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Immature Stages of Curculionidae: Larvae of the Soil-dwelling Weevils of New Zealand

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Abstract

Larvae of 27 broad-nosed weevils (Adelognatha) in the sub-families Leptopiinae, Brachyderinae (Thylacitinae), Otiorhynchinae (Brachyrhininae) and 9 in Rhytirhininae (Cylindrorhininae) (Phanerognatha) are described and figured. The subfamilies and genera are defined, and two keys are provided. The first key is arranged phylogenetically, while the second is simplified and includes only those species which occur in agronomic areas. Of the 19 species recognised as pests, or occasional pests, in New Zealand, 13 are introduced.

INTRODUCTION

Since the publication in 1966 of my paper on the immature stages of soil-inhabiting weevils, in which I provided a key to the larvae and pupae of some 11 species and species-groups, several more exotic pests have established in New Zealand (Kuschel 1972) and many more larvae/adult relationships have been confirmed by rearing. Larvae of 36 species are covered here: 27 broad-nosed weevils in the subfamilies Leptopiinae, Brachyderinae, Otiorhynchinae and 9 in the phanerognathous subfamily Rhytirhininae. The latter, in addition to the root-feeding element, includes the genera *Listroderes* Schoenherr and *Hyperodes* Jekel which develop on the green parts of low-growing herbs but enter the soil only for pupation, so that mature larvae are picked up in soil samples.

Taxonomy

All the species are described. For foreign weevils, this will usually be a redescription, necessary for uniformity and ease of comparison. In order to avoid tedious repetition in the text and, again, for purposes of comparison, an index of setae (Table 1) has been prepared. The few species whose larvae/adult association has yet to be confirmed by rearing are annotated. Material examined has been listed under the areas, represented by a 2-letter code, defined by Crosby *et al.* (1976). Immature forms from the southern islands of New Zealand, from Snares Is (latitude 48°S) southwards, have been treated in a separate publication (May 1971). Larvae of the following endemic genera are still unknown: *Paelocharis* Broun, *Notiopatae* Broun, *Thotmus* Broun, *Eurynotia* Broun, *Lyperobates* Broun, *Echinopeplus* Broun, *Epitimetes* Pascoe, *Nonnotus* Sharp, *Hygrochus* Broun, and the introduced *Leptopius squalidus* (Boheman) (Leptopiinae), *Nestrius* Broun (Rhytirhininae). Except for *Leptopius,* all the introduced species are described here.

The need for a means of larval identification, arising as it does from two different sources, systematics and agronomy, is difficult to satisfy in a single key. Therefore, a second key is included, not arranged phylogenetically, and excluding those species which do not occur in cultivated areas.

The external morphology of weevil larvae is expounded in detail by Emden (1952), but the system of nomenclature I have followed is substantially that of Thomas (1957), as discussed in a previous paper (May 1967). Emden placed considerable emphasis on relative size and position of setae, especially on the pronotum and pedal lobes. The variation among minor and minute setae can be very confusing however, and I have avoided this type of comparison wherever possible. Although I have used mandibular characters it should be noted that they do not show up well on all specimens since the cutting edges and tips tend to become eroded as feeding proceeds. The alimentary canal usually provides clearly defined characters, especially in the shape, relative size, number and position of the gastric caeca. Its wider use as a taxonomic factor in Curculionoidea will not be treated here.

Pest Status

Of the 16 introduced species, all except 3 are recognised as pests or potential pests. Of the endemic species, 7 are recorded as reaching pest proportions occasionally, under certain conditions. The remainder either do not occur within agricultural or horticultural areas, or do not inhibit plant growth to any significant extent. The origin of each species (whether endemic or introduced) and its pest status is indicated in Table 1.

TECHNIQUES

Rearing

Prepupal or almost mature larvae, field collected, were placed in damp soil, in individual glass vials. No food was given. Pupation and emergence could usually be observed through the glass. The larval head capsule and skin was recovered and preserved along with the adult. First instar larvae were obtained from eggs laid by adults kept in petri dishes on damp filter paper and fed on clover (*Trifolium repens* L.).

Preparation of Specimens

Most features can be seen, using a binocular microscope, under 64× magnification. Mouthparts can be made accessible by spreading or removing the mandibles. But, examination of the spiracles, especially the airtubes, and the locating of setae, particularly the dorsolaterals, is greatly facilitated when specimens are stained and slide-mounted.

For detailed study, submature larvae were used, rather than prepupae. The fat-body accumulated in the latter tends to obscure internal structures and to make dissection difficult. Measurements were made first; then specimens, using 2 at a time, were prepared for examination. The process, which has been modified slightly from that described in my 1971 paper, is as follows:

1. The lower mouth parts are separated, but not completely severed, from the head, using a pointed scalpel.

2. The head (including lower mouthparts) is removed, avoiding damage to the postoccipital condyles (Fig. 3b).

3. The lower mouthparts and mandibles are separated from the head capsule. Preliminary drawings are made at this stage.

4. Using a pair of fine corneal scissors, the cuticle of one specimen is cut along the mid-lines of dorsum and venter; of the other specimen, along the sides between the rows of pleural lobes, clipping across the anus but leaving the body contents intact. The halves are then pulled apart and the alimentary canal examined.

5. All parts except the alimentary canal are prepared as slide mounts by the following method:

a. Heat in 10 percent KOH until cleared.

b. Wash in distilled water.

c. Stain in 100 percent ethanol to which a few drops of chlorazol black solution have been added. Staining is not necessary for head capsules which are pigmented.

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Table 1. Origin, pest status and setal index

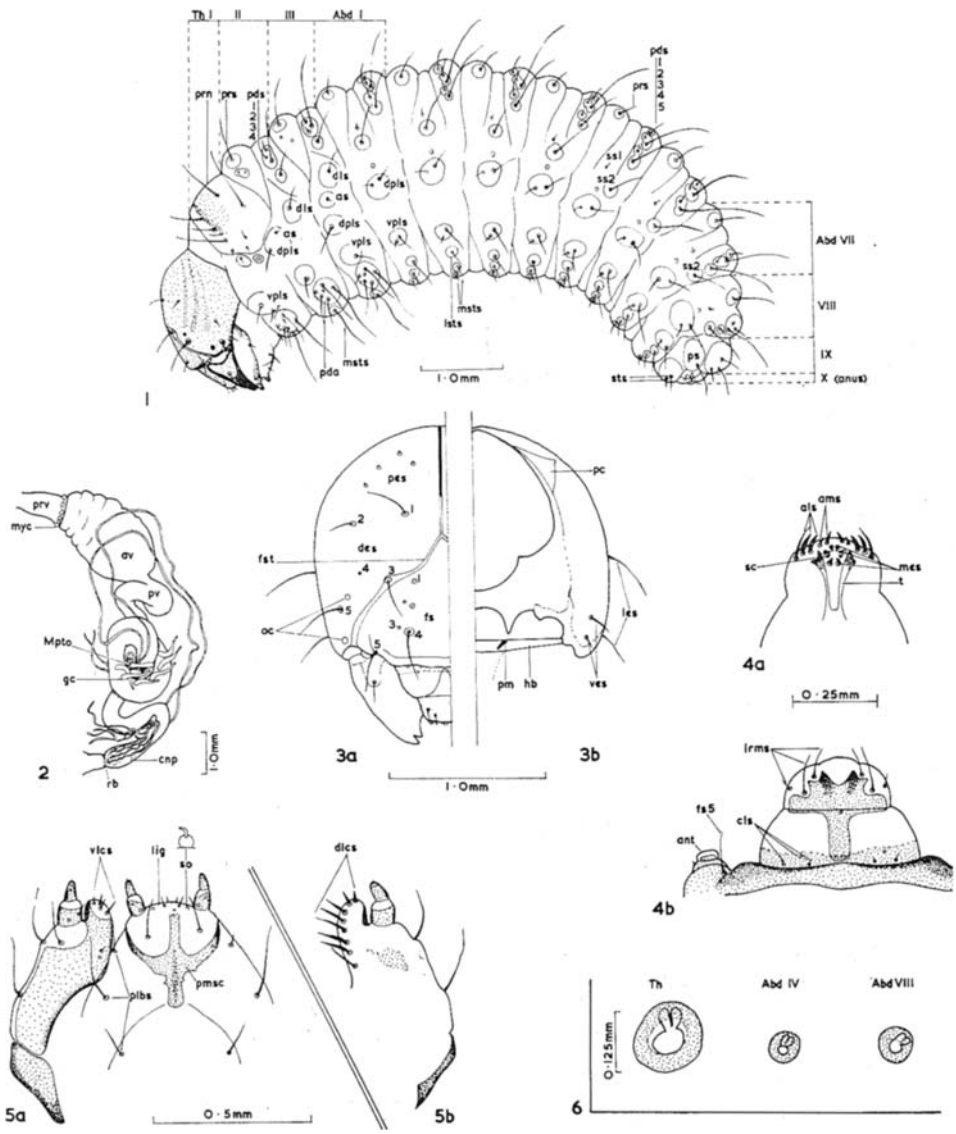
	Modal numbers	Listroderes obliquus	Listroderes delalpei	Desiantha d. lineata	Desiantha sexita	Desimtha variabilis	Hyperodes bonariensis	Gramlus thoracicus	Gramlus sp.	Liparogetus sp.	Sitona humeralis	Malvinterpes spinipes	Graphognathus leucoloma	Asynonychus cervinus	Florelsianus sordidus	Atrichonotus taeniatulus	Otiorhynchus sulcatus	Otiorhynchus rugosostriatus	Otiorhynchus ovatus	Phlyctinus callosus	Cecyropa discors	Cecyropa setigera	Cecyropa modesta	Catoptes robustus	Catoptes cuspidatus	Catoptes brevicornis	Catoptes sp.	Sargon quadrinodosus	Mandaliotus miricollis	Brachyolus posticalis	Brachyolus obscurus	Brachyolus postrectus	Irenimus compressus	Irenimus aequalis	Irenimus duplex	Nicaeana cervina	Nicaeana sp.
Origin		I	I	I	E	E	I	E	E	E	I	I	I	I	I	I	I	I	I	I	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Pest status		P	P	P	N	O	P	N	N	N	P	N	P	P	P	P	P	P	P	P	N	O	N	N	N	N	N	N	N	O	O	O	N	N	N	N	O
PROTHORAX																																					
pronotum	V	9	8+9	7	10	10	3-4	9	6+2	8	8	8-9	8-9	8-9	8	8	8-10	8-10	8-10	8-10	9	9	8-9	10	8-10	10-11	10	9	11	9	9	9	9	9	9	8-9	8-9
dorsopleural	1-3	1	1	0	0	0	*2*	1	*2*	*2*	*2*	1	2	1+*1*	1+*1*	1	*2*	*1*	?	1	1+*1*	1+*1*	2	3	3	3	3	2	2	2	2	2	2	2	2	2	2
ventropleural	2						1+*1*																														
mediosternal	1						*1*																														
pedal area	V	0	0	6	6	6	4+*2*	6+*1*	6	6+*1*	6	6	8	8	8	8	5+*2*	5+*2*	5+*2*	6+*1*	6	6	6	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*
MESO-, METATHORAX																																					
prodorsal	1						*1*																														
postdorsal	4	3-4					1+*3*																														
dorsolateral	1-2	2	2	1	1	1	*1*	1	1	1	1	2	2	2	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
alar area	1-3	2	2	1	1	1	*1*	1	1	1	1	1	3	2+*1*	2+*1*	2+*1*	*1*	1+*2*	1+*2*	2+*1*	2+*1*	2+*1*	2+*1*	2+*1*	2+*1*	2+*1*	3	2+*1*	3	2+*1*	2+*1*	3	2+*1*	3	3	2+*1*	2+*1*
dorsopleural	1																																				
ventropleural	1																																				
mediosternal	1																																				
pedal area	V	0	0	6	6+*1*	6	4+*2*	6	6	6+*1*	5+*1*	6	8	8	8	8	5+*2*	5+*2*	5+*2*	6+*1*	6	6	6	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*	6+*1*
ABDOMEN I-VIII																																					
prodorsal I-VII	1						*1*																														
VIII	1						*1*				0	0																						4	4	4	4
postdorsal I-VII	5				VII4		1+*4*	VI-VII4	VI-VII4	VII4		VII+ VIII circlet																VII4									
VIII	V	3	3	3	3	3	1+2	3	3	3	3		4	4	4	4	4+*1*	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
spiracular I-VII	1+*1*						*2*																														
VIII	1	2	0				*1*					?			*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	1+*1*	1+*1*	1+*1*	1+*1*										
dorsopleural	*2*						1+*1*														3-4	3-4	5-7														
ventropleural	*2*	1-2	0				1+*1*																														
laterosternal	1	0	0				*1*																														
mediosternal	*2*	0	0				*2*																														
ABDOMEN IX																																					
dorsal	V	3	3	3	3	3	2	3	3	3	3+*1*	circ)	4	3+*1*	4	4-5	3	2+*1*	3	3	3	3	3	2+*1*	1+*1*	2+*1*	2+*1*	3	2+*1*	3	3	3	3	2	3	3	3
pleural	2	0	0				1+*2*					-let)			1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*2*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*
sternal	2	0	0				*2*																		2+*2*	2+*1*	2+*1*	2+*1*									
ABDOMEN X																																					
anal lateral	1-3	0	0	3	3	3	0	3	3	3	3	*2*	*4*	*3*	1+*3*	1+*3*	3	3	3	3	3	3	3	1+*1*	1	1+*1*	1+*1*	2+*1*	*2*	1+*2*	1+*2*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*
HEAD																																					
dorsal	5			4	4	4	4	4	4	4			2+*3*	2+*3*	2+*3*	2+*3*	4	4	4	4	4	4	4	4	3+*1*	3+*1*	3+*1*	4	4	4	4	4	4	4	4	4
posterior	*4*																																				
lateral	2												*2*	*2*	1+*1*	1+*1*																					
ventral	2				*2*	1		1+*1*	*2*				1+*1*	1+*1*	*2*	*2*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*
frontal	5	3+2	3	1+*1*	1	1	1	2	1	2	4		2+*3*	2+*3*	2+*3*	2+*3*	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
clypeal	*2*																							1		1												
labral	3	2	2+*1*	2+*1*	2	2+*1*	2+*1*	2+*1*	2+*1*	2																											
mandibular	2	1+*1*	1+*1*	1	1	1+*1*	1	1+*1*	*2*	1		1+*1*					1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*		1+*1*	1	1	1	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*
EPIPHARYNGEAL LINING																																					
anterolateral	3	2-3	2-3								2																										
anteromedian	1+*1*									2																											
median	3																																				
MAXILLA																																					
lacinia (dorsal	V	6	6	7	7	7	6	7	7	7	6-7	7	8	8	8	8	8	8	8	8	7	7	?	8	8	8	8	7	7	7	7	7	7	7	7	7	7
lacinia (ventral	V+*1*	4+*1*	4+*1*	5+*1*	5+*1*	5+*1*	4+*1*	5+*1*	5+*1*	5+*1*	4+*1*	4+*1*	4+*1*	4+*1*	4+*1*	4+*1*	4+*1*	4+*1*	4+*1*	4+*1*	5	5	?	4+*1*	4+*2*	4+*1*	4+*1*	5+*1*	5+*1*	5+*1*	5+*1*	5+*1*	5+*1*	5+*1*	5+*1*	5+*1*	5+*1*
palpal	*1*	0	0				0																	1													
stipital	1																																				
palpiferal	2																																				
LABIUM																																					
postlabial	3	*1*	*2*	2+*1*	1+*2*				2+*1*			1+*2*																									
prelabial	1																																				
ligular	*2*				*1*																							1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*	1+*1*

Notes: Numbers of setae are stated only where they differ from the "modal number".
Italics represent minute setae
Abbreviations: I, introduced; E, endemic; P, pest or potential pest;
O, occasional pest; N, "neutral"; V, variable.
The prothoracic dorsopleural lobe is the "prothoracic epipleurite" of Enden 1952.

d. Wash in 100 percent ethanol.

e. Mount direct into Euparal or Sandeural. Minute knobs of chewing gum (jelutong) are used to support the cover slip above head capsules. It is easily pressed to the required depth and remains inert provided no direct heat is applied. It is possible, except with large larvae, to mount both specimens on the one slide, by placing the heads and mandibles at one end, under a 13 mm coverslip and the 4 cuticle halves with the lower mouthparts, in the centre of the slide, under an 18 mm coverslip. There is still room for a label.

f. Dry at 30°C. Fill up any marginal airspaces after 24 hours.



FIGS. 1-6. — *Otiorhynchus sulcatus* (Fabricius): 1, larva; 2, alimentary canal; 3, head — a, dorsal view; b, ventral view; 4, upper mouthparts — a, epipharynx; b, labrum, clypeus, frontal margin, antenna; 5, maxilla and labium — a, ventral view; b, dorsal side of maxilla; 6, spiracles, showing alignment.

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LIST OF ABBREVIATIONS USED IN TEXT AND FIGURES

Abd., abdominal segment
als, anterolateral setae
ams, anteromedian setae
ans, anal setae
ant, antenna
as, alar setae
asts, anterosternal seta
av, anterior ventriculus
cls, clypeal setae/sensillus
cnp, cryptonephridium
des, dorsoepicranial setae
dlcs, dorsal lacinial setae
dls, dorsolateral setae
dpls, dorsopleural setae
el, endocarinal line
fs, frontal setae
fst, frontal suture
gc, gastric caeca
hb, hypopharyngeal bracon
les, lateral epicranial setae
lrms, labral setae
lsts, laterosternal setae
ma, muscular apodeme
mes, median epipharyngeal spines or setae
Mpto, origin of Malphighian tubules
msts, mediosternal setae
myc, mycetomes
N.I., North Island
oc, ocelli
oec, oenocyte cluster
pc, postoccipital condyle
pda, pedal area
pds, postdorsal setae
pes, postepicranial setae
plbs, postlabial setae
pm, paramedian maculae
pmsc, premental sclerite
prn, pronotum
prs, prodorsal setae
prv, proventriculus
ps, pleural setae
pv, posterior ventriculus
rb, rectal bracon
sc, sensilli clusters
S.I., South Island
so, sensory organ
ss, spiracular setae
sts, sternal setae
t, torma
Th, thoracic segment
tt, tracheal trunk
ves, ventral epicranial setae
vlcs, ventral lacinial setae
vpls, ventropleural setae

PHYLOGENETIC KEY TO LARVAE

1 Antennae hemispherical to conical; as long or longer than wide (Fig. 12) ..... Phanerognatha; Rhytirhininae 2
— Antennae transverse; much shorter than wide (oval in cross-section) (Fig. 4b) ..... Adelognatha 10

2 (1) Spiracles with black crescent-shaped area on anterodorsal part of peritreme (Fig. 17). Head dark brown with blackish maculae (Fig. 9). Pronotal shield with dark maculae. Terminal segments Abd. IX and X narrowed and extended to form a pseudopod (Fig. 15) ..... *Listroderes* spp. 3
— Spiracles, colour of head and pronotum; shape of terminal segments, not as above 4

3 (2) Mandibles with 2 supplementary teeth, acute (Fig. 10). Antennal cone shorter, length less than 0.25 width of basal cushion (Fig. 12). Maximum length 12.0 mm ..... *Listroderes obliquus* (p. 201)
— Mandibles without distinct supplementary teeth (Fig. 14). Antennal cone longer, length greater than 0.3 width of basal cushion (Fig. 16). Maximum length 8.0 mm ..... *Listroderes delaiguei* (p. 201)

4 (2) Spiracles with airtubes external (not obviously so in *D. variabilis*). Epipharyngeal lining with tormae united for at least basal 0.25 (Figs. 20, 24, 27) ..... *Desiantha* spp. 5
— Spiracles with airtubes internal. Epipharyngeal lining with tormae convergent but not joined at base 7

5 (4) Abdominal spiracles with airtubes elongate, united to form a single spine, acute at apex 6
— Abdominal spiracles with airtubes short, not united, individually rounded at apex (Fig. 26) ..... *Desiantha variabilis* (p. 203)

6 (5) Abdominal spiracles I-VII lateral; pair VIII laterodorsal, well separated (Fig. 18). Mediosternal setae on simple fold. Non-aquatic species. Maximum length 7.0 mm .... *Desiantha diversipes lineata* (p. 203)

— Abdominal spiracles I-VII dorsal; pair VIII on mid-dorsum, close together (Fig. 30). Mediosternal setae mounted on paired lobes. Aquatic or semiaquatic species. Maximum length 15.0 mm .... *Desiantha ascita* (p. 204)

7 (4) Head with endocarinal line absent. Minor abdominal setae short, stout. Sternal setae well developed. Sternal folds simple. Not associated with Gramineae 8

— Head with endocarinal line present (Fig. 31). Minor abdominal setae minute, slender. Sternal setae obsolete (Fig. 32). Sternal folds with paired lobes (pseudopods). In leaf sheaths of Gramineae, or as prepupae, in soil beneath .... *Hyperodes bonariensis* (p. 204)

8 (7) Abd. VI with 4 postdorsal setae. Premental sclerite with posterior extension abruptly expanded before acute apex (arrowshaped) (Fig. 42). Epipharynx with spicules not extending behind proximal pair of *mes*; marginal setae of varying lengths (Fig. 38) .... *Gromilus* spp. 9

— Abd. VI with 5 postdorsal setae. Premental sclerite with posterior extension not abruptly expanded before acute apex (Fig. 45). Epipharynx with spicules extending behind proximal pairs of *mes* to base of tormae; marginal setae of similar lengths (Fig. 46) .... *Liparogetus* sp. (Lewis Pass) (p. 207)

9 (8) Head capsule bright red-brown. *fs* 5 well developed (Fig. 39). Alimentary canal with gastric caeca 2.5x longer than width of tube, widely spaced (Fig. 40) .... *Gromilus thoracicus* (p. 206)

— Head capsule yellow. *fs* 5 minute or absent. Alimentary canal with gastric caeca as long as width of tube, close together .... *Gromilus* sp. (Big South Cape I.) (p. 206)

10 (1) Antennae more or less symmetrical. Epipharynx with anterior median pair of setae inconspicuous, usually weaker than *als*. Mandibles uni- or bidentate; minor seta, if present, close to major seta, placed within scrobe. Alimentary canal with gastric caeca, if present, vermiform 11

— Antennae strongly asymmetrical, with outer side produced (Fig. 53). Epipharynx with anterior median pair of setae conspicuous, much stronger than *als* (Figs. 51, 52). Mandibles tridentate; minor seta distant from major seta, placed on lateral surface (Fig. 49). Alimentary canal with gastric caeca subcircular, compressed (Fig. 50) .... *Sitona humeralis* (p. 207)

11 (10) Terminal segments VII-IX with dorsal areas combining to form a disc enclosed by a circlet of up to 50 long, serrate hairs (Fig. 55) .... *Maleuterpes spinipes* (p. 209)

— Terminal segments not as above 12

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12 (11) Head mainly colourless; strongly retracted into prothorax, with setae on anterior 0.25 only (Figs. 62, 64). Thoracic spiracle ovate-fringed (Fig. 72) ..... Brachyderinae; Naupactini 13

— Head coloured; exserted (free), with strong setae on at least anterior 0.5. Thoracic spiracle annular 16

13 (12) Minor abdominal dorsal setae pigmented, stout, spinous, particularly in younger larvae (Fig. 71). Length in final instar greater than 10.0 mm ..... *Graphognathus leucoloma* (p. 210)

— Minor abdominal dorsal setae pale, hairlike in all stages. Length in final instar less than 10.0 mm 14

14 (13) Antennae with apex and base of similar width; sides parallel (Fig. 80). Lacinia with a group of hairlike spinules at proximal end of dorsal row of setae (magnification x100) (Figs. 77, 82). Abd. II-V with *pds* 1 subequal in length to *pds* 2 (Fig. 78). 1 strong anal seta present (Figs. 79, 81) 15

— Antennae with apex wider than base; sides divergent (as in *G. leucoloma* (Fig. 67)). Lacinia without a group of spinules at proximal end of dorsal row of setae (Fig. 74). Abd. II-V with *pds* 1 2x length of *pds* 2 (Fig. 75). Strong anal seta not present ..... *Asynonychus cervinus* (p. 210)

15 (14) Abd. VIII with minor postdorsal seta (*pds* 3) approximately 0.5 length of adjacent setae (Fig. 79). Maxilla, on inner surface, with spinules abundant (Fig. 77). Abd. I with asperities on prodorsal fold (Fig. 78). Mesothorax with asperities between and behind mediosternal setae (x100) (Fig. 76) ..... *Atrichonotus taeniatulus* (p. 212)

— Abd. VIII with *pds* 3 approximately 0.1 length of adjacent setae (Fig. 81). Maxilla, on inner surface, with spinules sparse (Fig. 82). Abd. I without asperities on prodorsal fold. Mesothorax without asperities on mediosternal area ..... *Floresianus sordidus* (p. 212)

16 (12) Meso- and metathorax with 2 dorsolateral ("alar" of Emden 1952) setae. Posterior and median ("anterior" of Emden) pairs of *mes* more or less equally separated (as in Fig. 110). Alimentary canal lacking a ring of mycetomes at base of proventriculus. (Fig. 126) ..... Leptopiinae 20

— Meso- and metathorax with 1 dorsolateral seta (Fig. 1). Posterior pair of *mes* closer together than median pair (Fig. 40). Alimentary canal with a ring of white, globular mycetomes at base of proventriculus (Fig. 2) ..... Otiorhynchinae 17

17 (16) Abd. V-VII with major spiracular seta (*ss*2) on middle fold, dorsal to spiracle. Cuticle of dorsal abdominal folds lacking asperities. Maculae of hypopharyngeal bracon extending along posterior margin (Fig. 93) ..... *Phlyctinus callosus* (p. 215)

— Abd. V-VII with major spiracular seta on posterior fold, caudal to

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spiracle (Fig. 1). Cuticle of dorsal abdominal folds asperate. Maculae of hypopharyngeal bracon not extending along posterior margin (Fig. 3b) ..... *Otiorhynchus* spp. 18

18 (17) Mesothorax with *pds* 1 long, subequal in length to *pds* 3. Ventropleural lobes of Abd. II-V with minor seta 0.5 length of major seta. Labrum with lateral seta subequal to anterior seta (Fig. 83) ..... *Otiorhynchus ovatus* (p. 214)

— Mesothorax with *pds* 1 short, less than 0.5 length of *pds* 3. Ventropleural lobes of Abd. II-V with minor seta 0.2 length of major seta. Labrum with lateral seta 0.5 or less, length of anterior seta 19

19 (18) Posterior margin of premental sclerite Y-shaped (Fig. 5a). Alimentary canal with gastric caeca not expanded at base (vermiform) (Fig. 2) ..... *Otiorhynchus sulcatus* (p. 213)

— Posterior margin of premental sclerite V-shaped (Fig. 89). Alimentary canal with gastric caeca expanded at base (flask-shaped) (Fig. 88) ..... *Otiorhynchus rugosostriatus* (p. 214)

20 (16) Abd. VII-IX with setae approximately 3x wider than those of preceding segments; often clubbed (Fig. 105). Dorsopleural lobes of abdomen bearing 3 or more setae (Figs. 102, 106, 107). Abd. IX with pleural lobes simple (though well pigmented) ..... *Cecyropa* spp. 21

— Abd. VII-IX with setae scarcely wider than those of preceding segments; never clubbed. Dorsopleural lobes of abdomen bearing 2 setae. Abd. IX with pleural lobes modified to a greater or less degree 23

21 (20) Dorsopleural lobes of abdomen bearing 3-4 setae (Figs. 102, 106). Mandibular setae unequal in length (Fig. 98) 22

— Dorsopleural lobes of abdomen bearing 5-7 setae (Fig. 107). Mandibular setae subequal in length ..... *Cecyropa modesta* (p. 218)

22 (21) Distribution north of latitude 39°S (northern Hawke's Bay) ..... *Cecyropa discors* (p. 217)

— Distribution south of latitude 38.5°S (Poverty Bay) ..... *Cecyropa setigera* (p. 217)

23 (20) Abd. IX with pleural lobes enlarged and elongated to form a heavily sclerotised ventral plate ("type B" of Emden). Abd. X (anal segment) longer than wide (Figs. 114, 118, 120). Ventral folds of abdomen each with a transverse row of coarse spinules (Fig. 113) ..... *Catoptes* spp. 24

— Abd. IX with pleural lobes enlarged or not; not elongated to form a sclerotised ventral plate ("type A" of Emden). Abd. X subquadrate to subcircular (Fig. 127). Ventral folds of abdomen without a transverse row of coarse spinules 27

24 (23) Abd. IX with dorsal and sternal areas triangular; sternal area enclosed anteriorly by bases of extended pleural lobes (Figs. 114, 118) 25

— Abd. IX with dorsal area trapezoidal; sternal area subquadrate, not enclosed anteriorly by bases of extended pleural lobes (Fig. 120) 26

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25 (24) Cuticle of Abd. I-V with coarse, pigmented spicules congregated along dorsal folds and on dorso-lateral lobes (Fig. 113). Frons mainly yellow-brown, without distinct pattern (Fig. 108) ..... *Catoptes* cf. *robustus* (p. 218)

— Cuticle of Abd. I-V without spicules except ventrally. Frons mainly white, with pattern present as a red-brown band (Fig. 116) ..... *Catoptes* cf. *cuspidatus* (p. 220)

26 (24) Labrum with lateral seta subequal in length to anterior seta (Fig. 119). Spicules present on dorsopleural lobes of Abd. I-II. Sternal area of Abd. IX with inner seta greater than 0.5 length of outer seta (Fig. 120). Maximum length 13.5 mm ..... *Catoptes brevicornis brevicornis* (p. 220)

— Labrum with lateral seta much shorter than anterior seta. Spicules absent from dorsopleural lobes of Abd. I-II. Sternal area of Abd. IX with inner seta less than 0.5 length of outer seta. Maximum length 7.0 mm ..... *Catoptes* sp. (Big South Cape I.) (p. 220)

27 (23) Pleural lobe of Abd. IX strongly expanded; width greater than width of dorsum (Figs. 148, 152). Alimentary canal with 0-4 gastric caeca on each side of lower coil 28

— Pleural lobes of Abd. IX scarcely expanded; width less than width of dorsum (Fig. 127). Alimentary canal with 6-7 gastric caeca on each side of lower coil (Fig. 126) ..... *Sargon quadrinodosus* (p. 221)

28 (27) Pleural lobe of Abd. IX with major seta in apical 0.3. Abd. X with major anal seta strong, subequal to major pleural seta of Abd. IX (Fig. 137). Thoracic and abdominal spiracles similar; with or without airtubes 29

— Pleural lobe of Abd. IX with major seta midway between basal margin and apex (Fig. 133). Abd. X with both anal setae weak; much smaller than major pleural seta of Abd. IX. Thoracic and abdominal spiracles dissimilar; thoracic with 2, abdominal with 1 or 0 airtubes (Fig. 134) ..... *Mandalotus miricollis* (p. 222)

29 (28) Dorsum of Abd. IX with 2 setae (Figs. 152, 153) ..... *Irenimus aequalis* (p. 225)

— Dorsum of Abd. IX with 3 setae (Figs. 137, 148) 30

30 (29) Spiracles with 0, or occasionally 1, airtubes (Fig. 144) 31

— Spiracles with 2 airtubes (Fig. 138) 32

31 (29) Abd. I-VII with asperities present on area between dorso- and ventropleural lobes (Fig. 145). Head with frontal colour band absent ..... *Brachyolus* cf. *postrectus* (p. 225)

— Abd. I-VII lacking asperities on area between dorso- and ventropleural lobes. Head with frontal colour band present (Fig. 157) ..... *Nicaeana cervina* (p. 226)

32 (30) Mandibles bidentate (Fig. 150) 33

— Mandibles unidentate (except occasionally in teneral larvae) (Fig. 143) 35

33 (32) Spiracles with peritreme pigmented (Fig. 155). Dorsum of Abd. IX with a brown median macula (Fig. 156) ..... *Irenimus duplex* (p. 226)

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— Spiracles with peritreme unpigmented. Dorsum of Abd. IX without a median macula 34

34 (33) Premental sclerite complete. Head predominantly pale with wide, red, medianly peaked, frontal band (fades in alcohol) (Fig. 150) ..... *Irenimus compressus* (p. 225)

— Premental sclerite broken before median extension (Fig. 162). Head predominantly light red without frontal colour band ..... *Nicaeana* sp. (Ohakune) (p. 226)

35 (32) Abd. IX with posterior dorsal seta less than 0.5 length of median seta (Fig. 140) ..... *Brachyolus obscurus* (p. 225)

— Abd. IX with posterior dorsal seta greater than 0.5 length of median seta (Fig. 137) ..... *Brachyolus posticalis* (p. 223)

SIMPLIFIED KEY TO LARVAE OCCURRING IN AGRONOMIC AREAS

1 Head partially retracted into thorax (Fig. 64); oval in outline (Fig. 62) 2

— Head exserted (Fig. 1); subcircular in outline (Fig. 3) 5

2 (1) Abd. II-V with *pds* 1 subequal in length to *pds* 2 (as in Figs. 64, 71); dorsal minor setae stout or slender. Lacinia with a group of hair-like spinules at proximal end of dorsal row of setae (x100) (Figs. 70, 77, 82) 3

— Abd. II-V with *pds* 1 2x length of *pds* 2 (Fig. 75); dorsal minor setae slender, hair-like. Lacinia without a group of spinules at proximal end of dorsal row of setae (Fig. 74). Maximum length 9.0 mm ..... *Asynonychus cervinus* (p. 210)

3 (2) Minor abdominal dorsal setae stout, spinous; pigmented in younger larvae (Fig. 71). Antennae with apex wider than base; sides divergent (Fig. 67). Maximum length greater than 10.0 mm ..... *Graphognathus leucoloma* (p. 210)

— Minor abdominal dorsal setae slender, hair-like; pale in all stages. Antennae with apex and base of similar width; sides sub-parallel (Fig. 80). Maximum length less than 8.0 mm 4

4 (3) Abd. VIII with *pds* 3 approximately 0.5 length of adjacent setae (Fig. 79). Maxilla, on inner surface, with spinules abundant (Fig. 77) ..... *Atrichonotus taeniatulus* (p. 212)

— Abd. VIII with *pds* 3 approximately 0.1 length of adjacent setae (Fig. 81). Maxilla, on inner surface, with spinules sparse (Fig. 82) ..... *Floresianus sordidus* (p. 212)

5 (1) Abd. VII-IX with setae approximately 3x wider than those of preceding segments; often clubbed (Figs. 102, 107). Dorsopleural lobes of abdomen bearing 3 or more setae (Figs. 102, 106, 107) ..... *Cecyropa spp.* (p. 217)

— Abd. VII-IX with setae scarcely wider than those of preceding segments; never clubbed. Dorsopleural lobes of abdomen bearing 2 setae 6

6 (5) Abd. IX with pleural lobes enlarged; elongated to form a heavily sclerotised ventral plate. Abd. X (anal segment) longer than wide (Figs. 114, 118, 120). Ventral folds of abdomen each with a transverse row of coarse spinules (Fig. 113) ..... *Catoptes spp.* (p. 218)

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— Abd. IX with pleural lobes enlarged or not; not elongated to form a sclerotised ventral plate. Abd. X subquadrate to subcircular. Ventral folds of abdomen without a transverse row of coarse spinules 7

7 (6) Terminal segments Abd. VII-IX with dorsal areas combined to form a disc enclosed by a circlet of up to 50 long, serrate hairs (Fig. 55) ..... *Maleuterpes spinipes* (p. 209)

— Terminal segments not as above 8

8 (7) Pleural lobe of Abd. IX strongly expanded (as in Fig. 133); width (A-B) much greater than width of dorsum (B-C) (as in Fig 148) 9

— Pleural lobe moderately expanded; width subequal to width of dorsum ..... *Phlyctinus callosus* (p. 215)

— Pleural lobe of Abd. IX scarcely, or not, expanded (as in Fig. 1); width less than width of dorsum (as in Fig. 15) 16

9 (8) Pleural lobe of Abd. IX with major seta in apical 0.3. Abd. X with major anal seta strong, subequal to major pleural seta of Abd. IX (Fig. 137) 10

— Pleural lobe of Abd. IX with major seta midway between basal margin and apex (Fig. 133). Abd. X with both anal setae weak; much smaller than major pleural seta of Abd. IX ..... *Mandalotus miricollis* (p. 222)

10 (9) Dorsum of Abd. IX with 2 setae (Figs. 152, 153) ..... *Irenimus aequalis* (p. 225)

— Dorsum of Abd. IX with 3 setae (Figs. 148, 137) 11

11 (10) Spiracles with 0, or occasionally 1, airtubes (Fig. 144) 12

— Spiracles with 2 airtubes (Fig. 147) 13

12 (11) Abd. I-VII with asperities present on area between dorso- and ventropleural lobes (Fig. 145). Head with frontal colour band absent ..... *Brachyolus* cf. *postrectus* (p. 225)

— Abd. I-VII lacking asperities on area between dorso- and ventropleural lobes. Head with frontal colour band present (Fig. 157) (fades in alcohol) ..... *Nicaeana cervina* (p. 226)

13 (11) Mandibles bidentate (Fig. 150) 14

— Mandibles unidentate (Fig. 143) (may be finely divided at tip, in teneral larvae) 15

14 (13) Premental sclerite complete. Head predominantly pale, with wide, red, 3-peaked, frontal band (Fig. 150) (fades in alcohol) ..... *Irenimus compressus* (p. 225)

— Premental sclerite broken before median extension (Fig. 162a). Head predominantly light red, without frontal colour band ..... *Nicaeana* sp. (Ohakune) (p. 226)

15 (13) Abd. IX with posterior dorsal seta less than 0.5 length of median seta (Fig. 140) ..... *Brachyolus obscurus* (p. 225)

— Abd. IX with posterior dorsal seta greater than 0.5 length of median seta (Fig. 137) ..... *Brachyolus posticalis* (p. 223)

16 (8) Spiracles with black crescent-shaped area on anterodorsal part of peritreme (Fig. 17). Head dark brown with blackish maculae (Fig. 9). Pronotal shield with dark maculae. Terminal segments, Abd. IX and X, narrowed and extended to form a pseudopod (Fig. 15) ..... ***Listroderes*** spp. 17

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— Spiracles, colour of head and pronotum, shape of terminal segments, not as above 18

17 (16) Antennal cone shorter, length less than 0.25 width of basal cushion (Fig. 12). Mandibles, if uneroded, with 2 small, acute supplementary teeth (x64) (Fig. 10). Maximum length 12.0 mm ..... *Listroderes obliquus* (p. 201)

— Antennal cone longer, length greater than 0.3 width of basal cushion (Fig. 16). Mandibles, apart from apical pair of teeth, with no more than an obtuse projection (Fig. 14). Maximum length 8.0 mm ..... *Listroderes delaiguei* (p. 201)

18 (16) Epipharyngeal lining with tormae united for at least basal 0.25 (Figs. 20, 24). Spiracles with airtubes external (not distinct in *D. variabilis*) (Figs. 18, 23, 26) ..... *Desiantha* spp. 19

— Epipharyngeal lining with tormae not united basally. Spiracles with airtubes internal 20

19 (18) Abdominal spiracles with airtubes elongate, united to form a single spine, acute at apex (Fig. 18). Non-aquatic ..... *Desiantha diversipes lineata* (p. 203)

— Abdominal spiracles with airtubes short, not united, individually rounded at apex (Fig. 26). Semi-aquatic ..... *Desiantha variabilis* (p. 203)

20 (18) Head with endocarinal line present; epicranium with narrow, pale, paramedian stripes (Figs. 31, 47) 21

— Head with endocarinal line absent; epicranium with paramedian areas not as above 22

21 (20) Epipharynx with major *ams* strong, red-brown, longer than *als* (Fig. 52). Mandibles tridentate (Fig. 49). Labrum with strong V-shaped colour pattern (Fig. 51). Abd. IX with dorsal setae upstanding ..... *Sitona humeralis* (p. 207)

— Epipharynx with major *ams* weak, pallid, shorter than *als* (Fig. 34). Mandibles bidentate. Labrum without strong colour pattern (Fig. 33). Abd. IX with dorsal setae curved, trailing (Fig. 32) ..... *Hyperodes bonariensis* (p. 204)

22 (20) Mesothorax with *pds* 1 long, subequal in length to *pds* 3. Ventropleural lobes of Abd. II-V with minor seta 0.5 length of major seta ..... *Otiorhynchus ovatus* (p. 214)

— Mesothorax with *pds* 1 short, less than 0.5 length of *pds* 3. Ventropleural lobes of Abd. II-V with minor seta 0.2 length of major seta (Fig. 1) 24

23 (22) Posterior margin of premental sclerite Y-shaped (Fig. 5a). Terminal segments scarcely pigmented ..... *Otiorhynchus sulcatus* (p. 213)

— Posterior margin of premental sclerite V-shaped (Fig. 89). Terminal segments strongly pigmented ..... *Otiorhynchus rugosostriatus* (p. 214)

SUBFAMILY RHYTIRHININAE

Head usually free; anterior and posterior ocelli present; postoccipital condyles distinct, acute, coloured as head; endocarinal line often absent; sutures distinct; frontal setae reduced, with *fs* 4 constant, always longer than *fs* 5; *des* 2 well developed; *des* 3 placed within frontal suture; *des* 4 minute. Mandibles bifid, with an accessory tooth or obtuse projection medially; 1 only, visible seta.

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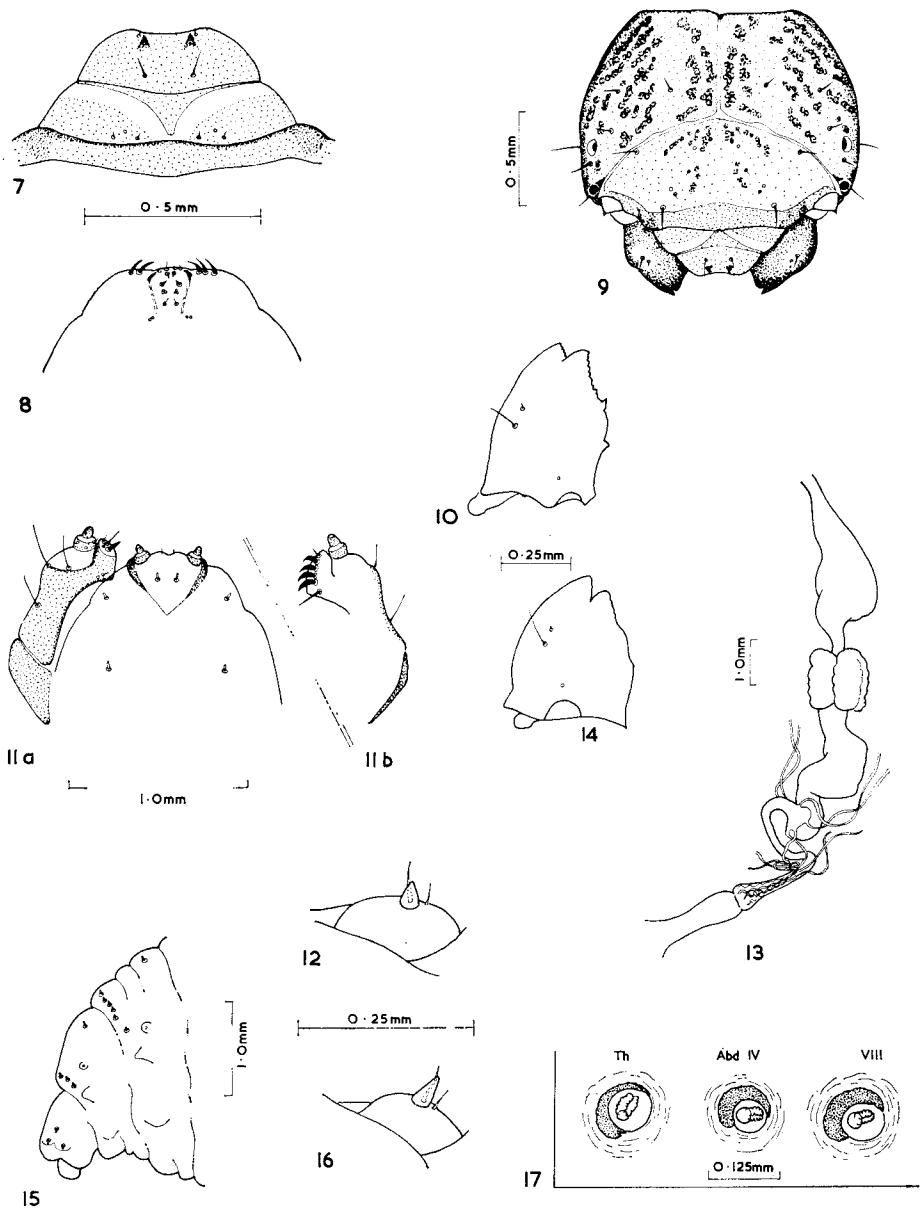
Hypopharyngeal bracon clear or with paramedian maculae. Labrum never distinctly lobed, often truncate, with lateral setae reduced or absent. Tormae convergent, contiguous, or united at base. Posterior pair of postlabial setae less widely separated than median pair. Lacinia with fewer than 8 dorsal setae. Anus 4-lobed; lateral lobes with 3 or 0 setae.



FIGS. 7-17. — Rhytirhininae: 7-13, *Listroderes obliquus* Klug; 7, labrum, clypeus, frontal margin; 8, epipharynx; 9, head; 10, mandible; 11, maxilla and labium — a, ventral view; b, dorsal view of maxilla; 12, antenna; 13, alimentary canal. 14-17, *Listroderes delaiguei* Germain; 14, mandible; 15, terminal segments of abdomen, lateral view; 16, antenna; 17, spiracles.

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Genus **Listroderes** Schoenherr

Body cuticle shagreened, without asperities. Pedal and sternal lobes with setae obsolete, developed for adhesion to plant surfaces. Posterior end tapering, with pleural lobes acute. Anus produced to form a pseudopod. All dorsal setae of similar size, very small, peg-like. Pronotum dull brown with darker maculae.

Head small in relation to body; wider than long; *des* 3 situated just inside frontal plate; *des* 4 variable; *fs* 5 minute. Ocelli distinct, with raised corneae. Antennae conical with hairlike basal papillae. Hypopharyngeal bracon clear. Tentorial bridge thickened and pigmented. Mandibles short, wide, usually with supplementary teeth. Labrum completely pigmented, with anterior margin depressed. Tormae obsolete. Epipharyngeal lining with 2-3 (variable) anterior lateral setae. Premental sclerite visible at sides only. Spiracles circular, bicameral; airtubes with 5-6 annuli, directed dorsad on thoracic, caudad on abdominal segments; peritreme with a dark, crescent-shaped area antero-dorsally. Anus ventral.

Alimentary canal with proventriculus expanded, as large as ventriculus; mycetomes absent; anterior ventriculus short, 4-lobed; posterior ventriculus simple, with coils ill-defined and gastric caeca lacking; Malpighian tubules arising from thickened ring; evenly distributed, rejoining hind gut beyond final bend. Cryptonephridium evenly developed. Rectal bracon an unpigmented ring. Rectum as long, or longer than cryptonephridium.

Listroderes obliquus Klug (= **costirostris** of authors) (Figs. 7-13)

Common name: Vegetable weevil.

Maximum size: 11.5 × 3.5 mm. Head width 1.75 mm.

Body greenish cream to bright green, according to food plant; slightly curved. Head dull brown with well defined, darker maculate pattern. Antennae with cone length 0.2 width of basal cushion, with 2 basal papillae, 1 shorter, 1 longer than cone. Mandibles with median and submedian, acute, supplementary teeth. Alimentary canal with rectrum equal in length to cryptonephridium.

Habitat: Any area in cultivation.

Recorded food plants: Most vegetables and many weeds.

Distribution: N.I., throughout; S.I., north of latitude 45.50°S.

Material examined: AK: Pukekohe, damaging carrot (*Daucus carota* L. cv. *sativa* DC) seedlings, 24.v.1956, 14 larvae; Panmure, on turnip (*Brassica rapa* L.) leaves, 7.viii.1959, 42 larvae (Dep. Agric.); Karaka, beneath *Stellaria* sp., 4.vi.1964, 15 larvae (J. G. Bilkey); Mt Albert, Auckland, 1.v.1967, 20 first instar larvae reared from eggs (B. M. May). WO: Huntly, on cabbages (*Brassica oleracea* cv. *capitata* L.), 17.vi.1957, 4 larvae (F. G. Tregoweth); BP: Tauranga, on cabbage leaves, 30.viii.1967, 7 larvae (Dep. Agric.). RI: Te Horo, on celery (*Apium graveolens* L. cv. *dulce* (P. Miller) (Pers.), 7.v.1957, 8 larvae (Dep. Agric.).

Listroderes delaiguei Germain (Figs. 14-17)

Common name: Subterranean clover weevil.

Maximum size: 9.0 × 3.0 mm. Head width 1.5 mm.

Body dull cream, scarcely curved. Head dull brown, usually with a darker maculate pattern, obscurely defined. Antennae with cone length 0.3× width of basal cushion, with 2 basal papillae, 1 shorter, 1 longer, than cone. Mandibles with 1 median, usually eroded, supplementary tooth. Alimentary canal with rectum 2× length of cryptonephridium.

Habitat: Pasture.

Recorded food plants: Polyphagous, with a preference for subterranean clover (*Trifolium subterraneum* L.).

Distribution: N.I., throughout, including Great Barrier I.; d'Urville I.; S.I. throughout.

Material examined: AK: Karaka, 26.viii.1963, 3 larvae (J. G. Bilkey). BP: Whakatane, -.ix.1964, 5 larvae (J. S. Timlin); WO: Hauraki Plains, 10.ix.1973, 11 larvae (P. D. King); Te Awamutu, 5.ix.1962, 6 larvae (J. S. Timlin).

Listroderes foveatus (Lea)

Common name: None.

Larvae unknown.

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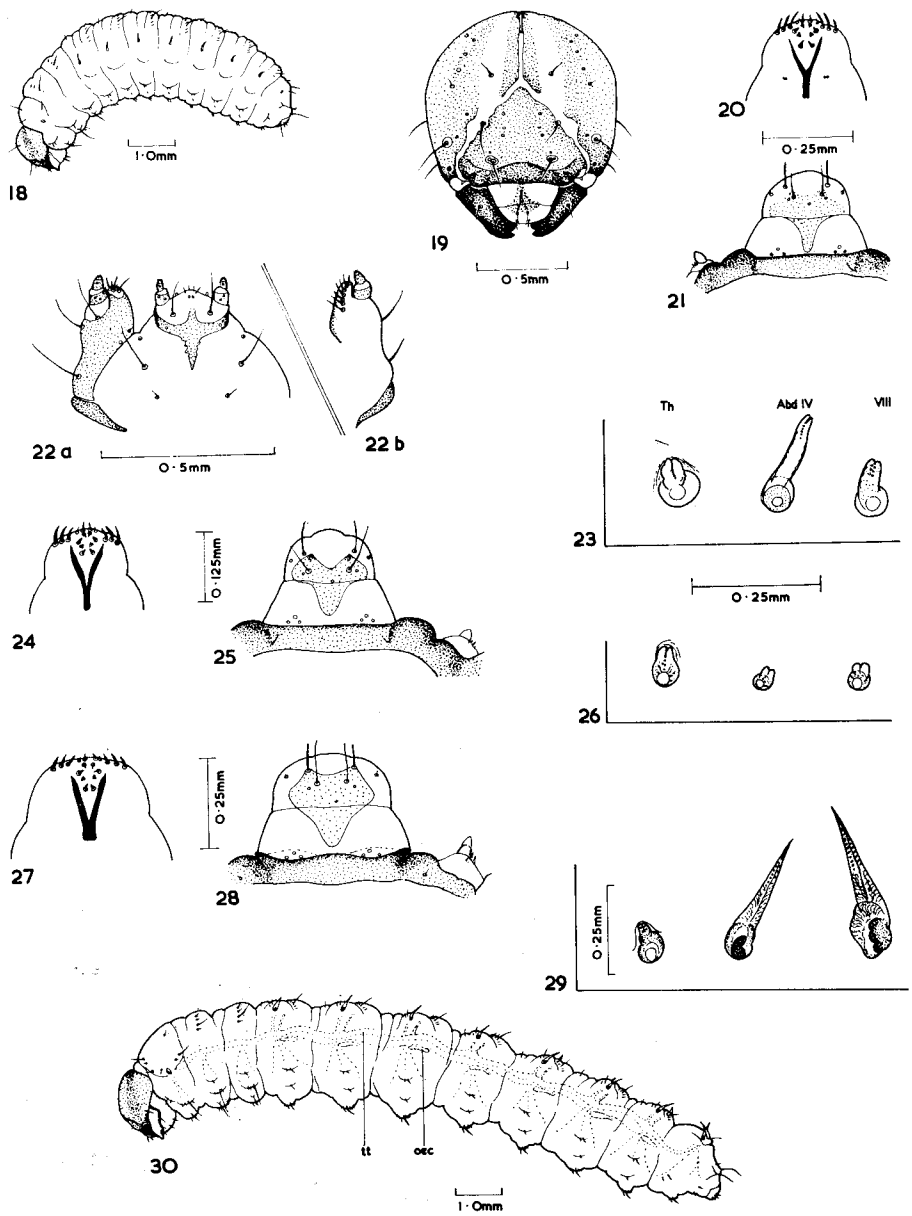
Adults are found occasionally amongst populations of *L. obliquus,* to which they are superficially similar. The larvae are likely to be almost identical to those of *L. obliquus.*

Distribution: Known from Whangarei to New Plymouth.



FIGS. 18-30. — Rhytirhininae: 18-23, *Desiantha diversipes lineata* Pascoe; 18, larva; 19, head; 20, epipharynx; 21, labrum, clypeus, frontal margin, antenna; 22, maxilla and labium—a, ventral view; b, dorsal view of maxilla; 23, spiracles. 24-26, *Desiantha variabilis* Broun; 24, epipharynx; 25, labrum, clypeus, frontal margin, antenna; 26, spiracles. 27-30, *Desiantha ascita* (Pascoe); 27, epipharynx; 28, labrum, clypeus, frontal margin, antenna; 29, spiracles; 30, larva.

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Genus **Desiantha** Pascoe

The genus *Desiantha* contains species which, though living in diverse habitats, show evidence, in the form of modified spiracles, of association with the aquatic environment (May 1970).

Head free, coloured, evenly rounded, scarcely emarginate behind; ocelli without raised corneae; endocarinal line absent. Mandibles wide, flattened, with a median obtuse projection. Labrum pigmented medianly; with 3 sensilli and with lateral seta minute. Premental sclerite with posterior median extension longer than anterior, irregularly margined, arrow-shaped. Postlabium with anterior and posterior pairs of setae small to minute; median pair long. Spiracles circular, with paired airtubes external, usually combined to form a spine. Major spiracular seta never directly above spiracle and placed progressively further caudad on Abd. I-VII. Anus 4-lobed; lateral lobes with 3 setae.

Alimentary canal with proventriculus not expanded. A ring of white, globular mycetomes present around cardiac valve at base of proventriculus. Anterior ventriculus simple, 0.5 length of body. Posterior ventriculus with 1 transverse, 1 longitudinal coils, gastric caeca usually present, vermiform. Malpighian tubules arising from a thickened ring. Cryptonephridium weakly developed. Rectal bracon circular, unpigmented. Rectum short.

Desiantha diversipes lineata Pascoe (formerly known as **maculata** Blackburn (Kuschel 1972)) (Figs. 18-23).

Common name: Victoria weevil.

Maximum size: 7.0 × 2.0 mm. Head width 1.0 mm.

Body moderately robust, widest behind middle; setae red-brown, fusiform, small. Cuticle with asperities only on sternal folds. Head light red-brown with paramedian stripes connecting *des* 1 and 3, and circular areas around setae, pallid. Mandibles, frontal margin, genae and labral pattern, red-black. Anterior ocelli larger than posterior. Antennae broadly conical, with small basal papillae. Labral tormae united for basal 0.3. Hypopharyngeal bracon clear. Thoracic spiracle with airtubes rounded, 2× width of peritreme. Abdominl spiracles I-VII with airtubes united and elongated to form a spine, 5× longer than width of peritreme, dorsad; Abd. VIII spiracle with airtubes united, but shorter, less acute, located laterally. Alimentary canal as generic description, with 4 gastric caeca in a single row on each side of tube before ileo-colic valve.

Note: Larvae of *D. caudata* Pascoe, damaging to roots of germinating cereals in South Australia (Allen 1972), have an apical blade-like process, on the spiracles, similar to those on the rice water weevil *Lissorhoptrus oryzophilus* Kuschel (Erirhininae). Such appendages are not visible on *D. d. lineata.*

Habitat: Light soils such as sand, pumice, alluvial.

Recorded food plants: Polyphagous.

Distribution: N.I., throughout. S.I., north of latitude 44°S.

Material examined: AK, Pukekawa, in pasture, 5.ix.1962, 9 larvae; Waiuku, 19.ix.1963, 4 larvae (J. G. Bilkey). BP: Kaingaroa Forest Nursery, roots of sorrel (*Rumex acetosella* L.), 7.xii.1961, 8 larvae (R. Zondag). NC: Waipara, roots of roadside weeds, 10.ix.1972, 12 larvae. MC: Dorie, roots of lucerne (*Medicago sativa* L.), 12.ix.1972, 8 larvae (B. M. May); Christchurch, roots of strawberry (*Fragaria* sp. cult.), 22.ix.1972, 52 larvae (B. M. May, K. G. Somerfield).

Desiantha variabilis (Broun) (Figs. 24-26)

Common name: Cotula weevil.

[This is a new combination. Dr G. Kuschel has established the synonymy of *Dryopais* Broun 1886 with *Desiantha* Pascoe 1870.]

Maximum size: 5.0 × 2.0 mm. Head width 1.0 mm.

Similar to *D. lineata* except for the following features: Body of even width with setae subulate (evenly tapered). Spiracles with airtubes external but not united, short, 2× width of peritreme, apices individually rounded, dorsad on all segments. Abdominal spiracles smaller than those of thorax.

Habitat: Swamp margins, salt meadows, bowling greens (other than grass greens).

Recorded food plants: *Cotula* spp., *Myriophyllum* sp., *Dichondra* spp.

Distribution: N.I., south of latitude 38.50°S.; S.I., throughout.

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Note: *D. variabilis* was unknown in the North I. until it was discovered to be damaging a *Dichondra* bowling green in Napier and a *Cotula* green in Palmerston North. Both occurrences were in March 1974.

Material examined: HB: Napier, in *Dichondra* bowling green, 7.iii.1974, 1 larva (Dep. Agric.). WI: Palmerston North, in *Cotula* bowling green, 14.iii.1974, 1 larva (M. J. Esson). MC: Christchurch, in *Cotula* bowling green, 14.ii.1974, 4 larvae (A. C. Eyles). MK: Lake Tekapo 1500 m, in *Myriophyllum* sp., 18.ii.1962, 1 larva (G. F. Woods).

Desiantha ascita (Pascoe) (Figs. 27-30)

Common name: None.

Maximum size: 15.0 × 3.0 mm. Head width 1.5 mm.

Body pearly white, translucent with tracheal trunks and oenocyte clusters visible laterally; elongate with lobes and folds prominent and coarsely spiculate. Abd. VII with 4 postdorsal setae. Head bright red-brown, without colour pattern. Antennae unusually large with basal papillae easily visible. Hypopharyngeal bracon with pale brown paramedian maculae. Labral tormae thick, basally united and truncate. Thoracic spiracle with airtubes short, united at base, individually rounded at tips. Abdominal spiracles I-VII with united airtubes lengthened to 3× basal width, tapering to an aciculate apex, dorsad; those on Abd. VIII placed close together on dorsum, with airtubes cephalad. Anus subterminal, retractile. Alimentary canal as generic description, but with posterior ventriculus twisted rather than coiled and lacking gastric caeca. Rectum short, corrugated (retractile).

Habitat: Among submerged roots of Cyperaceae and Typhaceae in swamps and at margins of lakes.

Recorded food plants: *Baumea articulata* (R. Br.) Blake, *B. rubiginosa* (Spreng.) Boeck.; *Typha orientalis* C. B. Presl. (raupo).

Distribution: N.I., probably throughout; S.I., Nelson.

Material examined: AK: Bethells, Waitakere Ra., 25.ix.1968, 20 larvae; 3.x.1969, 22 larvae; 14.v.1970, 4 larvae (B. M. May); 24.xi.1968, 26 larvae (D. J. Allan). WO: Rukuhia, 28.vii.1969, 6 larvae (B. M. May).

Genus **Hyperodes** Jekel

The many species comprising the genus *Hyperodes* are native to the Americas. No definition of the genus has been attempted, since larvae of only one species are available for study. The subfamily characters are in agreement.

Hyperodes bonariensis Kuschel (Figs. 31-36)

Common name: Argentine stem weevil.

Maximum size: 5.0 × 1.5 mm. Head width 0.75 mm.

The larva is adapted for movement within green leaf sheaths by enlargement of lobes and reduction in size of most body setae; and for migration along external plant surfaces by development of an anal pseudopod (as in *Listroderes*) and long, trailing terminal hairs.

Body slender, tapering; terminal segments depressed, with prominent pleural lobes; ventral lobes on Abd. I-VI expanded; major setae of Abd. VII-IX rather long. Head free, orange coloured with pale paramedian stripes from sutural angle, enclosing *des* 1 and converging at posterior margin; frontal suture angulate above *des* 3; ecdysial line dark; endocarinal line present, 0.3 length of frons. Antennae conical, pubescent. Hypopharyngeal bracon with paramedian maculae on posterior margin only. Labral tormae slender, contiguous at extreme base. Epipharyngeal lining with all setae unusually long. Premental sclerite wide, with posterior extension irregularly margined, arrow-shaped. Postlabium with posterior pair of setae longer than anterior; median pair long. Thoracic spiracle circular with 8-annulate airtubes obliquely dorsad. Abdominal spiracles similar, slightly smaller, with airtubes caudad. Anus ventral, extended as pseudopod.

Alimentary canal with proventriculus not expanded, inwardly striate. A ring of globular mycetomes around cardiac valve. Anterior ventriculus 0.5 of body length. Posterior ventriculus with 1 transverse, 1 longitudinal coil. Gastric caeca absent. Malpighian tubules with bases simple, grouped 4+2. Cryptonephridium weakly developed. Rectal bracon membraneous.

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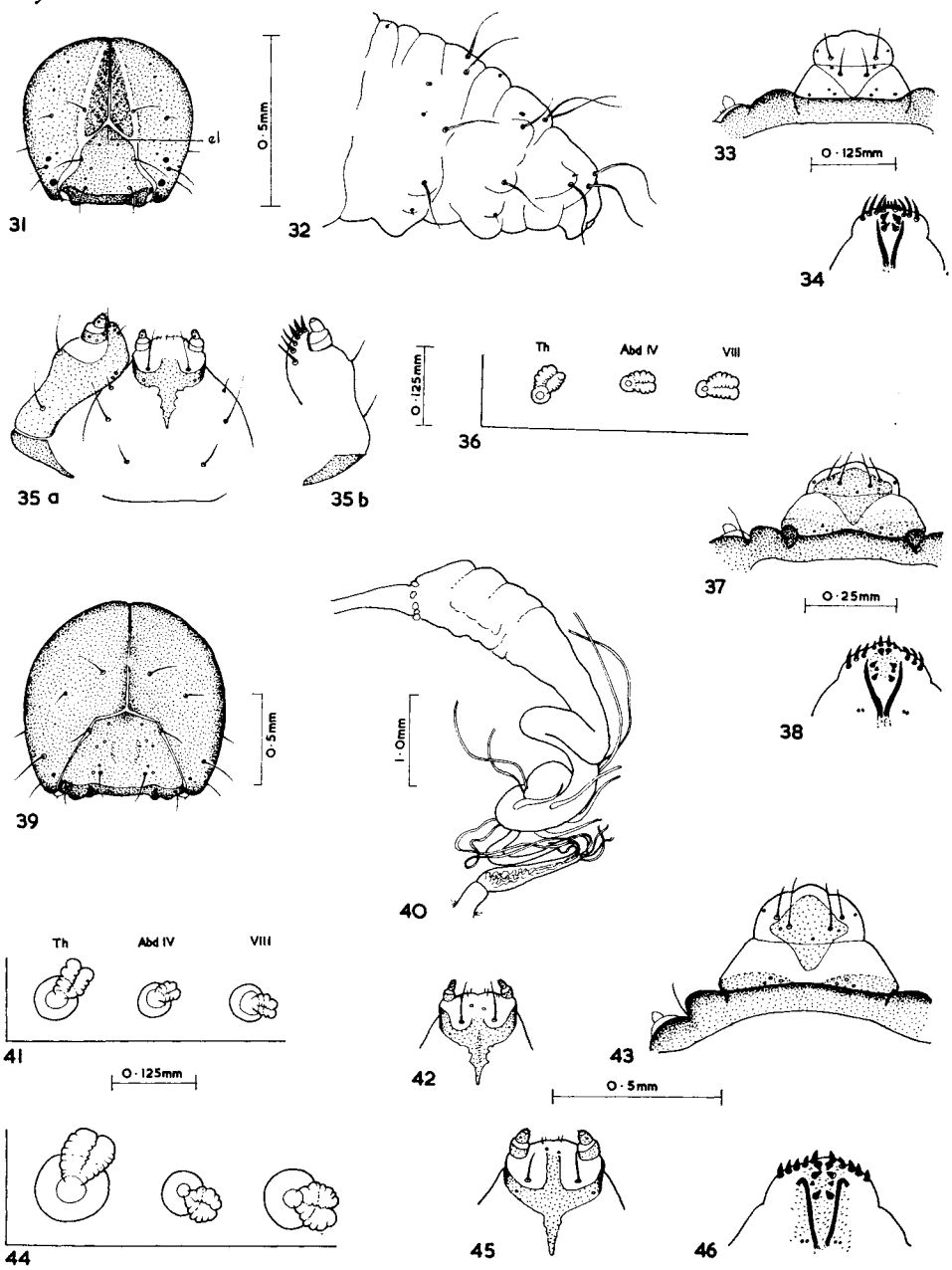
Habitat: Agricultural areas, in Gramineae.

Recorded food plants: *Lolium* spp., *Dactylis glomerata* L., *Poa annua* L., *P. trivialis* L., *Phleum pratense* L., *Hordeum vulgare* L., *Avena sativa* L., *Zea mays* L.



FIGS. 31-46. — Rhytirhininae: 31-36, *Hyperodes bonariensis* Kuschel; 31, head, 32, terminal segments of abdomen, lateral view; 33, labrum, clypeus, frontal margin, antenna; 34, epipharynx; 35, maxilla and labium — a, ventral view; b, dorsal view of maxilla; 36, spiracles. 37-42, *Gromilus thoracicus* (Broun); 37, labrum, clypeus, frontal margin, antenna; 38, epipharynx; 39, head; 40, alimentary canal; 41, spiracles; 42, ligula, labial palpi, premental sclerite. 43-46, *Liparogetus* sp.; 43, labrum, clypeus, frontal margin, antenna; 44, spiracles; 45, ligula, labial palpi, premental sclerite; 46, epipharynx.

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Distribution: Throughout.

Material examined: AK: Mangere, in ryegrass (*Lolium perenne* L.) 2.xi.1959, 28 larvae; 27.i.1960, 8 larvae (B. M. May). BP: Te Aroha, in seedling maize, 9.xii.1961, 3 larvae (Piako Farm Improvement Club). MC: Lincoln, ex ryegrass, -.x.1960, 30 larvae; Ashburton, 11.iv.1958, 12 larvae (J. M. Kelsey).

Genus **Gromilus** Blanchard

Body moderately robust, evenly curved; pronotum pigmented; minor abdominal setae coarse, spinous; major setae approximately 10× longer, tapering; Abd. II-VI with dorsal median fold reduced or absent; Abd. VI and VII with 4 postdorsal setae. Head free, slightly emarginate behind; outline somewhat quadrate; endocarinal line absent. Clypeal setae minute. Anterior ocelli distinct; posterior faint. Antennae only slightly longer than wide. Mandibles wide and somewhat flattened. Hypopharyngeal bracon with paramedian triangular maculae. Labrum with lateral seta minute or absent; tormae bowed, convergent, not joined at base. Premental sclerite with posterior extension arrow-shaped. Alimentary canal with proventriculus not expanded; mycetomes present as a ring of white globules; anterior ventriculus 0.5 body length; posterior ventriculus with 1 transverse, 1 longitudinal, coils; gastric caeca present, vermiform. Malpighian tubules arising from a thickened ring, with bases simple; cryptonephridium weakly developed, symmetrical; rectal bracon membraneous.

Note: Gromilus species are associated with various native plants and do not usually occur in areas under cultivation.

Gromilus thoracicus (Broun) (Figs. 37-42)

Common name: None.

Maximum size: 7.0 × 2.5 mm. Head width 1.5 mm.

Body strongly but evenly curved; cuticle sparsely asperate, sclerotised around setal bases (visible when stained); setae red-brown. Head bright red-brown with obscure colour pattern; margins and tips of mandibles blackish; widest at middle; sutures narrow; only anterior ocelli visible. Antennae slightly asymmetrical. Clypeus pigmented at base. Labrum pigmented medio-basally. Tormae strong, contiguous at base. Thoracic spiracle circular; airtubes with 6-7 annuli, dorsad. Abdominal spiracles similar but smaller; airtubes 3-5-annulate, caudad. Abd. VIII spiracle on dorsum. Alimentary canal with anterior ventriculus rugose; posterior ventriculus with gastric caeca long (2.5 width of tube), tapering, 6-8 widely spaced, not in rows, on lower coil.

Habitat: Among roots of ferns on bush margins.

Recorded food plant: *Blechnum capense* (L.) Schlecht.

Distribution: N.I., north of latitude 38°S.

Material examined: ND: Tutamoe, 12.x.1968, 11 larvae (B. M. May).

Gromilus sp.

Common name: None.

Maximum size: 5.5 × 2.0 mm. Head width 1.0 mm.

Similar to *G. thoracicus* except for the following. Head yellow, unpatterned, widest behind middle, with sides straight, convergent; *fs* 5 minute. Alimentary canal with gastric caeca short, equal in length to width of tube, 3 close together in a row each side.

Habitat: Among roots of various native plants.

Recorded food plants: *Stilbocarpa lyallii* J. B. Armst. (Araliaceae), *Olearia colensoi grandis* Simpson (Compositae).

Distribution: Big South Cape I., southwest of Stewart I.

Material examined: SI: Big South Cape I., in soil, -.xi.1968, 8 larvae (G. Kuschel); among roots *Stilbocarpa,* 11.ii.1969, 13 larvae; among roots *Olearia colensoi grandis,* 15.ii.1969, 6 larvae (B. M. May).

Genus **Liparogetus** Broun

As far as can be determined from the single species available, differs from *Gromilus* only in those characters used for separation in the key. It is doubtful whether they have generic significance. These moderate to large weevils inhabit alpine herbfields, usually in association with *Celmisia* (Compositae).

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Liparogetus sp. (not reared) (Figs. 43-46)

Common name: None.

Maximum size: 10.0 × 3.0 mm. Head width 2.5 mm.

Head bright yellow-brown, unpatterned; ecdysial line short, 0.25 length of coronal suture; *fs* 4, 5, subequal. Labral tormae elongate, convergent, not meeting at base. Epipharyngeal lining densely spiculate to base of tormae; all setae of similar length, short, broad. Mandibles bifid in teneral larvae, eroded later. Premental sclerite with posterior extension acute. Spiracles as in *G. thoracicus*. Alimentary canal as in *Gromilus* except: Gastric caeca short, finger shaped, 2 each side of tube on caudal part of coil.

Habitat: Among roots of alpine plants.

Recorded food plants: *Celmisia coriacea* (Forst.f.) Hook.f.

Material examined: BR/NC: Lewis Pass 1500 m, on *Celmisia coriacea*, 31.xi.1961, 6 larvae associated with adults (G. F. Woods, J. I. Townsend).

SUBFAMILY BRACHYDERINAE

As constituted at present, the subfamily Brachyderinae is a somewhat heterogeneous collection of groups, distinct in themselves, which are best considered at the tribal level. There does not appear to be a combination of features to characterise the subfamily as a unit (Emden 1952).

Genus **Sitona** Germar (Tribe Sitonini)

Head free, *des* 1 as strong as *fs* 4, lying behind middle of head capsule; *des* 4 small but distinct; endocarina present; frontal sutures distinct. Antennae at least 0.3 wider than long, asymmetrical, angulate on outer side. Ocelli usually absent. Labrum trilobate; paired sensilli absent. Epipharynx with major (inner) anteromedian setae (*ams*) strong, long and pointed; with either 2 or 3 anterolateral setae (*als*). Mandibles tridentate; minor seta distant from major, placed laterally. Premental sclerite with anterior median extension parallel sided; posterior extension subequal in length, acute. Pronotum with 8 setae plus 2 dorsolaterals on same sclerite. Meso- and metathorax with 1 dorsolateral seta ("alar area" of Emden). Anal lateral lobes with 3 setae. All spiracles bicameral with annulated airtubes.

Sitona humeralis Stephens (Figs. 47-54)

Common name: Lucerne weevil.

Maximum size: 6.0 × 2.0 mm. Head width 1.0 mm.

Body slender, of even width; live larvae medianly bent rather than curved; setae pale, slender; cuticle minutely asperate on ventral lobes and folds. Head light red-brown with conspicuous pale, narrow, convergent, paramedian stripes from frontal suture to hind margin; endocarinal line short, 0.25 length of frons; *fs* 4 and 5 subequal in length. Antennae strongly asymmetrical, partially overhung by a frontal projection. Hypopharyngeal bracon clear. Clypeus pigmented at base. Labrum with posterior V-shaped pattern; lateral setae distant from margin, 0.5 length of anterior setae; with 1, median sensillus. Tormae vestigial. Epipharyngeal lining with inner *ams* fang-like; 2 only *als;* sensilli clusters between proximal pairs of *mes;* posterior pair of *mes* hairlike. Mandibles with a third tooth immediately below subapical tooth. Airtubes of thoracic spiracle 6-7-annulate, obliquely dorsad; those of abdominal spiracles 4-5-annulate, caudad. Abd. IX unmodified and unsclerotised. Anus subterminal, 4-lobed.

Alimentary canal with proventriculus not expanded; mycetomes absent; anterior ventriculus smooth, 0.5 length of body; posterior ventriculus with 1.5 coils; gastric caeca laminate, of equal length and width, subequal to width of tube, 1 each side before ileo-colic valve. Malpighian tubules unusually thick, arising from simple bases. Cryptonephridium undeveloped. Rectal bracon membraneous.

In a footnote to his key to the species of *Sitona* (p. 686), Emden stated that from Grandi's (1913) description (and presumably, in the absence of specimens) *S. humeralis* could not be included. The following characters: Abd. VIII with 3 dorsal setae. Epipharyngeal lining with 2 *als;* posterior pair of *mes* behind and laterad of the sensilli clusters, place it in the group containing *flavescens* Marshall, *cylindricollis* Fabricius, *puncticollis* Stephens and *lineatus* Linnaeus.

Note. Sitona humeralis was first shown to be established in New Zealand when larvae were discovered in September 1974, beneath weeds on the foreshore at Napier. It was later found in mid-Canterbury, in numbers which suggest that this locality may have been the original focus of invasion. Of European origin,

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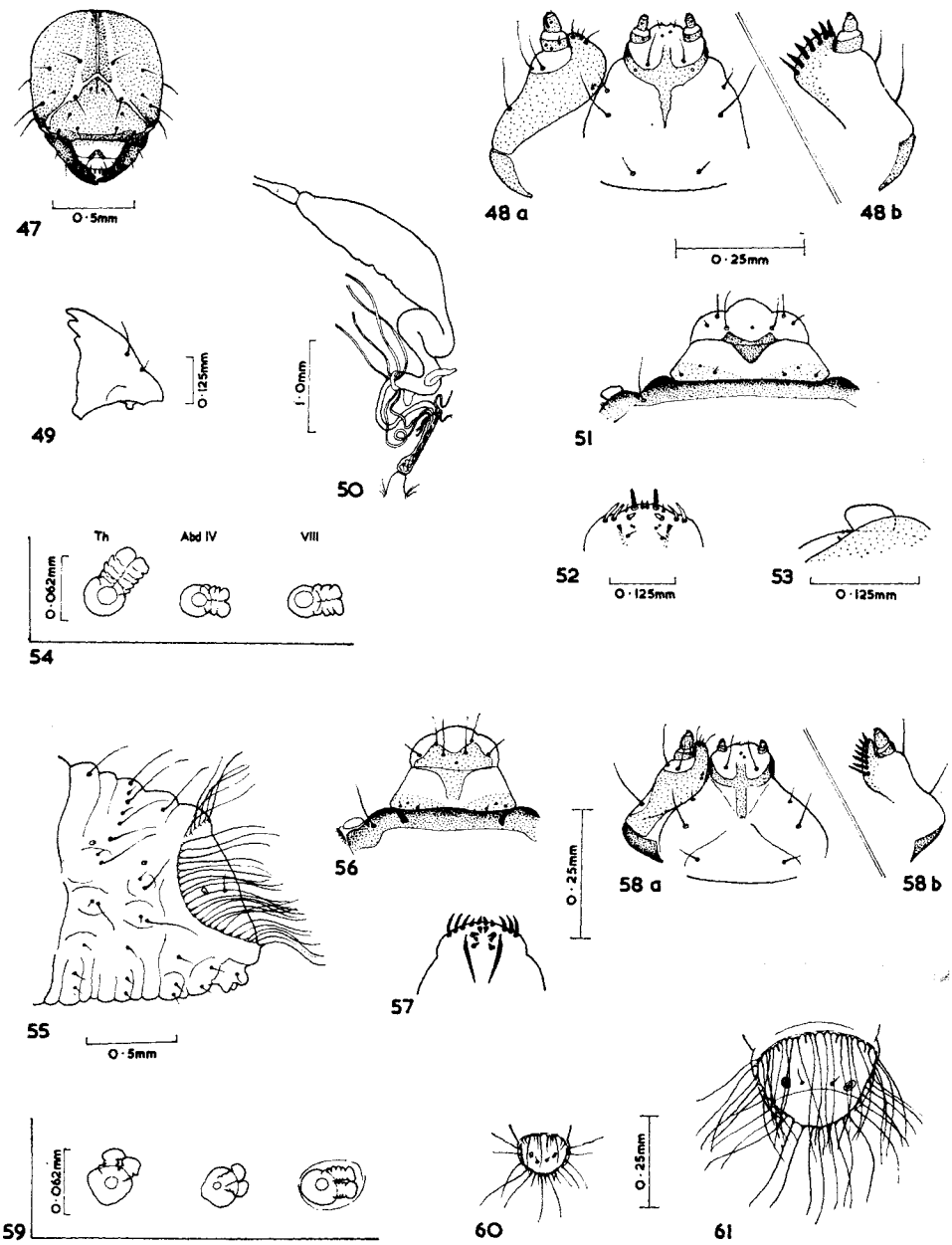

FIGS. 47-61. — Brachyderinae: 47-54, *Sitona humeralis* Stephens; 47, head; 48, maxilla and labium — a, ventral view; b, dorsal view of maxilla; 49, mandible; 50, alimentary canal; 51, labrum, clypeus, frontal margin, antenna; 52, epipharynx; 53, antenna; 54, spiracles. 55-61, *Maleuterpes spinipes* Blackburn; mature larva, terminal segments of abdomen, lateral view; 56, labrum, clypeus, frontal margin, antenna; 57, epipharynx; 58, maxilla and labium — a, ventral view; b, dorsal view of maxilla; 59, spiracles; 60, first instar larva, Abd. VIII and IX, dorsal view; 61, second instar larva, Abd. VIII and IX, dorsal view.

the species is present in New South Wales and South Australia, where it is severely damaging to lucerne.

Habitat: Among roots of leguminous plants, where it hollows out the nitrogen nodules, retarding growth.

Recorded food plants: *Medicago sativa, M. polymorpha* L. (burr clover).

Distribution: N.I., coastal Hawke Bay; S.I., Canterbury to north Otago.

Material examined: HB: Napier, Awatoto foreshore, under *Medicago polymorpha,* 15.ix.1974, 3 larvae (M. J. Esson); Tangoio to Clifton, under *M. polymorpha,* 8-9.x.1974, 23 larvae (M. J. Esson, P. J. Watts, B. M. May).

Genus **Maleuterpes** Blackburn (Tribe Ottistirini)

Head free; *des* 1 well behind middle; *des* 4 minute; *fs* 4 and 5 subequal. Frontal sutures fine but distinct, not agulate before apex; endocarina absent; ocelli absent. Antennae evenly convex, 3× wider than long. Labrum with lateral setae well developed. Tormae slender, convergent, rather long. Epipharynx with proximal pairs of *mes* equally spaced. Mandibles with 1 short, 1 longer setae, close together. Labial palpi much shorter than maxillary palpi; basal segments short, transverse. Premental sclerite a distinct trident. Meso- and metanotum with 2 dorsolateral setae ("alar setae" of Emden). Abd. VI with major spiracular seta on posterior fold. Spiracles subcircular, bicameral with airtubes obscurely annulate. Postdorsum of Abd. VII, dorsal and dorsopleural areas of Abd. VIII, IX, forming a disc set with spiracles of Abd. VIII; a pair of small setae between them; 3 pairs of minute setae in front and 3 pairs behind a transverse furrow. Disc surrounded by a circlet of elongate, minutely serrate, setae, each mounted on a small tubercle. Anus 4-lobed, ventral, extended to form a pseudopod.

Emden considered that the only larval characters to justify a position in Brachyderinae are the circlet of setae (importance not known) and the unusual position of the clypeal sensilli "lying to inner side (and slightly in front) of inner clypeal seta". The latter character can only be seen in slide mounted specimens, 2 of which were studied by Emden. In my own slide mounts, these sensilli are variable in position. The circlet of hairs could be a position-holding device associated with root-feeding, and thus, an adaptive specialisation. The combination of widely and equally spaced proximal pairs of *mes;* 2 dorsolateral ("alar") setae on meso- and metathorax; unequal, closely set mandibular setae, indicate that *Maleuterpes* could be placed in Leptopiinae.

Maleuterpes spinipes Blackburn (Figs. 55-61)

Common name: Dicky rice weevil.

Maximum size: 4.0 × 1.0 mm. Head width 0.5 mm.

Head light red-brown, unpatterned, with darker margins and mandibles; widest behind middle. Body white, slender, of even width; cuticle shagreened. Major setae slender, 12× length of minor setae. Circlet on Abd. VII to IX, in first instar, with 24-26 hairs of varying lengths; in second instar with 50-52, the third and eighth from mid-dorsum being very short, all others long; in mature larvae, with 50 hairs, subequal in length. Alimentary canal with gastric caeca vermiform, as long as width of tube, 1 each side of lower coil.

Habitat: In soil, feeding on roots.

Recorded food plants: Adults; *Phebalium nudum* Hook., *P. squameum* (Labill.) Engl., *Melicope simplex* A. Cunn. *Larvae; Citrus* sp. (Rutaceae), Gramineae.

Distribution: N.I., north of 37.30°S. (distribution of *P. nudum*).

Material examined: AK: Huia, Waitakere Ra., -.x.1973 to -.iii.1975, 15 first instar, 2 second instar larvae reared from eggs (B. M. May). ND: Kerikeri, in turf under *Phebalium squameum* hedge, 8.x.1975, 9 larvae (C. Butcher).

Note. The dicky rice weevil was first recorded in New Zealand by Cottier (1938) from Kerikeri, N. Auckland, where it had been known since 1935. It also occurred in citrus orchards at Avondale, Auckland. No reduction in vigour of the trees could be attributed to larval root-feeding (Cottier and Spiller 1942). It was the blemishes on fruit caused by adult chewing which aroused concern among growers. *M. spinipes* has not been seen in citrus orchards since the

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early 1950s. At that time, aldrin and dieldrin were used in the soil to control the Fuller's rose weevil (*Asynonychus cervinus* (Boheman)) (W. B. Fletcher, pers. comm.). In retrospect, it would appear that this treatment, which had no lasting effect on *A. cervinus,* may have banished *M. spinipes* from the orchards. Adults can be found feeding on the leaves of the native shrub *Phebalium nudum* and the Australian *P. squameum,* from September to April. Larvae presumably feed on the surface roots of these plants and certainly, from personal observation, on roots of grasses growing close by.

TRIBE NAUPACTINI

The following description is applicable to the four naupactine species present in New Zealand. In most respects it follows Emden's (1952, p. 690) description of *Pantomorus* Schoenherr.

Body robust, evenly curved, widest at thorax. Head usually colourless, deeply retracted into thorax; much longer than wide, with setae on anterior 0.3; *des* 3, 5, *fs* 4, 5, *ves* 2, long, subequal; others minute; ocelli small; endocarinal line absent; frontal sutures not visible. Mandibles black, rather wide, scoop-shaped, without accessory teeth below bifid apex; with 2 setae, subequal, set transversely in scrobe. Hypopharyngeal bracon with paramedian maculae. Clypeus pigmented at base. Labrum transverse with 5-pointed basal colour pattern; lateral and posterior setae subequal. Tormae bifurcate with distal tips dark, acute; horizontal arms rounded; obsolete below. Epipharynx with posterior pair of *mes* separated by 0.5 distance between median (Emden's "anterior") pair; sensilli clusters between these two pairs. Lacinia with 8 dorsal, 4 apicoventral setae. Premental sclerite with anterior median extension long, narrow; posterior extension widening to truncate apex. Meso- and metathorax with 2 dorsolateral setae. Alar area (Emden's "spiracular area") with 3 setae. Abd. V-VIII with major spiracular seta on postdorsal fold. Thoracic spiracles ovate-fringed; abdominal spiracles much smaller, subcircular; airtubes lacking or vestigial. Abd. VIII and IX with a sclerotised posterior ridge. Anus terminal, 4-lobed. Alimentary canal lacking mycetomes around cardiac valve; posterior ventriculus with gastric caeca vermiform, in a row of 4-10 each side of lower coil and a single pair further cephalad.

The following descriptions, of *G. leucoloma* (Boheman), *A. cervinus* (Boheman) and *A. taeniatulus* (Berg), agree with the key characters described by Anderson and Anderson (1973).

Graphognathus leucoloma (Boheman) (Figs. 62-73)

Common name: White-fringed weevil.

Maximum size: 15.0 × 5.0 mm. Head width 2.5 mm.

Body setae fusiform, light red to pallid, with dark bases. Younger larvae with minor dorsal setae very short, thick. Cuticle smooth except for a transverse row of spinules between setae on sternal fold of Abd. I-V. Mature larvae often with front of head yellow. Maxilla with a group of long, setiform spinules on inner (dorsal) side below palpus and a group below lacinial row of setae. Antennae 0.5 wider than long, slightly produced on inner side; apex subtruncate. Spiracles with airtubes absent in older larvae; vestigial in early instars. Anal lateral lobes without a strong seta.

Habitat: In soil, feeding on roots, including tap roots and tubers.

Recorded food plants: Polyphagous.

Distribution: N.I., throughout; S.I., north of Ashburton.

Material examined: AK: Riverhead, watermelon plants (*Citrullus lanatus* (Thunb.) Mansf.) 25.xi.1960, 9 larvae (Dep. Agric.); Kaipara South Head, in pasture, 15.xii.1960, 4 larvae (J. B. Montgomery); Devonport, in lawn, 12.vi.1961, 2 larvae (B. M. May). CL: Thames, 25.xi.1970, 10 larvae (J. S. Timlin). HB: Napier, roots of tomatoes, (*Lycopersicum esculentum* (L.) Karsten), -.xi.1959, 2 larvae. WN: Titahi Bay, in garden, -.vi.1963, 2 larvae (Mr Brough). MB: Blenheim, in potato (*Solanum tuberosum* L.), 2 larvae (A. C. Anderson). MC: Fairton, in potatoes, 5.iv.1972, 13 larvae (H. G. Halliwell); in paddock 4.xii.1972, 11 larvae (K. G. Somerfield).

Asynonychus cervinus (Boheman) (Figs. 74-75)

Common name: Fuller's rose weevil.

Maximum size: 9.0 × 4.0 mm. Head width 1.5 mm.

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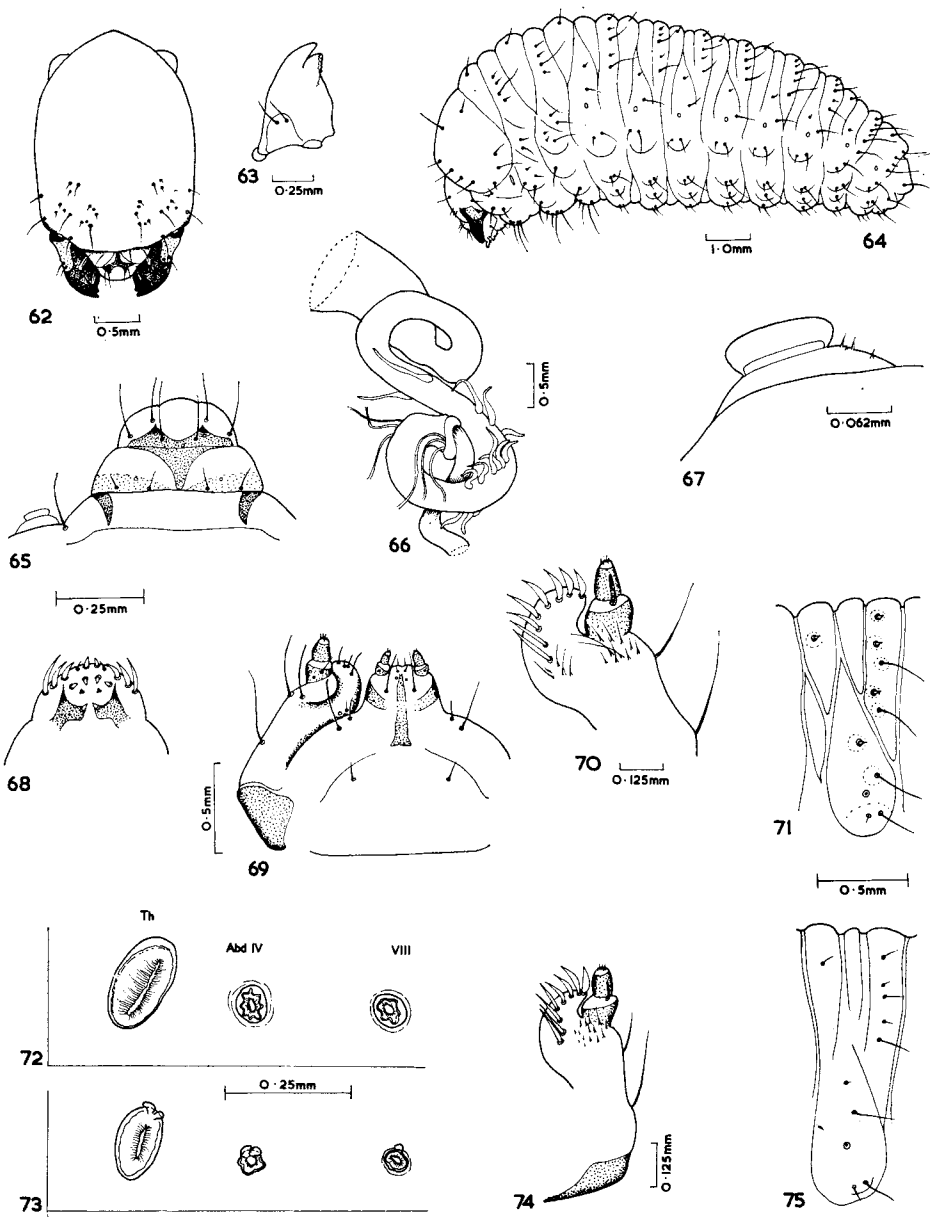
Body setae evenly tapered, red-brown (fading in alcohol). All stages with minor dorsal setae fine, inconspicuous. Minor spiracular setae of Abd. V-VII scarcely visible. Cuticle smooth except between mediosternal setae on Abd. I-V. Maxilla with a group of setiform spinules on inner side below palpus; spinules lacking below lacinial row of setae. Antennae as in *G. leucoloma*. Anal lateral lobes without a strong seta.



FIGS. 62-75. — Brachyderinae; Naupactini: 62-73, *Graphognathus leucoloma* (Boheman); 62, head; 63, mandible; 64, larva; 65, labrum, clypeus, frontal margin, antenna; 66, posterior ventriculus of alimentary canal showing gastric caeca and origin of Malpighian tubules; 67, antenna; 68, epipharynx; 69, maxilla and labium, ventral view; 70, dorsal view of maxilla; 71, dorsal and dorsolateral areas of Abd. III, showing setae; 72, spiracles of mature larva; 73, spiracles of early instar larva; 74-75, *Asynonychus cervinus* (Boheman); 74, maxilla, dorsal view; 75, dorsal and dorsolateral areas of Abd. III, showing setae.

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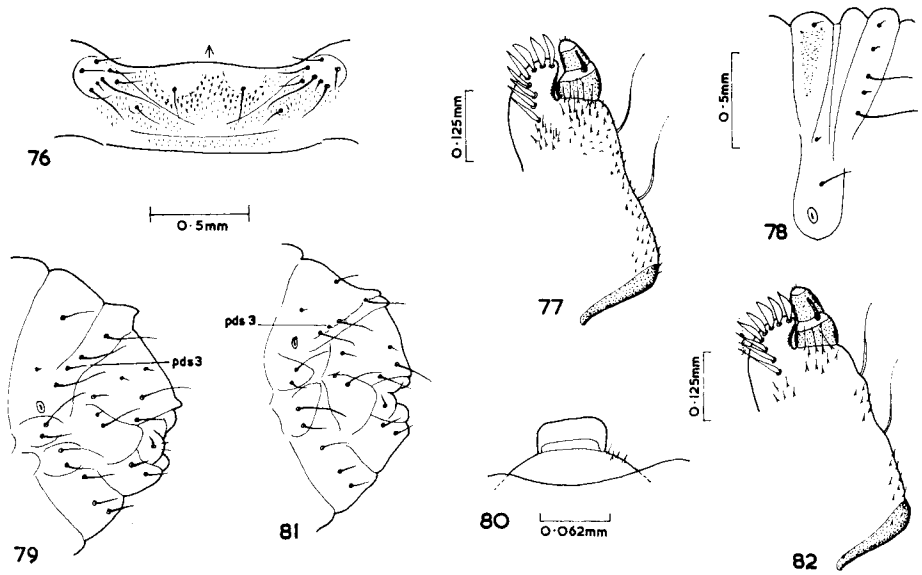
Habitat: In soil, feeding on roots.

Recorded food plants: Polyphagous.

Distribution: N.I., throughout; S.I., Nelson.

Material examined: AK: Auckland, Owairaka, under clover, 8.xi.1962, 14 larvae; 22.viii.1962, 8 larvae; Epsom, roots of *Hibiscus*, 2.vii.1965, 7 larvae (B. M. May). NN: Nelson, roots of *Vicia minor* (L.), 28.vi.1962, 8 larvae (E. S. Gourlay); 22.viii.1965, 10 larvae (G. Kuschel).



FIGS. 76-82. — Brachyderinae; Naupactini: 76-80, *Atrichonotus taeniatulus* (Berg); 76, sternal area of mesonotum showing asperities (arrow directed cephalad); 77, maxilla, dorsal view; 78, dorsal areas of Abd. I, showing prodorsal asperities; 79, terminal segments of abdomen, lateral view; 80, antenna. 81-82, *Floresianus sordidus* Hustache; 81, terminal segments of abdomen, lateral view; 82, maxilla, dorsal view.

Floresianus sordidus Hustache (Figs. 81-82)

Common name: Flores weevil.

Maximum size: 5.0 × 2.0 mm. Head width 1.0 mm.

Body strongly curved; setae evenly tapered, fine, yellow. Cuticle smooth except for a row of pallid spinules between setae on sternal folds of abdomen. Abd. VIII with *pds* 3 approximately 0.1 length of adjacent setae. Head with light red arch above antennae. Maxilla with 4-6 long spinules on inner side below palpus and 3-4 at base of lacinial setae. Spiracles with peritreme yellow-brown in fresh specimens; lacking airtubes. Antennae symmetrical, with sides subparallel. Anal lateral lobes with 1 strong, 3 minute, setae.

Habitat: In soil, feeding on roots.

Recorded food plants: Ryegrass, white clover. Probably polyphagous.

Distribution: N.I., Hawke's Bay.

Material examined: HB: Hatuma, in pasture, 19.vi.1973, 19 larvae (K. Bimler); 28.vi.1973, 52 larvae (K. Bimler, B. M. May).

Note: *F. sordidus* is endemic to Argentina but is not particularly common there (G. Kuschel, pers. comm.). It is present in Australia. On rolling hill pasture at Hatuma, in June 1973, larvae were more plentiful under clover (40 per 0.3 m^2) than under ryegrass (13 per 0.3 m^2). On the drier parts, both grass and clover had disappeared.

Atrichonotus taeniatulus (Berg) (not reared) (Figs. 76-80)

Common name: Little fringed weevil.

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Maximum size: 7.0 × 3.0 mm. Head width 1.25 mm.

Body strongly curved; setae evenly tapered, fine, coarser on ventral folds. Cuticle with asperities on prodorsal fold of Abd. I and on sternal folds of thorax and Abd. I-VII. Abd. VIII with a strongly sclerotised postdorsal ridge; minor postdorsal seta 0.5 length of adjacent major setae. Base of clypeus unpigmented. Maxilla with more than 10 spinules at base of palpus and of lacinial row of setae. Spiracles yellow in fresh specimens; lacking airtubes. Antennae and anal lobes as in *F. sordidus*.

Habitat: In soil, feeding on roots.

Recorded food plants: Lucerne.

Material examined: HB: Bridge Pa, under *Medicago sativa,* 28.xi.1974, 3 larvae (M. J. Esson); 17.vi.1975, 15 larvae (M. J. Esson, P. J. Watts, B. M. May). Alabama, U.S.A.: Florala, pasture of carpet grass, 1938, 4 larvae (det. W. H. Anderson).

Note: *A. taeniatulus* is endemic to South America. It is one of the complex of weevils including *G. leucoloma, Desiantha d. lineata,* and *Sitona humeralis,* which is becoming a threat to lucerne in New Zealand.

SUBFAMILY OTIORHYNCHINAE

The following definition is based on larvae of *Otiorhynchus* Germar (3 spp.), *Phlyctinus* Schoenherr, *Trachyphloeus* Germar, *Sciopithes* Horn, *Peritelinus* Casey, and *Nemocestes* Van Dyke (2 spp.):

Head free, *des* 1 as long as *fs* 4, lying behind middle of head; *des* 4 minute; endocarinal line absent. Epipharyngeal lining with posterior pair of *mes* much closer together than median ("anterior" of Emden) pair; sensilli clusters between these proximal pairs. Mandible with double, serrate cutting edges, attached to subapical tooth; minor seta less than 0.5 length of major; scrobe usually pallid. Premental sclerite with posterior extension expanded before apex; anterior extension as long, or longer than posterior. Pronotum with 8 setae. Meso- and metathorax with 1 dorsolateral seta. Abd. IX with 3 dorsal setae; 1 strong, 1 minute, pleural setae. Abd. X with 3 anal lateral setae.

Genus **Otiorhynchus** Germar

Body widest near thorax, tapered posteriorly; setal groups on all lobes and folds, set in wide sclerotised areas; terminal segments well sclerotised but not otherwise modified. Head coloured, subdepressed, emarginate behind, widest behind middle; frontal sutures conspicuous; *des* 3 within suture; *fs* 4, and 5 subequal in length; ocelli usually visible. Antennae oval, symmetrical. Labrum with median and posterior areas pigmented; lateral setae well developed; anterior setae usually less widely separated than discal pair. Ligula with lateral sensoria having a curved appendage (Fig. 5a) (obscure in *O. ovatus* (L.)). Premental sclerite with anterior and posterior extensions subequal in length. Tormae convergent, concavely bowed, broad distally, tapering. Hypopharyngeal bracon with paramedian diagonal maculae. Clypeus pigmented across basal angles. Abd. V-VII with major spiracular seta on postdorsal fold. Spiracles circular; those of older larvae usually with 2 small, unsegmented airtubes; of first instar larvae with longer, annulated airtubes; thoracic larger than abdominal; placed laterally on Abd. VIII. Anus terminal, 4-lobed. Alimentary canal with proventriculus simple, with a ring of 8-9 small, globular mycetomes at base, surrounding cardiac valve. Anterior ventriculus rugose, occupying less than 0.5 body space. Posterior ventriculus with 1 transverse, 1 longitudinal coils. Gastric caeca present on lower coil in a single row each side. Cryptonephridium elongate, but scarcely thickened. Rectal bracon membraneous.

Otiorhynchus sulcatus (Fabricius) (Figs. 1-6)

Common name: Black vine weevil.

Maximum size: 10.4 × 4.0 mm. Head width 1.75 mm.

Body with dorsopleural lobes produced laterally, almost angular, especially on Abd. VIII; cuticle finely spiculate; setae red-brown, strong; major dorsal and pleural setae long, very finely tapered; cuticle pigmented around bases. Pronotum pigmented with darker front margin. Abd. I-VI with *pds* 3 placed caudad of others in the row. Abd. II-V with minor seta of ventropleural lobes 0.2 length of major seta. Head bright yellow-brown with reddish parietal stripes; pallid at setal bases; frontal margin and genae blackish;

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postoccipital condyles right-angled, visible through cuticle; ecdysial line dark, 0.6 length of coronal suture. Anterior ocelli with raised corneae. Labrum with lateral seta 0.5 length of anterior. Premental sclerite with angle between lateral and posterior arms not sclerotised; hind margins irregular. Maxilla with pigmentation reaching outer side. Spiracles with broad, pigmented peritreme; airtubes not reaching beyond margin. Anal setae strong. Alimentary canal with gastric setae vermiform, length 1.5× width of tube, 6 on outer side, 8 on inner side of lower coil.

Habitat: In soil, feeding on roots and burrowing into crowns of plants.

Recorded food plants: Polyphagous. *O. sulcatus* is the commonest species attacking berry-fruit plants in Canterbury and Otago.

Distribution: N.I., south of latitude 36.50°S; S.I., throughout.

Material examined: AK: Te Rangiita, in strawberry roots, 28.vii.1958, 2 larvae (Dep. Agric.); Henderson, in Cyclamen corms in glasshouse, 1.iii.1961, 18 larvae (W. Suyker). BP: Rotorua, Forest Research Institute nursery, eating kahikatea (*Podocarpus dacrydioides* A. Rich) seedlings, 29.vii.1960, 4 larvae (R. Zondag). TK: New Plymouth, roots of *Hamamelis virginiana*, 2.vi.1965, 5 larvae (Dep. Agric.). MC: Christchurch, roots of blackcurrant (*Ribes nigrum* L.) 11.ix.1972, 8 larvae (M. Sisson); strawberry roots, -.iii.1974, 10 larvae (K. G. Somerfield). SC: Timaru, Studholme, in roots and crowns of strawberry plants, 13.ix.1972, 18 larvae (B. M. May). DN: Palmerston, roots of polyanthus (*Primula polyantha* Mill.), 18.ix.1972, 12 larvae (B. M. May). CO: Alexandra, roots of polyanthus. 17.viii.1962, 7 larvae (Dep. Agric.).

Otiorhynchus ovatus (Linnaeus) (Figs. 83-85)

Common name: Strawberry weevil.

Maximum size: 6.0 × 2.5 mm. Head width 1.25 mm.

Body evenly curved, widest at thorax, slightly tapered; sclerotised areas on Abd. VII-IX not pigmented. Setae slender, pallid with dark bases; minor setae not spinelike; Abd. II-V with minor seta of ventropleural lobes 0.5 length of major seta. Head yellow-brown with faint reddish parietal stripes; ocelli usually not visible. Labrum with lateral seta as long as anterior. Premental sclerite with posterior angles open (not pigmented). Spiracles small with colourless peritreme. Alimentary canal with gastric caeca vermiform, 2-4 each side of lower coil. Similar in other respects to *O. sulcatus*.

Habitat: In soil, feeding on roots.

Recorded food plants: White clover, strawberry, lucerne. Probably polyphagous.

Distribution: N.I., south of latitude 41°S; S.I., throughout.

Material examined: NC: Amberley, under clover and lucerne by roadside, 10.ix.1972, 10 larvae. MC: Christchurch, among strawberry roots, 22.ix.1972, 8 larvae (B. M. May, K. G. Somerfield).

Otiorhynchus rugosostriatus (Goeze) (Figs. 86-90)

Common name: None.

Maximum size: 7.0 × 3.0 mm. Head width 1.5 mm.

Similar to *O. sulcatus* except: Cuticle on dorsum more coarsely spiculate. Minor abdominal setae coarser, more spinelike. Premental sclerite with angle between lateral and posterior arms pigmented, presenting an uninterrupted V-shape of proximal margin. Abd. VII-IX conspicuously pigmented. Alimentary canal with gastric caeca flask-shaped, usually with 3 on outer, 5 on inner side of lower coil, well spaced.

Habitat: In soil, feeding on roots.

Recorded food plants: Polyphagous.

Distribution: N.I., throughout; S.I., north of latitude 43.50°S.

Material examined: CL: Thames, in roots of perennial garden plants, 25.vii.1970, 14 larvae (B. M. May). HB: Napier, under foreshore weeds, 9.x.1974, 1 larva (B. M. May).

Genus **Phlyctinus** Schoenherr

The generic definition differs from that of *Otiorhynchus* as follows: Head widest at middle; frontal sutures widened in front of *des* 3. Labrum with pigmentation on disc hemispherical. Clypeus pigmented medianly at base, not across angles. Premental sclerite

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with anterior extension longer than posterior. Abd. V-VII with major spiracular seta on middle fold above spiracle. Terminal segments with pleural lobes extended caudad; dorsal and ventral plates not reduced in width.

Phlyctinus callosus Boheman (Figs. 91-94)

Common name: Garden weevil.

Maximum size: 9.0 × 3.0 mm. Head width 1.75 mm.

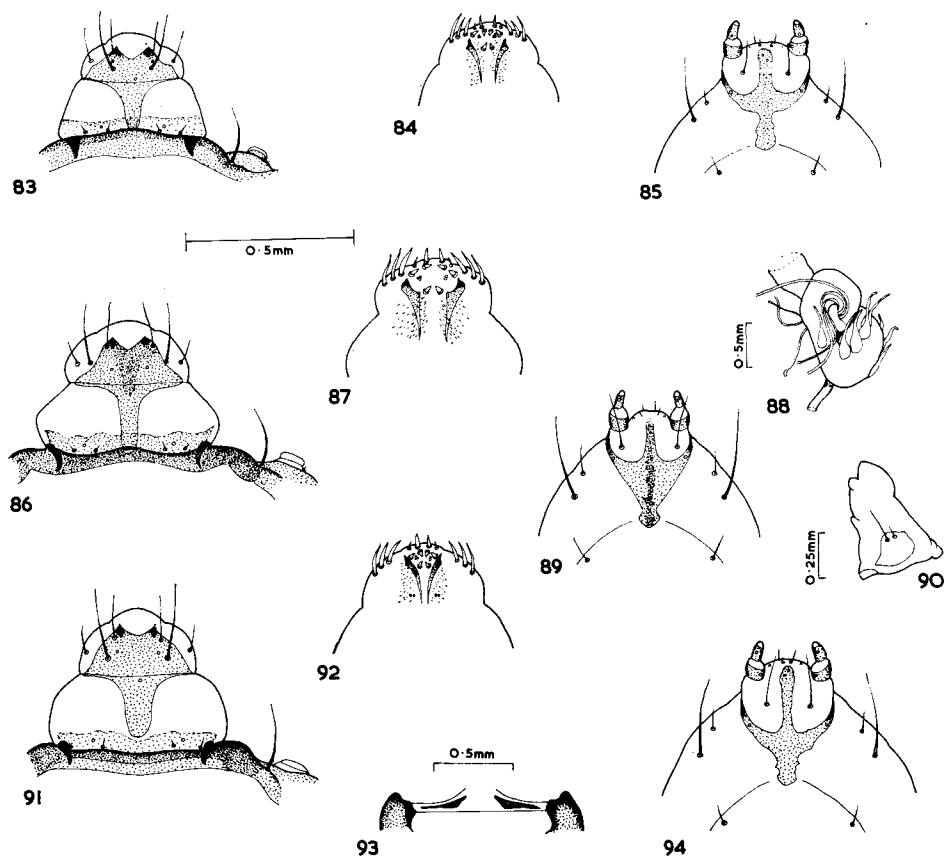
Head red-brown with paler paramedian area and darker parietal stripes; frontal margin black. Body with pronotum lightly pigmented; cuticle smooth on dorsum, asperate on ventral lobes and folds; sclerotised around bases of setal groups; setae red-brown, moderately long, robust. Hypopharyngeal bracon with maculae extending along posterior margin. Abd. II-V with minor seta of ventropleural lobes greater than 0.5 length of major seta. Alimentary canal with gastric caeca tapering, as long as width of tube, 5 each side of lower coil.

Habitat: In soil, feeding on roots, particularly tap roots and corms.

Recorded food plants: Polyphagous.

Distribution: N.I., throughout; S.I., Nelson.

Material examined: AK: Kaipara South Head, in vegetable garden, 17.ix.1962, 8 larvae; Mt Albert, under clover, 29.ix.1962, 6 larvae; 29.vii.1963, 6 larvae; 28.vi.1967, 19 larvae (B. M. May). WI: Himatangi, beneath pasture, 12.viii.1965, 26 larvae (D. H. Todd).



FIGS. 83-94. — Otiorhynchinae: 83-85, *Otiorhynchus ovatus* (Linnaeus); 83, labium, clypeus, frontal margin, antenna; 84, epipharynx; 85, labium. 86-90, *Otiorhynchus rugosostriatus* (Goeze); 86, labium, clypeus, frontal margin, antenna; 87, epipharynx; 88, posterior ventriculus of alimentary canal, showing gastric caeca and origin of Malpighian tubules; 89, labium; 90, mandible. 91-94, *Phlyctinus callosus* Boheman; 91, labrum, clypeus, frontal margin, antenna; 92, epipharynx; 93, hypopharyngeal bracon; 94, labium.

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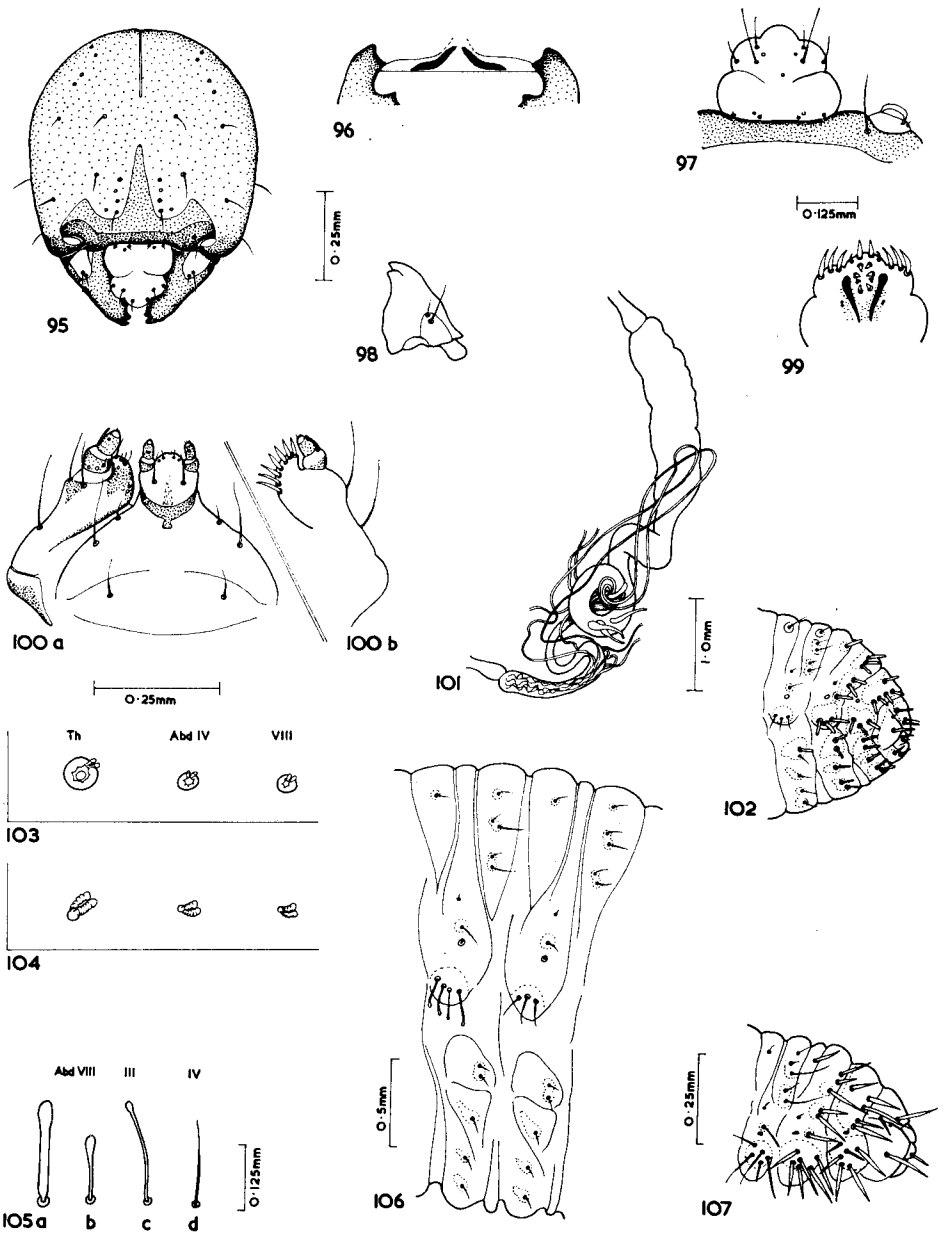
SUBFAMILY LEPTOPIINAE

The definition given for the Leptopiinae of the southern islands (May 1971) covers the New Zealand element as a whole. It is also in agreement with Leptopiinae of the North American Pacific coast, as represented by *Dyslobus* Leconte (2 species examined). It is repeated here for convenience.



FIGS. 95-107. — Leptopiinae: 95-106, *Cecyropa discors* Broun; 95, head; 96, hypopharyngeal bracon; 97, labrum, clypeus, frontal margin, antenna; 98, mandible; 99, epipharynx; 100, maxilla and labium — a, ventral view; b, dorsal view of maxilla; 101, alimentary canal; 102, terminal segments of abdomen, lateral view; 103, spiracles of mature larvae; 104, spiracles of first instar larvae; 105 a-d, types of setae; 106, abdominal segments III and IV, lateral view. 107, *Cecyropa modesta* Broun, first instar, terminal segments of abdomen, dorsal and dorsoplural areas.

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Head never retracted into prothorax; frontal sutures well developed; endocarinal line absent; *des* 1 behind middle of head and subequal to *fs* 4. Mandibles with, at most, a rounded projection near middle of cutting edge; setae usually unequal in length, close together. Lacinia usually with 8 dorsal, 4 ventroapical setae. Epipharyngeal lining with posterior and median pairs of *mes* more or less equally separated, with sensilli clusters between. Dorsolateral areas of meso- and metathorax with 2 setae. Abd. VIII with 4 or 5 dorsal setae. Abd. IX with 2 or 3 sternal setae. Abdominal spiracles of older larvae circular, usually bicameral. In addition: Alimentary canal with proventriculus simple; without a ring of mycetomes at base. Posterior ventriculus arranged in 1 transverse and 1 longitudinal, coil, with gastric caeca usually vermiform, occasionally absent. Malpighian tubules with simple bases arising from a thickened ring. Hind gut with cryptonephridium weakly developed; rectal bracon membraneous.

Genus **Cecyropa** Pascoe

Body moderately slender, of even width and evenly curved; cuticle sclerotised around setal groups and on all lobes of Abd. VII-IX; setae short, pallid, fusiform at base, acuminate, clubbed or blunt apically; very coarse on terminal segments. Dorsopleural lobes with variable numbers of setae, always more than 2. Major spiracular seta on middle fold, above spiracle, on Abd. I-VI. Head evenly rounded, deeply emarginate behind; *des* 4, *fs* 1, 2, 3 absent, other setae subequal in length; ocelli absent. Antennae oval, not always symmetrical. Hypopharyngeal bracon with paramedian falciform maculae. Clypeus rounded, unpigmented. Labrum strongly trilobate, unpigmented, with lateral and anterior setae subequal; tormae straight, convergent. Premental sclerite with posterior extension short, truncate; anterior extension faint or obsolete. Thoracic spiracle subcircular, bicameral, with airtubes short, unsegmented, obliquely dorsad. Abdominal spiracles similar but smaller; airtubes annulate, longer, in first instar larvae. Abd. IX with pleural lobes enlarged, extended caudad; dorsum trapezoidal; ventral plate transversely oblong. Anus 4-lobed, terminal. Alimentary canal of typical form.

Cecyropa discors Broun (Figs. 95-106)

Common name: Northern sand weevil.

Maximum size: 5.5 × 2.0 mm. Head width 0.75 mm.

Head pale yellow with reddish lateral flush; frons with dark marginal line and a light red supramarginal band, extended into short peaks and a long median peak, reaching to frontal apex. Abd. II-III with *pds* 2 and 4 approximately 0.5 length of *pds* 3 and 5. Dorsopleural lobes of Abd. I-III usually with 4 slender, clubbed setae; of Abd. IV-VIII with 3 setae, acuminate on IV-VI. All setae of Abd. VII-IX coarse, blunt. First instar larvae with all setae acuminate. Alimentary canal with gastric caeca tapering, length 1.5× width of tube, 3 each side of lower coil.

Habitat: In sand on foreshore and dunes, feeding on roots.

Recorded food plants: *Lupinus luteus* L., *Calystegia soldanella, Crepis* sp., *Hieracium* sp. Probably polyphagous.

Distribution: N.I., north of latitude 39°S, overlapping with *C. setigera* Broun around Gisborne, Poverty Bay (Kuschel, pers. comm.).

Material examined: AK: Bethells Beach, among lupins, 25.viii.1963, 9 larvae, 10 first instar larvae reared from eggs; Kariotahi Beach, 2.xii.1963, 7 larvae. BP: Ohope Beach, 19.ix.1964, 5 larvae (B. M. May).

Cecyropa setigera Broun (reared by P. Wigley)

Common name: Southern sand weevil.

Maximum size: 5.0 × 2.0 mm. Head width 0.75 mm.

There are no strong characters to separate this species from *C. discors* in the larval stage. The only dissimilarities are of doubtful value: Colour pattern of head more intense. Abd. II-III with *pds* 2 and 4 approximately 0.3 length of *pds* 3 and 5.

Habitat: In sand of foreshore and dunes, and on reclaimed dune where coastal sand intrudes inland.

Recorded food plants: Subterranean clover, lucerne. Probably polyphagous.

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Distribution: N.I., south of latitude 38.50°S; S.I., throughout. (Kuschel, pers. comm.)

Material examined: WI: Himatangi, under sandy pasture, 12.viii.1965, 43 larvae (D. H. Todd); -.viii. to -.x.1967, 28 larvae (P. Wigley); Foxton, in sandy soil, 10.xii.1974, 4 larvae; Otaki, in lucerne and weeds, 22.x.1975, 65 larvae (D. Steven).

Cecyropa modesta Broun (Fig. 107)

Common name: Large sand weevil.

Maximum size unknown: Larger than *C. discors* and *C. setigera.*

Known only from first instar larvae which differ from those of *C. discors* in bearing from 5-7 setae on each of the dorsopleural lobes. In *C. discors,* the numbers of *dpls* are similar in all stages and the same should follow for *C. modesta.*

Habitat: In sand on coastal dunes.

Recorded food plants: Adult fed in laboratory on white clover.

Distribution: Throughout (Kuschel 1969).

Material examined: AK: Kaipara South Head, adult on sandy track through rough pasture, 24.vii.1964, 2 first instar larvae reared from eggs (B. M. May).

Genus **Catoptes** Schoenherr

Members of this genus have been variously placed in *Curculio, Otiorhynchus, Platyomida* White, and others (Kuschel 1969). Although larvae are picked up from time to time in cultivated areas, they mostly inhabit rough tussock and scrub country.

Body robust, with coarse musculature, widest behind thorax; cuticle sclerotised around setal groups and on all lobes of Abd. VIII and IX; postdorsal setae of Abd. II-V shorter than those of other segments. Head subdepressed, evenly rounded in outline, emarginate behind, with *des* 2 less than 0.5 length of *des* 1; *des* 4 absent; *fs* 5 variable, never longer than *fs* 4; *fs* 1, 2, 3, reduced to sensilli; postoccipital condyles elongate, inconspicuous. Hypopharyngeal bracon with paramedian, triangular maculae. Labral tormae subparallel. Mandibles wide; smooth, concave on inner side, with 1 only, visible seta, near apex of scrobe. Maxilla with apical seta of lacinia broad, blunt; stipes with pigment not reaching laterally to seta. Abd. I-VIII with major spiracular seta on middle fold, above spiracle; ventral folds each with a transverse row of coarse, often pigmented, spinules, extending to laterosternal lobes. Terminal segments strongly modified (type B of Emden 1952); Abd. VIII with dorsopleural lobe enlarged; Abd. IX with pleural lobe grossly enlarged and elongated ventrally to form a sclerotised plate supporting strong, wide bands of musculature, attached to an internal apodeme; dorsal and ventral areas reduced. Anal segment (Abd. X) longitudinally compressed; 4-lobed, ventral. Alimentary canal of typical form.

Note: Larvae of *Catodryobiolus* Brookes from Auckland and Campbell Is. agree in all respects with the definition of *Catoptes.*

Catoptes cf. **robustus** (Sharp) (not reared) (Figs. 108-115)

Common name: None.

Maximum size: 9.0 × 3.5 mm. Head width 1.5 mm.

Cuticle with coarse, pigmented spinules, in addition to sternal rows, congregated on Abd. I-V along pro- and postdorsal folds, on median fold above spiracle and on dorsopleural lobes. Major dorsal setae very long, slender; minor setae short, stout. Head with coronal area and postero-lateral stripes creamy white; parietal areas and most of frons yellow-brown; *fs* 5 subequal to *fs* 4; both pairs of ocelli faint. Labrum pigmented medianly; lateral and anterior setae subequal. Premental sclerite with posterior extension short, truncate, 0.5 length of anterior. Spiracles circular, bicameral with airtubes obscurely annulate on thorax; shorter, simple, on abdominal segments, obliquely dorsad. Abd. IX with dorsal area reduced to a small, elongate triangle with apex caudad and with anterior seta 0.5 length of median seta, posterior seta minute; sternal area larger, an equilateral triangle with apex cephalad, enclosed by extended pleural lobes. Alimentary canal with gastric caeca coarse, length 2.5× width of tube, 3 each side of lower coil; rectum elongate.

Habitat: In soil of lowland scrub, pasture and cultivated ground.

Recorded food plants: Probably Gramineae.

Distribution: S.I., east of divide, south of latitude 43.50°S.

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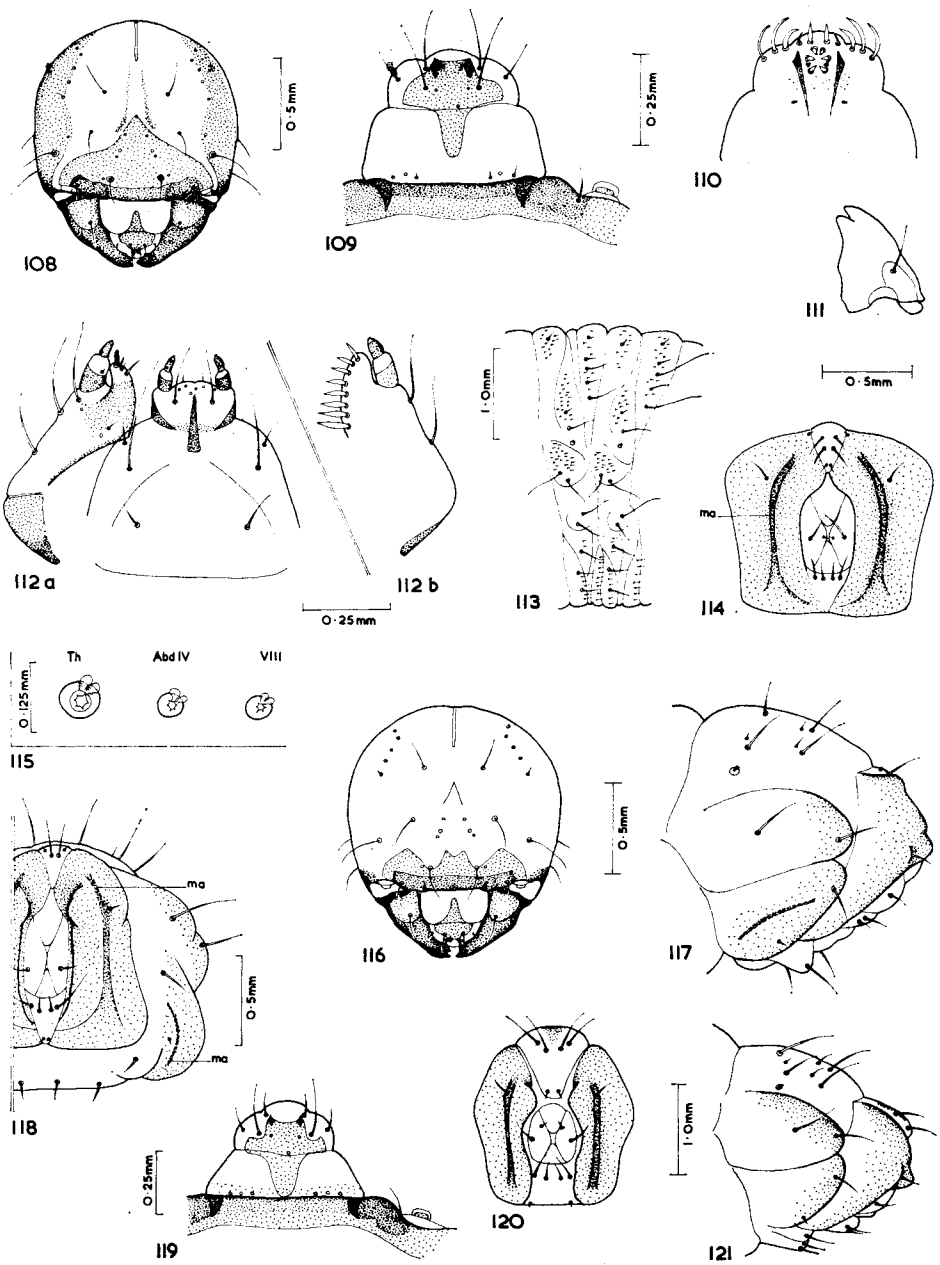

FIGS. 108-121. — Leptopiinae: 108-115, *Catoptes* cf. *robustus* (Sharp); 108, head; 109, labrum, clypeus, frontal margin, antenna; 110, epipharynx; 111, mandible; 112, maxilla and labium — a, ventral view; b, dorsal view of maxilla; 113, abdominal segments II and III; 114, abdominal segments IX and X, caudo-ventral view; 115, spiracles. 116-118, *Catoptes* cf. *cuspidatus* (Broun); 116, head; 117, abdominal segments VIII, IX, X, caudo-ventral view. 119-121, *Catoptes brevicornis brevicornis* (Broun); 119, labrum, clypeus, frontal margin, antenna; 120 abdominal segments IV and X, caudo-ventral view; 121, abdominal segments VIII, IX, X, lateral view.

Material examined: MC: Christchurch, Halswell, 28.viii.1964, 1 larva (C. T. Jessep). SC: Timaru, Clarkville, among parsnips (*Pastinaca sativa* L.), 11.ix.1972, 1 larva (B. M. May). DN: Palmerston, Goodwood Rd, in pasture, 18.ix.1972, 3 larvae (B. M. May); Waipori Rd, under grass and clover, 8.viii.1968, 1 larva (D. Perrott). SL: Dolamore Park, 14.ix.1968, 1 larva (J. A. Farrell).

Catoptes cf. **cuspidatus** (Broun) (not reared) (Figs. 116-118)

Common name: None.

Maximum size: 7.0 × 3.0 mm. Head width 1.25 mm.

Similar to the previous species except: Cuticle of dorsum and pleura without spinules or asperities. Head creamy except for a light red frontal band having median peak bifid; *fs* 5 shorter than *fs* 4. Dorsal triangle of Abd. IX with anterior seta 0.2 length of median seta; posterior seta not visible.

Habitat: In soil beneath tussock and high country pasture from approximately 500 m to 800 m altitude.

Recorded food plants: Gramineae, including *Festuca novae-zelandiae* (Hack.) Cockayne, *Chionochloa rubra* Zotov.

Distribution: S.I., east of divide, south of latitude 45.40°S.

Material examined: CO: Macraes Flat, under grass and clover, 18.ix.1972, 1 larva (B. M. May). DN: Waipori Rd uplands, 8.viii.1968, 9 larvae (J. Farrell); Pinelheugh 760 m, under *Festuca novae-zelandiae*, 2 larvae; Bridge Huts, Teviot Ra., 670 m, under *Festuca novae-zelandiae*, 11.ix.1968, 1 larva; Edievale, under grasses, 13.ix.1968, 1 larva (J. C. Watt).

Catoptes brevicornis brevicornis (Broun) (Figs. 119-121)

Common name: None.

Maximum size: 13.5 × 5.0 mm. Head width 2.0 mm.

Cuticle of Abd. I-V with small spinules congregated along pro- and postdorsal folds and on median fold above spiracles; of Abd. I-III, on dorsopleural lobes also; anterosternal setae prominent. Head yellow-brown except for pale coronal and postero-lateral areas; frontal margin, genae, mandibles, and labral pattern red-brown; ocelli not visible; *fs* 5 shorter than *fs* 4. Labral lateral setae subequal in length to anterior setae but more slender. Thoracic spiracles subcircular, bicameral, with airtubes obscurely 4-5-annulate, directed obliquely dorsad; abdominal spiracles similar but smaller. Abd. IX with dorsal area trapezoidal, anterior and median setae subequal; sternal area almost square, not enclosed anteriorly by pleural lobes. Alimentary canal with anterior ventriculus transversely ridged; posterior ventriculus with gastric caeca as long as width of tube, 4 each side of lower coil; Malpighian tubules with bases cupshaped; rectum elongate.

Habitat: In soil of coastal forest.

Recorded food plants: *Poa foliosa* Hook.f., *Stilbocarpa lyallii*. Probably polyphagous.

Distribution: S.I., Stewart I., Chatham I.

Material examined: SI: Big South Cape I., under *Poa foliosa*, 5.xi.1968, 4 larvae; in soil, -.xi.1968, 3 larvae (G. Kuschel); Puwai Bay, under *Stilbocarpa lyallii*, -.ii.1969, 1 larva (J. I. Townsend).

Catoptes sp.

Common name: None.

Maximum size: 7.0 × 2.5 mm. Head width 1.5 mm.

The larvae of this undescribed *Catoptes*, apart from their much smaller size, are difficult to separate from those of *C. brevicornis*. The species live in close association. Differences are as follows: Cuticle lacking spinules on dorsopleural lobes. Sternal area of Abd. IX with inner setae less than 0.5 length of outer setae. Labrum with lateral seta much shorter than anterior seta. Alimentary canal with 3 gastric caeca on each side. Malpighian tubules with bases simple.

Habitat: In soil of coastal forest.

Recorded food plants: *Poa foliosa*. Probably polyphagous.

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Distribution: Known only from Big South Cape I., southwest of Stewart I.

Material examined: SI: Big South Cape I., in soil, -.xi.1968, 4 larvae (G. Kuschel); under *Poa foliosa,* 9.ii.1969, 10 larvae (B. M. May).

Genus **Sargon** Broun

The genus *Sargon* is mainly associated with alpine herbfields. Most larval specimens have been collected singly, from scattered localities. *S. quadrinodosus* (Brookes), exceptional in that it is abundant in coastal forest, is the only species so far identified. It differs from *Catoptes* as follows:

Body more slender. Head widest behind middle, with *des* 2 well developed, at least 0.5 length of *des* 1. Maxilla with apical seta of lacinia not especially broad. Ventral folds of abdomen without transverse rows of coarse spinules. Terminal segments weakly modified; Abd. VIII with dorsopleural lobe larger than on preceding segments; Abd. IX with pleural lobe partially pigmented, not grossly enlarged, but produced apically, at inner margin, to form a tubercle; dorsal and ventral areas scarcely reduced. Anal segment quadrate. Alimentary canal of typical form.

Material examined: Single specimens, not determined to species, from: WA: Tararua Ra., Mt Holdsworth 1180 m, 18.xi.1968 (B. M. May). CO: Old Man Ra., 1615 m, under turf, 20.ii.1974; Pisa Ra., nr L. Mackay 1737 m, 23.xi.1974 (J. C. Watt); OL: Mt Niger 2000 m, in cushion of *Anistome imbricata,* 26.ii.1966 (G. Kuschel). FD: Takahe V., under *Hebe* sp., 13.xii.1972 (A. C. Eyles, J. M. Ward).

Sargon quadrinodosus (Brookes) (Figs. 122-129)

Common name: None.

Maximum size: 11.0 × 3.5 mm. Head width 2.0 mm.

Cuticle asperate on dorsal lobes and folds of Abd. I-V. Setae fine, pallid. Head yellow-brown with creamy paramedian and lateral stripes; frontal margin and mandibles red-brown; *fs* 5 shorter than *fs* 4; *des* 1, 2, 3, 5 subequal; *des* 3 within frontal suture; ocelli absent. Labrum with lateral seta as long as anterior seta; colour pattern 4-pointed with rounded proximal extension. Tormae very short, dark at apices, subparallel. Epipharynx with *als* long, slender; inner pair of *ams* stout, pigmented. Premental sclerite with posterior extension truncate. Thoracic spiracle bicameral with airtubes reaching just beyond peritreme, 4-5-annulate, obliquely dorsad. Abdominal spiracles smaller with airtubes caudad. Abd. VII with 4 (instead of the usual 5) *pds*. Anal lobes strongly asperate. Alimentary canal with gastric caeca flask-shaped, 6-7 in a single row each side of lower coil; rectum elongate.

Habitat: In soil of coastal forest.

Recorded food plants: *Poa foliosa*. Probably polyphagous.

Distribution: Stewart I. and associated smaller islands.

Material examined: SI: Big South Cape I., -.xi.1968, 11 larvae (G. Kuschel); under *Poa foliosa,* 10.xi.1968, 2 larvae (J. C. Watt); -.ii.1969, 8 larvae (J. McBurney); 13.ii.1969, 25 larvae (B. M. May).

Genus **Mandalotus** Erichson

Mandalotus is an Australian genus of well over 100 endemic species. It is represented in New Zealand only by *M. miricollis* Broun, on which the generic definition is based. *Aporolobus* Sharp, *Paelocharis* Broun, *Notiopatae* Broun, *Thotmus* Broun, are closely related, but their larvae are still unknown.

Body strongly curved. Head free, evenly rounded in outline, subdepressed, emarginate behind, with *des* 1 and 2, *fs* 4 and 5, subqual in length; *des* 4 absent. Hypopharyngeal bracon with paramedian brown maculae. Labral tormae short, subparallel. Mandibles with 2 unequal setae, aligned longitudinally, at apex of scrobe. Labium with ligular setae unequal. Premental sclerite slender, broken before middle; posterior extension short, spatulate. Maxilla with stipes scarcely pigmented; cardo dark. Abd. I-VII with major spiracular seta on middle fold above spiracle. Terminal segments modified (type A of Emden 1952); Abd. VIII with dorsopleural lobes 4× larger than those of Abd. VII. Abd. IX with dorsal area subtriangular; ventral area trapezoidal; pleural lobes grossly expanded and sharply angled, not extended into a ventral plate. Anus 4-lobed, terminal. Alimentary canal of typical form.

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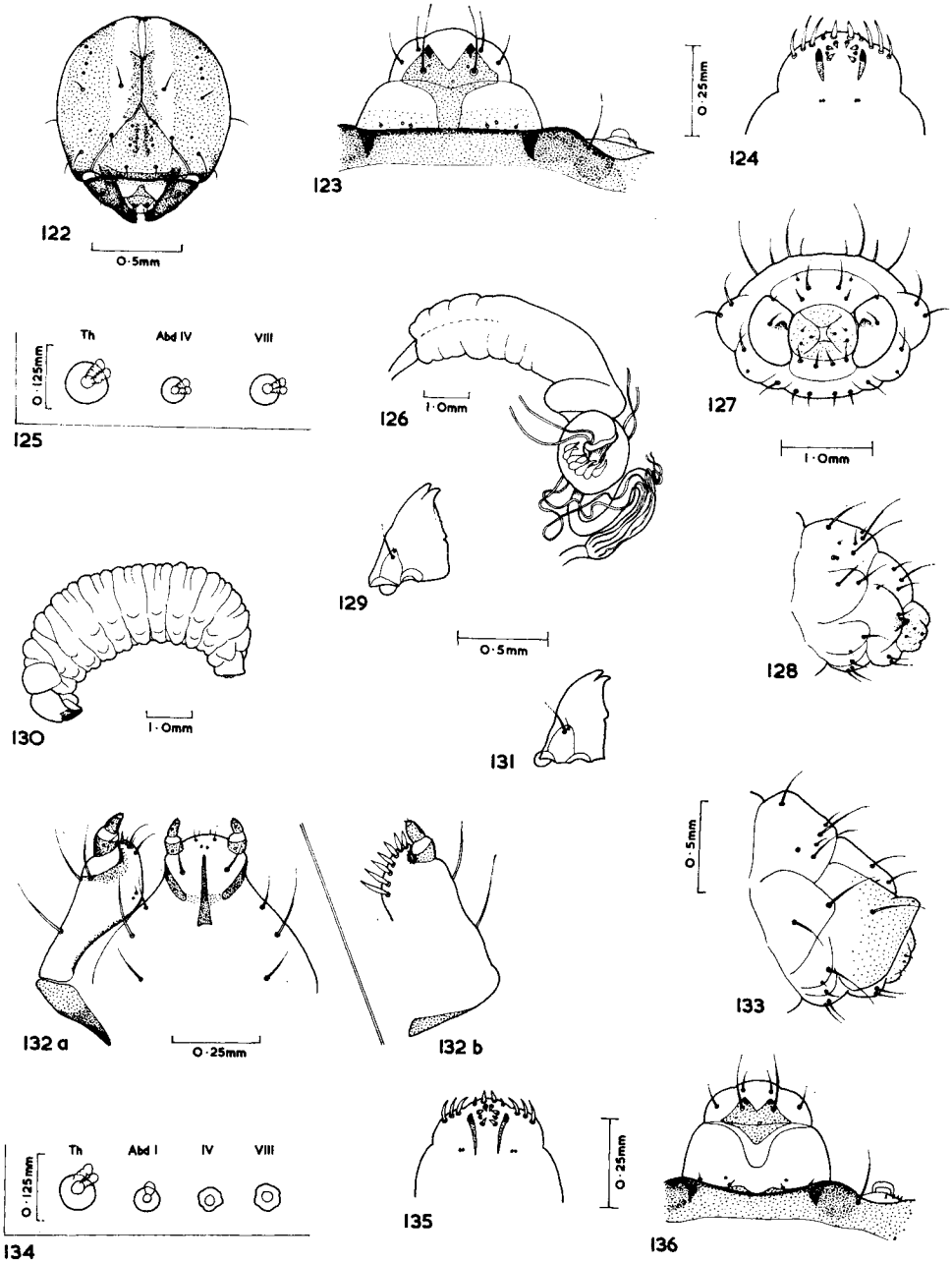
Mandalotus miricollis Broun (Figs. 130-136)

Common name: None.

Maximum size: 7.0 × 2.5 mm. Head width 2.0 mm.



FIGS. 122-136. — Leptopiinae: 122-129, *Sargon quadrinodosus* (Brookes); 122, head; 123, labrum, clypeus, frontal margin, antenna; 124, epipharynx; 125, spiracles; 126, alimentary canal; 127, abdominal segments VIII, IX, X, caudal view; 128, abdominal segments VIII, IX, X, lateral view; 129, mandible. 130-136, *Mandalotus miricollis* Broun; 130, larva; 131, mandible; 132, maxilla and labium —a, ventral view; b, dorsal view of maxilla; 133, abdominal segments VIII, IX, X, lateral view; 134, spiracles; 135, epipharynx; 136, labrum, clypeus, frontal margin, antenna.

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Body setae fine, pallid. Cuticle asperate on dorsal lobes and folds of Abd. I-V; all pleural and ventral lobes lightly sclerotised. Head pale yellow with reddish paramedian stripes; frontal margin, genae, and mandibles blackish; ocelli absent. Labrum with median area, but not proximal extension, coloured; lateral seta as long as anterior seta. Ligular setae unequal. Thoracic spiracle circular with airtubes 2-4-annulate, directed obliquely dorsad. Abdominal spiracles with airtubes absent or vestigial. Terminal segments with dorsopleural lobes of Abd. VIII caudally angulate; pleural lobes of Abd. IX abruptly angled with caudal surface almost plane; major seta much stronger than anal setae. Anal lobes retractile. Alimentary canal with gastric caeca vermiform, 2-3 each side of lower coil.

Note: The retractile anal lobes serve for attachment to roots and the caudal surface of Abd. IX serves as a " rocking base " while the larva is feeding.

Habitat: In soil of open grassland.

Recorded food plants: White clover.

Distribution: N.I., north of latitude 37.50°S.

Material examined: AK: Mt Albert, 6.iii.1962, eggs in dead leaf stems of clover, first instar larvae; 20.ix.1962, 16 larvae; 8.xii.1962, 6 larvae; 2.viii.1963, 64 larvae; Kaipara South Head, in pasture, 17.ix.1962, 11 larvae (B. M. May); Coatesville, in pasture, 24.vii.1975, 4 larvae (E. F. Block).

Genus **Brachyolus** White

I can find no separation at the generic level for larvae in *Brachyolus, Irenimus* Pascoe and *Nicaeana* Pascoe.

Body evenly curved, not tapering, with cuticle asperate, at least on dorsal folds; sclerotised around setal groups and on all lobes of Abd. VIII and IX. Head free, widest at middle, subdepressed, with *des* 2 well developed but usually weaker than *des* 1; *fs* 4 and 5 subequal; ocelli present or absent. Mandibles not always bidentate. Hypopharyngeal bracon usually with paramedian brown maculae. Labrum with 5-pointed median colour pattern, including posterior extension; lateral and anterior setae subequal in length; tormae subparallel to convergent. Mandibles with minor seta minute, close to major seta, or absent. Labium with ligular setae unequal. Prementa sclerite faint or broken before middle; posterior median extension short, spatulate; anterior extension longer, acute. Maxilla with stipes and cardo scarcely pigmented. Abd. I-VII with major spiracular seta on middle fold above spiracle. Spiracles circular; thoracic larger than abdominal. Terminal segments modified (type A of Emden 1952); Abd. VIII with dorsopleural lobe 2× larger than that of Abd. VII. Abd. IX with dorsal area subtriangular to trapezoidal; ventral area transverse, rectangular; pleural lobe grossly expanded, obtusely angled, not extended ventrad, with major seta in apical 0.3. Anus 4-lobed, terminal, with 1 strong, 1 weak setae. Alimentary canal of typical form.

Note: Spiracles, in the *Brachyolus* group exhibit progressive stages of obsolescence, the airtubes varying from fully segmented (annulate), in first instar larvae; segmentation obscure; reduction of terminal lobe (vestigial); reduction in number to a single, simple airtube and finally, complete absence.

Larvae of the alpine members of the *Brachyolus* complex are poorly known and none has been included.

Brachyolus posticalis Broun (Figs. 137-138)

Common name: None.

Maximum size: 4.0 × 1.75 mm. Head width 1.0 mm.

Cuticle with asperities lacking on mid-pleural area; setae moderate, fine, pallid. Head pale yellow-brown, without paramedian flushing; sutures distinct; frontal margin narrow, dark; ocelli absent. Mandibles red-brown; subapical tooth usually obsolete. Hypopharyngeal bracon clear. Labral tormae short, partially membraneous. Thoracic spiracles with airtubes 5-6-annulate, oblique; abdominal spiracles smaller, with airtubes simple. Alimentary canal not examined.

Habitat: In soil, feeding on small roots.

Recorded food plants: Clover-ryegrass pasture, polyanthus.

Distribution: S.I., Canterbury, Otago.

Material examined: DN: Palmerston, in pasture, 18.ix.1972, 4 larvae; polyanthus roots, 18.ix.1972, 2 larvae (B. M. May).

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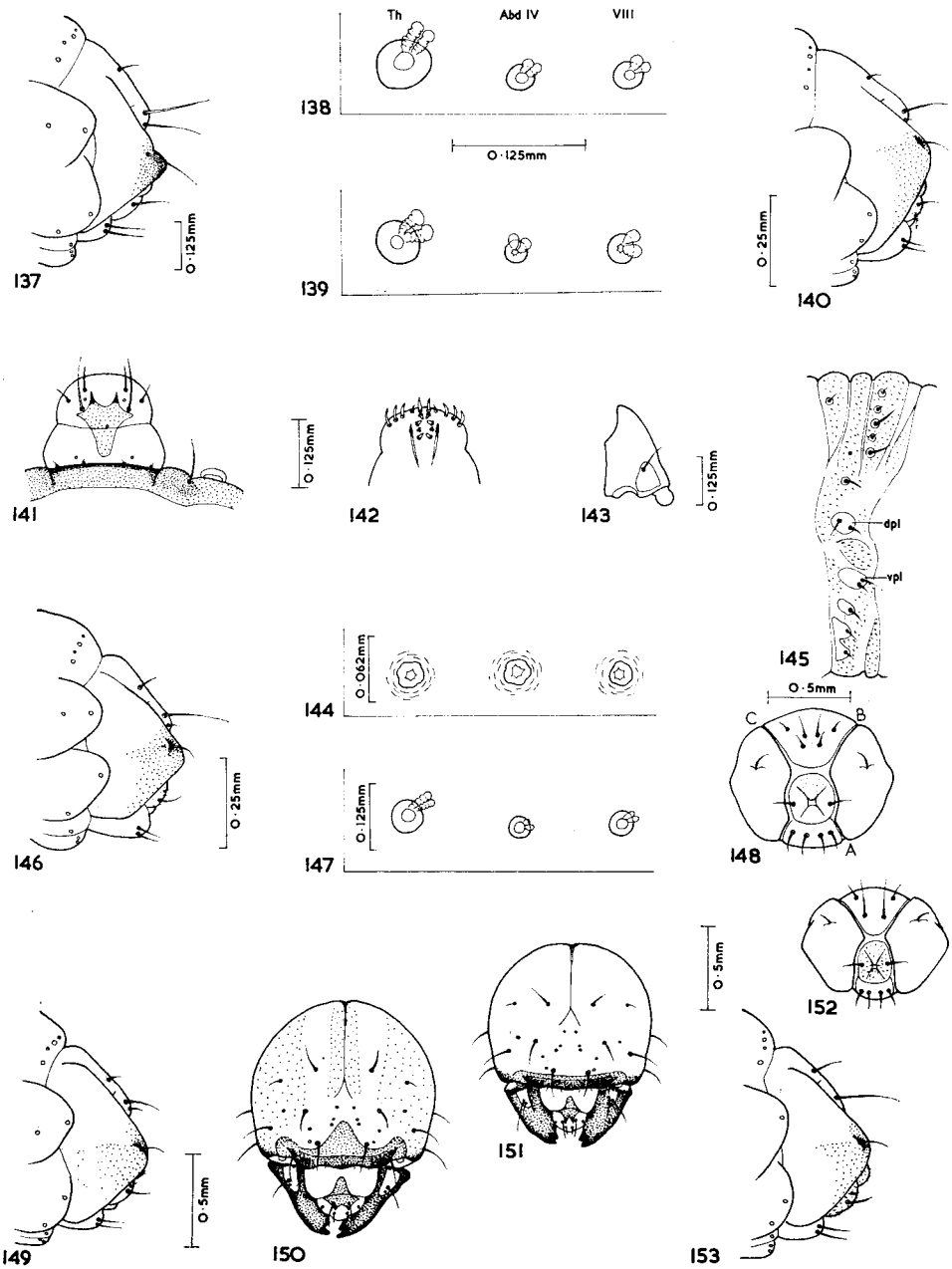

FIGS. 137-153. — Leptopiinae: 137-138, *Brachyolus posticalis* Broun; 137, abdominal segments VIII, IX, X, lateral view; 138, spiracles; 139-143, *Brachyolus obscurus* (Sharp); 139, spiracles; 140, abdominal segments VIII, IX, X, lateral view; 141, labrum, clypeus, frontal margin, antenna; 142, epipharynx; 143, mandible. 144-146, *Brachyolus* cf. *postrectus* Marshall; 144, spiracles; 145, abdominal segment V, lateral view; 146, abdominal segments VIII, IX, X, lateral view. 147-150, *Irenimus compressus* (Broun); 147, spiracles; 148, abdominal segments IX, X, caudal view; 149, abdominal segments VIII, IX, X, lateral view; 150, head. 151-153, *Irenimus aequalis* (Broun); 151, head; 152, abdominal segments IX, X, caudal view; 153, abdominal segments VIII, IX, X, lateral view.

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Brachyolus obscurus (Sharp) (Figs. 139-143)

Common name: None.

Maximum size: 4.0 × 1.25 mm. Head width 0.75 mm.

Cuticle with setae short, fine, pallid. Head pale yellow, without paramedian flushing; sutures not visible; frontal margin dark, narrow; ocelli faint. Mandibles red-brown, unidentate. Hypopharyngeal bracon with paramedian maculae usually visible. Labrum evenly rounded (not lobate). Tormae distinct, convergent. Thoracic spiracles with airtubes 4-5-annulate, oblique; abdominal spiracles smaller with airtubes simple, dorsad. Alimentary canal not examined.

Habitat: In soil, feeding on small roots.

Recorded food plants: *Trifolium* sp. Probably polyphagous. Adults have caused damage to seedling brassicas.

Distribution: S.I., Canterbury, Otago.

Material examined: DN: Ngapara 400 m, under clover, 15.ix.1972, 18 larvae; Palmerston, in pasture, 18.ix.1972, 7 larvae (B. M. May).

Brachyolus cf. **postrectus** Marshall (not reared) (Figs. 144-146)

Common name: None.

Maximum size: 3.5 × 1.5 mm. Head width 1.0 mm.

Similar to *B. obscurus* except: Cuticle with larger asperities. Mandibles bidentate, unless subapical tooth eroded in older larvae. Ocelli not visible. Spiracles without airtubes. Alimentary canal not examined.

Habitat: In soil, feeding on small roots.

Recorded food plants: *Raoulia australis* Hook.f. Probably polyphagous. Adults have caused damage to seedling brassicas and to strawberry flowers.

Distribution: S.I., Canterbury, Otago.

Material examined: CO: Alexandra, Raggedy Ra., under *Raoulia australis*, 9.ix.1968, 8 larvae (J. S. Dugdale).

Irenimus aequalis (Broun) (Figs. 151-153)

Common name: None.

Maximum size: 5.0 × 2.0 mm. Head width 1.0 mm.

Cuticle with setae short, fine, pallid. Head pale yellow; genae and mandibles red-brown; frons with light red supramarginal band (fades in alcohol) having posterior margin straight; ocelli absent. Hypopharyngeal bracon with paramedian maculae. Labrum obscurely trilobate; tormae distinct, convergent. Epipharyngeal lining with *als* larger than anterior seta of labrum. Thoracic spiracle with airtubes 4-annulate, oblique; abdominal spiracles smaller, with airtubes simple. Abd. IX with 2 only, dorsal setae. Anal lobes spiculate. Alimentary canal with gastric caeca vermiform, 2 each side of lower coil. Rectum elongate, occupying 0.5 distance from final bend of hind gut.

Habitat: In soil, feeding on small roots.

Recorded food plants: White clover, strawberry.

Distribution: N.I., south of latitude 37°S; S.I., throughout.

Material examined: WO: Otorohanga, under clover, 21.xi.1965, 4 larvae (B. M. May); Ohaupo, in pasture, light soil, 28.vii.1969, 21 larvae; Te Kuiti, in pasture, 29.vii.1969, 43 larvae (H. A. Oliver, B. M. May). MC: Halswell, 28.viii.1964, 7 larvae (C. T. Jessep); Christchurch, among strawberry roots, 22.ix.1972, 9 larvae (K. G. Somerfield, B. M. May).

Irenimus compressus (Broun) (Figs. 147-150)

Common name: Compressed weevil.

Maximum size: 9.0 × 2.75 mm. Head width 1.5 mm.

Similar to *I. aequalis* except: Almost 2× larger when mature. Frons with wide, light red, supramarginal band, strongly produced medianly. Ocelli faint. Abd. IX with 3 dorsal setae; posterior seta 0.5 length of median seta. Anal lobes scarcely spiculate. Alimentary

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canal with gastric caeca 3 each side, as long as width of tube; Malpighian tubules unusually wide.

Habitat: In soil, feeding on small roots.

Recorded food plants: Clover-ryegrass pasture, polyanthus. Probably polyphagous.

Distribution: Throughout.

Material examined: ND: Bream Islet, Whangarei Heads, under mat plants, 24.x.1968, 1 larva (J. C. Watt). AK: Pukekohe, pasture, 28.vi.1963, 4 larvae; Waiau Pa, 25.vii.1964, 3 larvae; Karaka, 16.ix.1964, 13 larvae (J. G. Bilkey). BP: Opotiki, 11.viii.1964; 3 larvae (G. A. Helson). HB: Omarunui, in pasture, 18.v.1975, 3 larvae (B. M. May). RI: Ohakune, in pasture, 28.x.1970, 7 larvae; 2.xi.1970, 14 larvae (B. M. May). MB: Opouri, in pasture, 15.0 cm deep, 22.vii.1966, 2 larvae (G. J. Hitchings); 4-yr old pasture, 27.v.1969, 1 larva (G. McNae). CO: Macraes Flat, pasture, 3.vi.1964, 3 larvae (J. G. Brown). DN: Palmerston, among polyanthus roots, 28.ix.1964, 7 larvae (M. Stockdill); Balclutha, 24.iv.1974, 2 larvae (H. J. Jagger).

Irenimus duplex (Broun) (not reared) (Figs. 154-156)

Common name: None.

Maximum size: 10.0 × 3.0 mm. Head width 1.5 mm.

Cuticle densely but finely asperate, with setae moderate, reddish. Head creamy, with genae light red; mandibles red-black; frons with light red supramarginal band having posterior margin straight; *des* 1 and 2, *les* 1 and 2, subequal in length; ocelli small but distinct. Hypopharyngeal bracon with paramedian triangular maculae. Labrum trilobate. Tormae subparallel. Epipharyngeal lining with *als* larger than anterior labral setae. Premental sclerite dark, complete, with posterior margins scalloped. Maxilla with lacinia and cardo pigmented. Thoracic spiracle with airtubes 3-annulate, barely reaching beyond peritreme; abdominal spiracles with airtubes simple; those of Abd. VIII dorsad; peritreme of all spiracles pigmented. Abd. IX with pleural lobes red-brown; dorsum with a median, brown patch and with posterior seta 0.2 length of median seta. Alimentary canal not examined.

Habitat: In sandy soil.

Recorded food plants: *Poa laevis* R.Br.

Distribution: S.I., Central Otago.

Material examined: CO: Cromwell, in soil, 19.xi.1974, 1 larva; under *Poa laevis*, 12.iii.1975, 1 larva (J. C. Watt).

Nicaena cervina Broun (Figs. 157-159)

Common name: None.

Maximum size: 4.0 × 1.75 mm. Head width 1.0 mm.

Cuticle with asperities sparsely distributed, absent from mid-pleural areas; setae moderate, slender, pallid. Head creamy, widest behind middle, narrowed in front; frons with supramarginal band, light red, slightly produced medianly and at both ends; ocelli faint. Hypopharyngeal bracon clear. Labrum scarcely lobate. Tormae convergent. Premental sclerite unbroken with median extensions stronger than lateral arms. Spiracles without airtubes. Abd. IX with posterior dorsal seta less than 0.5 length of median seta. Alimentary canal with 1 gastric caecum, longer than width of tube, on each side of lower coil.

Habitat: In soil, feeding on small roots.

Recorded food plants: Clover-ryegrass pasture, *Chionochloa rubra*.

Distribution: S.I., Canterbury, Otago.

Material examined: MC: Cass 700 m, ribbonwood (*Hoheria* sp.) fan, 12.vi.1962, 1 larva (E. G. White); Kyle, Ashburton, under new grass, 16.iii.1966, 6 larvae (D. Hurst). CO: Sailors Cutting, Macraes Flat 457 m, 7.ix.1968, 2 larvae (J. C. Watt, J. A. Farrell); Macraes Flat, 18.ix.1972, 20 larvae (B. M. May). DN: Palmerston, 18.ix.1972, 7 larvae (B. M. May).

Nicaeana sp. (Figs. 160-162)

Common name: None.

Maximum size: 5.0 × 2.0 mm. Head width 1.0 mm.

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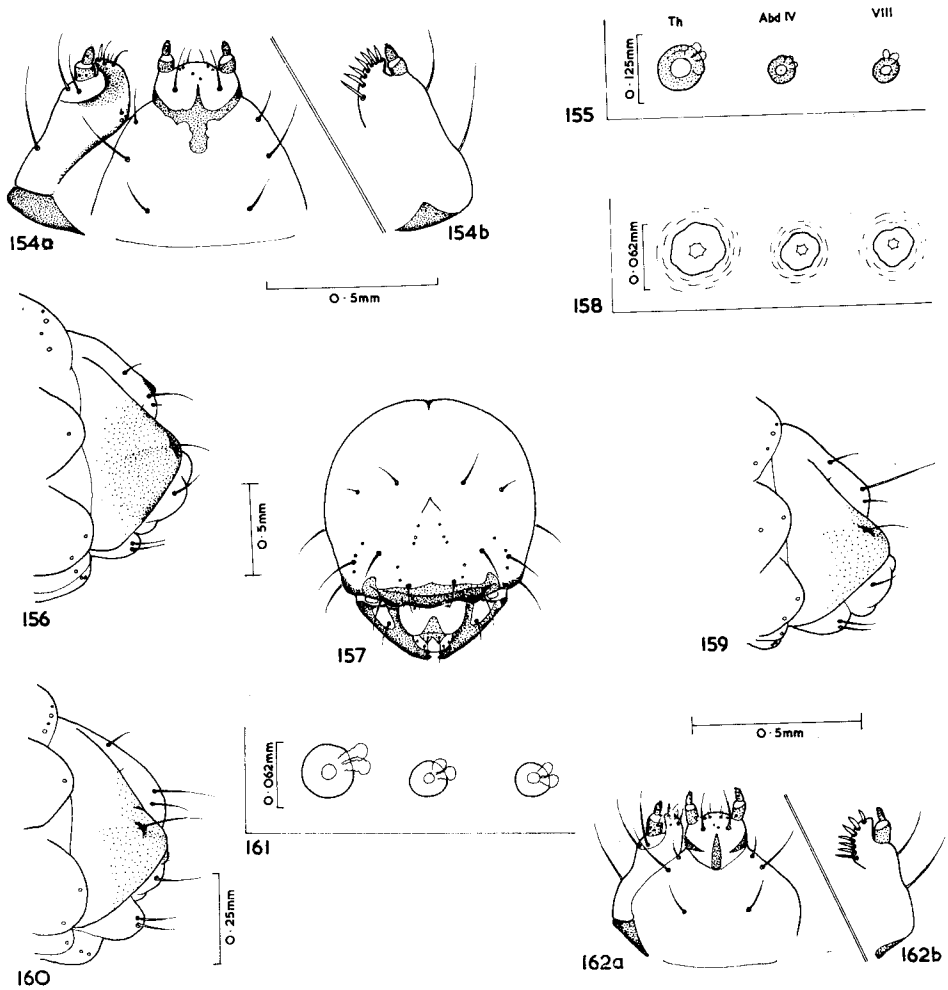

FIGS. 154-162. — Leptopiinae: 154-156, *Irenimus duplex* (Broun); 154, maxilla and labium — a, ventral view; b, dorsal view of maxilla; 155, spiracles; 156, abdominal segments VIII, IX, X, lateral view. 157-159, *Nicaena cervina* Broun; 157, head; 158, spiracles; 159, abdominal segments VIII, IX, X, lateral view. 160-162, *Nicaena* sp.; 160, abdominal segments VIII, IX, X, lateral view; 161, spiracles; 162, maxilla and labium — a, ventral view; b, dorsal view of maxilla.

Similar to *N. cervina* except: Cuticle with setae longer, more robust. Head light red (yellowish in alcohol); genae, front margin, mandibles, red-brown; without supramarginal colour band. Premental sclerite broken paramedianly. Labial palpi with proximal segment unusually elongate. Thoracic spiracles with airtubes obscurely annulate; abdominal spiracles with airtubes simple, oblique. Abd. IX with posterior dorsal seta at least 0.5 length of median seta. Alimentary canal with gastric caeca lacking.

Habitat: In light soil, feeding on tap roots, into which they tunnel.

Recorded food plants: Carrot.

Distribution: Known only from N.I., Ohakune area. The species is probably of South Island origin, having been transported by human agency (G. Kuschel, pers. comm.).

Material examined: RI: Ohakune, damaging carrots, 15.x.1968, 4 larvae (D. H. Todd); Karioi, feeding on carrots, 2.xi.1970, 23 larvae (B. M. May).

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