface of the cavity, which in turn makes fresh cells available for the mealybugs. In the alimentary canal an unusual type of excretory process is indicated by the caudally arranged Malpighian tubules, which rejoin the hind gut at the rectal bracan (Fig. 714).
instead of anastomosing to form a cryptonephridium. On *Nestegis*, when a sliver of gall was removed, the larva repaired the damage within 20 minutes with masticated, semiliquid material. Pupation takes place within the gall.

**Genus Oreocalus Marshall**

*Oreocalus* Marshall, 1943: 118.

Type species *Oreocharis nigriceps* Broun.

Genus *Oreocalus* occurs throughout New Zealand. Its many species are confined to live plants of the genus *Hebe*. The majority are stem miners, characterised by a small globose head and elongate body shape. *O. hebe*, which constructs terminal galls of rolled leaves, is short and convex.

*Oreocalus albosparsus* (Broun)

*albosparsus* Broun, 1912: 126 (*Oreocharis*).

Fig. 715–724

Maximum dimensions 11.0×2.0 mm; head width 0.75 mm. Body very elongate, of even width, slightly curved; pigmented oenocytic clusters conspicuous laterally. Cuticle smooth; Th with circular pedal lobe lightly sclerotised; Abd IX ds and ps on pigmented tubercles. Setae short, pallid; minor setae minute. Head small, sub spherical, only slightly emarginate behind, dark smoky brown with a paler lateral stripe; oral margins and mandibles black; endocarpinal line present; postoccipital condyles absent; both pairs of ocelli distinct. Antennae narrowly conical, rather elongate. Mandibles short; incisor section a curved blade below apical teeth. Labrum truncate, with setae short, subequal. Tormae approximate at base. Epipharyngeal lining with 4 mes pairs, the distal pair close together immediately below inner ans pair. Th spiracles 10- or 11-annulate; Abd spiracles not much smaller, 7- or 8-annulate. Alimentary canal with 10–12 globular gastric caeca in a single row on either side of lower coil.

**Material examined.** NEW ZEALAND: AK – Huia, in live stems of *Hebe macrocarpa*, 10 Jul 1966, 15 larvae, 2 pupae, 1 adult*, BMM; 10 May 1968, 10 larvae, BMM.

**Biology.** The life history given below is representative of the various *Oreocalus* which develop as stem miners in all *Hebe* species, from sea level to the subalpine zone. Eight species have been reared, five of them undescribed (May 1987). The eggs are placed in terminal or lateral leaf buds. Newly hatched larvae work spirally downwards beneath the cortex to occupy eventually the entire lumen of the stem, by which time the shoot above the working has wilted and drooped. Pupation takes place in a cell blocked off at either end by shredded fibres. A partial exit hole is prepared, leaving the cortex entire.

Pupae are parasitised by a proctotrupid. *O. hebe* makes a terminal bud-gall; an account of its biology is given by Gourlay (1964).

**Genus Scolopterus White**

*Scolopterus* White, 1846: 14.

Type species *Scolopterus tetracanthus* White.

Genus *Scolopterus* requires degrading plant material for larval development, and the two species I have reared appear to be specific in their preference for *Pseudopanax* bark (*S. penicillatus* White) and for the tree fern *Cyathea* (*S. aequus* Broun). *Scolopterus* and *Stephanorhynchus* White are so alike as larvae that I can find only two stable characters, excepting pigmentation and size, to separate them. (1) In *Scolopterus* the *pds* pattern on Th II/III is short, long, short, long, whereas in *Stephanorhynchus* it is short, short, long, long. (2) On the head capsule *fs1,2,3* of *Scolopterus* are minute, whereas in *Stephanorhynchus* they are well developed. Both genera occur together in dead bark of *Pseudopanax arboreus*.

*Scolopterus aequus* Broun

*aequus* Broun, 1880: 473.

Fig. 725–734

Maximum dimensions 9.0×3.0 mm; head width 1.3 mm. Body fairly robust, of even width, with strong musculature. Cuticle minutely asperate. Setae pallid; major setae moderately long. Head subquadrate, slightly emarginate behind, pale red-brown, with oral margins and mandibles darker; only primary ocelli visible. Antennae broadly conical. Mandibles apically bifid, with a median projection. Labrum trilobate. Tormae with base narrowly joined, bifurcate. Epipharyngeal lining with inner als pair away from margin. Th and Abd VIII spiracles 12–14-annulate; Abd I–VIII spiracles half as large, 5–7-annulate, dorsocaudal. Alimentary canal with gastric caeca numerous, globular, about 40 in a double row on either side of lateral and lower parts of posterior coil.

**Material examined.** NEW ZEALAND: AK – Waitakere Ra., in dead rhachides of *Cyathea dealbata*, 11 Nov 1964, 9 larvae*, BMM. NN – Nelson, Whangamoa Hill, in dead rhachis of *Cyathea dealbata*, 13 Apr 1966, 9 larvae, pupal cocoon, JIT, JCW.
Biology. *Scolopterus aequus* has been reared in the dead, dry rhachides (midribs) of the tree fern *Cyathodes dealbata*. Larvae work in the central cavity, leaving the pith between the outer fibres to the smaller inhabitants, mainly Cossoninae. Development is rather slow. A partly grown larva found in mid July did not pupate until late October. A cocoon is made from shredded fibres and cemented inside. The pupal period occupies 2 weeks. A 4.0 mm exit hole is chewed by the emerging adult.

Remarks. *Scolopterus penicillatus* White develops in recently dead bark of *Pseudopanax (=Nothopanax)* (Araliaceae). The larva figured in Cawthra (1965), however, is that of a *Stephanorhynchus*, probably *S. curvipes* White, which utilises this same habitat. Here is an instance where larval association with adults or pupae is not reliable for identification. The larval description given in the text fits both genera.

Tribe Gymnetrini

The tribe Gymnetrini, of which *Gymnetron* Schoenherr is the largest genus, is predominantly European, but several species associated with weeds have become widespread. *Gymnetron pascuorum* (Gyllenhal) was discovered in New Zealand in 1971. Larvae of seven *Gymnetron* species are included in Emden’s (1938) “Key to the subfamilies and tribes of weevil larvae with two tergal folds”. Scherf (1964) gives biological information for fifteen species, and describes six of them. Anderson (1973) provides a key to the three genera (including *G. pascuorum*) present in North America. Although the biology of Gymnetron, all of which develop in the live tissue of herbaceous plants, resembles that of many Curculionini, the larvae themselves are strongly divergent. They are distinguished by the following characters: (1) abdominal segments with 2 dorsal folds; (2) labial palpi 1-segmented; (3) Abd spiracles often unicameral; and (4) pedal lobes grossly expanded. Gymnetrini, although separated radically from Apioninae by an incomplete frontal suture, nevertheless show an affinity with that group by reason of the first three features mentioned above. Their mode of life is also similar.

Genus Gymnetron Schoenherr

*Gymnetron* Schoenherr, 1825: 587.

Type species *Curculio beccabungae* Linnaeus.

Body small, less than 6.0 mm long, tapering; Abd segments with 2 dorsal folds, and thorax with expanded, sclerotised pedal lobes. Head free, subcircular in outline, variously pigmented; frontal suture incomplete in front, not reaching mandibular membrane; endocarinal line present; fs4 and fs5 subequal; antennae exposed, narrowly conical. Mandibles short, broad, apically bifid, with 2 setae aligned longitudinally. Labrum more or less evenly rounded, often fused with clypeus. Labial palps 1-segmented. Abd spiracles unicameral, caudal; Abd VIII spiracle sometimes obsolete. Anus terminal, X-shaped.

Remarks. The generic diagnosis takes into account the work of Emden (1938, p. 21), Scherf (1964), and D.M. Anderson (1973).

*Gymnetron pascuorum* (Gyllenhal)

*pascuorum* Gyllenhal, 1813: 124 (*Rhynchaenus*).

Fig. 735-744

Maximum dimensions 2.3×0.9 mm; head width 0.5 mm. Cuticle invested with coarse skin-points, giving a granular appearance; dorsopleural lobes of Th II/III and Abd I–VII expanded into a soft tubercle above the setae. Setae pallid, fine, mostly minute but longer on head and thorax, apparently in modal numbers. Head pale yellow, with margins and mandibles reddish; frontal suture not visible; des1,2,3,5 and fs1,4,5 subequal. Labrum fused with clypeus, unpigmented; setae mesad, near front margin. Epipharyngeal lining with setae clustered frontomesad. Tormae obsolete. Maxillary palps short; basal segment incompletely pigmented in front. Premental sclerite V-shaped. Postlabium smooth, with mid-pair of setae 4× as long as the others. Thoracic spiracle and 8 pairs of Abd spiracles all unicameral, 3–5–annulate. Alimentary canal with proventriculus narrow; 2 large cardiac mycetomes present; anterior ventriculus smooth; posterior ventriculus 1-coiled, lacking gastric caeca; Malpighian tubules 4+2; cryptonephridium short, symmetrical.

Material examined. New Zealand: AK – Henderson, in seed capsules of *Plantago lanceolata*, 15 Dec 1971, 45 larvae, 12 pupae, 18 associated adults, BMM.

Biology. Adults of *G. pascuorum* were discovered in June 1971 during a routine inspection of kiwifruit (*Actinidia delicosa*) packaged for export. They were subsequently found on a Henderson, Auckland property, overwintering on both kiwifruit and grape vines. In early November adults were abundant on the heads of *Plantago lanceolata* (long-leaved or ribwort plantain), and young larvae were in the fruits. By mid December, when the seeds were in all stages of maturity, larvae, pupae, and emergent adults were
present. A larva consumes the entire content of one capsule before pupating in situ. There was no evidence from empty capsules with exit hole to suggest that larvae migrate. The adult emerges by lifting the top of the capsule. Plantago heads had mostly shed their seeds by mid January, and adults had moved back to vines and hedgerow shrubs.

The few larvae that remained were parasitised by a hymenopteran, *Mesopolobus incultus* (Walker). This pteromalid is recorded from plantain seed in Europe, but is also known to be a secondary parasite of *Apion* on *Trifolium repens* (E.W. Valentine, pers. comm.).

**Tribe Curculionini**

The following characters are held in common: (1) cuticle microasperate in transverse series, or occasionally spicate; (2) postoccipital condyles acute; (3) fs1,2,3 minute or absent, and fs4 longer than fs5; (4) antennae fully exposed; (5) endocarinal line present; (6) mandibular setae aligned longitudinally; (7) labral tormae subparallel or slightly convergent; (8) postlabium with proximal pairs of setae equidistant; (9) Th II/III with pds arranged short, short, long, long; (10) Abd VIII with 3 pds; (11) all spiracles bicameral; (12) Abd spiracles with airtubes caudad; (13) Abd VIII spiracle on dorsum.

**Remarks.** Members of the tribe Curculionini, known as 'flower weevils', occupy niches in all parts of living plants. Many utilise the inflorescence for oviposition, their larvae feeding in unopened buds or in the flowers, penetrating to the ovary with its developing seeds. Some species enter when the fruits are nearing maturity, and although most of them are small, less than 5.0 mm long, some of the seed (nut)-feeding larvae in genus *Curculio* Latreille reach 15.0 x 5.0 mm or more. Other species are stem borers and leaf miners. All are host-specific at the plant genus level.

There are approximately 100 endemic species, spread through the literature in various subfamilies and brought together in Curculionini(-ae) in Kuschel (1981). The systematics of the New Zealand element is overdue for revision, and therefore, with the exception of *Peristoreus* Kirsch, generic diagnoses have not been attempted. The six genera studied here are representative of different habitats. *Peristoreus innocens* Kirsch and *Notinus aucklandicus* Kuschel are diagnosed and figured in May (1971).

**Genus Peristoreus Kirsch**

*Peristoreus* Kirsch, 1877: 270.

*Type species Peristoreus innocens* Kirsch.

Body moderately robust, tapering, less than 10.0 mm long, usually about 5.0 mm; Abd VIII/IX with dorsum depressed. Cuticle minutely asperate in transverse series. Setae pallid, inconspicuous. Setation differing from modal numbers as follows: maxilla 6–8 dms, 5 vms; pronotum 4+5 setae; Th II/III 1 dls, 2 ss; pedal area variable; Abd VIII 1+2 pds; Abd IX 1+1 ds. Head free or slightly retracted, sub-circular in outline; postoccipital condyles acute. Labrum slightly lobate, with anterior setae as long as discal setae. Epipharyngeal lining arranged modally, with clusters of sensilli in front of median mes pair. Hypopharyngeal bracon clear.

**Remarks.** This diagnosis is based on slide-mounted specimens of seven species from a variety of habitats.

*Peristoreus grossus* (Broun)

grossus Broun, 1893: 1224 (*Dorytomus*).

Fig. 745–754

Maximum dimensions 9.0 x 3.0 mm; head width 1.35 mm. Body widest at middle. Fat-body dense white. Head pale red, with a darker paramedian stripe; oral margins and mandibles red-black; frontal suture narrow, distinct; endocarinal line two-thirds as long as frons; ocelli faint; antennae broadly conical, with 5 basal papillae. Mandibles slender, apically bifid. Pronotum lightly pigmented, darker in front. Labrum distinctly trilobate, pigmented in proximal half; lateral setae half as long as anterior setae. Labral tormae slender, arcuate. Epipharyngeal lining with all setae well developed. Premental sclerite a complete trident. Th spiracles with airtubes 12-annulate, obliquely dorsad; Abd spiracles 8–or 9-annulate, caudad. Anus terminal, 6-lobed. Alimentary canal with proventriculus narrow; cardiac mycetomes absent; anterior ventriculus smooth; posterior ventriculus almost as wide, with 1+1 coils; gastric caeca vermiform, translucent, 30–40 in a single row on either side; Malpighian tubules 4+2; cryptonephridium symmetrical, elongate; rectal bracon a membranous ring.

**Material examined.** NEW ZEALAND: NN-Mt Arthur, 1050 m, in spent rhachides of *Dracophyllum traversii*, 14 Dec 1961, 11 larvae, JIT, GFW; 16 Nov 1969, 9 larvae*, BMM; 3 Feb 1982, 11 larvae*, JSD.

**Biology.** The species of *Peristoreus* are mainly associated with the reproductive parts of plants — buds, flowers, and fruits — but a few inhabit the thick, durable axis (rhachis) of certain plants. *P. trilobus* (Pascoe), for instance, has been reared from the succulent stems of *Collospermum hastatum* and *Astelia fragrans* (Liliaceae).
**P. grossus** is the largest representative of this endemic genus; its host plant *Dracophyllum traversii* (Eucryphiaceae) is the largest of the grass trees, with an inflorescence up to 30 cm long and a rhachis 4 cm in diameter at the base. The eggs of *P. grossus* are inserted at the basal leaf axils. After tunnelling in the cortex the larvae feed in the degrading rhachis. Panicles gathered on Mt Arthur in February 1982 had finished flowering, and were harbouring larvae in all stages from first instar to prepupa. Seven months later these heads still contained final-instar larvae. Pupation takes place in situ. Adults emerge throughout the summer.

Three smaller species of *Peristoreus*, as yet unnamed, occupying a similar habitat have been reared from *Dracophyllum traversii* at Arthur’s Pass, NC–WD; *D. latifolium* on the Urewera Range, BP and Mt Pirongia, WO; and *D. matthewsii* on Mt Moehau, CL.

**Genus Aneuma Pascoe**

*Aneuma Pascoe*, 1876: 56.

Type species *Aneuma fulvipes* Pascoe.

Genus *Aneuma*, as applied at present, contains species whose larvae have been reared from unopened buds (*A. fulvipes*), flowers (*A. rubricale* (Broun)), developing seeds (*A. compta* Broun), and leaf-mines (*A. spinifer* Broun).

*Aneuma compta* Broun

*Broun*, 1885: 387.

Fig. 755–765

Maximum dimensions 5.0×1.5 mm; head width 0.7 mm. Body slender, evenly curved, tapering. Fat-body dense. Maximum dimensions 6.0×1.0 mm; head width 0.5 mm. Body slender, elongate, of even width. Cuticle minutely spiculate on dorsal folds, coarsely spiculate on Abd VIII/IX, smooth ventrally. Setae pallid; major setae moderately long, minor setae reduced in number. Setation differing from modal numbers as follows: head 1+3 fs, 3+2 ds; maxilla 6 dms, 5 vms; pronotum 4+3 setae; Th II/III 1 ds, 1 ss, pedal area 2+5 setae; Abd VIII 1+2 pds; Abd IX 1+2 ds. Head subglobose, emarginate behind, pale red-brown, unpatterned but with margins and mandibles darker; frontal suture distinct; endocarinal line half as long as frons; primary ocelli large, with raised corneae; antennae broadly conical, with 3 basal papillae. Mandibles slender, apically bifid. Pronotum lightly pigmented. Labrum indistinctly trilobate, pigmented in basal half; anterior setae longer than discal setae. Labral tormae short, thick, convergent. Epipharyngeal lining with middle mes pair wider apart than the other 2 pairs; setae otherwise modally arranged. Premental sclerite a complete trident. Hypopharyngeal bracen clear. Spiracles of Th and Abd VIII larger than those of Abd I–VII. Anus terminal. Alimentary canal lacking cardiac mycetomes; anterior ventriculus smooth, posterior ventriculus loosely 2-coiled, with 6–8 gastric caeca, longer than diameter of tube, on either side; Malpighian tubules 4+2, slender. Cryptonephridium weak; rectal bracen a membranous ring.

**Material examined.** NEW ZEALAND: AK—Mt Albert, in green fruits of *Hoeheria populnea*, 30 Mar 1972, 40 larvae, 3 pupae*, BMM; Parau, 4 Apr 1972, 14 larvae, BMM; Laingholm, 1 Mar 1978, 20 larvae, BMM.

**Biology.** Flowers of *Hoeheria* (lacebark) appear in late summer and the fruits in March. Females of *Aneuma compta* wait until the petals have dropped and wings have formed on the developing fruits before ovipositing. Then a single egg is inserted at the base of a wing. The growing larva, having consumed the contents of the first carpel, chews its way through to an adjoining one. During April fully fed larvae drop to the ground to pupate. Once the cell is constructed the prepupal stage is somewhat prolonged, and in Auckland adults were emerging from late July.

**Genus Phorostichus Broun**

*Phorostichus* Broun, 1882a: 409.

Type species *Pachyodon linearis* Broun.

This leaf-mining genus occurs throughout New Zealand on many species of *Astelia* and on *Collospermum hastatum* (Liliaceae).

*Phorostichus linearis* (Broun)

*Broun*, 1881: 705 (*Pachyodon*).

Fig. 766–776

Maximum dimensions 6.0×1.0 mm; head width 0.5 mm. Body slender, elongate, of even width. Cuticle minutely spiculate on dorsal folds, coarsely spiculate on Abd VIII/IX, smooth ventrally. Setae pallid; major setae moderately long, minor setae minute; pds reduced in number. Setation differing from modal numbers as follows: head 1+3 fs, 3+2 ds; maxilla 6 dms, 5 vms; pronotum 4+5 setae; Th II/III 1 ds, 1 ss, pedal area 2+5 setae; Abd VIII 1+3 pds; Abd IX 1+2 ds. Head subcircular in outline, depressed, emarginate behind, orange-brown with a pallid paramedian stripe; margins and mandibles darker; frontal suture distinct; endocarinal line half as long as frons; primary ocelli large, with a raised cornea; antennae narrowly conical, with 4 slender papillae at base. Mandibles apically bifid. Pronotum lightly pigmented. Labrum more or less truncate, with all setae of similar
length. Tormae short, subparallel. Epipharyngeal lining with als curving inwards from margin, otherwise modally arranged. Premental sclerite a complete trident. Postlabium lightly sclerotised. Hypopharyngeal bracon clear. Spiracles of Th and Abd VIII larger than those of Abd I–VII. Anus subterminal, 4-lobed. Alimentary canal similar to that of *Aneuma compta* except 12 gastric caeca in a cluster on either side of posterior ventriculus.

**Material examined.** NEW ZEALAND: AK – Huia, in leaves of *Astelia trinervia*, 14 Nov 1971, 63 larvae, 6 pupae, 4 adults*; Mt Auckland, Glorit, in *Collospermum hastatum*, 17 Nov 1973, 11 larvae, 1 pupa*; Huia, in *Astelia solandri*, 12 larvae, BMM. NN – Nelson, Brook Reservoir, 300 m, in *Astelia fragrans*, 14 Sep 1971, 8 larvae*, JSD. BR – Greymouth, Mawhera State Forest, in *Astelia fragrans*, 6 Nov 1971, 14 larvae, 2 pupae*, JSD.

**Biology.** The larvae of *Phoristochus linearis* are leaf-miners which live communally in the strap-like leaves of *Astelia* and *Collospermum*. In *Astelia* the initial working utilises the tissue between two parallel costae (veins). Up to twelve larvae have been counted, apparently of similar age, and as they grow the feeding area is extended sideways to take in three or four costae, as well as lengthways up to 50 cm. This linear mine shows up as a brown streak in the green leaf blade. Pupation takes place in situ, in cells blocked off with scraped fibres. Adults emerge from November through to April. They feed elsewhere and are rarely found on the plant. In the softer leaves of *Collospermum hastatum* the working becomes more open, resembling the communal blotch-mines of *Peristoreus discoideus* (Broun) seen on *Griselinia* species. In *Astelia* the distance between the leaf surfaces (about 1.0 mm) is such that the larval head capsule is easily accommodated and it has not acquired the modifications apparent in other leaf-miners. In the later stages the larvae are highly mobile inside the mines, and the coarsely spiculate cuticle would provide the friction necessary for vigorous movement.

**Genus Hypotagea Pascoe**

*Hypotagea* Pascoe, 1876: 61.
Type species *Hypotagea rubida* Pascoe.

**Hypotagea concolor** (Broun) new combination

Fig. 777–787

*concolor* Broun, 1881: 710 (*Erirrhinus*) [n. comb. fide G. Kuschel].

Maximum dimensions 4.0×1.0 mm; head width 0.5 mm. Body slender, tapering, slightly curved. Cuticle minutely asperate in transverse linear series; medio-sternal and pedal areas of Th I pigmented. Setae dark; major setae moderately long, minor setae minute. Setation differing from modal numbers as follows; head 0 fs, 1 des, 1 les; maxilla 6 dm, 5 vm; pronotum 5+2 setae; Th II/III 1 ds, 1 ss, pedal area 2+3 setae; Abd VIII 1+2 ds; Abd IX 1+2 ds. Head dusky brown, partially retracted, depressed, deeply emarginate behind; postoccipital condyles conspicuous; frontal suture distinct; coronal suture half as long as frons; endocarinal line strong, dark; ocelli obsolete; antennae broadly conical, with 4 basal papillae. Mandibles apically bifid. Pronotum dusky brown. Labrum trilobate, with anterior setae 3× as long as the other 2 pairs. Tormae short, dark, subparallel. Epipharyngeal lining with distal mes pair close together. Premental sclerite distinct at sides, and with elongate median extensions. Postlabium sclerotised. Hypopharyngeal bracon indistinct. Spiracles of Th and Abd VIII 6–9–annulate; Abd I–VII spiracles smaller, 4- or 5-annulate, caudal. Alimentary canal bearing 4 gastric caeca on either side of posterior ventriculus, otherwise similar to that of *Aneuma compta*.

**Material examined.** NEW ZEALAND: AK – Little Barrier I., Summit Track, in leaves of *Nothofagus truncata*, 5 Oct 1975, 5 larvae*, BMM; Hunua Ra., Mangatangi Vly, 3 Nov 1981, 42 larvae, 2 pupae*, BMM.

**Biology.** *Hypotagea concolor* is a leaf-miner in *Nothofagus truncata* (hard beech). A single egg is cemented into the rolled tip of a young leaf (Fig. 787), the female having first broken the margin by chewing. The site is marked by a pink colour reaction. The larva feeds for about 3 weeks, making a blotch-shaped mine. Prepupae exit from the leaf to pupate amongst surface litter. The cycle from egg to adult took between 8 and 9 weeks during early summer.

Another leaf-miner, *Neomyctapulicaris* Pascoe, may be present at the same time. It is distinguished by larvae which are pale-headed, with a circlet of setae on the Abd VIII dorsum (Fig. 798) and by the insertion of its egg in the middle of a leaf blade beside the main vein. Both these weevils probably feed on all four endemic species of *Nothofagus*.

**Genus Neomycta Pascoe**

*Neomycta* Pascoe, 1877: 145.
Type species *Neomycta pulicaris* Pascoe.
**Neomycta rubida** Broun

rubida Broun, 1880: 457.

Fig. 788–797

Maximum dimensions 4.0×1.5 mm; head width 0.5 mm. Body widest in anterior half, tapering; pleural lobes prominent, and Abd VIII dorsum produced caudad. Cuticle minutely asperate in transverse linear series. Setae pallid; major dorsal and pleural setae moderately long, others minute. Setation differing from modal numbers as follows: head 0 fs, 2 dls, 1 les, maxilla 6 dms, 5 vms; labrum 2 lrms; pronotum 4 setae; Th II/III 1 dls, 1 ss, pedal area 2+5 setae; Abd VII 0 pds; Abd VIII 3 pds; Abd IX 3 ds. Head dusky yellow, deeply retracted; posterior emargination reaching frontal suture; postoccipital condyles prominent; frontal suture distinct; coronal suture absent; endocarinal line dark, as long as frons; ocelli obsolete; antennae broadly conical, with 3 basal papillae. Mandibles bidentate, with a median projection. Pronotum pallid. Labrum truncate, with short setae. Tormae slender, dark, subparallel. Epipharyngeal lining with distal mes pair as wide apart as the other 2 pairs and of similar size. Premental sclerite broken before middle; posterior extension elongate. Postlabium with basal plbs as long as middle pair and equidistant. Hypopharyngeal bracon distinct. Spiracles of Abd I–VII similar in size to Th spiracle, ventrocaudad, level with dorsopleural lobes. Paired spiracles of Abd VIII larger, 7–9-annulate, close together at apex of dorsal lobe. Alimentary canal without cardiac mycetomes or gastric caeca.

Material examined. NEW ZEALAND: AK – Huia, ex young leaves of *Metrosideros fulgens*, 8 Dec 1972, 25 larvae*, BMM; Mt Albert, ex young leaves of *M. kermadecensis*, 5 Aug 1974, 12 larvae, 1 pupa, 4 adults*, JSD. SD – Queen Charlotte Sound, Ship Cove, ex young leaves of *M. fulgens*, 30 Nov 1972, 6 larvae, JSD.

Biology. *Neomycta rubida* is a leaf-miner associated with the medium- to large-leaved species of *Metrosideros* such as *M. robusta* (northern rata), *M. excelsa* (pohutukawa), *M. umbellata* (southern rata), *M. kermadecensis* (Kermadec rata), and the scarlet climbing rata *M. fulgens*. Oviposition follows immediately on the growth of new foliage. A single egg is inserted into the blade of young leaves, where larval feeding results in a blotch-shaped mine. The larvae are able to transfer from one leaf to another if food runs short. Development occupies about 3 weeks, and pupation takes place on the ground; adults emerge during summer.

Remarks. In *Neomycta plicaris*, which is sympatric with *Hypotagea concolor* in hard beech, the Abd VIII spiracles are set in a depressed disc (Fig. 798), and on the head capsule the posterior emargination does not obliterate the coronal suture.

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**Genus Geochus** Broun

*Geochus* Broun, 1882b: 128.

Type species *Geophilus inaequalis* Broun.

*Geochus* comprises about twenty-five species of very small weevils living on the forest floor. Because the adults are considerably modified, the systematic position of the genus has always been uncertain – it has been placed by various authors in groups such as Cylindrorhinidae, Eriphiniidae, Hylobiinae, and Diabatharini. The problem has at last been resolved with the discovery by J.S. Dugdale in 1990 that the larva of *G. tibialis* Broun is a miner of dead leaves on the ground. Larval morphology is closely akin to that of *Rhamphus oxyacanthus* Marshall and *Rhynchaenus pallicornis* (Say), both of which I have examined, and to the Rhynchaenini figured by Emden (1938) and Scherf (1964). Moreover, as described on p. 13, *Geochus* represents the climax of a morphological regression among the New Zealand element of Curculionini (May 1992).

**Geochus tibialis** Broun

tibialis Broun, 1893: 1465.

Fig. 799–808

Maximum dimensions 2.0×1.0 mm; head width 0.4 mm. Body depressed, tapering, widest behind thorax; dorsopleural lobes prominent; dorsal folds obsolete. Cuticle minutely spiculate in linear series on dorsum of Th III and Abd I–VII, and ventrally on Abd VIII/IX. Setae pallid, very short to minute. Setation differing from modal numbers as follows: head 0 fs, 1 des, 1 les, 0 ves; mandibles 1 seta; labrum 2 lrms; maxilla 6 dms, 5 vms; pronotum 1+4 setae; Th II/III 1 dls, 0 ss, pedal area 2+2 setae; Abd I–VII 4 pds; Abd VIII 3 pds; Abd IX 3 ds. Head red-brown, unpatterned, retracted, strongly depressed; posterior emargination reaching frontal suture; postoccipital condyles conspicuous at epicranial apices; frontal suture distinct; endocarinal line strong, dark, as long as frons; 2 pairs of ocelli distinct; antennae narrowly conical with a stem, pubescent. Mandibles apically bifid. Pronotum lightly pigmented. Labrum transverse, trilobate, with 2 pairs of short setae. Tormae very short, oval. Epipharyngeal lining with als and ans in a straight line on margin; mes obsolete. Premental sclerite mediadly obsolete. Labium enlarged. Hypopharyngeal bracon obsolete. All spiracles of similar size, 6–8-annulate, caudad. Abd VIII spiracle lateral. Anus terminal. Alimentary canal not examined.
Material examined. NEW ZEALAND: WN – Akatarawa Saddle, ex dead leaves of Weinmannia racemosa on ground, 17 Sep 1990, 13 larvae, 3 pupae, 1 teneral adult*, JSD; same locality, 21 Nov 1990 (G.W. Gibbs), 12 larvae, 2 pupae, 5 teneral adults, extracted BMM.

Biology. Geochus adults are commonly extracted from leaf litter on the forest floor, where they are locally very abundant. They inhabit the middle layer of humus which is damp but not decomposed. They feed by scraping the surface of dead leaves to obtain the underlying tissues. So far larvae have been found only in leaves of Weinmannia racemosa, where the mines show up as raised meanders.

The progress of one such working was followed in December 1990. A first-instar larva, taken from a small blister at the leaf edge for identification, was replaced. It continued to feed until the working occupied most of the leaf area. After 28 days the larva, now fully fed, scraped out a circular, convex chamber 3.0 mm in diameter. This was provided with three or four minute ventilation holes on either surface, and was strengthened around the perimeter by a wall of compacted frass. The prepupa evidently resented the small slit made for viewing because, by the following day, it had prepared another cell 10 mm away, where it eventually pupated. The adult (G. politus) emerged in January 1991, about 2 months after hatching.

Remarks. Geochus politus Broun was reared from dead Weinmannia leaves collected on Mt Ngongotaha (Rotorua, BP, 22 Oct 1990, JSD). Two larvae extracted from leaves in the Mamaku Forest (BP, 9 Mar 1991, BMM) may belong to the same species. They are similar in appearance to larvae of G. tibialis.

Tribe Cleonini

Cleonini occur predominantly in the Northern Hemisphere, and include such genera as Lixus Fabricius and Cleonis Dejean, both gall-makers on roots. The only representative in New Zealand is Rhinocyllus conicus (Frölich), a European species imported in 1972 as a biocontrol agent for nodding thistle, Carduus nutans. Outstanding larval characteristics are: (1) thorax, abdomen (pds) and often epipharyngeal lining (als) with more than the modal number of setae; (2) spiracles of Abd VIII lateral; (3) alimentary canal with cardiac mycetomes arranged in grape-like clusters; and (4) anterior ventriculus puckered into longitudinal furrows.

Genus Rhinocyllus Germar

Rhinocyllus Germar, 1817: 341.
Type species Rhinocyllus conicus Frölich.

Rhinocyllus conicus Frölich

conicus Frölich, 1792: 132.
‘Nodding thistle receptacle weevil’
Fig. 809–819

Maximum dimensions 7.0×2.5 mm; head width 1.25 mm. Body stout, with dense fat-body, strongly curved, tapering abruptly. Cuticle minutely asperate. Setae pallid, fine, very short. Setal numbers differing from the modal pattern as follows. Maxilla 6 pdms, 5 vms; pronotum 11 setae; Th II/III 5 pds, 1 dls, 3 ss, pedal area 7 or 8 setae; Abd I–VII 6 pds; Abd VIII 5 pds; Abd IX 4 dls. Pronotum lightly pigmented, with dusky anterior fascia. Head subcircular, dusky brown, with pallid parietal and paramedian areas; oral margins and mandibles blackish; postoccipital condyles rounded, coloured as head; sutures distinct; endocarinal line dark, three-quarters as long as frons; anterior ocelli large, with cornea. Antennae minutely conical. Mandibles bidentate, short, broad. Labrum transverse pigmented. Tormae short, thick, subparallel. Premental sclerite a complete trident. Epipharyngeal lining with als and mes stronger than labral setae, and sensilli between proximal mes pairs. Hypopharyngeal bracon clear. Th spiracles 7–9-annulate, dorsad; Abd spiracles smaller, dorsocaudad. Alimentary canal with proventriculus internally 6-ridged; 4 large mycetomes in bunches at cardiac valve; anterior ventriculus rugose, puckered into 4 longitudinal furrows; posterior ventriculus in 1+1 coils, with about 20 squamiform gastric caeca randomly distributed; Malpighian tubules rather thick, arranged 3+3; cryptonephridium well developed; rectal bracon a membranous ring.

Material examined. NEW ZEALAND: BP – Whakatane, in capitula of Carduus nutans, 25 Mar 1976, 40 larvae, 4 pupae, reared CTJ.

Biology (after Jessep 1981, 1989). The biology of R. conicus and its effects on the nodding thistle had been closely studied in both Canada and California before the species was imported into New Zealand for testing. The progeny of the 1972 importation was released in Nelson (NN) and central Canterbury (MC), with subsequent releases near Whakatane (BP). They became established in all these districts and, helped by some redistribution of adults, the weevil is now present in most areas where nodding thistle is troublesome. Overwintering is in the adult stage.
Throughout spring and summer *Rhinocyllus* oviposits on thistle buds, where larvae feed in the capitula and pupate *in situ*. The primary inflorescences — i.e., terminal and first two lateral heads — receive most of the eggs, and production of seeds in these is strongly inhibited. Seeds in secondary heads which receive less attention are likely to mature. Although *Carduus nutans* is the preferred host, larvae have completed development on Californian thistle (*Cirsium arvense*), marsh thistle (*Cirsium palustre*), plumeless thistle (*Carduus acanthoides*), winged thistle (*Carduus tenuiflorus*), and slender winged thistle (*Carduus pycnocephalus*). The two last-named are early-flowering, and oviposition on them ceases once *C. nutans* comes into bud.

**Tribe Molytini**

The tribe Molytini (Hylobiinae of authors) is based on the Nearctic genus *Hylobius* Germar and its allies. The New Zealand genera *Lyperobius* Pascoe, *Hadramphus* Broun, and *Karocolens* Kuschel differ from the typical form only in the alignment of spiracles. As presently composed, Molytini in New Zealand comprise two distinct elements — the live tissue feeders with modal mouthparts, and the inhabitants of dead wood (previously Phrynixinae) with mouthparts adapted to xylophagy. The fern-dwelling *Zealandia* is linked by morphology and especially biology to Molytini, as demonstrated by the Australian genera *Melanterius* Erichson (May, in press).

The following characters are common to both tribes: (1) cuticle microasperate in transverse linear series; (2) *fs1,2,3* usually minute or absent; (3) antennae conical, exposed; (4) mandibular setae aligned longitudinally; (5) labral tormae subparallel or bowed; (6) Abd VIII with 3 *psd*; (7) Abd VIII spiracle on dorsum.

**Genus Arecophaga Broun**

*Arecophaga* Broun, 1880: 533.

Type species *Arecophaga varia* Broun.

*Arecophaga* is a monotypic genus host-specific to the nikau palm, *Rhopalostylis sapida*, which is present throughout New Zealand.

**Arecophaga varia Broun**

*varia* Broun, 1880: 534.

Fig. 820–829

Maximum dimensions 5.0×1.5 mm; head width 0.7 mm. Body moderately robust, evenly curved, with dorsum of Abd VIII/IX slightly depressed. Cuticle spiculate. Setae red-brown, with major setae of Abd VIII/IX about 10× as long as minor setae. Setation differing from modal numbers as follows: head 2 *fs* (*fs4* shorter than *fs5*), 4 *des*; maxilla 7 *dns*, 5 *vms*; pronotum 9 setae; Th II/III 1 *dls*, 2 *ss*, pedal area 2+4 setae; Abd VIII 2+2 *psd*; Abd IX 1+1 *ds*. Head evenly rounded, depressed, bright red-brown, with a pallid paramedian stripe enclosing *des1* and *des3*; frontal suture curved before apex; endocarinal line dark, two-thirds as long as frons; ocelli not visible. Antennae minute, rounded, partially overhung. Mandibles bidentate apically, with incisor section flanged, serrate, and with a supplementary tooth at base. Labrum trilobate, transverse; proximal half pigmented. Tormae dark, elongate, subparallel. Epipharyngeal lining modal, with paired clusters each of 2 sensilli behind middle *mes* pair. Premental sclerite broad, with median extensions tapering. Hypopharyngeal braco maculate on hind margin. Abd spiracles with air tubes caudal. Anus terminal, 4-lobed. Alimentary canal of modal form except cardiac mycetomes absent, gastric caeca in 2 groups of 3 and 5 each, cryptonephridium extended into a ventral pad, and rectal braco membranous.

Material examined. NEW ZEALAND: AK — Huia, in green leaf base of *Rhopalostylis sapida*, 28 Feb 1974, 33 larvae, 3 pupae, 7 adults*, BMM. CL — Little Barrier I., Pohutukawa Flat, in damaged leaf base of *R. sapida*, 6 Dec 1978, 5 larvae, 1 pupa, 3 adults*, BMM.

**Biology.** A nikau palm with a shorter trunk than usual provided an opportunity to examine fronds sheathing the crownshaft. The outer frond, when removed, had a few *Arecophaga* adults sheltering behind it and there was one larva near the edge. Removal of the second frond revealed an abundance of adults, well adapted by their smooth, flattened shape to crawl in such a narrow space. The inner (abaxial) side of the frond was brown-scared where the larvae were working in the spongy intervascular tissue. The relatively large eggs (1.0×0.5 mm) are deposited singly in holes chewed through the cuticle. The workings proceed in a series of right angles, cutting through the vascular fibres and then longitudinally between them. Pupation takes place in a cell blocked off from the feeding tunnel by shredded fibres. Dispersal is probably triggered when the outer frond falls and the ‘nursery’ begins to dry.
out. *R. sapida* loses up to three fronds a year (Esler 1969). Thus the selection of an inner frond for mass oviposition would ensure a moist food supply for at least one generation. The adults are fully winged.

**Genus Lyperobius Pascoe**

*Lyperobius* Pascoe, 1876: 54.

Type species *Lyperobius huttoni* Pascoe.

Body very robust, strongly curved, widest behind middle, with all lobes prominent; dorsum of Abd VIII/IX depressed. Cuticle smooth or finely asperate, with V-shaped pockets medio-externally. Setae dark brown; major setae partially overhung. Mandibles bidentate (teeth eroded in older specimens). Labrum trilobate, pigmented, with lateral setae well developed. Tormae strong, dark, bowed dorsad. Anus subterminal, 4-lobed. Alimentary canal with all lobes prominent; dorsum of Abd VIII/IX depressed. Anus subterminal, 4-lobed. Alimentary canal with all lobes prominent; dorsum of Abd VIII/IX depressed. Anus subterminal, 4-lobed. Alimentary canal with all lobes prominent; dorsum of Abd VIII/IX depressed.

**Remarks.** *Lyperobius* is a genus of medium-sized to large weevils associated with *Aciphylla* (spargrass, wild sparrow) and *Anisotome* (Apiaceae). As with their host plants, there are a large number of species with limited distribution in the high country and subalpine zones. The genus is closely related to *Hadrampus* Broun (larva; see May 1981) and *Karocolens* Kuschel (larva; see May 1987), known only from coastal lowlands and some offshore islands and virtually indistinguishable as larvae from *Lyperobius*. Larvae of the xylophagous Nearctic weevils in

**Hylobius Germar and Pachylobius LeConte** differ mainly in the shape (elongate-ovate) and alignment (dorsad) of the spiracles. The generic diagnosis is based on three species.

**Lyperobius sp. indet.**

Fig. 830–839

Maximum dimensions 32.0×10.0 mm; head width 5.0 mm. Cuticle smooth. Head dark red-brown, mandibles black; endocarinal line pallid, one-third as long as frons; ocelli not visible. Antennae very small, with 2 basal papillae. Spiracles pear-shaped, all of similar size; airtubes with 14–18 close-set annuli. Otherwise similar to generic diagnosis.

**Material examined.** NEW ZEALAND: NN—Mt Arthur, 1700 m, in crowns of *Aciphylla ferox*, 16 Nov 1969, 3 larvae, 1 pupa, 1 adult, BMM.

**Biology.** In the spring of 1969, on Mt Arthur, a yellowed, unhealthy-looking plant of *Aciphylla ferox* was found to be hosting several large, submature larvae which were feeding ectophytically on the crown at soil level. Adults were chewing the leaves at the margins. In captivity the larvae were fed on carrot, and one pupated on 10 December but died before ecysis.

**Genus Paedaretus Pascoe**

*Paedaretus* Pascoe, 1876: 55.

Type species *Paedaretus hispidus* Pascoe.

The monotypic genus *Paedaretus* has previously been placed in Pissodinae and Cossoninae. It is associated with soft, decaying wood. The only morphological indication of xylophygy is some rugosity on the mandible and inwardly curving *als* on the epipharyngeal lining. Its cossonine affinity is indicated by complete cephalic setae and the lateral position of the Abd VIII spiracle.

**Paedaretus hispidus Pascoe**

*hispidus* Pascoe, 1876: 55.

Fig. 840–849

Maximum dimensions 5.0×1.5 mm; head width 0.75 mm. Body strongly, evenly curved, not tapered. Cuticle minutely asperate, spiculate ventrally on Abd VIII/IX. Setae pallid, short, except for major *pds* on Abd VI–IX. Setation differing from modal numbers as follows: maxilla 4 dms, 4 vms; pronotum 8 setae; Th II/III 1 *dis*, 3 ss, pedal area 6 setae; Abd VIII 1+2 *pds*; Abd IX 1+1 *ds*. Head subglobose,
slightly produced behind, pallid, with narrow oral margin and mandibles dark; sutures not visible; endocarinal line and ocelli absent. Antennae broadly conical, with 4 basal papillae. Mandibles bidentate, rugose on inner surface; setae subequal, rather long. Labrum transverse, trilobate, pigmented, with lateral setae as long as anterior setae. Tormae elongate, dark, subparallel. Epipharyngeal lining modal except for inward-curving row of als. Hypopharyngeal bracon maculate. Spiral of Th larger than the others, 6–8-annulate, dorsal; Abd spiracles 3–5–annulate, caudad; Abd VIII spiral lateral. Anus terminal, 4-lobed. Alimentary canal with proventriculus slender; cardiac mycetomes present; anterior ventriculus smooth; postventriculus with 1 or 2 long, slender gastric caeca halfway along either side; Malpighian tubules 4+2; cryptonephridium extended into a ventral pad; rectal bracon membranous.

**Material examined.** NEW ZEALAND: ND – Whangarei, Mt Manaia, in dry decaying log, 28 Apr 1970, 18 larvae, 4 pupae, 10 adults*, BMM.

**Phrynixus astutus Pascoe**

*Phrynixus* Pascoe, 1875: 221.

Type species *Phrynixus terreus* Pascoe.

Body cuticle thin, minutely asperate in transverse linear series. Abd setae very short except for 1 major seta on all postdorsal and pleural stations. Th II/III pds arranged short, short, long, short. Setation differing from modal numbers as follows: head 2 or 3 fs, 4+1 des; maxilla 10 dms, 4 vms, 3 pfs; pronotum 8 setae; Th II/III 1 des, 2 ss, 4 ss, pedal area 6 setae; Abd VIII 1+2 pds; Abd IX 1+1 ds. Head subglobose, depressed in front, pallid or yellowish, with dark brown oral margins and mandibles; sutures not visible; endocarinal line present; ocelli faint. Antennae exposed, narrow, elongate, pubescent. Mandibles bifid, with molar area raised and corrugated. Labrum longer than wide, completely pigmented except on recurved anterior margin; proximal extension short. Tormae strong, elongate, bowed. Epipharyngeal lining pubescent, with als arranged longitudinally, 2 mes pairs proximally with clusters of sensilli between them, 1 am5 pair on anterolateral margin, and inner am5 pair and distal mes pair on anterior labral surface. Premental sclerite subtriangular. Hypopharyngeal bracon completely pigmented. Spiral of Th 6–8-annulate, dorsad; spiracles of Abd I–VII smaller, dorsad, those of Abd VIII 6–8-annulate, caudad. Anus terminal, 6-lobed. Alimentary canal with proventriculus grossly expanded; 8 globular cardiac mycetomes present; anterior ventriculus short; posterior ventriculus 2-coiled, with 1 or 2 long, slender gastric caeca halfway along either side; Malpighian tubules 4+2; cryptonephridium extended into a ventral pad; rectal bracon membranous.

**Remarks.** Genus *Phrynixus* is typical of the group of genera formerly in Phrynixinae of which the larvae, for the most part, have mouthparts adapted for feeding on the hard, resistant parts of dead wood. Representatives of *Astyplus* Broun, *Cuneopterus* Sharp, *Doliocethus* Broun, and five species of *Phrynixus* have been reared, and are remarkably homogeneous except for variation in size. They diverge sharply from the *Hylobius / Lyperobius* section of Molytini. The third (innermost) seta on the palpifer is the usually minute basal malar enlarged and displaced. *Cuneopterus* lacks cardiac mycetomes and has 10–12 long gastric caeca.

**Phrynixus astutus Pascoe**

*astutus* Pascoe, 1875: 221.

Fig. 850–860

Maximum dimensions 5.0×2.0 mm; head width 1.0 mm. Body moderately slender, evenly curved, slightly tapering. Head pallid, with fs5 longer than fs4, other fs minute, des1,2,3,5 long, and des4 short. Endocarinal line faint. Pronotum pallid, with 4+4 setae. Otherwise as in generic diagnosis.

**Material examined.** NEW ZEALAND. AK – Huia, in *Metrosideros robustus*, dead branch on ground, 9 Jul 1967, 35 larvae, 5 pupae, 3 adults*, BMM. SI – Stewart I., Port William, 7 Feb 1969, 10 larvae, 6 pupae, 1 adult*, BMM.

**Biology.** Larvae are found in damp, dead wood, on or near the ground, feeding in the harder parts such as knot wood which is resistant to decay. Pupation occurs *in situ*.

**Genus Rystheus Broun**

*Rystheus* Broun, 1893: 1218.

Type species *Rystheus ocularis* Broun.

The monotypic genus *Rystheus* is a fern-inhabiting weevil, formerly placed in Phrynixinae. As a soft tissue feeder it lacks the distinctive mouthparts of *Phrynixus* and its associates. *Rystheus* is linked to the *Lyperobius*-complex by short antennae and caudally directed spiracles, and to the phrynixine group by ten dorsal malar setae (instead of seven), by the short, short, long, short pattern of thoracic pds, and by the enlarged proventriculus.
**Rystheus notabilis** Broun

*notabilis* Broun, 1917: 441.

Fig. 861–870

Maximum dimensions 8.0×2.25 mm; head width 1.25 mm. Body elongate, moderately slender, with 3 or 4 Abd folds; terminal segments depressed. Cuticle finely spiculate. Setae red-brown, rather short except for long dorsal and pleural setae on Abd VIII/IX. Setation differing from modal numbers as follows: head 2 fs, 4+1 des; maxilla 10 dms, 4 vms; pronotum 8 setae; ThII/III 1 dls, 1 ss, pedal area 2+5 setae; Abd VIII 1+1 pds; Abd IX 2 ds. Head evenly rounded, depressed, partially retracted, yellow-brown, with a paramedian pallid stripe; frons pallid; oral margins raised grinding area. Labrum transverse, trilobate, pigmented. Tormae strong, bowed. Epipharyngeal lining modally arranged. Premental sclerite a distinct trident. Hypopharyngeal bracon maculate. Spiracles of Th and Abd VIII larger than those of Abd I–VII; all Abd spiracles caudal. Anus ventral, 4-lobed, with ventral lobe small. Alimentary canal with proventriculus enlarged; cardiac caudad. Anus ventral, 4-lobed, with ventral lobe small. Abdominal spiracles caudal. Anus ventral, 4-lobed, with ventral lobe small. Abdominal spiracles caudal. Anus ventral, 4-lobed, with ventral lobe small. Abdominal spiracles caudal.

Material examined. NEW ZEALAND: TK — Mt Egmont [Mt Taranaki], 1000 m, Dawson Falls, in rhachides of *Blechnum* sp. (kiokio), 5 Mar 1968, 15 larvae, 1 pupa, 5 adults*, BMM. WN — Tararua Ra., Mt Holdsworth, 350 m, in dead rhachides of *Blechnum* sp. (kiokio), 19 Nov 1968, 6 larvae, pupal exuviae, 2 adults, BMM.

**Biology.** Larval workings of *Rystheus notabilis* are initiated in the rhachides of mature fronds of ferns, usually in the upper half. The larvae work downwards, cutting off the sap supply so that the frond is brown by the time they have finished feeding. Pupation occurs in situ. Adults emerge through a circular chewed hole. Larvae have been taken in *Blechnum* species, *Polystichum vestitum*, and *Leptopteris hymenophylloides*. At Dawson Falls in March the lower, thicker portion of some rhachides of *Blechnum* sp. (kiokio) was occupied by *Megacolabus decipiens* Marshall. The niches appear to remain separate, and thus competition is avoided (May 1973).

The New Zealand fern known as *Blechnum capense* is at present awaiting revision since the name *'capense'* is preoccupied by a South African species (Brownsey & Smith-Dodsworth 1989).

**Tribe Ceutorhynchini**

Members of the tribe Ceutorhynchini are of predominantly Holarctic distribution. Many genera are common to both North America and Europe. Most species are small, up to 5.0 mm long, with larvae inhabiting seeds, petioles, and stems of herbaceous plants, especially those preferring low-lying damp areas. Their habits and small size show a resemblance to Curculionini, but in some important aspects their morphology diverges, and a separate derivation for the group is indicated.

Two ceutorhynchines are present in New Zealand. *Rhinoncus australis* Oke, living in the stems of pasture weeds, is adventive and *Trichosirocalus horridus* (Panzer) has been introduced for the biological control of nodding thistle, *Carduus nutans*. The following tribal characters have emerged from the study of these and from *Mecysmoderes stylicornis* Marshall in Gardner (1934) and ten *Ceutorhynchus* species in Scherf (1964): (1) head with *des3* on epicranial half; (2) antennae hemispherical, fully exposed; (3) endocarinal line absent; (4) frons with only *fs4* developed; *fs5* absent; (5) tormae separate, subparallel; (6) postlabium with proximal pairs of *plbs* as far apart as the median pair; (7) Abd spiracles with airtubes caudal; (8) Abd VIII spiracle lateral; (9) Abd segments with ventral lobes developed as ambulatory ampullae.

Characters (2), (3), and (8) suggest an affinity with Bra- chicerinae, but in that group *des3* is in the frontal suture or on the frons. Once again we have a transitional situation, and a systematic placing early in the subfamily Curculioninae, say between Eriirhiniini and Cryptorhynchini, could be justified.

**Genus Rhinoncus** Schoenherr

*Rhinoncus* Schoenherr, 1825: 586.

Type species *Curculio quadrituberculatus* Fabricius.

Genus *Rhinoncus* is indigenous to both North America and Europe. The adults are very small, rotund weevils found among weeds in pasture and waste places. Larvae of eight species are diagnosed but not figured in Scherf (1964), all from either *Polygonum* or *Rumex*. *Rhinoncus australis* was described from Australia in 1931, and was discovered in Auckland in 1960.
Rhinoncus australis Oke

australis Oke, 1931: 198.

Fig. 871–879

Maximum dimensions 3.25×1.0 mm; head width 0.5 mm. Body opaque, evenly curved, tapering, with a dense fat-body. Cuticle very finely asperate. Setae pallid, fine, short to minute. Head with 1 fs, 4 des, 2 les; maxilla 6 dms, 4 vms; pronotum 3+4 setae; only 1 major seta in postdorsal, dorsopleural, and pedal stations; ventral setae obsolete. Head subglobose, pale yellow, unpatterned, with margins and mandibles pale red; sutures indistinct; ecdysial valve longer than coronal suture; endocarinal line and ocelli absent; antennae on a convex base with 3 papillae. Mandibles apically bidentate, without accessory teeth. Labrum transverse, subtruncate, with 1 long seta and 2 minute setae in line across. Tormae slender, elongate, slightly convergent. Premental sclerite weak, triangulate. Epipharyngeal lining with als curved away from margin, otherwise modal. Hypopharyngeal bracon clear. Spiracles circular, bicameral, those of Th and Abd VIII 6–9-annulate, others 3–5-annulate, caudad. Anus terminal, 4-lobed. Alimentary canal with 3 slender gastric caeca on either side.

Material examined. NEW ZEALAND: AK – Auckland, Mt Albert, in stems of Polygonum persicaria, 23 Mar 1970, 5 larvae, 1 pupa, 3 adults*, BMM.

Biology. Larvae were found in willow weed in late summer, feeding in the lower part of the stems. The workings led back to a node or leaf axil. In some stems the workings were up to 42 cm long. In other plants tunnelling continued downwards into the fleshy part of the root. Pupation occurred in situ, in a mucus-lined cell among the dark frass.

Genus Trichosirocalus Colonnelli

Trichosirocalus Colonnelli, 1979: 213. Type species Curculio troglodytes Fabricius.

Trichosirocalus horridus (Panzer)

horridus Panzer, 1801: 84 (Ceutorrhynchidius). 'Nodding thistle crown weevil'

Fig. 880–888

Maximum dimensions 4.5×1.8 mm; head width 0.65 mm. Divergent from Rhinoncus as follows: head more quadrate and slightly depressed; 2 pairs of ocelli distinct; des2 and des4 minute; epipharyngeal lining with distal mes pairs on margin between ans; pedal lobe with all setae minute; all spiracles of similar size, with airtubes 6–8-annulate, caudad. Alimentary canal not examined.

Material examined. NEW ZEALAND: MC – Lincoln, ex potted plants of Carduus nutans, 16 May 1989, 19 larvae, CTJ.

Biology (after Jessep 1989). T. horridus, of European origin, has been introduced as a biological control agent on nodding thistle, Carduus nutans. It is active in winter, and attacks a different part of the plant from the summer-active, seed-inhibiting Rhinocyllus conicus. T. horridus aestivates during the summer months. After emerging, the adults oviposit on new thistle rosettes throughout winter and spring. Larval feeding damages and often destroys the central growth of the crown. Because of the long oviposition period, any regrowth is also subject to oviposition. Carduus tenuiflorus (winged thistle), C. pycnocephalus (slender-winged thistle), Cirsium vulgare (Scotch thistle), and C. palustre (marsh thistle) are alternative hosts, and should ensure a continuing food resource. The progeny of 200 adults released into a field cage at Winchmore (MC) in 1984 has become established locally.

Tribe Baridini

Although Australia has many endemic Baridini, the only species to reach New Zealand is Linogeraeus urbanus (Boheman), a grass-dwelling weevil from South America. It was discovered in Auckland in 1975, but has been known in Australia since 1927 as Lepidobaris metasternalis Lea (E.C. Zimmerman, pers. comm.). The characters of Baridini in America and India have been summarised by B ö v ing (1927) and G ar d n e r (1934a) respectively. The head capsule provides distinguishing features in having a dark epicranial ridge (as in the cossonine tribe Pentarthrini) and a pallid, V-shaped pattern. In addition, the Abd VIII spiracles are lateral and the anus is terminal and four-lobed.

Genus Linogeraeus Casey

Linogeraeus Casey, 1920: 309. Type species Centrinus lineellus Casey.

Linogeraeus urbanus (Boheman)

urbanus Boheman, 1859: 138 (Brachygeraeus). Fig. 889–897

Maximum dimensions 7.0×2.0 mm; head width 2.0 mm. Body of even width, slender, weakly curved. Cuticle
Neosaccolaemus pairs of ocelli present. Antennae very small, broadly conical; ridge visible as a dark line extending below median pallid stripes extending on to frons; epicranial minutely asperate. Setae fine, pallid; major setae moderately sparse. Major mycetomes around cardiac valve and 4 or 5 gastric caeca on Mt Albert, from stolons of bare ground with robust, node-rooting stolons and circular, bicameral; airtubes of Abd spiracles caudad. Hypopharyngeal bracon clear. Premental sclerite with pallid, transverse, trilobate, cal. Mandibles with 2 apical teeth and 2 smaller ones. Distinct; endocarinal line three-quarters as long as frons; 2 slightly retracted, subspherical, pale red-brown, with paraphyses, close to Scolytinae. Lekander (1967) pointed to the conformity between Neosaccolaemus and Scolytinae than to any other weevil groups. They appear to be transitional between these two subfamilies, similar to Cossoninae in biology but morphologically closer to Scolytinae. 

Material examined. NEWZEALAND: AK—Auckland, Mt Albert, from stolons of Paspalum paspaloides, Feb–Nov 1977, 414 larvae*, BMM.

Biology. In New Zealand L. urbanus has been found only in Mercer grass (Paspalum paspaloides), a primary invader of bare ground with robust, node-rooting stolons and capable of rapid growth in frost-free areas. Adults of L. urbanus are rarely seen because, although able to fly, they live and feed at ground level. Their eggs are inserted into the stolons near the nodes, where oviposition sites are difficult to distinguish from feeding punctures. The larvae tunnel along the stolon for a considerable distance (up to 60 cm), increasing in size until the fifth instar. When fully fed they remain quiescent within the plant during the colder months. In spring they pupate in the soil, and adults emerge during summer. There is one generation a year. A diagram showing the life cycle of L. urbanus is given in May (1984).

Tribe Magdalinini

Magdalinini, as represented by larvae of the Northern Hemisphere genus Magdalis Germar and the Australian Neosaccolaemus Hustache, are more closely allied to Cossoninae and Scolytinae than to any other weevil groups. They appear to be transitional between these two subfamilies, similar to Cossoninae in biology but morphologically closer to Scolytinae. Lekander (1967) pointed to the conformity between Magdalis and Scolytus Geoffrey. Like-wise, Neosaccolaemus narinus (Pascoe) converges towards S. multistriatus Marsham. Scolytus is itself divergent in some respects from other genera in the subfamily. 

Salient characters used in these comparisons are as follows: (1) typical Abd segments with 3 dorsal folds; (2) frons with fs1 present; (3) labrum with lateral setae as long as frons; (4) epipharyngeal lining with 1 pair of sensilli clusters, in front of proximal mes pair; (5) prothorax enlarged; (6) pedal lobes expanded; (7) spiracles without airtubes; (8) Abd VIII spiracle lateral.

Genus Neosaccolaemus Hustache

Neosaccolaemus Hustache, 1937: 201. 
Type species Laemosaccus subsignatus Boheman. Neosaccolaemus is known from southern Australia, Tasmania, and New Zealand.

Neosaccolaemus narinus (Pascoe) narinus Pascoe, 1872: 141 (Laemosaccus). Fig. 898–907

Maximum dimensions 6.0×2.3 mm; head width 1.3 mm. Body stout, widest at thorax; terminal segments recurved. Cuticle delicate, coarsely spiculate on all dorsal folds. Setae pallid, very short, longer on head, thoracic mesosternum, and pedal lobes. Setation differing from modal numbers as follows: 1 mandibular seta; maxilla 6 dms, 4 vms; pronotum 10 setae; Th II/III 1 dls, 2 s, 2 vfs; pedal lobes 5 setae; Abd VIII 3 pdv; Abd IX 2 ds. Head slightly retracted, subspherical, pale-red-brown, with parmedian pallid stripes extending on to frons; epicranial ridge visible as a dark line extending below des2; des1,3,5 and fs4,5 subequal; other setae minute; frontal suture distinct; endocarinal line three-quarters as long as frons; 2 pairs of ocelli present. Antennae very small, broadly conical. Mandibles with 2 apical teeth and 2 smaller ones. Pronotum lightly pigmented. Labrum transverse, trilobate, with lateral setae well developed. Tormae subparallel, slender, reaching epistoma. Epipharyngeal lining modally arranged, with sensilli between proximal pairs of mes. Hypopharyngeal bracon clear. Premental sclerite with anterior median extension short or obsolete. Spiracles circular, bicameral; airtubes of Abd spiracles caudad. Alimentary canal of modal form, with small globular mycetomes around cardiac valve and 4 or 5 gastric caeca on either side of lower coil.

Maximum dimensions 6.0×2.3 mm; head width 1.3 mm. Body stout, widest at thorax; terminal segments recurved. Cuticle delicate, coarsely spiculate on all dorsal folds. Setae pallid, very short, longer on head, thoracic mesosternum, and pedal lobes. Setation differing from modal numbers as follows: 1 mandibular seta; maxilla 6 dms, 4 vms; pronotum 10 setae; Th II/III 1 dls, 2 s, 2 vfs; pedal lobes 5 setae; Abd VIII 3 pdv; Abd IX 2 ds. Head slightly retracted, subspherical, pale-red-brown, with parmedian pallid stripes extending on to frons; epicranial ridge visible as a dark line extending below des2; des1,3,5 and fs4,5 subequal; other setae minute; frontal suture distinct; endocarinal line three-quarters as long as frons; 2 pairs of ocelli present. Antennae very small, broadly conical. Mandibles with 2 apical teeth and 2 smaller ones. Pronotum lightly pigmented. Labrum transverse, trilobate, with lateral setae well developed. Tormae subparallel, slender, reaching epistoma. Epipharyngeal lining modally arranged, with sensilli between proximal pairs of mes. Hypopharyngeal bracon clear. Premental sclerite with anterior median extension short or obsolete. Spiracles circular, bicameral; airtubes of Abd spiracles caudad. Alimentary canal of modal form, with small globular mycetomes around cardiac valve and 4 or 5 gastric caeca on either side of lower coil.

Material examined. NEWZEALAND: AK—Auckland, Mt Albert, from stolons of Paspalum paspaloides, Feb–Nov 1977, 414 larvae*, BMM.

Biology. In New Zealand L. urbanus has been found only in Mercer grass (Paspalum paspaloides), a primary invader of bare ground with robust, node-rooting stolons and capable of rapid growth in frost-free areas. Adults of L. urbanus are rarely seen because, although able to fly, they live and feed at ground level. Their eggs are inserted into the stolons near the nodes, where oviposition sites are difficult to distinguish from feeding punctures. The larvae tunnel along the stolon for a considerable distance (up to 60 cm), increasing in size until the fifth instar. When fully fed they remain quiescent within the plant during the colder months. In spring they pupate in the soil, and adults emerge during summer. There is one generation a year. A diagram showing the life cycle of L. urbanus is given in May (1984).

Tribe Magdalinini

Magdalinini, as represented by larvae of the Northern Hemisphere genus Magdalis Germar and the Australian Neosaccolaemus Hustache, are more closely allied to Cossoninae and Scolytinae than to any other weevil groups. They appear to be transitional between these two subfamilies, similar to Cossoninae in biology but morphologically closer to Scolytinae. Lekander (1967) pointed to the conformity between Magdalis and Scolytus Geoffrey. Like-wise, Neosaccolaemus narinus (Pascoe) converges towards S. multistriatus Marsham. Scolytus is itself divergent in some respects from other genera in the subfamily.

Salient characters used in these comparisons are as follows: (1) typical Abd segments with 3 dorsal folds; (2) frons with fs1 present; (3) labrum with lateral setae as long as frons; (4) epipharyngeal lining with 1 pair of sensilli clusters, in front of proximal mes pair; (5) prothorax enlarged; (6) pedal lobes expanded; (7) spiracles without airtubes; (8) Abd VIII spiracle lateral.

Genus Neosaccolaemus Hustache

Neosaccolaemus Hustache, 1937: 201. 
Type species Laemosaccus subsignatus Boheman. Neosaccolaemus is known from southern Australia, Tasmania, and New Zealand.

Neosaccolaemus narinus (Pascoe) 
narinus Pascoe, 1872: 141 (Laemosaccus). Fig. 898–907

Maximum dimensions 6.0×2.3 mm; head width 1.3 mm. Body stout, widest at thorax; terminal segments recurved. Cuticle delicate, coarsely spiculate on all dorsal folds. Setae pallid, very short, longer on head, thoracic mesosternum, and pedal lobes. Setation differing from modal numbers as follows: 1 mandibular seta; maxilla 6 dms, 4 vms; pronotum 10 setae; Th I pronotum 9 setae, vpls + pedal area 14 setae, 7 or 8 msts; Th II/III 1 dls, 1 ss, pedal area 4–7 setae, 3–5 msts; Abd VIII 3 pdv; Abd IX 3 ds. Pronotum lightly pigmented, areolate, expanded posteriorly into a rugose, transverse ridge, reducing Th II dorsal area. Head partially retracted, longer than wide, straight-sided, rounded behind, not emarginate, pallid except for dusky brown epistoma, genae, and mandibles; sutures not visible; endocarinal line and ocelli absent. Antennae exposed, conical, with 3 basal papillae. Mandibles unidentate, chisel-shaped when eroded; a single seta near base. Labrum transverse, evenly rounded, basally pigmented. Tormae strong, convergent, reaching epistoma. Clypeus unpigmented; setae subequal. Epipharyngeal lining with ans and distal mes pair together on margin; rosettes of 3 sensilli between proximal mes pairs only. Labium slightly concave. Premental sclerite narrow, with median extensions obsolete. Hypopharyngeal bracon clear. Spiracles ovate, without airtubes, those of Th twice as large as Abd spiracles. Anus terminal. Alimentary canal of modal form; cardiac mycetomes and gastric caeca absent; hind gut elongate, looped forwards dorsally to meet anterior ventriculus.
Material examined. NEW ZEALAND: NN – Nelson, in dying branchlets of *Racosperma (Acacia) decurrens*, 1 Jul 1973, 50 larvae, 9 pupae, 3 adults*, GK.

Biology. *N. narinus* is indigenous in New South Wales, South Australia, and Tasmania, and has been known in New Zealand since 1939 (as *Laemosaccus*). Associated with wattle trees, *Racosperma (Acacia)* and *Albizia,* it has become widespread in the North Island and in the Nelson region. Eggs are inserted into dead and dying branchlets through the thin bark. The female weevil covers the puncture with viscous excreta, which dry to form an inconspicuous brown scab. Unlike the scolytine bark beetles she does not enter the wood. Newly hatched larvae work under the bark for a short distance before entering the phloem. Workings of the numerous larvae in the same branch run parallel to each other, and are tightly packed with frass. Pupation takes place just below the bark, and circular exit holes 1.5 mm in diameter are chewed by the emerging adults.

Subfamily COSSONINAE

The Cossoninae comprise a somewhat diverse group of small weevils living in dead woody tissues. They are not to be confused with the ‘bark beetles’ Scolytinae, for although they may be found in similar situations, an evolutionary divergence has ensured that, in general, the adults are distinct, each group shaped according to its life habit. In the larva too there are good morphological distinctions. Typically, cossonine adults are slender, depressed, suited for moving in narrow spaces, and with a rostrum long enough to excavate an oviposition cavity from an external position. Workings are made only by the larvae, which are slender, of even width, and not strongly curved. Scolytine adults are convex and cylindrical, with the rostrum obsolescent and the head capsule blunt, modified for tunnelling. They bore through the bark to construct a nursery gallery, and only secondary workings are made by the larvae. A phylogenetic link is indicated by the cossonine tribe Araucariini, the members of which, as adults (Kuschel 1966) and as larvae (May 1967), show apomorphies of both Cossoninae and Scolytinae. Their biological strategy is close to that of the bark beetles.

The following larval characters were used for a comparison of Cossoninae and Araucariini with Scolytinae.

Held in common:
(1) labral lateral setae as long as anterior setae;
(2) epipharyngeal lining with 2 groups of sensilli;
(3) tormae strong, separate (a few exceptions);
(4) Abd VIII spiracle lateral.

Held by Cossoninae, Araucariini, and up to 50% of Scolytinae:
(5) mandibular setae (two) aligned longitudinally;
(6) spiracles bicameral;
(7) rectal bracon a pigmented loop.

Held by Cossoninae only (excluding Araucariini):
(8) head with 4 fs (fsI absent);
(9) Abd II–VI with 4 dorsal folds (except Cotasterini).

Held by Cossoninae only (including Araucariini):
(10) Abd IX with 2 dorsal setae.

In most cossonine larvae (and some Cryptorhynchini), when alive or freshly killed, the oenocyte clusters are visible as grey patches beneath the dorsopleural lobes (Wigglesworth 1950). In preserved specimens the clusters become creamy-white like the fat-body. The work of Gardiner (1934a, 1938), Anderson (1952), and Viedma (1963) has been of assistance in compiling the subfamily and tribal characters. I have followed the systematic arrangement for New Zealand Cossoninae of Kuschel (unpublished).

Tribe Cossonini

Cossonini are represented in New Zealand only by the sparsely distributed *Exomesites* Broun, larvae of which are still unknown, and by the littoral adventive species *Mesites pallidipennis* Boheman from southern Europe. Anderson (1952) considered the larvae of *Cossonus* Clairville (seven species) to be almost identical to those of *Mesites* (two species). The tribe differs from Pentarthrini by: (1) Th II/III with 4 pds; (2) Abd I–VII with 5 pds (modal numbers); (3) posterior pair of plbs closer together than the middle pair; (4) thoracic spiracle much larger than Abd spiracles; and (5) anus subdorsal.

Genus *Mesites* Schoenherr

*Mesites* Schoenherr, 1838: 1043.

Type species *Mesites pallidipennis* Boheman.

*Mesites pallidipennis* Boheman

*pallidipennis* Boheman in Schoenherr, 1838: 1045. Fig. 908–917

Maximum dimensions 7.0×2.0 mm; head width 1.5 mm. Body slender, evenly curved, caudally truncate, with Abd VIII expanded ventrally and Abd IX small. Cuticle finely asperate, coarser ventrally on terminal segments. Setae pallid, inconspicuous, in modal numbers except as follows: maxilla 7 dns, 5 vns; pronotum 11 setae; Th II/III 1 dl, 2 ss, pedal area 6 setae; Abd VIII 3 pds; Abd IX 2 ds. Pronotal
shield pallid. Head free, subglobose, slightly emarginate behind, pallid, with narrow oral margin and mandibles dark brown; sutures indistinct; endocarinal line dark, half as long as frons; ocelli absent; all setae developed. Antennae exposed, narrowly conical. Mouthparts adapted for xylophyge as follows: mandibles with raised, corrugated grinding surface; labrum elongate, diamond-shaped, heavily pigmented; epipharyngeal lining with als and anterior mes pair aligned longitudinally, outer ans pair strong; hypopharyngeal bracon entirely pigmented. Premental sclerite broken before middle. Postlabium unusually narrow. Thoracic spiracles ovate, 4× longer than Abd spiracles; airtubes contained within peritreme. Alimentary canal lacking cardiac mycetomes; all immature stages are present. Anatomy shows (1) frons with endocarinal line present; and (4) tormae separate.

**Eiratus suavis Broun**

suavis Broun, 1885: 387.  
Fig. 918–927  
Maximum dimensions 3.5×0.8 mm; head width 0.7 mm. Body strongly curved, of even width, tapering abruptly. Abd I–VII with 3 dorsal folds. Cuticle sparsely asperate. Setae pallid; major setae moderately long, in modal numbers except as follows: head 4 fs, mandibles 1 seta; maxilla 7 dns, 5 vms; pronotum 9 setae; Th II/III 1 dis, 2 ss, pedal area 3+3 setae; Abd VIII 4 pds; Abd IX 3 ds. Pronotum pallid. Head free, subcircular, depressed, emarginate behind, pale yellow, with oral margins and mandibles redbrown; sutures indistinct; endocarinal line half as long as frons; fs1 absent. Antennae exposed, broadly conical, pubescent, with 3 or 4 basal papillae. Mandibles bidentate, with a small median projection and with only 1 seta. Labrum transverse, trilobate. Tormae thickened at base, meeting each other. Clypeal setae unequal in length. Epipharyngeal lining modally arranged. Labial palps with a large apical process. Premental sclerite with medial extension elongate posteriorly, obsolete in front. Postmentum with posterior plbs pair closer together than middle pair. Hypopharyngeal bracon clear. Spiracles small, circular, with annulated airtubes. Alimentary canal of modal form, with 5 or 6 vermiform, well spaced gastric caeca on either side; cryptonephridium short, asymmetrical; rectal bracon a pigmented loop.

**Tribe Cotasterini**

The only New Zealand genera to be placed in Cotasterini are *Eiratus* Pascoe and *Allaorus* Broun. The larva of *Cotaster uncipes* Boheman, diagnosed by Viedma (1963), shows (1) frons with 5 fs; (2) anterior ocelli present; (3) endocarinal line present; and (4) tormae separate.

**Genus Eiratus Pascoe**

*Eiratus* Pascoe, 1877: 142.  
Type species *Eiratus parvulus* Pascoe.

*Eiratus* species are small weevils found throughout New Zealand in dead bark of *Pseudopanax*. The larvae are divergent from those of *Cotaster* in having four frontal setae, and tormae which meet but are not joined at the base. *Eiratus*, in company with tribe Araucariini, has three Abd dorsal folds (instead of four).
Genus Pentarthrum Wollaston

Pentarthrum Wollaston, 1854: 129.
Type species Pentarthrum huttoni Wollaston.

Pentarthrum is represented in southern Australia and Tasmania, and fifteen species are recognised in New Zealand. These are not known to damage commercial timber, but the European P. huttoni Wollaston has reportedly caused damage in plywood and panelling made from birch, alder, and oak (Hammad 1955).

Pentarthrum zealandicum Wollaston

zealandicum Wollaston, 1873: 598.

Fig. 928–938
Maximum dimensions 3.5×1.5 mm; head width 0.75 mm. Body stout, C-shaped, somewhat humped, with thorax expanded; dorsal folds of Abd indistinct. Cuticle finely asperate, sclerotised on Th I sternum. Setae pallid, short, in modal numbers except: head 4 fs; maxilla 5 dms, 5 vms; pronotum 9 or 10 setae; Th II/III 3 pds, 1 dls, 3 ss; pedal area 6 setae (3 indistinct pedal lobe); Abd I–VII 4 pds; Abd VIII 3 pds; Abd IX 2 ds. Pronotum pallid. Head partially retracted, longer than wide, straight-sided, entire behind, pale yellow-brown with pallid paramedian stripes; oral margins and mandibles red-brown; sutures indistinct; endocarinal line and oceli absent. Antennae exposed, narrowly conical, differentiated into stem and club, pubescent. Mandibles indistinctly bidentate, usually eroded. Labrum more or less evenly rounded, lightly pigmented. Tormae slender, convergent, reaching epistoma. Clypeus unpigmented; setae subequal. Epipharyngeal lining with inner als submarginal. Labial and maxillary palps each with a large apical process. Premental sclerite medially obsolete. Hypopharyngeal bracon entirely pigmented. Spiracles of Th and Abd VIII similar in size, with airtubes dorsad; other spiracles slightly smaller, with airtubes caudad. Alimentary canal of modal form, with 8–10 vermiform gastric caeca on either side; cryptonephridium asymmetrical; rectal bracon a pigmented loop.

Material examined. NEW ZEALAND: AK – Waitakere Range, in dead wood of Melicytus sp., 21 Jun 1965, 25 larvae, 4 adults*, BMM; Te Henga, in dead Corynocarpus laevigatus, 23 Nov 1967, 42 larvae, 5 pupae, 6 adults*, BMM.

Biology. P. zealandicum is attracted to sound dead wood, and is not host-specific. Larvae have been found in Hedycarya arborea (pigeonwood) and Macropiper excelsum (kawakawa) as well as in Melicytus and karaka, mentioned above. The larval workings were in soft but un-decayed phloem, running parallel to each other and tightly packed with frass. Pupation takes place in situ. Some adults were present in tunnels which had been cleared of frass. In the laboratory, in August 1965, a flight of adults occurred when the temperature had risen after a long cold spell.

Genus Areocryptus Hutton

Areocryptus Broun in Hutton, 1904: 217.
Type species Arecocryptus bellus Broun.

Areocryptus is a monotypic genus specific to Rhopalostylis sapida, nikau, the only palm endemic to the mainland flora. The larvae are typical Pentarthrini.

Areocryptus bellus (Broun)

bellus Broun, 1880: 526 (Canthorhynchus).

Fig. 939–948
Maximum dimensions 4.5×1.0 mm; head width 0.75 mm. Body slender, tapering, scarcely curved; Abd I–VI with dorsal folds 2 and 4 plicate, pleural lobes inconspicuous. Cuticle finely asperate. Setae pallid; major setae very long, filamentous. Setation differing from modal numbers as follows: head 4 fs; maxilla 6 dms, 5 vms; pronotum 9 setae; Th II/III 3 pds, 1 dls, 2 ss, pedal area 6 setae; Abd I–VII 4 pds; Abd VIII 3 pds; Abd IX 2 ds. Pronotum pallid. Head free, subcircular, depressed, emarginate behind, pale red-brown with darker epicantral ridge, frons, oral margins, and mandibles; frontal suture distinct anteriorly; endocarinal line and oceli absent; des3 in suture; fs1 absent, fs2,3 short, fs4,5 long. Antennae exposed. Mandibles quadridentate, slender. Labrum transverse, evenly rounded. Tormae subparallel. Clypeus membranous. Epipharyngeal lining with medial mes pair wider apart than proximal pair; single sensilli scattered between mes pairs. Labial and maxillary palps with distal segment straight-sided, cylindrical, each with a large apical process. Premental sclerite an elongate trident. Hypopharyngeal bracon clear. Spiracles 6–8-annulate; airtubes on Th dorsad, on Abd segments caudad. Alimentary canal of modal form, with 12–18 short gastric caeca in a single row on either side; cryptonephridium asymmetrical, extended into a ventral pad; rectal bracon a pigmented loop.

Material examined. NEW ZEALAND: AK – Titirangi, in dead sheath of Rhopalostylis sapida, 16 Jun 1964, 52 larvae, 17 pupae, 8 adults*, BMM.
Biology. *A. bellus* inhabits the large, sheath-like bases of fallen nikau leaves when they have been on the ground long enough to turn brown. Larvae feed on pithy tissue between the fibres, and pupate in situ. The habitat is shared by the cossonines *Stenotrups wollastonianus* (Sharp) and the smaller *S. debilis* Sharp, which have larvae very similar to those of *A. bellus*, and with the anthribid *Arecopais spectabilis* Broun, which has strongly curved and distinctively pubescent larvae.

Tribe Rhyncolinini

Rhyncolinini are characterised by: (1) prementum with posterior *plbs* pair wider apart than middle pair; (2) pronotum with 11 setae; (3) hypopharyngeal bracon entirely pigmented; (4) Abd II–V with dorsal folds 2 and 4 plicate; (5) Th and Abd spiracles similar in size. The diagnoses of *Rhynus* Germar by Anderson (1952) and Viedma (1963) are somewhat at variance with each other.

**Genus Pachyops Wollaston**

*Pachyops* Wollaston, 1873: 493, 579.

Type species *Pachyops cylindrica* Wollaston.

Larvae of *Pachyops* differ from those of *Phloeophago soma* only in small details.

**Pachyops dubius** (Wollaston)

dubius Wollaston, 1873: 638 (*Eutornus*). Fig. 949–958

Maximum dimensions 3.5×1.0 mm; head width 1.0 mm. Body slender, slightly curved, of even width. Cuticle finely asperate. Setae pallid; major setae long, slender; *pds* as long as *pds* and *pds* on Abd I–VII. Setation differing from modal numbers as follows: head 4 *fs*; maxilla 6 *dns*, 5 *vms*; pronotum 11 setae; Th II/III 1 *dl*, 2 *ss*, pedal area 6 setae, mediosternal fold 2 *msts*; Abd VIII 4 *pds*; Abd IX 2 *ds*. Pronotum pallid. Head free, widest behind middle, emarginate behind, pale red-brown with pallid paramedian stripes; oral margins and mandibles darker; epicranial ridge faint; frontal suture visible in anterior half; endocarinal line absent; anterior ocelli present. Antennae broadly conical, pubescent, partially overhung. Mandibles bidentate; base of incisor section raised and longitudinally ridged. Labrum transverse, pigmented. Tormae strong, parallel. Clypeus pigmented at base; setae unequal. Epipharyngeal lining with *als* curved away from margin; proximal 2 pairs of *mes* bifid, anvil-shaped. Premental sclerite triangular, distinct at sides only. Spiracles with airtubes simple. Alimentary canal of modal form, with 2 well spaced veriform gastric caeca on either side; cryptonephridium asymmetrical, produced into a caudal pad; rectal bracon a pigmented loop.


Biology. *P. dubius* appears to show a preference for the dead vines of woody climbing plants, where the larvae tunnel between the vascular bundles. Pupation occurs in situ. A few adults were found within the workings.

Tribe Araucariini

The tribe Araucariini is restricted to the Southern Hemisphere. Six genera are distributed between South America, South Africa, Queensland, New Caledonia, and New Zealand. All are host-specific on the ancient plant group Gymnospermae (Kuschel 1966). In New Zealand, *Xenocnema spinipes* Wollaston is found in dead bark of kauri and *Inosomus rufopiceus* Broun in both kauri and kahikatea. As discussed earlier, Araucariini are considered to be transitional between Cossoninace and Scolytinae.

**Genus Inosomus Broun**


Type species *Stenopus rufopiceus* Broun.

*Inosomus* and *Xenocnema* differ from the bulk of endemic cossonines in having three dorsal Abd folds, five *fs*, and the postmentum with the posterior *plbs* pair closer together than the middle pair. *X. spinipes* larvae are larger (5.5 mm) and have a pigmented head (May 1967).

**Inosomus rufopiceus** (Broun)

rufopiceus Broun, 1881: 739 (*Stenopus*). Fig. 959–968

Maximum dimensions 4.0×1.5 mm; head width 1.0 mm.
Body robust, C-shaped, of even width. Cuticle coarsely spiculate on Th and Abd VIII/IX, more finely elsewhere. Setae pallid, short to moderate, longer on head; setation differing from modal numbers as follows: maxilla 7 dms, 5 vms, 1 als, 2 ss; pedal area 7 setae; Abd VIII 4 dms; Abd IX 2 ds. Pronotum pallid. Head free, subospherical, pallid, with oral margins and mandibles red-brown; sutures and ocelli not visible; endocarinal line short, reaching fs1. Antennae broadly conical, partially overhung. Mandibles bidentate, rugose on inner grinding surface. Labrum unpigmented. Tormae strong, convergent. Clypeus pigmented at base; setae unequal. Epipharyngeal lining with inner als curved away from margin; proximal mes pairs close together. Maxilla and postmentum coarsely spiculate laterally. Premental sclerite triangular, distinct only at sides. Hypopharyngeal bracon maculate on posterior margin. Th spiracles circular, bicameral, irregularly 5-7-annulate, dorsad. Abd spiracles smaller, 4-6-annulate, caudad. Aimentary canal lacking cardiac mycetomes; anterior ventriculus bulky, medially constricted; posterior ventriculus with about 20 vermiform gastric caeca in a single row on either side; cryptonephridium asymmetrical; rectal bracon a pigmented loop. (Xenocnema usually has cardiac mycetomes, and the rectal bracon is shorter, almost annular.)

Material examined. NEW ZEALAND: ND – Omahuta Forest, in Dacrycarpus dacrydioides, 26 Nov 1958, 15 larvae, 6 adults, JMC. AK – Waitakere Range, in dead Agathis australis, 11 Aug 1966, 7 larvae, 3 adults, BMM.

Biology. In October 1966, in a kauri tree at Huia (AK) which had died as a result of mechanical injury 6 years previously, first- and second-instar larvae of I. rysopeicus were present in small numbers. The parent tunnels, up to 40 mm into the phloem, had eggs inserted at intervals along the sides. Workings of young larvae were branching away from the nursery tunnel. The workings were intermixed with those of the cossonian Torostoma apicale Broun and the anthribid Cacephatus inornatus (Sharp).

Subfamily SCOLYTINAE

The Scolytinae comprise two tribes, Scolytini and Hylesini, collectively known as bark beetles. Wood (1982) classified the group as a family, separate from the main body of weevils: Curculionidae. He stated (p. 36) "Largely because larval characters were not found to distinguish these two families from Curculionidae, Crowson (1967) reduced the time-honoured families Platypodidae and Scolytidae to subfamilies of Curculionidae. In view of the unique gular character (in adults) and the limited and apparently superficial search for larval characters, his action is considered untenable."

My larval studies refute that statement by showing the bark beetles to be an evolutionary extension of Curculionidae through Cossoninae, from which there are transitional features linking Scolytus and Phloeosinus with Pentarthrum, Xenocnema, and Inosomus, and also with Magdalis (see Lekander 1967) and Neosaccoclaeus in Magdalini.

Nearly sixty years ago, having studied seventeen genera at Dehra Dun, Gardner (1934b), wrote: "I have not succeeded in finding characters to separate scolytid larvae as a whole from Curculionidae. So far as larvae are concerned, the two families should be treated together, the Scolytidae perhaps being divided into at least two groups each more closely allied to separate curculionid groups than to one another".

The following character states, constant in Scolytinae (Thomas 1957, Lekander 1968), occur also in Cossoninae and other weevil groups: 3 Abd dorsal folds, absence of ocelli, and Abd VIII spiracle lateral. Distinctions are to be found mainly in body contours, dictated by a style of living where adults bore into the wood to prepare a well organised nursery, and larvae work in tissue which is still succulent though degrading.

Wood (1986) keyed out Scolytidae and Platypodidae to a position between the orthocerous families Oxycorynidae and Attelabidae. For such a placement to have credence, the larval head capsules would need frontal sutures reaching the mandibular membrane without interruption and antennae isolated from the frontal sutures. But this is not the case. As in Curculionidae (Fig. 387, 645), the frontal suture is delimited anteriorly by an epicranial bridge and meets the antennal cushion. These features are mentioned in couplet 1 of Wood's key (p. 26), but their systematic implications are ignored.

The accidentally introduced bark beetles which have become pests of forestry are well documented by workers at the Forest Research Institute, Rotorua. The native species are less well known. Four introduced species are diagnosed and figured here, three of which are indubitably established. These include Scolytus multistriatus Marsham, a recently recorded vector of Dutch elm disease, present in spite of vigorous control measures. Two native bark beetles are also diagnosed. Four additional species diagnosed and figured in May (in press) are included in the key (p. 23); three are established and one, Ips grandicollis Eichhoff, present in Australia, is occasionally intercepted.
Tribe Hylesinini

Hylesinini are characterised by the posterior pair of plbs being closer together than the middle pair, the three plbs pairs on either side forming a triangle, and the thoracic pedal areas bearing 6 or 7 setae. All the bark beetle species in New Zealand that I have studied, with the exception of Scolytus multistriatus, belong in this tribe.

Genus Chaetoptelius Fuchs

Chaetoptelius Fuchs, 1913: 40, 43.

*Type species* Homarus mundulus Broun.

In genus *Chaetoptelius* the only other species mentioned in Reitter (1913) is C. vestitus Rey, with a distribution from the Mediterranean eastwards to Russian Armenia.

*Chaetoptelius mundulus* (Broun)

*mundulus* Broun, 1881: 740 (*Homarus*).

‘Pittosporum bark beetle’

Fig. 969–978

Maximum dimensions 3.5×1.0 mm; head width 0.5 mm. Body robust, C-shaped, widest at thorax. Cuticle finely asperate on dorsum and pleural lobes. Setae minute, in modal numbers except: head 4 fs, 2 des, 1 les; mandibles 1 minisetae; maxilla 6 dms, 5 vms; epipharyngeal lining 2 mes pairs; pronotum 9 setae; Th II/III 1 dls; pedal area 7 setae, 4 sensilli; 2 msts; Abd VIII 5 pds; Abd IX 4 ds. Pronotal shield pallid. Head free, subglobose, pallid, with narrow oral margins and mandibles red-brown; sutures indistinct; endocarinal line very short, pallid. Antennae exposed, narrowly conical, with 4 basal papillae. Mandibles apically bifid, with a small median projection and with only 1 seta. Labrum membranous, hemispherical; setae subulate, short, subequal. Tormae strong, subparallel. Clypeal setae subulate, short, subequal. Epipharyngeal lining with mes minute, proximal pair longitudinal. Premental sclerite triangular, distinct at sides. Spiracles circular, without airtubes. Anus subdorsal. Alimentary canal with 8 globular gastric caeca on either side of posterior ventriculus.

**Material examined.** NEW ZEALAND: AK – Auckland, in *Pittosporum crassifolium*, 30 Aug 1965, 108 larvae, 27 pupae, 6 adults*, BMM.

**Biology** (after Miller 1971, as *Pteleobius*). *C. mundulus* is host-specific to the larger kinds of *Pittosporum*. It is recorded from tarata (*P. eugeniioides*), kohuhu (*P. tenuifolium*), and karo (*P. crassifolium*), but probably attacks any species with bark thick enough to provide cover. The adult beetles overwinter under bark and emerge in early spring, when they are attracted probably by the strong resinous aroma of trees under stress or dying. The beetles bore through the bark to construct a nursery gallery engraved on the surface of the phloem. The female excavates the gallery, chews individual oviposition sites on both sides of the tunnel, and places an egg in each; the male removes the debris and covers each egg with frass. Larval workings radiate from the main gallery, and larvae pupate at the end of their feeding tunnels. There are two generations a year, with emergence in summer and autumn. At Mt Albert the karo I investigated in 1965 is still sparsely inhabited by *C. mundulus* 25 years later, healthy new branches having grown from below the original infestation.

Genus Dendrotrupes Broun

*Dendrotrupes* Broun, 1881: 740.

*Type species* Dendrotrupes vestitus Broun.

*Dendrotrupes*, with three species (one undescribed), is endemic to New Zealand and is present throughout.

*Dendrotrupes costiceps* Broun

costiceps Broun, 1881: 741.

Fig. 979–988

Maximum dimensions 2.6×0.6 mm; head width 0.5 mm. Body strongly curved. Cuticle coarsely spiculate. Setae pallid, finely tapering; major pds 10× as long as minor setae. Setae in modal numbers except as follows: mandibles 1 seta; maxilla 7 dms, 5 vms; epipharyngeal lining 1 mes pair; pronotum 9 setae; Th II/III 1 dls, pedal area 7 setae; Abd VIII 3 pds; Abd IX 3 ds. Pronotal shield pallid. Head free, subglobose, pale yellow with oral margins and mandibles red-brown; sutures indistinct; endocarinal line half as long as frons. Antennae exposed, widely conical, with 4 basal papillae. Mandibles bifid, with a small median projection and with only 1 seta. Labrum membranous, hemispherical; setae subulate, short, subequal. Tormae strong, subparallel. Clypeal setae subulate, short, subequal. Epipharyngeal lining with mes minute, proximal pair longitudinal. Premental sclerite triangular, distinct at sides. Spiracles circular, without airtubes. Anus terminal. Alimentary canal modal, with 3 or 4 flask-shaped gastric caeca on either side of posterior ventriculus; cryptonephridium symmetrical; rectal bracon a membranous ring.

**Material examined.** NEW ZEALAND: AK – Huia, Marama Valley, in dead *Pseudopanax crassifolius*, 28
May 1977, 16 larvae, 9 adults*, BMM. TK – Mt Egmont, Pouakai Ra., 1300 m, subcortical in dying *Pseudopanax simplex*, 12 Jan 1978, 15 larvae, 4 adults, JCW.

**Biology.** *Dendrotrupes* species are host-specific on *Pseudopanax* (Araliaceae), and are associated with freshly dead or dying trees. The species often coexist on the same branch, separated only by the relative thickness of different areas of the tree (branchlets, branches, trunk) (Kuschel 1990). The pattern of working as shown by *D. costiceps* in *P. arboreus* (five-finger) is similar to that of *Chaetoptelius mundulus*. *Dendrotrupes* is also recorded from *P. lessonii*.

**Genus Hylastes Erichson**

*Hylastes* Erichson, 1836: 47.

Type species *Hylesinus ater* Fabricius.

Body moderately robust, widest at thorax, with pedal area prominent. Head free, pigmented, subglobose, entire behind; cephalic setae well developed; epistoma usually bearing a medial tubercle; endocarinal line short. Antennae exposed, undifferentiated, with 4 or 5 basal papillae. Mandibles tridentate on incisor lobe, with a small tooth on molar section; setae arranged longitudinally, well spaced. Labrum with 2 *ans* pairs on reflexed margin. Tormae strong, curved inwards at base, often joined. Clypeal setae unequal. Epipharyngeal lining with *als* curved away from margin; sensilli in clusters of 3 in front of proximal *mes* and in pairs behind. Hypopharyngeal bracon clear. Premental sclerite with medial extensions conspicuous. Anus terminal, 4-lobed. Alimentary canal with gastric caeca vermiciform.

**Remarks.** The diagnosis is based on the work of Lekander (1968, three species) and Beaver (1970) on *H. ater*.

*Hylastes ater* (Paykull)

*ater* Paykull, 1800: 153 (*Bostrichus*).

'Black pine bark beetle'

Fig. 989–998

Maximum dimensions 6.5×1.5 mm; head width 1.2 mm. Cuticle with coarse, dense, pigmented spinules. Setae pale brown, moderate, slender, in modal numbers except as follows: maxilla 7 *dns*, 5 *vms*; pronotum 11 setae; ThII/III 1 *dls*, 2 *ss*, pedal area 7 setae (4 within pedal lobe); Abd VIII 5 *pds*; Abd IX 4 *ds*. Pronotal shield pale red-brown. Head red-brown, unpattered, with oral margins and mandibles darker; frontal suture distinct in front only; epistoma with a tubercle situated medially near posterior margin. Mandibles with a nodule basally, above dorsal articulation, similar to that figured for *Dendroctonus ponderosae* Hopkins in Thomas (1965). Labrum transverse, trilobate. Thoracic spiracles broadly ovate, with airtubes irregularly annulate, barely extending beyond peritreme, dorsad. Abd spiracles smaller, circular, with airtubes dorsad. Alimentary canal modal; gastric caeca numerous, anteriorly arranged in a single row on either side, becoming shorter and more densely packed on lower part of ventricular coil; cryptonephridium elongate, asymmetrical; rectal bracon a tenuous loop.

**Material examined.** NEW ZEALAND: WD – Mahina-pua State Forest, subcortical in *Pinus radiata*, 24 Apr 1974, 16 larvae, 1 pupa, eggs, 4 adults, JMcB.

**Biology (after Milligan 1978).** *Hylastes ater* is a Holarctic species, widely distributed in Scandinavia and Europe, and since the early 1900s in exotic forests on both main islands of New Zealand. It is also present in Australia. Its workings are almost always confined to the inner bark at the base and roots of dead conifers, especially *Pinus radiata*, and in logs left in contact with the ground. In the latter situation fungi which cause sapstaining may be introduced. Adult feeding can damage the collar area of several kinds of seedling conifers. Brood workings consist of a short nuptial chamber leading to a nursery gallery, parallel with the grain of the wood, in which the female places up to 100 eggs in prepared wall niches. The male does not necessarily remain in the working. Larval tunnels lead off at right angles, but later proceed randomly. The duration of larval development depends on temperature, and varies from 60 days during summer to almost a year if the larvae are forced to overwinter in diapause. Copulation may occur before newly emerged adults leave the bark. Swarming flights have been observed in spring and autumn.

*Hylurgus ligniperda* (Fabricius), a later European immigrant species, can easily be confused with *H. ater*. The habits and workings of the two species scarcely differ, and they are often found together in pine plantations. The frass ejected from the bark tunnels, being reddish, distinguishes the colonies from those of *Pachycotes* Sharp, which is white from their workings in sapwood.

**Genus Pachycotes Sharp**

*Pachycotes* Sharp, 1877: 10.

Type species *Pachycotes ventralis* Sharp (= *peregrinus* (Chapuis)).

Body strongly curved, of even width, with thoracic pedal areas prominent, truncate posteriorly. Head free, pig-
mented, subglobose, entire behind; cephalic setae well developed; endocarinal line present. Antennae exposed, narrowly conical. Mandibles bidentate, with a small subapical tooth; inner surface of incisor lobe finely ridged; setae arranged longitudinally, well spaced. Mouthparts adapted for xylophagy. Ligula densely hirsute. Thoracic spiracle bicameral \((\text{peregrinus})\) or without airtubes \((\text{australis})\). Anus subdorsal.

**Remarks.** The diagnosis is based on the Australian species \(P. \text{australis}\) Schedl and the native \(P. \text{peregrinus}\).

**Pachycotes peregrinus** \((\text{Chapuis})\)

\(\text{peregrinus}\) Chapuis, 1869: 21 \((\text{Hylastes})\).

Fig. 999–1007

Maximum dimensions 5.0×1.5 mm; head width 1.2 mm. Cuticle coarsely but sparsely spiculate on dorsal folds of Abd I–V, ventrally on Abd VIII/IX. Setae moderate, and minor setae minute, in modal numbers except as follows: maxilla 13 \(\text{dms}\), 5 \(\text{vms}\); pronotum 10 setae; Th II/III 1 \(\text{dls}\), 2 ss, pedal area 6 setae; Abd VIII 5 \(\text{pds}\); Abd IX 3 ds. Pronotal shield pallid. Head pale yellow, unpatterned, with oral margins and mandibles red-brown; sutures indistinct; endocarinal line half as long as frons. Mandibles with a raised, ridged grinding area. Labrum diamond-shaped, elongate, entirely pigmented. Tormae strong, subparallel. Clypeus quadrate, pigmented in proximal half; setae unequal. Epipharyngeal lining with \(\text{als}\) arranged longitudinally. Maxilla with mala truncate, expanded, bearing 13 \(\text{dms}\); palpus displaced laterally; stipes pigmented only on inner margin; cardo unusually large. Labium with ligula hirsute, upstanding. Premental sclerite broken before middle. Spiracles circular, bicameral; Th spiral twice as large as Abd spiracles. Alimentary canal of modal form, lacking both cardiac mycetomes and gastric caeca; rectal bracoon a pigmented loop.

**Material examined.** NEW ZEALAND: TK – Mt Egmont, 700 m, in dead rimu \((\text{Dacrydium cupressinum})\), 2 Nov 1967, 10 larvae, 4 adults, BMM.

**Biology** \((\text{after Bain 1977b})\). \(P. \text{peregrinus}\) bores into the phloem of native gymnosperms which are under stress or recently dead, with the sapwood still moist. Its nuisance value is increased in exotic forests and timber yards, where freshly sawn boards, posts, and poles may be attacked when stored under damp conditions. Adults enter the wood at right angles and construct brood galleries parallel with the grain. The first evidence of their presence is white frass ejected from these tunnels. Eggs are laid in lateral notches, and larval workings follow a confused pattern similar to that of \(Hylastes\) but do not enter the bark layer. The tunnels are lined with clay-like excreta. Pupation occurs anywhere in the working, and adults emerge during summer. Development may take up to 2 years.

**Genus Phloeosinus Chapuis**

\(\text{Phloeosinus}\) Chapuis, 1873: 245.

Type species \(Hylurgus \text{dentatus}\) Say.

Body strongly curved, widest at thorax, with prominent pedal lobes. Head retracted into thorax, longer than wide, with setae on anterior third; endocarinal line short or absent. Antennal cushion bearing a seta longer than the cone. Mandibles tridentate, with setae arranged transversely, close together, near base. Labrum transverse, bearing 1 \(\text{ans}\) pair on reflexed margin. Tormae subparallel, reaching epistoma. Epipharyngeal lining with 2 distal \(\text{mes}\) pairs in a compact group with medial \(\text{ans}\) pair, near margin. Maxilla with stipes mainly unpigmented. Premental sclerite broken before middle. Spiracles circular, without airtubes; thoracic spiracle larger than the others.

**Remarks.** The Holarctic genus \(\text{Phloeosinus}\), present in both New Zealand and Australia, does not entirely agree with either \(\text{Hylodesinein or Ipini}\), and some systematists have placed it in a tribe of its own. While its biology is undoubtedly scolytine, it shares with the genus \(\text{Scolytus}\) several features which provide links with \(\text{Cossoninae}\) (e.g., \(\text{Pentalarthrum}\) and/or \(\text{Magdalinini}\)): (1) head longer than wide, retracted into thorax; (2) mandibular setae arranged transversely, very close together; (3) Abd I–VII with 3 dorsal folds; (4) Th II/III with 3 \(\text{pds}\), Abd I–VII with 4 \(\text{pds}\); (5) spiracles without airtubes. The diagnosis is based on the introduced species \(P. \text{cupressi}\) Hopkins and on the work of Gardner (1934b), Thomas (1957), and Lekander (1969).

**Phloeosinus cupressi** Hopkins

\(\text{cupressi}\) Hopkins, 1903: 35.

`Cypress bark beetle`

Fig. 1008–1017

Maximum dimensions 5.0×2.0 mm; head width 0.8 mm. Cuticle densely covered with coarse, pigmented spicules. Setae pallid, slender, very short, in modal numbers except as follows: maxilla 7 \(\text{dms}\), 5 \(\text{vms}\); pronotum 10 setae; Th II/III 3 \(\text{pds}\), 1 \(\text{dls}\), 2 ss, pedal area 5 setae (3 in sclerotised lobe); Abd I–VIII 4 \(\text{pds}\), 1 \(\text{vpl}\); Abd IX 3 ds. Pronotal shield pallid, tilted forwards. Head pale yellow, with anterior of frons and oral margins red-brown, and mandibles dark.
brown; sutures obsolete. Labrum transverse, lightly pigmented; margin crenate. Hypopharyngeal bracon faintly maculate. Alimentary canal modal; gastric caeca vermiform; margin crenate. Hypopharyngeal bracon faintly rau.

ress bark beetle breeds under the bark of dead and dying cal; rectal bracon a pigmented loop. Diameter of posterior ventriculus, followed by 10 caeca form, anteriorly with 10-12 on either side as long as twice that length; cryptonephridium elongate, asymmetrical; rectal bracon a pigmented loop.


Biology (after Zondag 1976). The North American cypress bark beetle breeds under the bark of healthy trees, especially when felled. It does not breed in healthy trees, but newly emerged adults will bore into the centre of small twigs, causing them to break off. The ‘feather-pattern’ of the workings engraved into the phloem is typical of many scolytines. Larval feeding tunnels 50–60 mm long radiate from the brood gallery, increasing in diameter to end in a pupal chamber from where emergent adults make individual exit holes. There are two overlapping generations a year. Many species of cypress and cedar are recorded as host plants.

A hymenopterous parasite, Rhaphitetus maculatus Walker (Pteromalidae), has been recorded from Hawkes Bay.

Genus Scolytus Geoffroy

Scolytus Geoffroy, 1762: 309.
Type species Bostrichus scolytus Fabricius.

Members of genus Scolytus attack both hardwood and softwood trees which are in some way under stress. While most species are not of economic importance, some of them are disease carriers, particularly S. multistriatus Marsham, which is the principal vector of the fungus Ceratocystis ulmi, causing Dutch elm disease. As for Phloeosinus, several features link Scolytus with Pentarthrum: (1) head longer than wide, retracted into thorax, (2) Th II/III with 3 pds, Abd I–VII with 4 pds, (3) spiracles without airtubes; and with Magdalinini: (1) mandibles unidentate, chisel-shaped, (2) epipharyngeal lining with only 1 group of sensilli, (3) spiracles without airtubes.

Scolytus multistriatus (Marsham)
multistriatus Marsham, 1802: 54 (Ips).

‘Dutch elm disease beetle’

Fig. 1018–1026

Maximum dimensions 4.0×1.0 mm; head width 0.7 mm. Body stout, strongly curved, widest at thorax, with pedal areas prominent, tapering weakly to rounded extremity. Cuticle finely asperate in linear series. Setae minute, in modal numbers except as follows: head 2 or 3 des, 6 fs, 1 les; maxilla 7 dms, 5 vms; pronotum 4 setae; ThII/III 3 pds, 1 dls, 2 ss, pedal area 4 setae (2 in sclerotised lobe); Abd I–VIII 4 pds; Abd IX 3 ds. Pronotal shield densely but minutely spiculate posteriorly. Head retracted, ovate, longer than wide, pallid, with narrow oral margins and mandibles red-brown; sutures and endocarinal line obsolete. Antennae exposed, minute, with 4 basal papillae. Mandibles unidentate, with a chisel-shaped cutting edge. Labrum hemispherical, lightly pigmented, with well developed setae. Tormae strong, slightly convergent. Epipharyngeal lining with distal mes pair on margin with ans; a few scattered sensilli between proximal mes pairs. Hypopharyngeal bracon clear. Maxilla partially pigmented. Premental sclerite with posterior extension spatulate. Spiracles circular, without airtubes; Th spiracle twice as large as those on Abd I–VIII. Anus terminal. Alimentary canal with posterior ventriculus expanded behind cardiac valve; posterior ventriculus with 5–12 vermiform gastric caeca arranged irregularly; cryptonephridium symmetrical; rectal bracon a ligamentous ring.

Material examined. NEW ZEALAND: AK – Auckland City, Myers Park, under bark of Ulmus (elm), 5 Jan 1990, 47 larvae, numerous adults, RCC, JSD.

Biology (after Chamberlin 1939, Wood 1982). S. multistriatus is a European beetle host-specific to Ulmus spp. and known to be present in the U.S.A. since 1909. It was discovered in New Zealand in elm trees in an Auckland City park in January 1990. Its biology follows the general pattern of many other bark beetles. Adults appear in spring from overwintering larvae. They feed on healthy new growth, at which time the spores of Ceratocystis ulmi, the fungus causing Dutch elm disease, are introduced. After a few days they are attracted to a weakened tree or branch, where the female constructs a brood gallery, engraving both bark and wood. Eggs are laid in lateral niches, from where larval mines radiate at right angles until they turn to follow the grain. These tunnels are longer than the brood gallery, and may reach 20 cm. Pupation cells are usually in the bark, whence the beetles emerge individually. In the southern U.S.A. there may be three generations a year.

Subfamily PLATYPODINAE

Body cylindrical, straight, with prothorax and often Abd IV–VI expanded; Abd II–VI with pleural lobes subdiv-
related to locomotion — their need to move along the tunnel, and the labral margin is entire. The lateral lobes of Abd IX may not be present. The fourth instar is stout enough to fill the width of the tunnel, and it has lost the lateral pseudopods. In the fifth instar various types of holdfast appear. These enable the larvae to maintain position while making tunnel extensions, and include the distinctive pronotal sclerotisations which serve for muscle attachment. Pigmented skin points, verrucae, and probably the terminal armature also serve as holdfasts. R.H. Milligan (pers. comm.) observed mature larvae using the rake-like labrum for (presumably) spreading fungi on newly excavated galleries.

**Genus Platypus Herbst**

*Platypus* Herbst, 1793: 128.

Type species *Bostrichus cylindrus* Fabricius.

*Platypus* is by far the largest genus of the subfamily. *Platypus*-related genera are distinguished from *Crossotarthus* Chapuis and *Diapus* Chapuis, both present in Australia, by the presence of an airtube (“accessory chamber” of authors) on the spiracles. The labrum has only one pair of discal setae; the incisions between the anterior lobes are usually deep and narrow but may be wider, shallower notches as in *P. gracilis* Broun. The declivity of Abd IX is without paired lateromedian spines; basal armature may or may not be present.

*Platypus apicalis* White

*apicalis* White, 1846: 18.

Fig. 1027–1042

Maximum dimensions 8.0×2.0 mm; head width 1.5 mm. Body of typical shape. Cuticle of Abd I–IV dorsally and of Abd IV/V ventrally spiculate; other segments more or less smooth; Abd pleural lobes slightly rugose. Abd IX declivity finely shagreened, with a spiculate tubercle (verruca) anterior to pleural setae and a median, pigmented, hooked tubercle at base. Setae fine, pale, moderate to minute. Major setae of Th II/III *pds* and Abd I *pds* mounted on rugose tubercles. Setation in modal numbers except as follows: maxilla 6 malar setae (1 bifid), 3 *pfs*; pronotum 8–10 setae; pedal area 5+2 setae; Abd I–IV 2 *pds*; Abd V–VII 1 *pds*; Abd VIII 2 *pds*; Abd IX 6+1 *ds*. Head pale yellow, with margins and mandibles red–brown. Epi-
Pharyngeal lining with anus bifid. Premental sclerite with anterior extension linear, posterior extension spatulate. Postlabium with proximal pair of plbs closer together than median pair. Pronotal pattern of 3 incomplete circles joined behind by a tenuous line not extending mesad. Alimentary canal: proventriculus expanded symmetrically, with a constriction before cardiac valve.

Larval instars. Length of 1st instar 1.5 mm (Fig. 1037). Broadly conical in lateral outline. Pleural lobes acute, each bearing 2 setae. Abd V dorsum with a pair of upstanding tubercles each with an elongate seta, these persisting in successive instars but becoming smaller at each moult (Fig. 1039–1041). Abd VI and VII each with a pair of small, setose tubercles. In 4th instar, caudal horn evident.

**Material examined.** NEW ZEALAND: ND – Brynderwyn, in sound wood felled 1 year of Agathis australis, 3 Aug 1966, 2× 1st, 2× 2nd, 2× 3rd, 1x 4th, 5× 5th-instar larvae, 1 adult. AK – Waitakere Range, in recently dead trunk of Olea rani, 5 Jul 1966, 50 larvae, 8 adults*, BMM; Titirangi, in 2-year-old log of Dysoxylum spectabile, 4 Jun 1970, 6 larvae, 3 pupae*, BMM. NN – Nelson, Maitai Vly, in Nothofagus sp, 1 May 1946, 80 larvae, JMK.

**Platypus caviceps Broun**

*caviceps* Broun, 1880: 542.

Fig. 1043–1049

Maximum dimensions 9.0×2.5 mm; head width 1.5 mm. Divergent from *P. apicalis* as follows. Cuticle finely spicate except around groups of setae; prodorsal folds of Abd I–V pigmented yellow-brown; Abd IX declivity coarsely shagreened and pigmented, with a median, longitudinal, rugose ridge at base, but lateral verruca absent. Cuticle of head nodulate. Pronotal pattern with 2 incomplete circles, joined behind by a distinct line extending mesad. Alimentary canal with proventriculus expanded asymmetrically in a goose-neck shape.

First- and 2nd-instar larvae (Fig. 1043) with 2 pairs of short, rounded tubercles dorsally on Abd VI/VII.

**Material examined.** NEW ZEALAND: TO – Kaimanawa Ra., State Forest 90, Clements Clearing, in Nothofagus fusca felled 8 months, 2 Feb 1966, 8 larvae, 3 adults, RHM. NN – Nelson, Mt Domett, 1400 m, Nov 1971, 16 larvae, JMcB. NC – Ashley State Forest, in Nothofagus solandri, 23 Aug 1971, 21 larvae, 10 pupae, 8 adults, RHM. SL – Rowallan State Forest, Alton Valley, in Nothofagus menziesii, 4 Aug 1966, 15 eggs, 2× 1st, 1x 2nd, 2× 3rd, 3× 4th, 5× 5th-instar larvae, 5 adults, RHM.

**Platypus gracilis Broun**

*gracilis* Broun, 1893: 1254.

Fig. 1050–1061

Maximum dimensions 5.0×1.3 mm; head width 1.0 mm. Smaller than the two previous species, and diverging from them as follows. Cuticle more coarsely spicate, especially on Abd IV/V where skin-points become pigmented nodules, functioning as part of an abdominal holdfast; Abd IX declivity densely shagreened but not pigmented, and without basal armature or a lateral verruca. Labrum with incisions between anterior lobes wider, shallower. Maxillary mala pubescent on dorsal surface. Pronotal pattern with 3 incomplete circles not joined posteriorly. Spiracles of Abd VI/VII without airtubes. Alimentary canal with proventriculus expanded asymmetrically, and with a globe swelling before cardiac valve.

First- and 2nd-instar larvae not available. No indication of dorsal tubercles in 3rd instar.

**Material examined.** NEW ZEALAND: TO – Kaimanawa Ra., State Forest 90, Clements Clearing, in Nothofagus fusca felled 3 years, 18 Dec 1966, 16 eggs, 4× 3rd, 7× 4th, 75× 5th-instar larvae, 37 pupae, 2 adults, RHM.

**Biology** (after Milligan 1970, 1979). The habits of Platypodinae have much in common with scolytine ambrosia beetles in that both adults and larvae feed on fungi which they cultivate in their galleries. Nest building is initiated by the male, which is attracted to the odour of stressed or freshly felled trees. Only *P. gracilis* will establish nests in timber which is long dead and which has previously been invaded. Extension of the primary tunnel is eventually taken over by a female, the male then ejecting the waste and excess fungal growth. This tunnel is taken through the bark and sapwood to follow the boundary between sapwood and heartwood. Ambrosia is carried by the beetles in pits (mycetangia) on the pronotum, and a shining film appears on the walls of recent excavations.

Up to seven eggs are laid near the end of the primary tunnel, and a second batch at the end of a branch tunnel. Both parents tend the brood, and if either dies during the early stages the nest will not survive. Eight to 10 months after initiation, frass is no longer ejected and the males become busy with nest clearing. Further gallery extensions and short (8.0 mm) pupation chambers are constructed by fifth-instar larvae. These produce a more granular frass, and have been observed to use their rake-like mouthparts to spread ambrosia (presumably) around new tunnels. Young larvae feed on the fungus, digesting only the hyphae; the spores pass through to germinate in the faeces.
From nests in a relatively stable substrate, adults of *P. apicalis* and *P. caviceps* emerge after 2 years, with greater numbers in the third season and dwindling numbers in the fourth. Adults of *P. gracilis*, however, were still emerging from nests in red beech (*Nothofagus fusca*) after 6 years.

**Subfamily RHYNCHOPHORINAE**

Many of the Rhynchophorinae (Calandrinae or Calendrini of authors) are important to horticulture – especially in tropical crops such as banana and coconut – and to commerce, where the depredations of the grain weevils (*Sitophilus* species) and their control are extremely costly. Thus, as with other weevils which command economic attention, the group is well documented, e.g., Cotton (1924), Gardner (1934a, 1938), Anderson (1948a), Zimmerman (1968). With only a few exceptions, rhynchophorine larvae inhabit live herbaceous plants, mainly grasses and grass-related plants such as bamboo, sugar cane, and palms. Some species develop in seeds, and a few in rotten wood. Only three genera are known to have reached New Zealand. *Sitophilus* has been present since the early days of colonisation by Europeans. *Sphenophorus brunnipennis* (Germar) has been known as an occasional adventive since 1925, and is now established in Northland. *Dryophthorus* was found in 1975. Diagnoses of these larvae are included here, and a key to eleven genera in Australia and the South Pacific islands is presented in May (in press).

Recognition features for the Rhynchophorinae are as follows. (1) Typical body shape (e.g., of *S. brunnipennis* but not of *Sitophilus* or *Dryophthorus*) expanded between Abd IV and Abd VI, narrowing abruptly to Abd VIII/IX, which together form a depressed dorsal disc. (2) Pleural areas subdivided into 2, 3, or 4 superimposed lobes. (3) Anus subterminal or ventral. (4) Abd I-VII with 3 dorsal folds; (5) Abd VIII/IX with 3 dorsal folds. (6) Thorax with 4 dorsal folds; (7) Abd IX-VI with 3 dorsal folds; (8) Abd IX with posterior margin rounded; (9) all spiracles well developed (functional), the orifice closed by interlocking rows of teeth.

**Sphenophorus brunnipennis** (Germar)

brunnipennis Germar, 1824: 297 (*Calendra*).

**Fig. 1062–1073**

Maximum dimensions 9.0×5.0 mm; head width 2.0 mm. Body contours typical of subfamily. Cuticle sclerotised around groups of setae, coarsely spiculate elsewhere. Setae red-brown, mostly short, but longer and coarser on terminal segments, in modal numbers except as follows: maxilla 8 *dms*, 5 *vms*; pronotum 8 setae; Th II/III 2 *dl*, 2 *ss*, pedal area 7 setae; Abd I-VII 4 *pds*; Abd VIII 3 *pds*; Abd IX 2 *ds*. Pronotal shield lightly pigmented, with a darker anterior fascia. Head bright red-brown, with pallid paramedian stripes and setal bases; frontal suture distinct, narrow, angled before apex; endocarinal line one-third as long as frons. Labrum with a stellate pattern of pigmentation. Tormae not completely joined at base. Epipharyngeal lining pubescent. Maxilla with 6 *dns* branched, 2 *dns* simple. Premental selerite a complete trident. Thoracic spiracle narrow, elongate, with airtubes wider than peritreme, 9–11-annulate; spiracles of Abd I-VII half as long, those of Abd VIII two-thirds as long, each surrounded anterodorsally by a pigmented skin-fold. Alimentary canal of modal form, with 15–20 short, vermiform gastric caeca on either side of lower coil; cryptonephridium symmetrical; rectal bracon a ligamentous ring.

**Material examined.** NEW ZEALAND: ND – Tangiteroria, in kikuyu (*Pennisetum clandestinum*) pasture, 7 Feb 1979, 3 larvae, 4 pupae* RHB, BMM. AUSTRALIA: W.A., near Perth, under kikuyu grass on racecourse, 10 Dec 1983, 4 larvae, ANS.

**Biology.** *S. brunnipennis* shows a preference for areas that are swampy for at least part of the year. The Tangiteroria site was on a slope above some patches of *Juncus* which would have been saturated in winter. In Perth the kikuyu

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South America. They are commonly known as ‘billbugs’. Apart from features general to the subfamily, *Sphenophorus* is characterised by the following: (1) head free, with posterior margin entire; (2) frons with 5 setae (fs1 and fs2 small but distinct); (3) endocarinal line present; (4) maxillary mala with setae branched and bearing tufts of pubescence at base of *dms*; (5) postlabium with posterior pair of *pibs* closer together than middle pair; (6) Th II/III with 4 *pds* and *dpls* subequal in length; (7) Abd I-VII with 4 *pds*; (8) Abd II–VI with 3 dorsal folds; (9) Abd IX with posterior margin rounded; (10) all spiracles well developed (functional), the orifice closed by interlocking rows of teeth.
grass on horseracing courses was watered heavily to promote growth. This caused waterlogged conditions in poorly drained areas, to which the billbugs were attracted. Larvae severed the roots, leaving large dead patches (A.N. Sproul, pers. comm.). The larvae on both occasions were mature when found, and were free in the soil, but since most rhyynchophorines are endophytic, the young larvae probably feed in the thick stolons of kikuyu grass. Pupation takes place in a prepared cell in the soil during summer, the adults emerging in February–March. Mating was observed shortly after emergence. The adults feed by clinging to the grass stems and moving backwards with rostrum inserted, leaving a longitudinal slit.

**Remarks.** *Dryophthus* is represented in New Zealand by a single adventive species, recorded by Kuschel (1990) but as yet undescribed. The larva is unknown. Larvae of four species from Hawaii and one from Maryland, U.S.A. are diagnosed by Anderson (1948a). All were found in rotten wood. Anderson noted that the mandible of *Dryophthus* is comparable with that of *Cossonus*, which has a similar granular area on the inner surface. Being in both instances an adaptation for chewing wood, this feature does not indicate a phyletic relationship. The diagnosis is after Anderson (1948a).

**Biology.** The New Zealand adult specimens were found in Auckland in a partly decayed *Pinus radiata* board deposited above a stream bank by flood waters in bush, and in a *Cupressus macrocarpa* stump (Kuschel 1990).

**Tribe Sitophilini**

**Genus Sitophilus** Schoenherr

*Sitophilus* Schoenherr, 1838: 967.

Type species *Curculio oryzae* Linnaeus.

Body small, up to 3.5 mm long, subspherical; Abd with 2 or 3 dorsal folds. Setae pallid, slender, short to minute, in modal numbers except as follows: maxilla 3–5 dms; 3+2 vms; epipharyngeal lining 2 als; pronotum 8 setae; Th II/III 3 pds, 1 dls, 1 ss, pedal area 4 setae (1 long); Abd II–VI 3 pds. Head free; frons usually bearing paramedian low tubercles and a transverse ridge; endocarinal line absent. Mandible with a granular area on inner surface; dorsal articulatory condyle with a distinct rim. Labrum hemispherical. Epipharyngeal lining with clusters of sensilli behind proximal mes pair. Labial palpi 1-segmented. Premental sclerite triangular, with anterior extension short. Postlabium with posterior pilb pair as widely separated as middle pair. Spiracles of Abd I–VII nonfunctional. Th and Abd VIII spiracles subtriangular, with orifice smooth-margined. Abd VIII bearing a short, fleshy process on either side. Abd IX posteriorly emarginate, with paired finger-like projections.

**Remarks.** Although some *Sitophilus* species are familiar as stored products pests—*the rice, maize, and granary weevils*—there are others which feed and develop in various kinds of seeds, e.g., *S. linearis* (Herbst) in the pods of tamarind, *S. rugicollis* (Casey) in *Shorea robusta*, and *S. glandinum* Marshall in acorns of *Quercus* species in India. The diagnosis is based on reared specimens of *S. oryzae*, *S. zeamais* Motschulsky, and *S. granarius* (Linnaeus) as well as on the publications of Cotton (1920, 1924), Gardner (1934a), Anderson (1948a), and Mathur (1954).

**Sitophilus oryzae** (Linnaeus)

*oryzae* Linnaeus, 1763: 395 (Curculio).

*‘Rice weevil’ Fig. 1074–1079*

Maximum dimensions 3.0×1.5 mm; head width 0.5 mm. Cuticle minutely asperate. Pronotal shield pallid. Head pale red-brown, with pallid paramedian stripes; frons darker in front; oral margins and mandibles red-brown; endocarinal line two-thirds as long as frons. Hypopharyn-
geal bracon clear. Abd segments lacking a ventropleural seta.


**Sitophilus granarius (Linnaeus)**

`Granary weevil`

![Fig. 1080-1084](image)

Maximum dimensions 3.5×2.0 mm; head width 0.6 mm. Slightly larger than *S. oryzae*, and differing as follows: (1) hypopharyngeal bracon with paramedian, rounded maculae on posterior margin; (2) Abd segments with the single *vpls* moderately distinct.

Material examined. NEW ZEALAND: AK – Auckland, from culture on oats, 22 Jan 1976, 7 larvae, 5 pupae*, JC. MC – Ashburton, from barley, 16 Jan 1950, 10 larvae, 4 pupae*, ADL.

**Sitophilus zeamais Motschulsky**

`Maize weevil`

Fig. 1085, 1086

Maximum dimensions 3.25×2.0 mm; head width 0.7 mm. Similar in size to *S. granarius*, but differing as follows: (1) labrum more trilobate; (2) tormae almost joined at base; (3) Abd segments lacking *vpls*.

Material examined. AUSTRALIA: A.C.T., Canberra, from culture on wheat, Feb 1988, 30 larvae, 12 pupae (ANIC).

**Biology.** Despite the common names by which they are known, the grain weevils are indiscriminate in their attack on stored cereals. They are also recorded on acorns and nuts. Larvae feed and pupate within the same seed. Larger grains such as maize may be occupied by two or more larvae. The rate of development and the expansion of populations largely depend on temperature and relative humidity. The three species have spread worldwide through the agency of commerce, and there is an extensive literature on their ecology and control.

**Remarks.** *S. zeamais* is established in New Zealand.

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APPENDIX 1

Hyperparasites and predators of curculionoid larvae described in this publication.

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Fig. 1–10 *Nemonyx lepturoides*: (1) habitus, lateral, x15; (2) head, dorsal, x45; (3) antenna, ventral, x265; (4) labrum and pseudoclypeus, x130; (5) epipharyngeal lining, x130; (6) mandible, x110; (7) maxilla and labium, x95 (a, ventral; b, dorsal maxilla); (8) hypopharyngeal bracon, x130; (9) leg, x130; (10) spiracles, x165.
Nemonychidae: Doydirhynchinae

Fig. 11–20 *Cimberis comptus*: (11) head, dorsal, x65; (12) antenna, x265; (13) labrum and pseudoclypeus, x220; (14) epipharyngeal lining, x220; (15) mandible, x110; (16) maxilla and labium, x95 (a, ventral; b, dorsal maxilla); (17) hypopharyngeal beam, x110; (18) pedal papilla, x265; (19) spiracles, x265; (20) Abd IX and X, lateral, x25. **Fig. 21, 22** *C. pilosus*: (21) alimentary canal, x30; (22) egg inserted into sporophyll of *Pinus banksiana*, x15.
Nemonychidae: Rhinorhynchinae: Rhinorhynchini

Fig. 23–32 *Rhinorhynchus rufulus*: (23) habitus, lateral, x20; (24, 25) head, dorsal and ventral, x130; (26) antenna, x265; (27) labrum and pseudoclypeus, x265; (28) epipharyngeal lining, x265; (29) mandible, x185; (30) maxilla and labium, x220 (a, ventral; b, dorsal maxilla); (31) spiracles, x265; (32) Abd VIII–X, caudal, x55.
Nemonychidae: Rhinorhynchinae: Rhynchitomacerini

Fig. 33–42 *Rhynchitomacer rufus*: (33) habitus, lateral, x15; (34) head, dorsal, x85; (35) antenna, ventral, x265; (36) labrum and pseudoclypeus, x265; (37) epipharyngeal lining, x265; (38) mandible, x130; (39) maxilla and labium, x130 (a, ventral; b, dorsal maxilla); (40) hypopharyngeal bracon, x130; (41) spiracles, x265; (42) Abd IX and X, x40.
Fig. 43–52 *Mecomacer scambus*: (43) habitus, lateral, x10; (44) head, dorsal, x30; (45) antenna, ventral, x130; (46) labrum and pseudoclypeus, x65; (47) epipharyngeal lining, x65; (48) mandible, x65; (49) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (50) hypopharyngeal bracon, x65; (51) pedal lobe of Th II, x55; (52) spiracles, x130.
Fig. 53–63  *Rhynchitomacerinus kuscheli*: (53) habitus, lateral, x15; (54) head, dorsal, x55; (55) antenna, ventral, x265; (56) labrum and pseudoclypeus, x95; (57) epipharyngeal lining, x130; (58) mandible, x95; (59) maxilla and labium, x130 (a, ventral; b, dorsal maxilla); (60) hypopharyngeal bracon, x130; (61) pedal lobe of Th II, x45; (62) spiracles, x265; (63) Abd IX and X, x45.

Nemonychidae: Rhinorhynchinae: Rhynchitoplesiini

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Fig. 64–73  *Bruchela lili*: (64, 65) head, dorsal and ventral, ×55; (66) antenna, ×530; (67) labrum, clypeus, and epistoma, ×130; (68) epipharyngeal lining, ×130; (69) mandible, ×130; (70) maxilla and labium, ×130 (a, ventral; b, dorsal); (71) hypopharyngeal bracon, ×130; (72) spiracles, ×265; (73) Abd VII–X, ×35.

*Anthribidae: Urodontinae*
Fig. 74–85  *Arecopais spectabilis*: (74) habitus, lateral, x10; (75–77) head—dorsal, x45, lateral, x20, ventral, x45; (78) antenna, x265; (79) labrum, clypeus, and epistoma, x65; (80) epipharyngeal lining, x95; (81) mandible, x65; (82) maxilla and labium, x65 (a, ventral; b, dorsal); (83) pedal papilla, x185; (84) spiracles, x265; (85) hind gut, x15.

**Anthribidae: Anthribinae**

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Anthribidae: Anthribinae

Fig. 86–97 *Cacephalus inornatus*: (86) habitus, lateral, ×10; (87, 88) head, dorsal and lateral (setae omitted), ×30; (89) antenna, ×265; (90) labrum, clypeus, and epistoma, ×65; (91) epipharyngeal lining, ×95; (92) mandible, ×55; (93) maxilla and labium, ×45 (a, ventral; b, dorsal); (94) hypopharyngeal sclerome, ×65; (95) position of mandibles relative to hypopharyngeal sclerome during feeding, ×30; (96) pedal papilla, ×65; (97) spiracles, ×130.
**Anthribidae: Anthribinae**

Fig. 98–107  *Dasyanthribus purpureus*: (98, 99) head, dorsal and ventral, x95; (100) antenna, x530; (101) labrum, clypeus, and epistoma, x265; (102) epipharyngeal lining, x265; (103) mandible, x185; (104) maxilla and labium, x185 (a, ventral; b, dorsal); (105) hypopharyngeal sclerome, x185; (106) pedal papilla, x265; (107) spiracles, x265.
Anthribidae: Anthribinae

Fig. 108–118 Garyus altus: (108) head, dorsal, x30; (109) antenna, x265; (110) labrum, clypeus, and epistoma, x65; (111) epipharyngeal lining, x65; (112) mandible, x55; (113) maxilla and labium, x95 (a, ventral; b, dorsal); (114) hypopharyngeal sclerome, x40; (115) pronotal shield, lateral, x45; (116) pedal papilla, x95; (117) spiracles, x265; (118) hind gut, x15.
**Anthribidae: Anthribinae**

*Helmoreus sharpi*: (119) head, dorsal, x55; (120) antenna, x530; (121) labrum, clypeus, and epistoma, x130; (122) epipharyngeal lining, x130; (123) mandible, x110; (124) maxilla and labium, x130 (a, ventral; b, dorsal); (125) hypopharyngeal sclerome, x110; (126) pedal papilla, x130; (127) spiracles, x265.
Fig. 128–138 *Hoherius meinertzhageni*: (128) habitus, lateral, x10; (129) head, dorsal, x30; (130) antenna, x530; (131) labrum, clypeus, and epistoma, x95; (132) epipharyngeal lining, x95; (133) mandible, x55; (134) maxilla and labium, x95 (a, ventral; b, dorsal); (135) hypopharyngeal sclerome, x95; (136) pedal papilla, x130; (137) spiracles, x185; (138) Abd IX, sternal fold, x55.
Anthribidae: Anthribinae

Fig. 139–149 *Phymatus hetaera*: (139) habitus, lateral, x10; (140) head, dorsal, x30; (141) antenna, x530; (142) labrum, clypeus, and epistoma, x65; (143) epipharyngeal lining, x65; (144) mandible, x65; (145) maxilla and labium, x65 (a, ventral; b, dorsal); (146) hypopharyngeal sclerome, x95; (147) pedal papilla, x130; (148) spiracles, x265; (149) Abd IX, sternal fold, x55.
**Anthribidae: Anthribinae**

Fig. 150–160  *Pleosporius bullatus*: (150) habitus, lateral, x10; (151) head, dorsal, x45; (152) antenna, x530; (153) labrum, clypeus, and epistoma, x130; (154) epipharyngeal lining, x130; (155) mandible, x130; (156) maxilla and labium, x95 (a, ventral; b, dorsal); (157) hypopharyngeal sclerome, x130; (158) pedal papilla, x130; (159) spiracles, x265; (160) Malpighian tubules, swollen bases, x20.
Fig. 161–170 *Sharpius brouni*: (161) habitus, lateral, x10; (162) head, dorsal, x45; (163) antenna, x530; (164) labrum, clypeus, and epistoma, x110; (165) epipharyngeal lining, x110; (166) mandible, x130; (167) maxilla and labium, x130 (a, ventral; b, dorsal); (168) hypopharyngeal sclerome, x110; (169) pedal papilla, x130; (170) spiracles, x265.

*Anthribidae: Anthribinae*
Anthribidae: Choraginæ

Fig. 171–182 *Araecerus palmaris*: (171) habitus, lateral, x10; (172) head, dorsal, x25; (173) antenna, x265; (174) labrum, clypeus, and epistoma, x55; (175) epipharyngeal lining, x55; (176) mandible, x45; (177) maxilla and labium, x45 (a, ventral; b, dorsal); (178) hypopharyngeal sclerome, x55; (179) pedal sclerite, x130; (180) spiracles, x130; (181) 1st instar, Abd II, egg-bursting spine, x265; (182) alimentary canal, x130.
Anthribidae: Choraginae

Fig. 183–186 *Dysnocryptus inflatus*: (183) head, dorsal, x95; (184) antenna, x530; (185) labrum, clypeus, and epistoma, x130; (186) Abd IX, sternal fold, x95.

Fig. 187–195 *Notochoragus crassus*: (187) head, dorsal, x65; (188) antenna, x530; (189) labrum, clypeus, and epistoma, x130; (190) epipharyngeal lining, x130; (191) mandible, x95; (192) maxilla and labium, x130 (a, ventral; b, dorsal); (193) pedal lobe and papilla, x95; (194) spiracles, x265; (195) Abd IX, sternal fold, x95.
Belidae: Belinae

Fig. 196–207 Agathinus tridens: (196) habitus, lateral, x3; (197–199) head—dorsal, x15, lateral, x10, ventral, x15, showing musculature; (200) antenna, x95; (201) labrum, clypeus, and epistoma, x40; (202) epipharyngeal lining, x45; (203) mandible, x30; (204) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (205) Th II, pedestal lobe and sternal setae, x45; (206) spiracles, x95; (207) alimentary canal, x6.
Belidae: Belinae

Fig. 208–218 *Pachyurinus rubicundus*: (208) habitus, lateral, x7; (209, 210) head, dorsal and ventral, x10; (211) antenna, x220; (212) labrum, clypeus, and epistoma, x55; (213) epipharyngeal lining, x65; (214) mandible, x55; (215) maxilla and labium, x55 (a, ventral; b, dorsal maxilla); (216) Th I/II, pedal lobe and sternal setae, x45; (217) spiracles, x220; (218) gastric caeca, x15.  

Fig. 219 *P. sticticus*, gastric caeca, x15.
Belidae: Oxycoryninae

Fig. 220–230 *Hydnorobius* sp.: (220) habitus, lateral, x10; (221, 222) head, dorsal and ventral, x35; (223) antenna, x265; (224) labrum, clypeus, and epistoma, x110; (225) epipharyngeal lining, x110; (226) mandible, x65; (227) maxilla and labium, x110 (a, ventral; b, dorsal maxilla); (228) Th II, pedal lobe and sternal setae, x65; (229) spiracles, x135; (230) Abd VII–X, ventral, x15.
Belidae: Oxycoryninae

Fig. 231–240 *Paralocorynus* sp.: (231) habitus, lateral, ×15 (setae omitted); (232, 233) head, dorsal and ventral, ×45; (234) antenna, ×265 (on dorsal surface of frons); (235) labrum, clypeus, and epistoma, ×185; (236) epipharyngeal lining, ×265; (237) mandible, ×130; (238) maxilla and labium, ×130 (a, ventral; b, dorsal maxilla); (239) Th II, pedal lobe with ventropleural and sternal setae, ×65; (240) spiracles, ×265.
Belidae: Oxycoryninae

Fig. 241–250 *Rhopalotria mollis*: (241) habitus, lateral, x15; (242, 243) head, dorsal and ventral, x65; (244) antenna, x530; (245) labrum, clypeus, and epistoma, x265; (246) epipharyngeal lining, x265; (247) mandible, x130; (248) maxilla and labium, x130 (a, ventral; b, dorsal maxilla); (249) Th I, pedal and medio-sternal lobes, ventropleural, x130; (250) spiracles, x265.
Belidae: Aglyciderinae

Fig. 251–261 *Aralius wollastoni*: (251) habitus, lateral, x20; (252, 253) head, dorsal and ventral, x85; (254) antenna, x530; (255) labrum, clypeus, and epistoma, x185; (256) epipharyngeal lining, x185; (257) mandible, x130; (258) maxilla and labium, x265 (a, ventral; b, dorsal maxilla); (259) Th II, pedal lobe and sternal setae, x130; (260) spiracles, x530; (261) alimentary canal, x20.
Attelabidae: Attelabinae

Fig. 262–275  *Attelabus nitens*: (262) habitus, lateral, x8; (263, 264) head, dorsal and ventral, x30; (265) antenna, x265; (266) labrum, clypeus, and epistoma, x130; (267) epipharyngeal lining, x130; (268) mandible, x65; (269) maxilla and labium, x85 (a, ventral; b, dorsal maxilla); (270) Th II, pedal lobe and sternal setae, x45; (271) thoracic spiracle, x265; (272) 1st instar, head and prothorax, x30, showing labial and prosternal processes; (273) 1st instar, maxilla, labium, and prosternum, ventral, x95; (274) 1st instar, Abd V, eggburstor and spiracle, x265; (275) box leaf-roll on oak (*Quercus* sp.), x0.5 (after Prell 1924).
Atelabidae: Rhynchitinae

Fig. 276–285 *Bytiscus betulae*: (276) habitus, lateral, x10; (277) head, dorsal, x40; (278) antenna, x265; (279) labrum, clypeus, and epistoma, x95; (280) epipharyngeal lining, x95; (281) mandible, x65; (282) maxilla and labium, x110 (a, ventral; b, dorsal maxilla); (283) Th II, ventropleural, pedal and sternal lobes, x95; (284) spiracles, x265; (285) cigar-shaped leaf roll on aspen (*Populus tremula*), x0.5 (after Prell 1924). Fig. 286 *B. populi*, antenna, x265.
**Attelabidae: Rhynchitinae**

**Fig. 287–298** *Deporaus betulae*: (287) habitus, lateral, x15; (288, 289) head, dorsal and lateral, x45; (290) antenna, x265; (291) labrum and clypeus, x185; (292) epipharyngeal lining, x185; (293) mandible, x185; (294) maxilla and labium, x95 (a, ventral; b, dorsal maxilla); (295) Th II, ventropleural, pedal and sternal setae, x95; (296) spiracles, x185; (297) funnel-shaped leaf roll on birch (*Betula* sp.) x0.5 (after Prell 1924); (298) 1st instar, Abd II, egg-burster and spiracle, x265.
Attelabidae: Rhynchitinae

Fig. 299–308 *Rhynchites auratus*: (299) habitus, lateral, ×4; (300, 301) head, dorsal and ventral, ×20; (302) antenna, ×265; (303) labrum and clypeus, ×185; (304) epipharyngeal lining, ×185; (305) mandible, ×55; (306) maxilla and labium, ×95 (a, ventral; b, dorsal maxilla); (307) Th II, pedal and sternal setae, ×55; (308) spiracles, ×265.
Fig. 309–319 Lasiorhynchus barbicornis: (309) habitus, lateral, x3; (310, 311) head, dorsal and ventral, x15; (312) antenna, x265; (313) labrum, clypeus, epistoma, and antenna, x30; (314) epipharyngeal lining, x95; (315) mandible, x45; (316) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (317) Th II, pedal and sternal areas, x40; (318) spiracles, x95; (319) alimentary canal, showing (a) Mpts of one side only, x4, and (b) origin of Mpts, x15.
Brentidae: Brentinae

Fig. 320–322 *Lasiorhynchus barbicornis*: (320) thoracic segments, x15; (321) 1st instar, Abd I, egg-bursting spine, x130; (322) male pupa, x7.

Brentidae: Cyladinae

Fig. 323 *Cylas formicarius*, male pupa, x10.
Fig. 324–333 *Cylas formicarius*: (324) habitus, lateral, x7; (325, 326) head, dorsal and ventral, x40; (327) antenna, x265; (328) labrum, clypeus, and epistoma, x130; (329) epipharyngeal lining, x130; (330) mandible, x130; (331) maxilla and labium, x95 (a, ventral; b, dorsal maxilla); (332) Th II, ventropleural, pedal, and sternal areas, x110; (333) spiracles, x110.

**Brentidae: Cyladinae**
Brentidae: Antliarhininae

Fig. 334–344  *Tanaos interstitialis*: (334) habitus, lateral, x8; (335–337) head, dorsal, frontal, and ventral, x30; (338) antenna, x530; (339) labrum, clypeus, and epistoma, x95; (340) epipharyngeal lining, x130; (341) mandible, x95; (342) maxilla and labium, x95 (a, ventral; b, dorsal maxilla); (343) Th II, ventropleural, pedal, and sternal areas, x65; (344) spiracles, x265.
Brentidae: Antliarhininae

Fig. 345–353 *Antliarhis zamiae*: (345) habitus, lateral, x7; (346) head, dorsal, x65; (347) antenna, x530; (348) labrum, clypeus, and epistoma, x265; (349) epipharyngeal lining, x265; (350) mandible, x165; (351) maxilla and labium, x130 (a, ventral; b, dorsal maxilla); (352) Th III, pedal area, showing typical skin points, x130; (353) spiracles, x265.
Brentidae: Apioninae

Fig. 354–363  *Exapion ulicis:* (354) habitus, lateral, x45; (355) head, dorsal, x165; (356) antenna, x330; (357) labrum, clypeus, and epistoma, x165; (358) epipharyngeal lining, x165; (359) mandible, x165; (360) maxilla and labium (a, ventral, x165; b, dorsal maxilla, x330); (361) Th II, ventropleural, pedal, and sternal areas, x65; (362) spiracles, x330 (Abd VIII absent); (363) alimentary canal, x45.

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Brentidae: Apioninae

Fig. 364–372 Neocyba metrosideros: (364) habitus, lateral, x15 (setae omitted); (365) head, dorsal, x65; (366) antenna, x265; (367) labrum, clypeus, and epistoma, x265; (368) epipharyngeal lining, x265; (369) mandible, x165; (370) maxilla and labium, x165 (a, ventral; b, dorsal maxilla); (371) Th III, pedal and medio-sternal lobes, x130; (372) spiracles, x330. Fig. 373 Neocyba sp. A, head, dorsal, x65.
Brentidae: Apioninae

Fig. 374–384 Neocyba sp. B: (374) habitus, lateral, x20; (375, 376) head, dorsal and ventral, x65; (377) antenna, x100; (378) labrum, clypeus, and epistoma, x265; (379) epipharyngeal lining, x265; (380) mandible, x130; (381) maxilla and labium, x185 (a, ventral; b, dorsal maxilla); (382) Th II, ventropleural, pedal, and sternal areas, x65; (383) spiracles, x265; (384) larva in seed-case of Libocedrus bidwilli, x65.
Curculionidae: Brachycerinae: Ithycerini

Fig. 385–394 Ithycerus noveboracensis: (385) habitus, lateral, x2; (386, 387) head, dorsal, 1st instar, x35, and laterofrontal, x10; (388) antenna, 1st instar, x265 (on ventral surface); (389) labrum, clypeus, and epistoma, 1st instar, x95; (390) epipharyngeal lining, 1st instar, x95; (391) mandible, 1st instar, x55; (392) maxilla and labium, 1st instar, x95 (a, ventral; b, dorsal maxilla); (393) Th II, 1st instar, ventropleural, pedal, and mediosternal lobes, x55; (394) spiracles, 1st instar, x265.

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Curculionidae: Brachycerinae: Brachycerini

Fig. 395–405 Brachycerus monachus: (395) habitus, lateral, ×2; (396, 397) head, dorsal and ventral, ×4; (398) antenna and frontal suture, ×35; (399) labrum, clypeus, and epistoma, 1st instar, ×25; (400) epipharyngeal lining, 1st instar, ×35; (401) mandible, ×9; (402) maxilla and labium, ×15 (a, ventral; b, dorsal maxilla); (403) Th II, ventropleural, pedal, and mediosternal lobes, 1st instar, ×40; (404) spiracles, ×70; (405) abdominal spiracle, 1st instar, ×40.
Curculionidae: Brachycerinae: Entimini: Leptopiina

Fig. 406-417  *Catoptes cuspidatus*: (406) habitus, lateral, x10; (407) head, dorsal, x20; (408) antenna, x265; (409) labrum, clypeus, and epistoma, x65; (410) epipharyngeal lining, x65; (411) mandible, x65; (412) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (413) Th III, ventropleural and mediosternal lobes, x40; (414) spiracles, x165; (415) types of abdominal setae, x95 (a, major *pds*; b, minor *pds*; c, *msts*); (416, 417) abdominal segments VIII-X, caudoventral and lateral, x10.
Curculionidae: Brachycerinae: Entimini: Leptopiina

Fig. 418–429 Irenimus compressus: (418) habitus, lateral, x7; (419) head, dorsal, x20; (420) antenna, x265; (421) labrum, clypeus, and epistoma, x65; (422) epipharyngeal lining, x65; (423) mandible, x45; (424) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (425) Th II, ventropleural, pedal, and mediosternal lobes, x55; (426) spiracles, x65; (427) abdominal segments VIII–X, lateral, x30; (428) abdominal segments IX and X, caudal, x15; (429) alimentary canal (distorted), x7.
Curculionidae: Brachycerinae: Entimini: Leptopiina

Fig. 430–440 *Mandalotus miricollis*: (430) habitus, lateral, x6; (431) head, dorsal, x45; (432) antenna, x265; (433) labrum, clypeus, and epistoma, x35; (434) epipharyngeal lining, x35; (435) mandible, x20; (436) maxilla and labium, x35 (a, ventral; b, dorsal maxilla); (437) Th II, ventropleural, pedal, and mediosternal lobes, x45; (438) spiracles, x65; (439) abdominal segments VIII–X, x10; (440) alimentary canal, x6.
Curculionidae: Brachycerinae: Entimini: Naupactina

Fig. 441–450  *Asynonychus cervinus*: (441) habitus, lateral, x7; (442, 443) head, dorsal and ventral, x20; (444) antenna, x130; (445) labrum, clypeus, and epistoma, x65; (446) epipharyngeal lining, x65; (447) mandible, x65; (448) maxilla and labium, x35 (a, ventral; b, dorsal maxilla); (449) Th II, ventropleural, pedal, and mediosternal lobes, x65; (450) spiracles, x130.
Curculionidae: Brachycerinae: Entimini

Fig. 451–461 Naupactina: 451, *Asynonychus cervinus*, Abd I, dorsal, spiracular, and dorsopleural areas, x20. 452–456, *Atrichonotus minimus*: (452) antenna, x130; (453) maxilla, dorsal, x55; (454) Th II, mediosternal and pedal areas, x20; (455) Abd I, dorsal, spiracular, and dorsopleural areas, x20; (456) Abd VIII–X, lateral, x20. 457–460, *Floresianus sordidus*: (457) antenna, x130; (458) maxilla, dorsal, x65; (459) Abd I, dorsal, spiracular, and dorsopleural areas, x20; (460) Abd VIII–X, lateral, x20. 461, *Graphognathus leucoloma*, alimentary canal, x4 (typical of the subtribe).
Curculionidae: Brachycerinae: Entimini: Naupactina

Fig. 462–472  *Graphognathus leucoloma*: (462) habitus, lateral, x4; (463) head, dorsal, x9; (464) antenna, x95; (465) labrum, clypeus, and epistoma, x35; (466) epipharyngeal lining, x35; (467) mandible, x20; (468) maxilla and labium, x20 (a, ventral; b, dorsal maxilla); (469) Th II, pedal and mediosternal lobes, x30; (470) spiracles, x55; (471) spiracles, early instar, x55; (472) Abd III, dorsal and dorsolateral areas, early instar, x20.
Curculionidae: Brachycerinae: Entimini: Otiorhynchina

Fig. 473–483  *Otiorhynchus sulcatus*: (473) habitus, lateral, x4; (474, 475) head, dorsal and ventral (anterior half only), x10; (476) antenna, x265; (477) labrum, clypeus, and epistoma, x35; (478) epipharyngeal lining, x35; (479) mandible, x25; (480) maxilla and labium, x25 (a, ventral; b, dorsal maxilla); (481) Th II, ventropleural, pedal, and mediosternal lobes, x20; (482) spiracles, x55; (483) alimentary canal, x4.
Curculionidae: Brachycerinae: Entimini: Otiorhynchina

Fig. 484–494  Phlyctinus callosus: (484) habitus, lateral, x4; (485, 486) head, dorsal and ventral (anterior half only), x15; (487) antenna, x265; (488) labrum, clypeus, and epistoma, x30; (489) epipharyngeal lining, x35; (490) mandible, x45; (491) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (492) Th II, ventropleural, pedal, and mediosternal lobes, x30; (493) spiracles, x130; (494) Abd VII–X, x20.
Curculionidae: Brachycerinae: Entimini: Sitonina

Fig. 495–504  *Sitona discoidea*: (495) habitus, lateral, x15; (496) head, dorsal, x25; (497) antenna, x130; (498) labrum, clypeus, and epistoma, x55; (499) epipharyngeal lining, x85; (500) mandible, x35; (501) maxilla and labium, x55 (a, ventral; b, dorsal maxilla); (502) Th II, ventropleural, pedal, and mediosternal lobes, x45; (503) spiracles, x120; (504) alimentary canal, x10.
Curculionidae: Brachycerinae: Rhytirhinini

Fig. 505–515 Gromilus thoracicus: (505) habitus, lateral, x10; (506) head, dorsal, x20; (507) antenna, x265; (508) labrum, clypeus, and epistoma, x45; (509) epipharyngeal lining, x45; (510) mandible, x55; (511) maxilla and labium, x35 (a, ventral; b, dorsal maxilla); (512) Th II, ventropleural, pedal, and medioisternal lobes, x40; (513) spiracles, x110; (514) Abd IV, dorsal, spiracular, and dorsopleural areas, x30; (515) alimentary canal, x10.
Curculionidae: Brachycerinae: Rhytirhinini

Fig. 516–525 *Steriphus diversipes lineata*: (516) habitus, lateral, x4; (517) head, dorsal, x25; (518) antenna, x265; (519) labrum, clypeus, and epistoma, x35; (520) epipharyngeal lining, x45; (521) mandible, x25; (522) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (523) Th II, pedal and mediosternal lobes, x55; (524) spiracles, x110; (525) alimentary canal, x4.
Curculionidae: Brachycerinae: Rhytirhinini

Fig. 526–537 Listroderes difficilis: (526) habitus, lateral, x6; (527) head and pronotum, dorsal, x15; (528) dorsal seta, x265; (529) head, ventral, x30; (530) antenna, x185; (531) labrum, clypeus, and epistoma, x35; (532) epipharyngeal lining, x35; (533) mandible, x35; (534) maxilla and labium, x55 (a, ventral; b, dorsal maxilla); (535) Th II, ventropleural, pedal, and mediosternal lobes, x30; (536) spiracles, x85; (537) alimentary canal, x6.
Curculionidae: Brachycerinae: Rhytirhinini

Fig. 538–547  *Listronotus bonariensis*: (538) habitus, lateral, x15; (539) head, dorsal, x35; (540) antenna, x365; (541) labrum, clypeus, and epistoma, x110; (542) epipharyngeal lining, x110; (543) mandible, x55; (544) maxilla and labium, x85 (a, ventral; b, dorsal maxilla); (545) Th II, ventropleural, pedal, and mediosternal lobes, x65; (546) spiracles, x110; (547) Abd VIII–X, dorsal, x30.

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Curculionidae: Brachycerinae: Aterpini

Fig. 548–557  *Anagotus helmsi*: (548) habitus, lateral, x3; (549) head, dorsal, x15; (550) antenna, x265; (551) labrum, clypeus, and epistoma, x65; (552) epipharyngeal lining, x65; (553) mandible, x45; (554) maxilla and labium, x55 (a, ventral; b, dorsal maxilla); (555) Th II, ventropleural, pedal, and mediosternal lobes, x30; (556) spiracles, x110; (557) Abd VII–IX, dorsal, x15.
Curculionidae: Brachycerinae: Aterpini

Fig. 558–568 Rhadinosomus acuminatus: (558) habitus, lateral, x7; (559) head, dorsal, x30; (560) antenna, x265; (561) labrum, clypeus, and epistoma, x95; (562) epipharyngeal lining, x95; (563) mandible, x55; (564) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (565) Th II, ventropleural, pedal, and medisternal lobes, x55; (566) spiracles, x185; (567) alimentary canal, x7; (568) egg, and 1st instar working on leaf of Haloragis erecta.
Curculionidae: Brachycerinae: Gonipterini

Fig. 569–580 Gonipterus scutellatus: (569, 570) habitus, lateral and ventral, x6; (571) detail of seta, x65; (572, 573) head, dorsal and ventral, x20; (574) antenna, x265 (on ventral surface); (575) labrum, clypeus, and epistoma, x65; (576) epipharyngeal lining, x65; (577) mandible, x65; (578) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (579) spiracles, x95; (580) alimentary canal, x4.
Curculionidae: Brachycerinae: Hyperini

Fig. 581–590 *Hyperapunctata*: (581) habitus, lateral, x6; (582) head, dorsal, x30; (583) antenna, x185; (584) labrum, clypeus, and epistoma, x65; (585) epipharyngeal lining, x110; (586) mandible, x65; (587) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (588) Th II, ventropleural, pedal, and mediosternal lobes, x30; (589) spiracles, x220; (590) alimentary canal, x7 (semi-diagrammatic).
Fig. 591–599  *Bryocatus amplus*: (591) habitus, lateral, x15 (setae omitted); (592) head, dorsal, x95; (593) antenna, x265; (594) labrum, clypeus, and epistoma, x265; (595) epipharyngeal lining, x265; (596) mandible, x185; (597) maxilla and labium, x185 (a, ventral; b, dorsal maxilla); (598) Th II, ventropleural, pedal, and mediosternal lobes, x55; (599) spiracles, x530.
Curculionidae: Curculioninae: Erirhinini

Fig. 600–610  *Lissorhoptrus oryzophilus*: (600) habitus, lateral, x45, showing tracheal trunks (setae omitted); (601) head, dorsal, x65; (602) antenna, x265; (603) labrum, clypeus, and epistoma, x265; (604) epipharyngeal lining, x265; (605) mandible, x130; (606) maxilla and labium, x130 (a, ventral; b, dorsal maxilla); (607) Th II, ventropleural, pedal, and mediosternal lobes, x65; (608, 609) spiracles of Th and Abd VIII, and of other Abd segments, x130; (610) alimentary canal, x65.

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Curculionidae: Curculioninae: Cryptorhynchini

**Fig. 611–622** *Psepholax tibialis*: (611) habitus, lateral, x4; (612) head, dorsal, x10; (613) antenna, x130; (614) labrum, clypeus, and epistoma, x45; (615) epipharyngeal lining, x45; (616) mandible, x45; (617) maxilla and labium, x15 (a, ventral; b, dorsal maxilla); (618) Th II, ventropleural, pedal, and mediosternal lobes, x20; (619) spiracles, x45; (620) alimentary canal, x6; (621) base of Malpighian tubules, x9; (622) rectal bracon, dorsal, x9.


Curculionidae: Curculioninae: Cryptorrhynchini

Fig. 623–632  *Mitrastethus baridioides*: (623) habitus, lateral, x20; (624) head, dorsal, x15; (625) antenna, x130; (626) labrum, clypeus, and epistoma, x65; (627) epipharyngeal lining, x65; (628) mandible, x35; (629) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (630) Th II, ventropleural, pedal, and mediosternal lobes, x20; (631) spiracles, x55; (632) alimentary canal, x20.
Curculionidae: Curculioninae: Cryptorhynchini

Fig. 633–642  *Rhynchodes ursus*: (633) habitus, lateral, x3; (634) head, dorsal, x10; (635) antenna, x185; (636) labrum, clypeus, and epistoma, x55; (637) epipharyngeal lining, x65; (638) mandible, x30; (639) maxilla and labium, x20 (a, ventral; b, dorsal maxilla); (640) Th II, ventropleural, pedal, and mediosternal lobes, x15; (641) spiracles, x40; (642) alimentary canal, x3.

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Curculionidae: Curculioninae: Cryptorhynchini

Fig. 643–653  *Tychanus gibbus*: (643) habitus, lateral, x3; (644, 645) head, dorsal and frontal, x20; (646) antenna, x265 (on ventral surface); (647) labrum, clypeus, and epistoma, x65; (648) epipharyngeal lining, x65; (649) mandible, x35; (650) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (651) Th II, ventropleural, pedal, and mediosternal lobes, x30; (652) spiracles, x130; (653) alimentary canal, x3.
Curculionidae: Curculioninae: Cryptorhynchini

Fig. 654–663  *Crisius variegatus*: (654) habitus, lateral, x6; (655) head, dorsal, x20; (656) antenna, x265; (657) labrum, clypeus, and epistoma, x45; (658) epipharyngeal lining, x65; (659) mandible, x35; (660) maxilla and labium, x45 (a, ventral; b, dorsal maxilla); (661) Th II, ventropleural, pedal, and mediosternal lobes, x30; (662) spiracles, x130; (663) alimentary canal, x7.
Curculionidae: Curculioninae: Cryptorrhynchini

Fig. 664–673 Sympedius testudo: (664) habitus, lateral, x10; (665) head, dorsal, x20; (666) antenna, x65; (667) labrum, clypeus, and epistoma, x55; (668) epipharyngeal lining, x65; (669) mandible, x130; (670) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (671) Th II. ventropleural, pedal, and mediosternal lobes, x65; (672) spiracles, x265; (673) alimentary canal, x10.
Curculionidae: Curculioninae: Eugnomini

Fig. 674–685 Ancistropterus quadrispinosus: (674) habitus, lateral, x10; (675, 676) head, dorsal, and ventral showing hypopharyngeal bracon, x40; (677) antenna, x265; (678) labrum, clypeus, and epistoma, x110; (679) epipharyngeal lining, x135; (680) mandible, x95; (681) maxilla and labium, x95 (a, ventral; b, dorsal maxilla); (682) dorsal seta of mala, showing rectangular base, x265; (683) Th III, ventropleural, pedal, and mediosternal lobes, x55; (684) spiracles, x265; (685) alimentary canal, x10.
Curculionidae: Curculioninae: Eugnomini

Fig. 686–694  Gonoropterus spinicollis: (686) habitus, lateral, x10; (687) head, dorsal, x50; (688) antenna, x265; (689) labrum, clypeus, and epistoma, x135; (690) epipharyngeal lining, x190; (691) mandible, x95; (692) maxilla and labium, x95 (a, ventral; b, dorsal maxilla); (693) Th II, ventropleural, pedal, and mediosternal lobes, x30; (694) spiracles, x265.
Curculionidae: Curculioninae: Eugnomini

Fig. 695–704 *Hoplocneme inaequale*: (695) habitus, lateral, x10; (696) head, dorsal, x50; (697) antenna, x265; (698) labrum, clypeus, and epistoma, x95; (699) epipharyngeal lining, x135; (700) mandible, x95; (701) maxilla and labium, x110 (a, ventral; b, dorsal maxilla); (702) Th II, ventropleural, pedal, and mediosternal lobes, x55; (703) spiracles, x265; (704) alimentary canal, x10.
Fig. 705–714 Nyxetes bidens: (705) habitus, lateral, x10; (706) head, dorsal, x40; (707) antenna, x265; (708) labrum, clypeus, and epistoma, x65; (709) epipharyngeal lining, x135; (710) mandible, x65; (711) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (712) Th II, ventropleural, pedal, and mediosternal lobes, x40; (713) spiracles, x265; (714) alimentary canal, x10.
Curculionidae: Curculioninae: Eugnomini

Fig. 715–724  *Oreocalus albosparsus*: (715) habitus, lateral, x10; (716) head, dorsal, x65; (717) antenna, x270; (718) labrum, clypeus, and epistoma, x135; (719) epipharyngeal lining, x265; (720) mandible, x135; (721) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (722) Th II, ventropleural, pedal, and mediosternal lobes, x55; (723) spiracles, x265; (724) alimentary canal, x10.
Fig. 725–734  *Scolopterus aequus*: (725) habitus, lateral, x7; (726) head, dorsal, x20; (727) antenna, x265; (728) labrum, clypeus, and epistoma, x65; (729) epipharyngeal lining, x110; (730) mandible, x50; (731) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (732) Th II, ventropleural, pedal, and mediosternal lobes, x30; (733) spiracles, x265; (734) alimentary canal, x7.
Curculionidae: Curculioninae: Gymnetrini

Fig. 735–744 Gymnetron pascuorum: (735) habitus, lateral, x25; (736) head, dorsal, x100; (737) antenna, x265; (738) labrum, clypeus, and epistoma, x265; (739) epipharyngeal lining, x265; (740) mandible, x135; (741) maxilla and labium, x200 (a, ventral; b, dorsal maxilla); (742) Th II, ventropleural, pedal, and mediosternal lobes, x100; (743) spiracles, x530; (744) alimentary canal, x25.
Curculionidae: Curculioninae: Curculionini

**Fig. 745–754 Peristoreus grossus**: (745) habitus, lateral, x7; (746) head, dorsal, x55; (747) antenna, x265; (748) labrum, clypeus, and epistoma, x135; (749) epipharyngeal lining, x200; (750) mandible, x100; (751) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (752) Th II, ventropleural, pedal, and mediosternal lobes, x55; (753) spiracles, x200; (754) alimentary canal, x7.
Curculionidae: Curculioninae: Curculionini

Fig. 755–765  *Aneuma compta*: (755) habitus, lateral, x20; (756) head, dorsal, x55; (757) antenna, x265; (758) labrum, clypeus, and epistoma, x200; (759) epipharyngeal lining, x265; (760) mandible, x135; (761) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (762) Th II, ventrolepleural, pedal, and mediosternal lobes, x30; (763) spiracles, x265; (764) alimentary canal, posterior ventriculus, x30; (765) larval exit holes in fruits of *Hoheria populnea*, x3.

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Curculionidae: Curculioninae: Curculionini

Fig. 766–776 *Phorostichus linearis*: (766) habitus, lateral, x15; (767) head, dorsal, x65; (768) antenna, x265; (769) labrum, clypeus, and epistoma, x200; (770) epipharyngeal lining, x265; (771) mandible, x200; (772) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (773) Th II, ventropleural, pedal, and mediosternal lobes, x100; (774) abdominal segments VIII–X, x40; (775) spiracles, x265; (776) alimentary canal, x15.
Curculionidae: Curculioninae: Curculionini

**Fig. 777–787** *Hypotagea concolor*: (777) habitus, lateral, x15; (778) head, dorsal, x100; (779) antenna, x330; (780) labrum, clypeus, and epistoma, x265; (781) epipharyngeal lining, x330; (782) mandible, x265; (783) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (784) Th II, ventropleural, pedal, and mediosternal lobes, x100; (785) spiracles, x330; (786) alimentary canal, x15; (787) egg in leaf-curl of *Nothofagus truncata*.
Curculionidae: Curculioninae: Curculionini

Fig. 788–797 *Neomycta rubida*: (788) habitus, lateral, x15; (789) head, dorsal, x100; (790) antenna, x265; (791) labrum, clypeus, and epistoma, x265; (792) epipharyngeal lining, x265; (793) mandible, x265; (794) maxilla and labium, x265 (a, ventral; b, dorsal maxilla); (795) Th II, ventropleural, pedal, and mediosternal lobes, x135; (796) terminal abdominal segments, lateral, x30; (797) spiracles, x265. 798 *N. pulicaris*, terminal abdominal segments, lateral, x30.

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Curculionidae: Curculioninae: Curculionini

Fig. 799–808  *Geochus tibialis*: (799) prepupal larva, habitus, lateral, x30; (800) feeding larva, habitus, dorsal, x30; (801) head, dorsal, x110; (802) antenna, x405; (803) labrum and frontoclypeus, x265; (804) epipharyngeal lining, x265; (805) mandible, x265; (806) maxilla and labium, x265 (a, ventral; b, dorsal maxilla); (807) Th II, ventropleural, pedal, and mediosternal lobes, x55; (808) spiracles, x530.
Curculionidae: Curculioninae: Cleonini

Fig. 809–819 Rhinocyllus conicus: (809) habitus, lateral, x7; (810) head, dorsal, x30; (811) antenna, x265; (812) labrum, clypeus, and epistoma, x135; (813) epipharyngeal lining, x135; (814) mandible, x65; (815) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (816) Th II, ventropleural, pedal, and mediosternal lobes, x30; (817) Th III and Abd I, dorsal and spiracular setae (x30); (818) spiracles, x265; (819) alimentary canal, x15.
Fig. 820–829 *Arecophaga varia*: (820) habitus, lateral, x15; (821) head, dorsal, x45; (822) antenna, x265; (823) labrum, clypeus, and epistoma, x185; (824) epipharyngeal lining, x185; (825) mandible, x135; (826) maxilla and labium, x110 (a, ventral; b, dorsal maxilla); (827) Th II, ventroleural, pedal, and mediosternal lobes, x65; (828) spiracles, x270; (829) alimentary canal, x15.
Curculionidae: Curculioninae: Molytini

Fig. 830–839  *Lyperobius* spp. (830–838, Mt Arthur; 839, Mt Murchison): (830) habitus, lateral, x3; (831) head, dorsal, x15; (832) antenna, x110; (833) labrum, clypeus, and epistoma, x30; (834) epipharyngeal lining, x30; (835) mandible, x30; (836) maxilla and labium, x20 (a, ventral; b, dorsal maxilla); (837) Th II, ventropleural, pedal, and mediosternal lobes, x7; (838) spiracles, x55; (839) alimentary canal, x3.
Curculionidae: Curculioninae: Molytini

Fig. 840–849  *Paedaretus hispidus*: (840) habitus, lateral, x15; (841) head, dorsal, x40; (842) antenna, x265; (843) labrum, clypeus, and epistoma, x185; (844) epipharyngeal lining, x185; (845) mandible, x135; (846) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (847) Th II, ventropleural, pedal, and mediosternal lobes, x45; (848) spiracles, x265; (849) alimentary canal, x15.
Curculionidae: Curculioninae: Molytini

Fig. 850–860 Phrynixus astutus: (850) habitus, lateral, x15; (851, 852) head, dorsal, and ventral, anterior portion, x45; (853) antenna, x220; (854) labrum, clypeus, and epistoma, x95; (855) epipharyngeal lining, x95; (856) mandible, x65; (857) maxilla and labium, x75 (a, ventral; b, dorsal maxilla); (858) Th II, ventropleural, pedal, and mediosternal lobes, x65; (859) spiracles, x185; (860) alimentary canal, x15.
Curculionidae: Curculioninae: Molytini

Fig. 861–870  *Rystheus notabilis*: (861) habitus, lateral, x10; (862) head, dorsal, x35; (863) antenna, x265; (864) labrum, clypeus, and epistoma, x65; (865) epipharyngeal lining, x185; (866) mandible, x65; (867) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (868) Th II, ventropleural, pedal, and mediosternal lobes, x55; (869) spiracles, x220; (870) alimentary canal, x10.
Curculionidae: Curculioninae: Ceutorhynchini

Fig. 871–879 *Rhinocorus australis*: (871) habitus, lateral, x20; (872) head, dorsal, x95; (873) antenna, x265; (874) labrum, clypeus, and epistoma, x265; (875) epipharyngeal lining, x265; (876) mandible, x185; (877) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (878) Th II, ventropleural, pedal, and mediosternal lobes, x135; (879) spiracles, x265.
Curculionidae: Curculioninae: Ceutorhynchini

Fig. 880–888 *Trichosirocalus horridus*: (880) habitus, lateral, x15; (881) head, dorsal, x65; (882) antenna, x265; (883) labrum, clypeus, and epistoma, x185; (884) epipharyngeal lining, x185; (885) mandible, x135; (886) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (887) Th II, ventropleural, pedal, and mediosternal lobes, x65; (888) spiracles, x265.
Curculionidae: Curculioninae: Baridini

Fig. 889–897 *Linogeraeus urbanus*: (889) habitus, lateral, x11; (890) head, dorsal, x22; (891) labrum, clypeus, epistoma, and antenna, x110; (892) epipharyngeal lining, x110; (893) mandible, x55; (894) maxilla and labium (a, ventral; b, dorsal maxilla), x95; (895) dorsopleural, ventropleural, pedal, and mediosternal areas, Th II, x55; (896) spiracles, x265; (897) alimentary canal, x11.
Curculionidae: Curculioninae: Magdalinini

Fig. 898–907 *Neosaccolaemus narinus*: (898) habitus, lateral, x10; (899) head, dorsal, x30; (900) antenna, x265; (901) labrum, clypeus, and epistoma, x110; (902) epipharyngeal lining, x135; (903) mandible, x95; (904) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (905) Th II, ventropleural, pedal, and mediosternal lobes, x40; (906) spiracles, x200; (907) alimentary canal, x10.
Curculionidae: Cossoninae: Cossonini

Fig. 908–917 *Mesites pallidipennis*: (908) habitus, lateral, x7; (909) head, dorsal, x30; (910) antenna, x265; (911) labrum, clypeus, and epistoma, x95; (912) epipharyngeal lining, x135; (913) mandible, x65 (a, outer surface; b, inner surface); (914) maxilla and labium, x95 (a, ventral; b, dorsal maxilla); (915) Th II, ventropleural, pedal, and mediosternal lobes, x55; (916) spiracles, x265; (917) alimentary canal, x10.

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Curculionidae: Cossoninae: Cotasterini

Fig. 918–927  *Eiratus suavis*: (918) habitus, lateral, x15; (919) head, dorsal, x65; (920) antenna, x330; (921) labrum, clypeus, and epistoma, x135; (922) epipharyngeal lining, x135; (923) mandible, x95; (924) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (925) Th II, ventropleural, pedal, and mediosternal lobes, x95; (926) spiracles, x330; (927) alimentary canal, x15.

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Curculionidae: Cossoninae: Pentarthrini

Fig. 928–938  *Pentarthurum zealandicum*: (928) habitus, lateral, ×15; (929) head, dorsal, ×45; (930) antenna, ×265; (931) labrum, clypeus, and epistoma, ×165; (932) epipharyngeal lining, ×165; (933) mandible, ×135; (934) maxilla and labium, ×135 (a, ventral; b, dorsal maxilla); (935) labial palp, ×330; (936) Th II, ventropleural, pedal, and mediosternal lobes, ×55; (937) spiracles, ×330; (938) alimentary canal, ×15.
Curculionidae: Cossoninae: Pentarthrini

Fig. 939–948  *Arecocryptus bellus*: (939) habitus, lateral, x15; (940) head, dorsal, x75; (941) antenna, x530; (942) labrum, clypeus, and epistoma, x135; (943) epipharyngeal lining, x135; (944) mandible, x65; (945) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (946) Th II, ventropleural, pedal, and mediosternal lobes, x90; (947) spiracles, x330; (948) alimentary canal, x15.
Curculionidae: Cossoninae: Rhyncolini

Fig. 949–958 *Pachyops dubius*: (949) habitus, lateral, ×15; (950) head, dorsal, ×55; (951) antenna, ×265; (952) labrum, clypeus, and epistoma, ×135; (953) epipharyngeal lining, ×220; (954) mandible, ×95; (955) maxilla and labium, ×135 (a, ventral; b, dorsal maxilla); (956) Th II, ventropleural, pedal, and mediosternal lobes, ×65; (957) spiracles, ×330; (958) alimentary canal, ×15.
Fig. 959–968 *Inosomus rufopiceus*: (959) habitus, lateral, x15; (960) head, dorsal, x15; (961) antenna, x265; (962) labrum, clypeus, and epistoma, x265; (963) epipharyngeal lining, x265; (964) mandible, x110 (a, outer surface; b, inner surface); (965) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (966) Th II, ventropleural, pedal, and mediosternal lobes, x110; (967) spiracles, x265; (968) alimentary canal - gastric caeca on posterior ventriculus, x30.
Curculionidae: Scolytinae: Hylesinini

Fig. 969–978 *Chaetoptelius mundulus*: (969) habitus, lateral, x20 (setae omitted); (970) head, dorsal, x65; (971) antenna, x530; (972) labrum, clypeus, and epistoma, x270; (973) epipharyngeal lining, x265; (974) mandible, x220; (975) maxilla and labium, x165 (a, ventral; b, dorsal maxilla); (976) Th II, ventroleural, pedal, and mediosternal lobes, x135; (977) spiracles, x330; (978) alimentary canal - gastric caeca on posterior ventriculus, x30.
Curculionidae: Scolytinae: Hylesini

Fig. 979–988 *Dendrotrupes costiceps*: (979) habitus, lateral, x20; (980) head, dorsal, x95; (981) antenna, x530; (982) labrum, clypeus, and epistoma, x135; (983) epipharyngeal lining, x265; (984) mandible, x185; (985) maxilla and labium, x185 (a, ventral; b, dorsal maxilla); (986) Th II, ventropleural, pedal, and mediosternal lobes, x135; (987) spiracles, x530; (988) alimentary canal, x20.
Curculionidae: Scolytinae: Hylesinini

Fig. 989–998 *Hylastes ater*: (989) habitus, lateral, x15; (990) head, dorsal, x45; (991) antenna, x265; (992) labrum, clypeus, and epistoma, x135; (993) epipharyngeal lining, x135; (994) mandible, x65; (995) maxilla and labium, x95 (a, ventral; b, dorsal maxilla); (996) Th II, ventropleural, pedal, and mediosternal lobes, x55; (997) spiracles, x265; (998) alimentary canal, x15.

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**Curculionidae: Scolytinae: Hylesinini**

Fig. 999–1007 *Pachycotes peregrinus*: (999) habitus, lateral, x15; (1000) head, dorsal, x45; (1001) antenna, x265; (1002) labrum, clypeus, and epistoma, x110; (1003) epipharyngeal lining, x135; (1004) mandible, x65 (a, inner surface; b, outer surface); (1005) maxilla and labium (a, ventral, x55; b, dorsal maxilla, x135); (1006) Th II, ventropleural, pedal, and mediosternal lobes, x45; (1007) spiracles, x330.
Curculionidae: Scolytinae: Hylesinini

Fig. 1008–1017 *Phloeosinus cupressi*: (1008) habitus, lateral, x30; (1009) head, dorsal, x45; (1010) antenna, x265; (1011) labrum, clypeus, and epistoma, x265; (1012) epipharyngeal lining, x265; (1013) mandible, x40; (1014) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (1015) Th II, ventropleural, pedal, and mediodistal lobes, x65; (1016) spiracles, x200; (1017) alimentary canal - gastric caeca on posterior ventriculus, x40.
Curculionidae: Scolytinae: Hylesinini

Fig. 1018–1026 *Scolytus multistriatus*: (1018) habitus, lateral, x15 (setae omitted); (1019) head, dorsal, x65; (1020) antenna, x530; (1021) labrum, clypeus, and epistoma, x185; (1022) epipharyngeal lining, x185; (1023) mandible, x135; (1024) maxilla and labium, x135 (a, ventral; b, dorsal maxilla); (1025) Th III, ventropleural, pedal, and mediosternal lobes, x135; (1026) spiracles, x265.
Curculionidae: Platypodinae

Fig. 1027–1036  *Platypus apicalis*: (1027) habitus, lateral, x7; (1028) head, dorsal, x30; (1029) antenna, x265; (1030) labrum, clypeus, and epistoma, x65; (1031) epipharyngeal lining, x95; (1032) mandible, inner surface, x65; (1033) maxilla and labium (a, ventral, x65; b, dorsal maxilla, x135); (1034) pronotal pattern, x45; (1035) spiracles, x265; (1036) alimentary canal, x10.
Curculionidae: Platypodinae

Fig. 1037–1042 *Platypus apicalis*: (1037) 1st instar larva, x30; (1038) Th II, ventropleural, pedal, and mediosternal lobes, x45; (1039–1041) mid-dorsal tubercle, 2nd–4th instar larvae, x30; (1042) abdominal segments VIII–X, lateral, x30. **Fig. 1043–1049** *P. caviceps*: (1043) 1st instar larva, x30; (1044) antenna, x265; (1045) epipharyngeal lining, x95; (1046) pronotal pattern, x45; (1047) abdominal segments VIII–X, lateral, x30; (1048) spiracle, x265 (similar on all segments); (1049) proventriculus and anterior ventriculus, x10.
Curculionidae: Platypodinae

Fig. 1050–1061 *Platypus gracilis*: (1050) habitus, lateral, x10; (1051) head, dorsal, x45; (1052) antenna, x265; (1053) labrum, clypeus, and epistoma, x95; (1054) epipharyngeal lining, x110; (1055) mandible, x95; (1056) pronotum, dorsolateral, x65; (1057) abdominal segments IV and V, lateral, x20; (1058) abdominal segments VIII–X, lateral, x30; (1059) spiracles, x265; (1060) proventriculus and anterior ventriculus, x15; (1061) egg, x15.
Curculionidae: Rhynchophorinae

Fig. 1062–1073 Sphenophorus brunnipennis: (1062) habitus, lateral, x7; (1063) head, dorsal, x15; (1064) antenna, ventral, x135; (1065) labrum, clypeus, and epistoma, x40; (1066) epipharyngeal lining, x45; (1067) mandible, x30; (1068) maxilla and labium, x40 (a, ventral; b, dorsal maxilla); (1069) malar seta, x110; (1070) Th III, ventropleural, pedal, and mediosternal lobes, x30; (1071) spiracles, x55; (1072) spiracular atrium in closed position, x265; (1073) alimentary canal, x7.
Curculionidae: Rhynchophorinae

Fig. 1074–1079 *Sitophilus oryzae*: (1074) habitus, lateral, x20; (1075) labrum, clypeus, and epistoma, x265; (1076) epipharyngeal lining, x265; (1077) mandible, x135; (1078) maxilla and labium, x65 (a, ventral; b, dorsal maxilla); (1079) thoracic spiracle, x265.  

Fig. 1080–1084 *S. granarius*: (1080) head, dorsal, x65; (1081) antenna, ventral, x265; (1082) Th II, ventropleural, pedal, and mediosternal lobes, x65; (1083) spiracles, x265; (1084) spiracular seta, x265.  

Fig. 1085, 1086 *S. zeamais*: (1085) epipharyngeal lining, x190; (1086) maxilla and labium, x95 (a, ventral; b, dorsal maxilla).
APPENDIX 2

List of host-plant/weevil larva associations, in alphabetical sequence of (a) plant families, (b) plant genera, (c) weevil genera. Fungi are listed separately at the end.
Cupressaceae
Cupressus macrocarpa
Dryophthorus sp.
Phloeosinus cupressi
Libocedrus bidwillii
Neocyba sp. B

Cyathea dealbata
Scolopterus aequus

Cycadaceae
Dioon sp.
Parallocorys us sp.
Encephalartos altensteinii
Antiarhis zamiae
Zamia furfuracea
Rhopalotria mollis

Cyperaceae
Cyperus esculentus
Phylctinus callosus

Epacridaceae
Dracophyllum latifolium
Peristoreus sp. indet.
Dracophyllum matthewsii
Peristoreus sp. indet.
Dracophyllum traversii
Agathius tridens
Peristoreus grossus
Rhynchodes ursus
Peristoreus sp. indet.

Fabaceae
Albizia julibrissin
Neosaccaloemus narinas
Lupinus arboreus
Phymatus hetaera
Medicago polymorpha
Sitonia discoidea
Medicago sativa
Hypha punctata
Naupactina
Sitonia discoidea

Racosperma decurrens
Neosaccaloemus narinas
Racosperma sp.
Araecerus palmaris
(carrying Uromycladium galls)
Sophora microphylla
Crisus variegatus
Trifolium incarnatum
Hypha punctata
Trifolium pratense
Hypha punctata
Trifolium repens
Mandalotus miricollis
Floresianus sordidus
Trifolium spp.
Sitonia discoidea
Ulex europaeus
Exapion ulicis

Fagaceae
Fagus spp.
Deporans betulae
Nothofagus cliffortioides
Pachyuris sticticus
Rhynchodes ursus

Nothofagus dombeyi
Rhyochitomacer rufus
Nothofagus fusca
Ancistroterus quadrispinosus

Nothofagus menziesii
Neocyba sp. A*
(*in galls on live stems)
Platypus caviceps

Nothofagus solandri
Psepholax tibialis
Pleosporus bullatus
Notochoragus crassus
Platybus cavitatus
Nothofagus sp.
Anagotus helmsi
Helmoreus sharpi
Platybus apicalis
Nothofagus truncata
Hypotagea concolor
Neomyca pulicaris
Quercus alba
Ithyecurus novieboracensis
Quercus macrocarpa
Ithyecurus novieboracensis

Grossulariaceae
Ribes nigrum
Otiorhynchus sulcatus

Haloragaceae
Haloragis erecta
Rhadinosomus acuminatus

Hydnoraceae
Prosopanche sp.
Hydnorobius sp.
(a parasitic plant on roots)

Iridaceae
Watsonia sp.
Bruchela lilii

Liliaceae
Aloe davyana
Brachycerus monachus
Astelia fragans
Phorostichus linearis
Peristoreus trilobus
Astelia solandri
Phorostichus linearis
Astelia spp.
Anagotus spp.
Astelia trinervia
Phorostichus linearis
Collospermum hastatum
Phorostichus linearis
Peristoreus trilobus
Phormium spp.
Anagotus spp.

Loganiaceae
Genistostoma ligustrifolium
Sympedius testudo

Malvaceae
Hoheria glabrata
Hoheria meinertzhageni
Hoheria populnea
Aneuma compta
Plagianthus betulinus
Hoheria meinertzhageni
Plagianthus divaricatus
Hoheria meinertzhageni

Meliaceae
Dysoxylum spectabile
Platybus apicalis
Metrosideros umbellata
Neomyca rubida

Monimiaceae
Hedycarya arborea
Lasiorhynchus barbicornis
Pentarhrynum zealandicum

Myoporaceae
Myoporum laetum
Sympedius testudo
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Salicaceae
Populus tremula
Salix spp.

Rutaceae
Citrus limon
Phebalium nudum
Salix spp.

Rosaceae
Crataegus monogyna
Eriobotrya japonica
Prunus sp. (yellow plums)
Prunus spinosa

Rubiaceae
Coprosma arborea
Coprosma australis
Coprosma lucida
Coprosma robusta
Coprosma serrulata
Coprosma sp.

Rutaceae
Pachyops dubius
Pentarthrum zealandicum

Sapindaceae
Alectryon excelsa
Scolytus multistriatus

Scrophulariaceae
Hebe macrocarpa
Oreocalus albosparsus

Smilacaceae
Ripogonum scandens
Pachyops dubius

Ulmaceae
Ulmus sp.

Violaceae
Melicytus sp.

Fungi
Botryosphaeria sp.
Ceratocystis ulmi
Endothia sp.
Monochaetia sp.

Seimatosporium sp.
Uromycladium sp.

Galls on live stems of
Nothofagus menziesii

Galls in Clematis paniculata vines

Gall in live trunk of
Hoheria populnea

Galls in live branches of
Nestegis lanceolata

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Area codes and boundaries used to categorize specimen locality data (after Crosby et al. 1976)

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(excludes Lord Howe, Norfolk, and Macquarie islands except in the context of extralimital zoogeography)
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