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ENTOMOLOGY OF THE AUCKLANDS AND OTHER ISLANDS SOUTH OF NEW ZEALAND: COLEOPTERA: SCARABAEIDAE, BYRRHIDAE, PTINIDAE, TENEBRIONIDAE

By **J. C. Watt**[1]

Abstract: Adults of all species of these families known to occur on New Zealand's subantarctic islands are described or redescribed, new synonymy and recombinations are noted, and larvae are described where known. Aspects of the higher classification of Byrrhidae and Tenebrionidae are discussed, and a subfamily Lagriinae is defined within the latter family. The family Scarabaeidae is represented only by *Prodontria longitarsis* (whose larva is described for the first time) on the Snares. The family Byrrhidae is represented by 4 species of *Epichorius*, and one temporarily referred to *Synorthus*. *Epichorius* is shown to be generically distinct from *Liochoria*, and is reinstated and redefined. *E. sorenseni* is newly recorded from Macquarie Island. The only ptinid is the cosmopolitan *Ptinus tectus*. The family Tenebrionidae is represented by a specifically or subspecifically distinct population of *Pseudhelops* on each island or group, and with 2 species occurring sympatrically on Antipodes Island. *Pseudhelops* is redefined, its systematic position in discussed, and species from New Caledonia and India are excluded.

INTRODUCTION

This is the first part of a study of subantarctic representatives of several families of Coleoptera, so general comments on zoogeography and evolution will be deferred until the second installment. The representatives of each of the families considered here except Ptinidae are medium to large, flightless beetles, and thus of special interest because of their limited means of dispersal. Despite this, Tenebrionidae are present on every island in the area except Macquarie; while *Epichorius sorenseni* (a byrrhid) occurs on both Campbell and Macquarie Islands.

The available material of many subantarctic Coleoptera is not adequate, despite the number of visits which have been made to the islands by various biologists and biological expeditions. Most of the latter have included few or no specialist entomologists. The Campbell Island beetle fauna is probably the best known, because of the relative ease of access, permanent facilities, and collecting by several meterological staff (notably Sorensen and Rennell) in addition to biological expeditions. Collections from the Snares are very deficient in larvae, which is unfortunate as the association of larvae with adults is very easy in such a limited fauna.

I am indebted to the following for kindly making material available for study: Dr E. B. Britton (Division of Entomology, CSIRO), Mrs M. M. Darby (Otago Museum), Dr J. L. Gressitt (Bishop Museum), Miss C. M. F. von Hayek and Mr R. D. Pope (British Museum, Nat. Hist.), Mr P. M. Johns (University of Canterbury), Mr R. G. Ordish (Dominion Museum), Mr K. A. J. Wise (Auckland Museum). Dr B. P. J. Molloy (Botany Division, D.S.I.R.) kindly identified gut contents of some byrrhids.

In lists of material examined, the following abbreviations have been used throughout:

L = Larva.

L_2 = Larva of second [etc] instar.

PUPA and EGG are written in full, to avoid confusion with other symbols. Where a number only is given,

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the number refers to adults. Dates are usually restricted to the month only.

AM = Auckland Museum, Auckland, N.Z.
ANIC = Australian National Insect Collection, CSIRO, Canberra.
BM = British Museum (Natural History), London, England.
BP = Bishop Museum, Honolulu, Hawaii.
CM = Canterbury Museum, Christchurch, N.Z.
DM = Dominion Museum, Wellington, N.Z.
ED = Entomology Division, DSIR, Nelson, N.Z.
MN = Museum National d'Histoire Naturelle, Paris, France.
UC = University of Canterbury, Zoology Dept, Christchurch, N.Z.

Family SCARABAEIDAE

Only one species is known from the subantarctic islands, namely *Prodontria longitarsis* from the Snares. Other species of *Prodontria*, as well as *Odontria* and *Sericospilus* (Melolonthinae), *Pericoptus* (Dynastinae) and *Saphobius* (Scarabaeinae) occur on Stewart Island and nearby small islands. No suitable habitats for *Pericoptus* are present in the subantarctic, but habitats similar to those occupied by the other Scarabaeidae on Stewart Island are present at least on Snares and Aucklands.

Genus **Prodontria** Broun

Broun, 1904, *Ann. Mag. nat. Hist.* **7**(14): 53.—Given, 1952, *Bull. N.Z. Dept. sci. industr. Res.* **102:** 13, 54.
Lewisiella Broun, 1904, *Ann. Mag. nat. Hist.* **7**(14): 53.

This genus is currently being revised. So far, no diagnostic characters additional to those of Given (loc. cit.) have been found in the adult. In the known larvae (3 species), in each case, on the epipharynx there are 2 distinct discal sclerotisations posteriorly (Fig. 4), the morphological right of which corresponds to the nesium of *Odontria*, *Costelytra* etc. (Hoy & Given 1952), and is termed NESIUM EXTERNUM by Böving (1942) for *Phyllophaga*, while the morphological left is termed NESIUM INTERNUM. No species of *Costelytra* or *Odontria* are known which have 2 nesia, although this character is present in *Costleya* (=*Chlorochiton*) and *Sericospilus*. In *Prodontria* the gymnopariae are extensive and lack punctures. In their study of larvae of New Zealand Melolonthinae, Hoy & Given (1952) did not attempt to define genera, and it is clear that more extensive studies, including characters not mentioned by them, need to be undertaken before this can be done adequately.

My preliminary studies suggest that *Prodontria* is indeed a monophyletic group, as stated by Given (1964). In this later paper, the known distribution of the genus (Central Otago, Southland, Stewart I and Snares) is mapped. All species are flightless, and their distribution is usually quite restricted. Two further undescribed species are known.

Prodontria longitarsis (Broun)

Broun, 1909, Subant. Is. N.Z. **1:** 105 (*Odontria*).—Hudson, 1909, op. cit., 58 (*Odontria*).—Given, 1952, *Bull. N.Z. Dept. sci. industr. Res.* **102:** 49 (*Odontria*); 1960, *N.Z. J. Sci.* **3:** 371, fig. 67–72.

Given has already described the holotype ♂, and the following comments augment this from study of the long series now available, especially with regard to the ♀.

Color dark brown; head, pronotum and elytra usually with lighter yellowish brown or reddish brown markings. Antenna of ♀ (Fig. 5) with lamellae of club shorter than in ♂, segment 5 much shorter, with a few setae towards apex somewhat longer than those of lamellae (segment 5 finely pubescent and lamellate in ♂). Front tibia of ♀ like that of ♂.

♂. Median lobe (penis) of aedeagus as illustrated (Fig. 1), largely membranous, sclerotisations not strong.

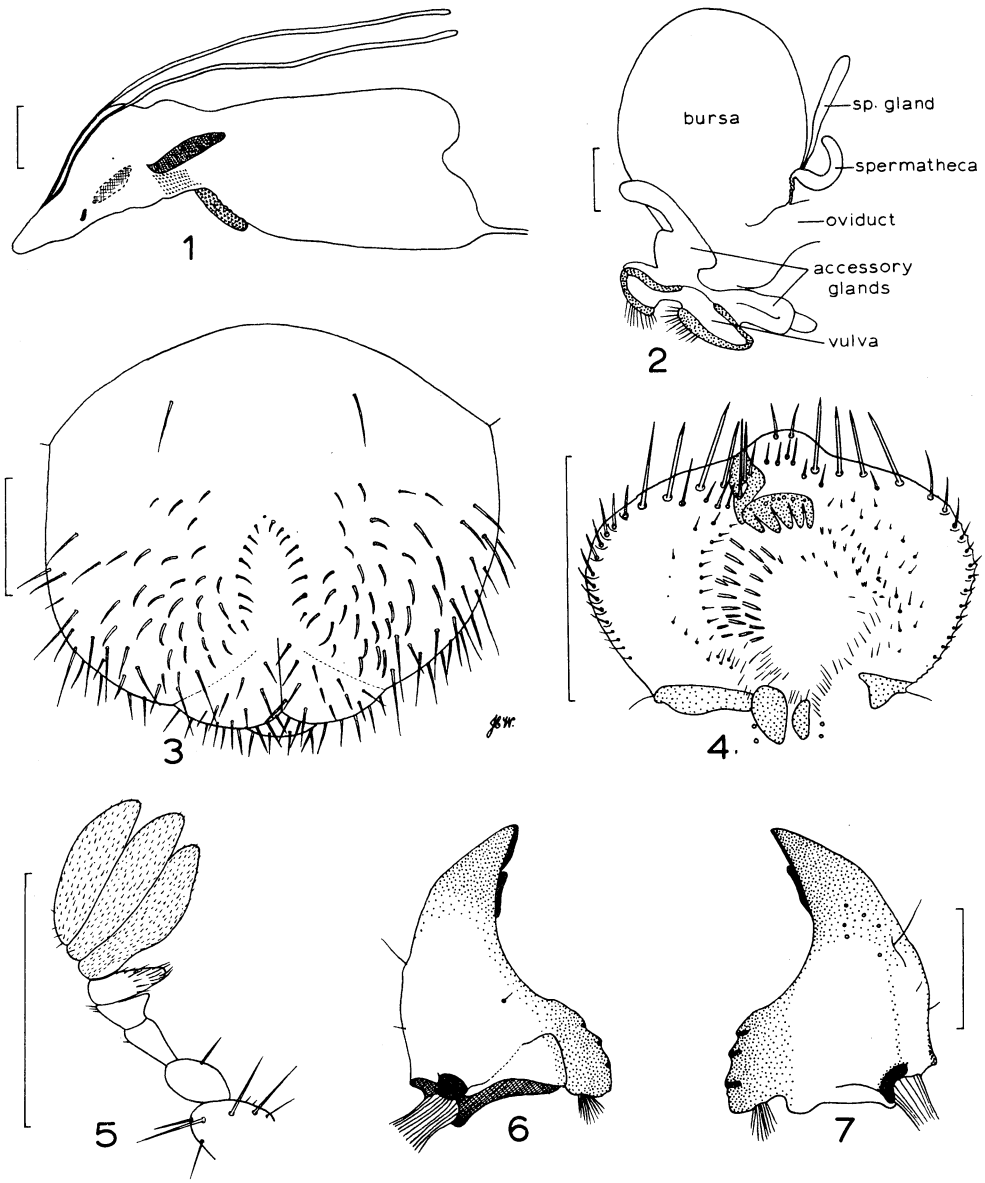

Fig. 1–7. *Prodontria longitarsis*. Fig. 1, Penis, lateral view, apex on left; Fig. 2, Chitinised parts of ♀ genitalia, ventral view; Fig. 3, Larva, raster; Fig. 4, Larva, epipharynx; Fig. 5, Left antenna, ♀; Fig. 6, Larva, right mandible, ventral; Fig. 7, Larva, right mandible, dorsal. [Scale lines = 1 mm.]

♀. Genitalia as in Fig. 2, basically similar to other species of *Prodontria* and *Odontria* examined, but spermatheca is larger both absolutely and relatively, and spermathecal duct enters oviduct further from its junction with bursa than in any other species studied. Dimensions 14–18 mm × 8.5–10 mm.

Larva. Epicranium with only a single pair of discal setae (lateral to junction of frontal and

epicranial ecdysial lines). Labrum with a single pair of discal setae, without other, smaller setae near base. Epipharynyx as in Fig. 4, epizygum complete, sensory punctures of zygum as indicated, plegmatia very small and indistinct, gymnopariae extensive, without punctures, acanthoparial setae 14, very small posteriorly. Two nesia (nesium externum and nesium internum) present, crepis absent, only 4 sensory punctures on area behind tormae, lateral to nesia.

Each mandible with a prominent, stout seta on exterior surface about half way between apex and base, right mandible also with 2 fine setae nearer base (Fig. 7). Each mandible with a stout seta arising on ventral surface near outside apex of molar part (Fig. 6). Left mandible with a dense brush of fine setae along ventro-internal edge.

Stridulatory teeth on dorsal surface of stipes of maxillae confined to posterior 2/3, with 5 fine setae in front of the row; dorsolateral surface of stipes without setae.

Raster as in Fig. 3, palidia forming a gothic arch, pali slender; tegilla separated slightly anteriorly (no preseptula setae), tegillar bristles numerous, stout, constricted at base, almost straight for most of their length, curved or hooked at apex. Barbula with numerous setae about as long as bristles of tegilla but much finer except at base; and slightly fewer long, slender setae.

Head width (3rd instar) 4.0–4.4 mm.

Type. Holotype ♂, Snares Is, X.1907, G. V. Hudson (DM).

Material examined. SNARES IS, Station Point, *Hebe elliptica* at night, 3.I.1967 (♀ UC); ditto, 4.I.1967 (7 ♂♂, 6 ♀♀ UC; 3 ♂♂, 3 ♀♀ ED; ♂, ♀ BP; ♂, ♀ BM; ♂, ♀ DM; ♂, ♀ CM); ditto, ex soil, *Olearia* roots, 5.I.1967 (2L UC; 2L ED).

Remarks. According to Given (1964), *P. grandis* from Mt Anglem, Stewart I, is most closely related to this species. However, *P. longitarsis* seems to have more in common with *P. praelatella* from coastal Southland, at least in superficial characters of the adult. Unfortunately neither the ♂ nor the larva of P. *grandis* is known. In the adult, *P. longitarsis* is easily distinguished from all other species by the elytral striae, which are marked by almost continuous shining nitid lines, apparently formed by coalescence of strial punctures, which contrast strongly with the dull velvety interstices. All other punctures have nitid bases, but these are very small. In *P. praelatella* the strial punctures are small, and the nitid areas do not coalesce anywhere. Strial punctures in *P. grandis* are minute.

In the larva of *P. longitarsis*, the epipharynx and rastral patterns are probably distinctive.

Family BYRRHIDAE

The New Zealand Byrrhidae have never been reviewed critically, although Broun (1910, *N.Z. Inst. Bull.* **2**) published a supposed "revision" of them. The present study shows that Broun's generic classification needs drastic revision, as does the general generic and suprageneric classification of the world fauna.

The subfamily classification proposed by Crowson (1955) is not satisfactory. According to his key, New Zealand species hitherto placed in *Pedilophorus* are Pedilophorinae on one character (first 3 visible abdominal sternites connate), and Byrrhinae on the other (metepisterna not concealed by elytral epipleura); while the larval characters of "Pedilophorinae" are based on Hudson's description of the New Zealand "*Pedilophorus*" *coruscans*. El Moursy's subfamily and tribal classification of North American Byrrhidae, and other earlier classifications, include some useful characters, but place too much stress on the presence or absence of elytral striae. In Böving & Craighead's key, *Epichorius* larvae run to their subfamily Lioninae, and in Crowson's key to Amphicyrtinae (which includes Lionini).

Existing generic classifications are based on superficial characters of adults, mainly of the Palaearctic and Nearctic faunas. Byrrhids from elsewhere have been fitted uncritically into this

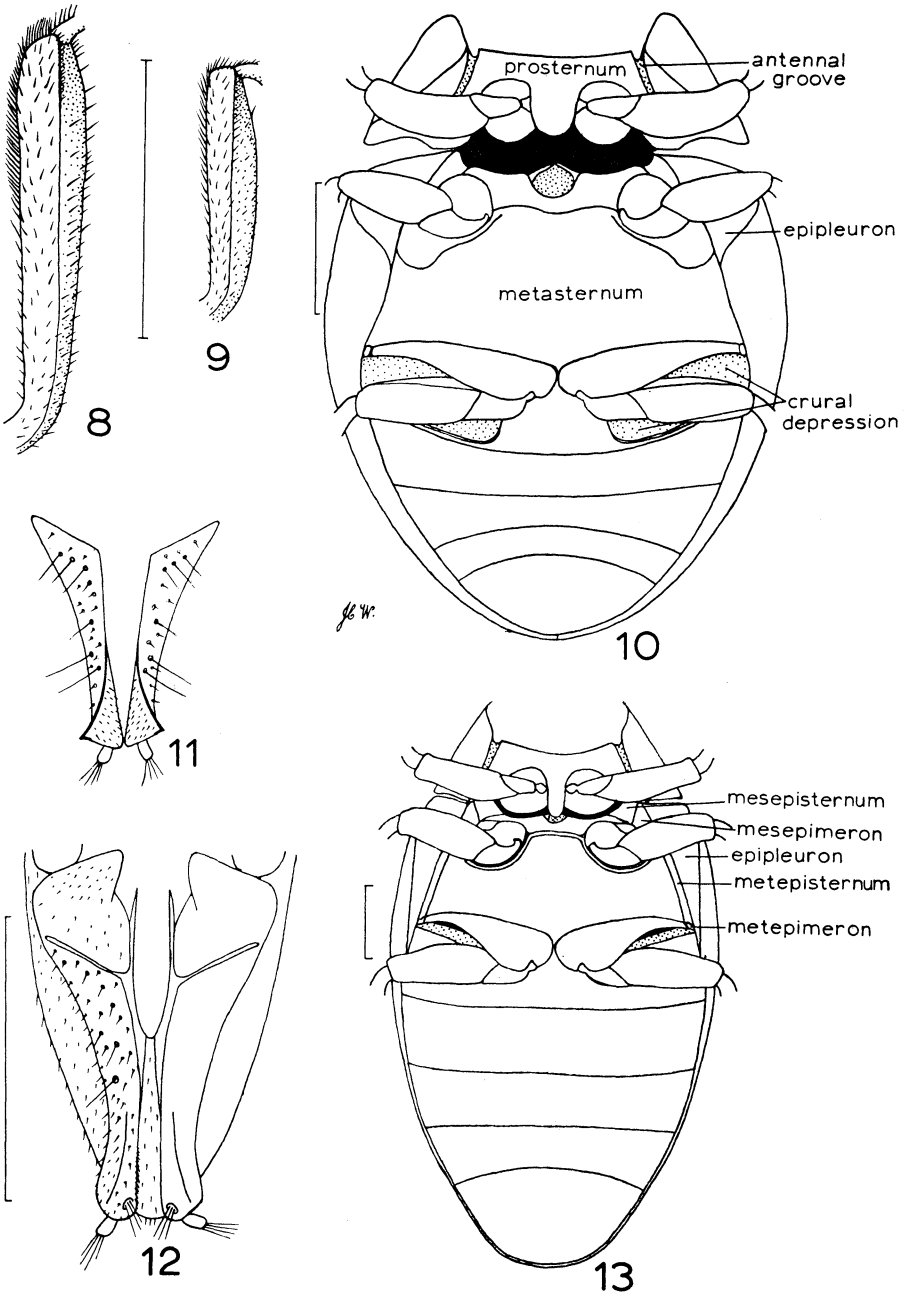

Fig. 8–13. BYRRHIDAE, Adults. Fig. 8, *Epichorius aucklandiae* ♂, front tibia; Fig. 9, *E. tumidellus* ♂, front tibia; Fig. 10, *Synorthus insularis*, ventral view, sculpture and clothing omitted; Fig. 11, *Epichorius aucklandiae*, ♀, coxites and styli of ovipositor; Fig. 12, *E. longulus*, ♀, apical parts of ovipositor; Fig. 13, *E. longulus*, ventral view, sculpture and clothing omitted. [Scale lines = 1 mm.]

unsound structure, usually into northern hemisphere genera. The study of concealed adult structures (particularly of mouthparts and ♀ genitalia), and larvae, must eventually result in a greatly improved classification of Byrrhidae.

Five species of Byrrhidae occur on subantarctic islands in the New Zealand area, i.e., *Epichorius aucklandiae* and *E. longulus* (Auckland Is), *E. sorenseni* (Campbell I and Macquarie I), *E. tumidellus* (Snares), and another, previously undescribed Snares species. The occurrence of *E. sorenseni* on Macquarie Island is of outstanding zoogeographical interest. The adults are flightless, so the only possible means of dispersal would seem to be carriage by birds or transport on floating ice or vegetation (as artificial introduction seems most unlikely, there having been very little transport of goods between Campbell and Macquarie Islands). Most flightless beetles this large (6.8–9.4 mm in length) are not subject to chance transoceanic dispersal.

The new species from the Snares has been referred temporarily to the New Zealand endemic genus *Synorthus*, as it appears to be related to some species placed there by Broun. These species will almost certainly be found to require a new genus when the fauna has been studied more comprehensively.

New Zealand Byrrhidae have usually been thought to feed mainly or exclusively on moss. Adults of *Epichorius sorenseni* were observed by Dr Kuschel at Beeman Camp, Campbell Island, feeding on foliose lichens on dead trunks at night. Adults of *E. longulus* were observed by Dr Kuschel on leafy liverwort at night on Adams Island. Dr B. P. J. Molloy, Botany Division, D.S.I.R., has kindly examined gut contents of adults of 4 of the 5 species considered here, and of *Liochoria huttoni* from Old Man Range, Otago. His identifications are listed below.

Epichorius aucklandiae (Preparation No. 56): Liverwort and abundant *Nostoc*-like fragments (moss protonema ?), minor green algae.

E. longulus (No. 35): Lichen, minor moss and *Metrosideros* pollen, rare filaments of blue-green algae.

E. sorenseni (No. 51): Leafy liverwort with minor moss.

Synorthus insularis (No. 44): Lichen dominant; minor liverwort with a few broken filaments of blue-green algae; rare pollen grains, composite type.

Liochoria huttoni (No. 47): Entirely moss.

Each of these determinations is based on examination of gut contents of a single specimen only, so they are no more than suggestive of the preferred foods of each species. It seems that in at least *E. sorenseni* and *E. longulus*, both lichens and liverworts can form a significant part of the diet. Probably the algae and pollen grains were on the surface of lichens or liverworts, and were ingested in the course of feeding on the latter plants.

Key to Genera and Species of Byrrhidae Adults

In addition to the characters given in the key, there are some minor differences in the proportions of various parts of the prosternum and metasternum in the species of *Epichorius*, which are expressed as ratios in Table 1.

1. Upper surface clothed with numerous erect, blunt bristles with slightly expanded apices, and coarse decumbent pubescence; undersurface and legs bear decumbent blunt bristles. First visible abdominal sternite with large deep crural depressions for receiving retracted femora (Fig. 10). Metepisterna completely concealed by inflected sides of elytra behind short epipleura (Fig. 10). Genitalia of ♂ and ♀ characteristic (Fig. 19, 20, 24). Snares... ..... **Synorthus insularis**

Body clothed with fine pubescence, without erect bristles. First visible sternite without distinct crural depressions. Metepisterna clearly visible, elytra with longer epipleura (Fig. 13).

Genitalia different.....2

2. Size large, exceeding 7 mm × 3.7 mm. Dorsal pubescence short, not more than 2 × diameter of punctures in length, *or* elytra with numerous raised shining impunctate areas. Metasternum with rounded carina along anterior margin (Fig. 13).....3

Size smaller, less than 6 mm × 3.3 mm. Dorsal pubescence long, about 5 × diameter of punctures in length, and elytra without impunctate areas. Metasternum without anterior carina. Snares.....**Epichorius tumidellus**

3. Elytra without smooth impunctate areas, but with faint striae. Dorsal pubescence not or scarcely visible at 25 × magnification, length of pubescence not or scarcely exceeding diameter of punctures. Campbell and Macquarie.....**Epichorius sorenseni**

Elytra with smooth impunctate areas, at least towards sides, and lacking striae. Dorsal pubescence clearly visible at 12 × magnification, length at least 2 × diameter of punctures (except sometimes on disc).....4

4. Elytra with numerous, fairly large shining impunctate areas over their whole surface, between which are depressed punctate areas; this produces a strongly mottled green and copper pattern to the naked eye. Length of setae of elytra about 5 × diameter of punctures. ♂ and ♀ genitalia as in Fig. 11, 14, 15, 25. Auckland Is.....**Epichorius aucklandiae**

Elytra with smaller impunctate areas which are absent from base and disc, punctate areas not depressed; appearance to naked eye weakly or not mottled. Length of setae of elytra about 2 × diameter of punctures (less on disc). ♂ and ♀ genitalia as in Fig. 12, 16–18, 26. Auckland Is.....**Epichorius longulus**

Table 1. Ratios of sternal measurements in Epichorius.

	A : B : C.	D : E
Epichorius tumidellus	1 : 3.5 : 2.2	1 : 1.9
E. sorenseni	1 : 3.6 : 1.4	1 : 2.2
E. aucklandiae	1 : 3.1 : 1.3	1 : 2.2
E. longulus	1 : 3.4 : 1.6	1 : 2.0

Key: A = length of prosternum in front of coxa (minimum); B = middle length of prosternal intercoxal process; C = width of prosternal intercoxal process between coxae; D = length of metasternum; E = width of metasternum (maximum).

Key to Known Larvae

Although two species occur on the Auckland Islands, it has not been possible to distinguish more than one type of larva in the material from there. As adults of *E. longulus* are much more common than adults of *E. aucklandiae*, it is assumed that most, if not all, of the larvae are *E. longulus*. Because of the uncertainty, larvae from Auckland Is are labelled only "*Epichorius* sp.," and have not been listed under "material examined." Apart from these, *E. sorenseni* is the only subantarctic byrrhid whose larva is known, none having been collected on the Snares.

1. Tergite 9 with numerous fine, short setae near anterior margin, especially towards sides; carinae absent near anterior margin. Pleurites 1–8 each with at least 10 setae (up to 20 on pleurites 2–6). Median sternites 2–7 each with at least 16 setae. Laterosternites 1–8 each with at least 5 setae. Campbell and Macquarie.....**Epichorius sorenseni**

Tergite 9 with only 4 setae near anterior margin; with a fine, curved, dark brown carina on each side near anterior margin, separated by about length of a single carina. Pleurites 1–8 each with 2 setae. Median sternites 2–7 each with 6 setae, 4 in a curved transverse row anteriorly and 2 posteriorly. Laterosternites 1–8 each with a single seta. Auckland Is.....**Epichorius longulus**

? **Epichorius aucklandiae**

Genus **Epichorius** Kirsch

Kirsch, 1877, Dt. ent. Zs. **21:** 165.

Type-species: *Epichorius aucklandiae* Kirsch, 1877 (by monotypy).

Strongly convex, elongate oval, dark brown or black, shining, usually with green and/or copper metallic reflections; with fine decumbent pubescence. Antennae 11-segmented, segments 2–4 approximately cylindrical, moderately pubescent, segments 5–11 somewhat flattened, becoming broader towards apex, more densely pubescent and with stronger microsculpture, forming an indistinct, loosely articulated, 7-segmented club. Eyes circular, lateral, moderately prominent. Labrum oval, slightly transverse. Epipharynx with distinct, sclerotised lateral tormae. Other mouthparts weakly sclerotised, galea, lacinia and glossae with fine setae.

Pronotum finely punctate, with fine lateral submarginal grooves. Scutellum clearly visible, triangular. Elytra with 11 striae visible in cleared preparations, usually not visible in entire specimens, scutellary striole absent. Epipleura confined to basal 1/4, broad at base, epipleural carina distinct. Hind wings vestigial.

Prosternum (Fig. 13) fairly short, intercoxal process fairly narrow, broad antennal grooves laterally. Mesosternum very short, transverse, ratio width:length about 3:1. Middle coxae large, with fully exposed trochantins, separated by about their own diameter, closed laterally partly by large mesepimera; mesepisterna only just reach coxal cavities, being almost excluded by mesosternum (Fig. 13). Metasternum transverse, about 2 × as wide as long (see table 1). Metepisterna clearly visible, not concealed by epipleura. Hind coxae (Fig. 13) almost contiguous, strongly narrowed towards sides. Tibiae distinctly more slender than femora, lacking grooves for reception of tarsi, although each with less convex area on outer surface near apex (Fig. 8, 9). Mid and hind tibiae slightly flattened, with outer edge carinate. All tarsi 5-segmented, segment 1 longer than 2 or dorsal part of 3, ventral part of 3 produced as a long, thin, narrow plate beneath 4 (very short) and base of 5, which is almost as long as basal 4 segments together.

Visible abdominal sternites 1–3 connate, 4 and 5 freely movable, 5 longest (Fig. 13). First visible sternite without distinct crural depressions, intercoxal process acuminate.

♂. Aedeagus as illustrated (Fig. 14–18, 21–23), dorsal part of penis at base fused with dorsal part of apicale of tegmen.

♀. Ovipositor (Fig. 25–27) short, well sclerotised, tergite 9 (proctiger) normally covers and protects coxites; distinct lateral paraprocts present at base of valvifers; coxites joined at base by membrane. Tergite 8 and sternite 8 each lightly sclerotised, each pubescent near apical margin. Tergite 9 bears fine pubescence, and there are some fine setae on coxites and styli. Internal chitinised parts membranous, bursa a large coiled structure with characteristic folding pattern in its walls (Fig. 26), separated from vagina by a constriction into which spermathecal duct enters.

Larva. (See also Gressitt & Samuelson 1964: 384–85) Moderately elongate, subcylindrical. Head and tergites (especially pronotum and tergite 9) well sclerotised. Head with distinct ventrolateral carinae and short dorsal endocarina. Frontal and epicranial ecdysial lines distinct. Ocelli 6, arrangement characteristic (Gressitt & Samuelson, fig. 4). Antennae 3-segmented, segment 2 longest, bearing a minute dome-shaped sensorium at apex, below base of segment 3; apex of basal membrane darkly pigmented (Fig. 29). Epipharynx as in Fig. 28, tormae strongly sclerotised. Mandibles each with 3 distinct, although somewhat blunt, teeth on cutting edge. Maxillae as in Fig. 29, lacinia elongate, with a prominent blunt, well-sclerotised tooth at apex.

Each tergite except 9th with an anterior and posterior transverse row of setae, usually 6 or 8 prominent setae in each row, often with smaller ones as well. Tergite 9 about 2 × length of any other tergite, dorsal surface slightly convex, with rounded carina along lateral and posterior borders; tergite oval in shape in dorsal view. Prothorax without laterotergites, meso- and meta-thorax each with 2 on each side; abdominal segments 1–5 each with 4 distinct laterotergites on each side below spiracles, segments 6–8 each with 3 on each side; sometimes with other small indefinite pigmented areas above laterotergites which are not, however, likely to be confused with them. Spiracles (Fig. 30) small, bicameral.

Cervicosternum comprises 3 sclerotisations, 2 lateral and one median. Each thoracic segment has distinct, sclerotised episterna and epimera, basisternum and intersternite. Abdominal segments 1–8 each with a pleurite on each side, a median sternite, and a pair of triangular, posterolateral laterosternites. Sternite

9 a single, crescent-shaped plate, tergite and sternite 10 lightly sclerotised.

Distribution. Auckland, Campbell, Macquarie, Snares and Stewart Island, and New Zealand.

Remarks. The above description is based primarily on the subantarctic species *E. aucklandiae*, *E. longulus* and *E. sorenseni*, but applies also to adults of such species as *E. tumidellus*, whose larvae are unknown. It may be necessary to modify the larval description when larvae of the more northern species have been studied.

The type-species was described from Auckland Is. Two species were described by Broun from Auckland I, in the genus *Liochoria*, and Brookes described *Liochoria sorenseni* from Campbell I. The latter generic assignment was accepted by Gressitt & Samuelson (1964), who suggested that *Epichorius* and *Liochoria* would probably have to be synonymised. Gourlay (1950) had already published this synonymy.

Examination of the type-species *Liochoria huttoni* Pascoe from Otago shows that it differs in many respects from *Epichorius*. The front tibia is excavate on its dorsolateral surface to receive the tarsus, the dorsal surface is glabrous, the mouth-parts are more strongly sclerotised and the lacinia bears stout peg-like bristles; the prosternal intercoxal process is broader, the ventral lobes of the 3rd tarsal segment are shorter, the 1st abdominal segment has slight crural depressions, in the ♀ the bursa is much more slender, the spermatheca minute, and the styli much larger and laterally flattened. These differences are certainly sufficient to justify the generic separation of *Liochoria* and *Epichorius*, so the latter is reinstated.

Most of the species listed by Hudson under the generic name "*Pedilophorus*" will probably eventually find a place in *Epichorius*, but they require further study. There is a distinct taxonomic gap between the Auckland and Campbell I species on one hand, and the Snares, Stewart I and mainland species on the other, but they appear to be basically similar and are best included in a single genus.

Epichorius aucklandiae Kirsch

Kirsch, 1877, *Dt. ent. Zs.* **21:** 166.—Gourlay, 1950, *Trans Roy. Soc. N.Z.* **78:** 190–91 (syn. *Liochoria sumptuosa*).—Brookes, 1951, *Bull. Cape Exped. Ser.* **5:** 31.

Black, with strong metallic reflections of copper and green, elytra strongly mottled with green (punctate areas) and copper (impunctate areas); legs antennae and underside dark reddish brown (antennae sometimes light yellowish brown). Upper surface of head moderately punctured, vertex often with shining impunctate area, largest punctures about equal to facets of eyes in diameter, mostly separated by more than their own diameter, length of fine setae mainly about 3 × diameter of punctures. Punctation and pubescence of pronotum like that of head, interstices shining, without microsculpture but with micropunctures just visible at 100 × magnification. Elytra with numerous shining impunctate areas over their entire surface, between which are depressed punctate areas, punctures mainly slightly larger and deeper than those of pronotum, setae coarser, length about 5 × diameter of punctures, color bright yellow. Striae absent.

Outer surface of anterior tibia with a less convex area near apex (Fig. 8), ventrolateral edge curved inwards towards apex. Other tibiae fairly slender, slightly flattened.

♂. Aedeagus as in Fig. 14, 15, much stouter than in other species, penis and parameres relatively stout and blunt apically, tip of penis flattened dorsoventrally, acuminate in lateral view.

♀. Genitalia as in Fig. 25, coxites with outer apical angle distinct, acute, outer surface somewhat excavate, carina runs in a curve from outer apical angle to inner edge (cf Fig. 11). Duct connecting vagina and bursa relatively broad; bursa wide, with 1.5 coils. Tergite 9 rounded at apex.

Variation. There is slight individual variation in shape, size, color and punctation. Specimens from Adams I are broader and more convex than specimens from Auckland I.

Larva. If included in material studied, not distinguishable from *E. longulus* (cf key to larvae).

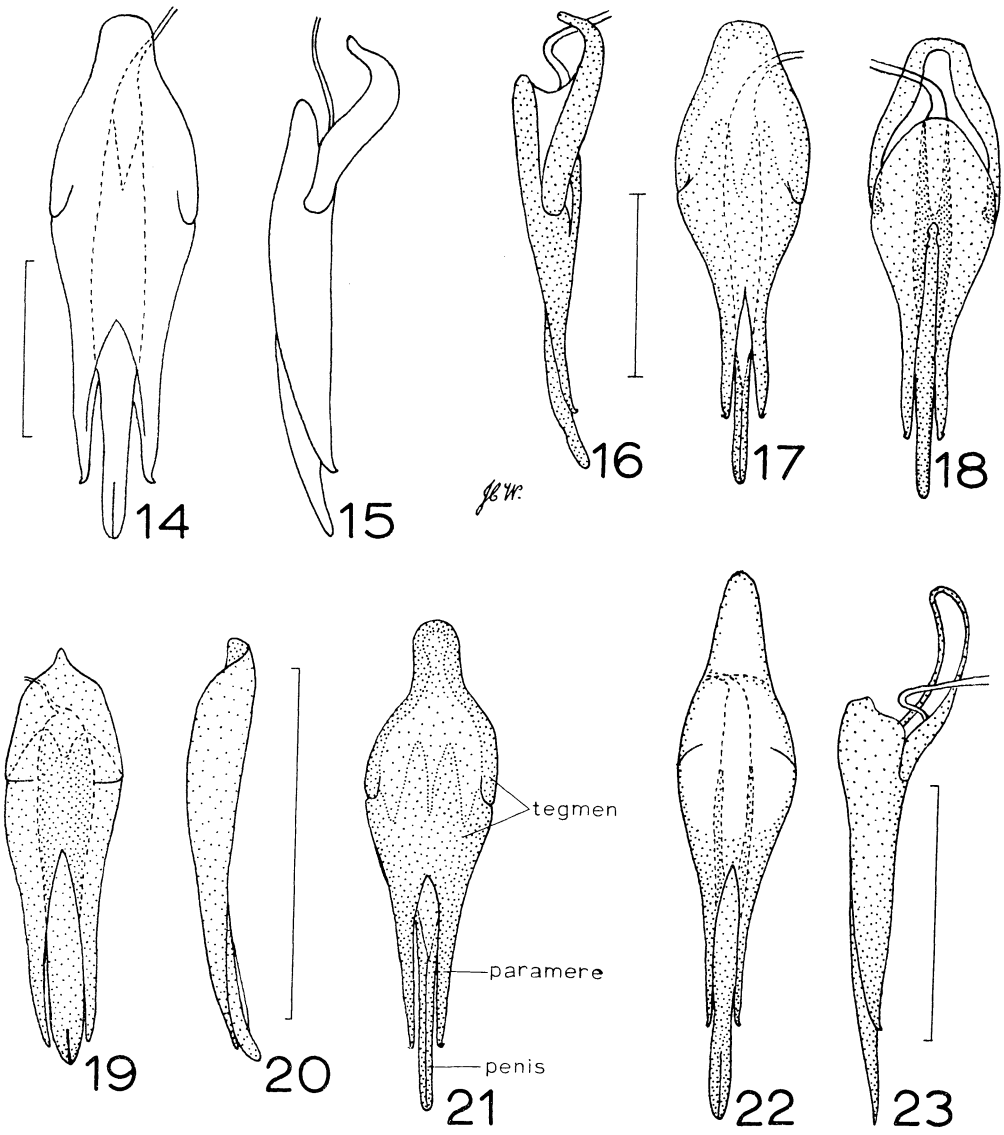

Fig. 14–23. BYRRHIDAE, ♂ aedeagi. Fig. 14, *Epichorius aucklandiae*, ventral; Fig. 15, same, lateral; Fig. 16, *E. longulus*, lateral; Fig. 17, same, ventral; Fig. 18, same, dorsal; Fig. 19, *Synorthus insularis*, ventral; Fig. 20, same, lateral; Fig. 21, *E. sorenseni* ventral; Fig. 22, *E. tumidellus*, ventral; Fig. 23, same, lateral. [Scale lines = 1 mm.]

Types. Rose Island, 21.I.1875, Krone, in Museum für Tierkunde, Dresden (not seen by me, but examined by Dr Gressitt and compared with Ocean Island specimen).

Material examined. (Adults only) AUCKLAND IS. *Ocean I*, Dec (♀ BP, comp with type by Gressitt); *Ewing I*, Jan (♂ ED); *Auckland I*, Ranui Cove, XII. (♂, ♀ ED), I. (♂ BP); Bivouac Hill,

400 m, I. (♀ in alcohol, BP); Musgrave Pen., II. (♂ BP); *Masked I*, II. (♀ UC); *Adams I*, East Ridge, 230–330 m, I. (♂, ♀ UC), 490–660 m (♀ UC; ♀ ED); Main Divide, north side, 500 m, I. (♀ BP), Fairchild's Garden, I. (♂ in alcohol, ED). Collectors E. S. Gourlay, J. L. Gressitt, P. M. Johns, G. Kuschel, K. A. J. Wise.

Ecology. *Olearia* (1), at light (1), *Metrosideros* forest (1), rock and tussock (2), fell-field (2), under rock (1), in litter sample (1).

Remarks. Gourlay (1950) states that *Rygmodus pedinoides* of Blanchard is actually this species. If this is so (and this could only be established by examining Blanchard's material: the description and figure are confused, and show some features of *Pseudhelops tuberculatus*!), it does not thereby make the specific name *pedinoides* available within *Liochoria* or *Epichorius*. "*Rygmodus pedinoides*" of Blanchard is clearly a misidentification of White's species, and as such, has no status in nomenclature ("Code," Article 49). Thus the name *Liochoria pedinoides* (Blanchard) Gourlay is invalid, and should not be used.

Epichorius aucklandiae occurs sympatrically with *E. longulus*, but seems to be much less common. Some of the specimens listed and labelled by Brookes as *Liochoria sumptuosa* have been examined, and all are *E. longulus*.

Epichorius longulus (Broun), new combination

Broun, 1909, Subant. Is. N.Z. **1:** 104 (*Liochoria*).—Hudson, 1909, op. cit.: 60, pl. 3, fig. 2 (*Liochria* [sic]).—Gourlay, 1950, *Trans. Roy. Soc. N.Z.* **78:** 191 (*Liochoria*).—Brookes, 1951, *Bull. Cape Exped. Ser.* **5:** 32 (*Liochoria*).

sumptuosus Broun, 1909, Subant. Is. N.Z. **1:** 103 (*Liochoria*). Hudson, 1909, op. cit.: 60 (*Liochria* [sic]).—Brookes, 1951, *Bull. Cape Exped. Ser.* **5:** 31–32 (*Liochoria*). **New Synonymy.**

Closely related to *E. aucklandiae*, differing as follows:

Color black, with metallic copper and green reflections, but elytra appearing only weakly or not mottled to naked eye. Pronotum and elytra relatively slightly broader at base; elytra less broadened in middle, their sides less strongly curved (except in Adams I specimens). Pubescence of frons as in *E. aucklandiae*, perhaps slightly shorter, but pubescence of vertex much shorter, length of setae not much greater than diameter of punctures. Pubescence of pronotum finer and shorter, length of setae no more than 2 × diameter of punctures. On elytra smooth impunctate areas smaller and usually confined to lateral and hind slopes, occasionally with a few small impunctate areas on disc; punctate areas between not depressed. Elytral pubescence much shorter and finer, length rarely exceeding 2 × diameter of punctures. Pubescence of undersurface in general shorter and finer.

♂. Aedeagus as in Fig. 16–18, parameres and penis considerably more slender; tip of penis compressed laterally, rounded in dorsal view. Tergite 9 bluntly pointed at apex (shovel-shaped).

♀. Genitalia as in Fig. 26; outer apical angles of coxites rounded, obtuse, carina not reaching them and less strongly curved, outer surface not excavate near apex (cf Fig. 12). Duct connecting vagina and bursa narrower.

Dimensions. 7.1–9.8 mm × 3.9–4.8 mm.

Larva. See key to larvae.

Types. *longulus*: Carnley Hrbr, under log (♀, BM). A second specimen, collected by Hudson at the same time (17.XI.1907), on which his figure was based, but apparently not seen by Broun, has been examined (DM). *sumptuosus*: Carnley Hrbr, under log (♂, BM).

Material examined (Adults only). AUCKLAND IS. *Enderby I*, XI. (1 ED); *Ewing I*, XI. (1 ED); *Ocean I*, XII. (1 BP), IV. (1 ED); *Auckland I*, Ranui Cove, XI. (124 ED; 2 DM); XII. (4 BP); I. (1 DM); Observation Point, XII. (2 BP); Bivouac, Mt Eden, 400–500 m, I. (1 BP); Grey Duck Creek, Laurie Hrbr, I. (1 BP); Musgrave Pen., I. (1 BP), II. (5 UC; 3 BP; 1 DM); Camp Cove, I. (3 UC); *Adams I*, Magnetic Station Cove, I. (9 ED; 12 UC; 3 BP); West end, I. (15 BP);

NE Ridge, Mt Dick, 360–450 m, I. (1 ED); East Ridge, 300–600 m, I. (2 UC). Collectors: R. A. Falla, C. A. Fleming, E. S. Gourlay, J. L. Gressitt, P. M. Johns, G. Kuschel, R. G. Ordish, E. G. Turbott, K. A. J. Wise.

Ecology. Under logs, rata forest (21); on *Metrosideros* at night (5); under rotten logs (2); on moss at night (15); under moss on plateau (1); *Poa* (1); at light (3); in copula at light (2); fell-field (2).

Remarks. This species occurs sympatrically with *E. aucklandiae* on Ocean I, Ranui Cove, Musgrave Peninsula, Mt Dick, and probably elsewhere. Presumably there are ecological differences between the two species, but the nature of these is not apparent from the available data. This is a problem which future entomological visitors to the islands should investigate, with particular reference to associating larvae with adults. The two species can be distinguished on external characters as indicated in the key, and with a little experience they should be identifiable in the field with the naked eye or a hand lens. The most obvious differences between the two species are in the genitalia.

Epichorius sorenseni (Brookes), new combination

Brookes, 1951, *Bull. Cape Exped. Ser.* **5:** 32–3, fig. 4 (*Liochoria*).—Gressitt & Samuelson, 1964, *Pacif. Ins. Monogr.* **7:** 383–5, fig. 4 (*Liochoria sorensoni* [sic]- adult, larva, pupa).

External characters described adequately by Gressitt & Samuelson (loc. cit.).

♂. Aedeagus as in Fig. 22, very similar to *E. longulus*, but with ventral lobe at base of tegmen narrower. Tergite 9 bluntly pointed at apex (shovel-shaped), pubescence longer than in *E. longulus* or *E. aucklandiae*.

♀. Very similar to *E. longulus*, setae of ovipositor slightly longer and stouter, duct between ovipositor and bursa slightly broader.

Dimensions. Holotype ♀ 8.7 × 4.7 mm; ♂♂ 6.8–8.0 mm × 3.6–4.2 mm; ♀♀ 7.1–9.4 × 3.9–4.8 mm.

Larva and Pupa. See Gressitt & Samuelson (loc. cit.). Early instar larvae have fewer setae than in later instars, and it is not clear how they can be distinguished from the early instar Auckland Island larvae.

Types. Holotype: "Holotype ♂, Coll. J. H. Sorensen, 13-12-46, leaf mould, Head of Tucker Cove, Campbell Is., *Liochoria sorenseni* Brookes, identified by A. E. Brookes" (DM); Paratypes: with same locality data as holotype (2 ♀♀ ED); "Col Peak, Campbell Is., Coll. J. H. Sorensen, 28.5.1942" (♂ [labelled "Allotype ♀] DM; 2 ♂♂, ♀ ED).

Material examined. CAMPBELL I. Types. Beeman Camp, X. (5 ED), I. (9 ED); Tucker Cove, I. (1 ED), XII. (2 DM); Tucker Valley, I. (2 ED); Shoal Point, I. (5 ED; 3 DM); Mt Lyall, I., 180 m (5L ED), 350 m (1, 2L ED); St Col Ridge, X. (5 ED; 1 DM); XI., 200 m (2 DM); I., 300 m (2L ED); Mt Azimuth, I., 450 m (1, 2L ED; 6 DM); XI. (1 DM); XII. (1 DM; 1 UC); Northwest Bay, I. (1 DM); Yvon Villarceau, I., 330 m (2 ED); X. (2 ED; 1 DM); Windlass Bay, XI. (5 ED), XII. (2 DM); Mt Eboulé, VI. (1, 2L DM); Filhol-Honey Saddle, XI. (3 ED), I. (2 DM); Mt Honey, I., 360 m (3L Ed); Mt Pusieaux, XI. (2 ED); I. (1 ED); South coast E of Mt Dumas, I. (1 ED); Penguin Valley, I. (1 DM): Venus Bay, V. (1 DM). Collectors: B. Bell, C. M. Clark, P. M. Johns, G. Kuschel, J. H. Sorensen, R. Taylor. MACQUARIE I. Sandell Bay, in moss, II.66, K. J. Simpson (1, 2 PUPAE, 2L ANIC; 1L ED).

Ecology. Under stones (5), scree (1), amongst tussock, turf and *Chrysobactron* (*Bulbinella*) (10), under boards (4), on lichen at night (9), on *Dracophyllum arboreum* (3), from mat plant sample (8, 14L).

Remarks. The type series were all wrongly sexed by Brookes, despite ovipositors projecting in the females. Most other specimens of *Epichorius* labelled by Brookes were also wrongly sexed.

The specimens from Macquarie I do not appear to differ significantly from Campbell I speci-

mens. The material is limited, but it seems doubtful that even a long series from Macquarie Island will disclose subspecific differences. Thus, it is likely that *E. sorenseni* arrived on Maquarie Island quite recently, possibly since the last glaciation.

Dr E. B. Britton compared the Macquarie adult with Australian species of "*Pedilophorus*," and concluded that it is near *simplicornis* or *bryophagus*. Consideration of the generic affinities of Australian species in "*Pedilophorus*" is beyond the scope of the present study, but it seems likely that at least some should be placed in or near *Epichorius*. The Macquarie I specimens were recorded as *Pedilophorus* sp. by Watson (1967).

Epichorius tumidellus (Broun), new combination

Broun, 1909, Subant. Is. N.Z. **1:** 102–3 (*Morychus*).—Hudson, 1909, op. cit., 58 (*Morychus*); 1934, N.Z. Beetles, 194 (*Pedilophorus*).

Moderately elongate oval, strongly convex. Dark shining brown with fine, light-colored pubescence, clearly visible at 10 × magnification; tarsi and antennae reddish brown; underside dark brown or reddish brown, pubescence much shorter than dorsal surface except on last visible sternite in ♂.

Dorsal surface of head evenly punctured, punctures slightly smaller than facets of eyes, depth moderate; pubescence fine, setae mostly 2 or 3 × diameter of punctures in length. Punctation of pronotum and elytra like that of head, but pubescence longer, setae at least 5 × diameter of punctures in length, longer towards sides than on disc. Elytra without trace of striae, punctation and pubescence evenly distributed over entire surface; without impunctate areas. Anterior tibia (Fig. 9) with outer surface less convex towards apex, with ventrolateral edge curved inwards.

Prosternum with intercoxal process somewhat broader than in more southern species (see Table 1). Metasternum without distinct anterior marginal carina. Thoracic sterna finely and evenly punctured, with fine pubescence exceeding 3 × diameter of punctures in length except medially. Last visible sternite in ♂ with fringe of much larger, coarser setae on and near apex, than on remainder of sternites.

♂. Aedeagus (Fig. 22, 23) elongate, with long slender penis and parameres. Tergite 9 rounded at apex.

♀. Ovipositor (Fig. 27) without distinct carinae or external angles on coxites, setae very fine and short. Internal chitinised parts basically similar to southern species, but bursa narrower, comprising 2-1/4 coils, and less distinctly divided from vagina.

Dimensions. 5.2–5.9 mm × 2.9–3.2 mm.

Larva. Unknown.

Type. The Snares, found under logs of *Olearia lyalli* (BM). A second specimen, collected by Hudson at the same time (15.XI.1907), but apparently not seen by Broun, has been examined (DM).

Material examined. SNARES IS. Station Point, I.1967, P. M. Johns, *Olearia* forest logs (2 UC, 1 ED).

Remarks. There are fairly substantial differences between this species and those from islands further south, especially in the thoracic sternites and ♀ genitalia. Its closest relatives are certain South Island and Stewart Island species. Broun's descriptions are worthless for identifying most of his "*Pedilophorus*" species, so it is not possible to name the relatives of *E. tumidellus* without examining Broun's types. Apparently *E. tumidellus* is confined to the Snares: a related species from Big South Cape Island is quite distinct.

Genus **Synorthus** Broun

Broun, 1910, *Bull. N.Z. Inst.* **2:** 9.

The species described below is included in this genus as it is related to those placed in Section 4 of *Synorthus* by Broun (loc. cit.). These do not seem to have much in common with *Synorthus* sensu

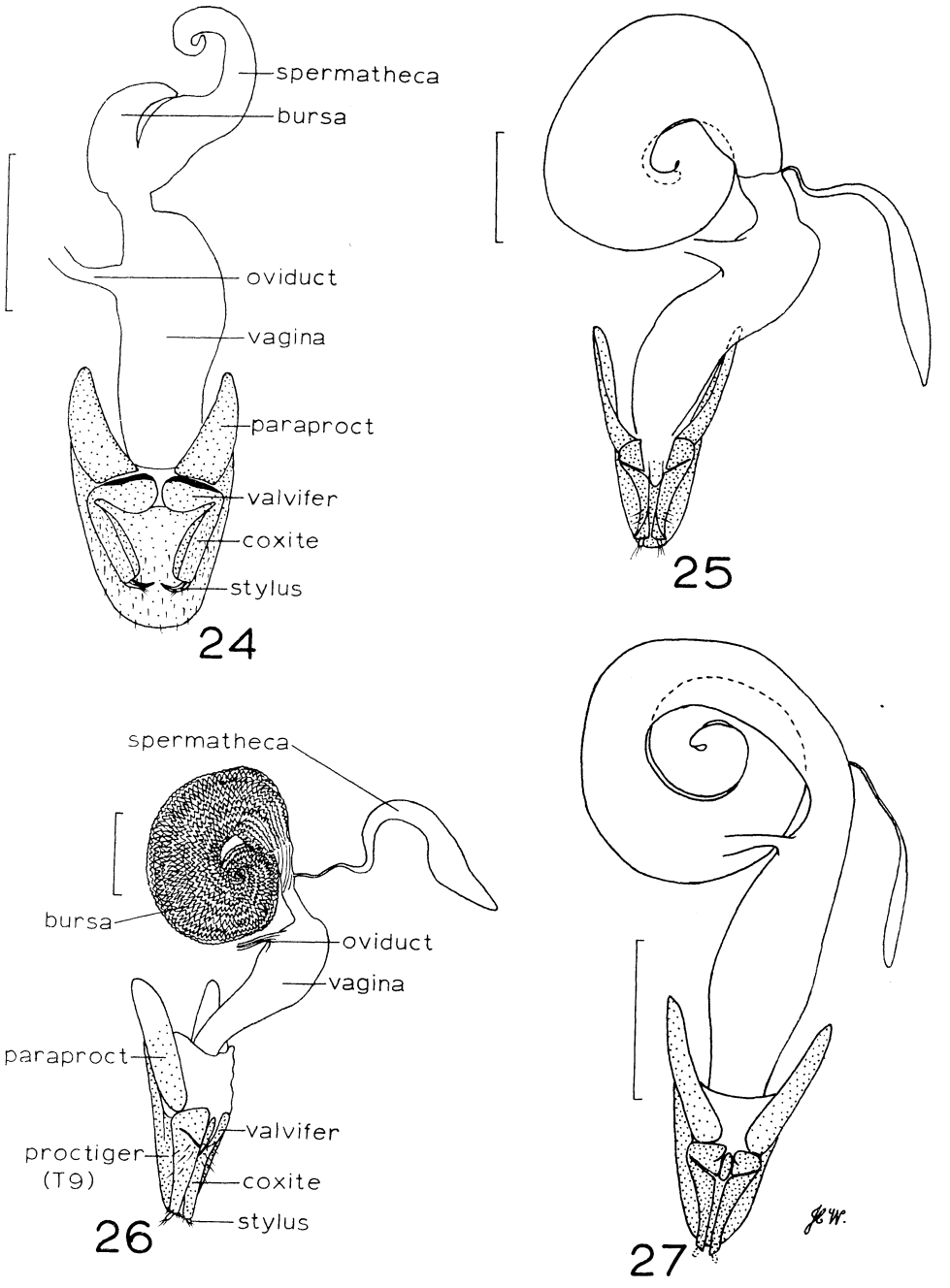

Fig. 24–27. BYRRHIDAE, ♀ genitalia. (Ventral views). Fig. 24, *Synorthus insularis;* Fig. 25, *Epichorius aucklandiae* [pattern of folding in wall of bursa not shown: see Fig. 26]; Fig. 26, *E. longulus;* Fig. 27, *E. tumidellus.* [Scale lines = 1 mm.]

strictu, and will almost certainly be found to require a new genus when the fauna has been studied more comprehensively.

Synorthus insularis Watt, new species

Broadly oval, moderately convex, in lateral view sloping gradually downwards from middle towards rear, more convex anteriorly. Dark reddish brown, dull, tarsi and antennae lighter brown, upper surface clothed with stout, erect blunt brown bristles and coarse decumbent yellow pubescence, undersurface with coarse decumbent and reclined bristles.

Antennae with segments 5–11 forming a loosely-articulated indistinct, somewhat flattened club, gradually expanded towards apex, each segment except 11 transverse. Labrum transversely oval, bearing about 12 long acuminate bristles and some shorter setae. Frontoclypeus almost truncate anteriorly, very short, clothed sparingly with stout, erect, blunt bristles and short decumbent pubescence which slightly exceeds in length the diameter of the punctures, which themselves are about equal to facets of eyes in diameter. (Surface often partly or largely obscured by detritus). Each blunt bristle is seen under high magnification to expand gradually to apex, which consists of a shallow depression surrounded by a ring of about 10 blunt teeth; there are also minute scale-like projections on shaft. Antennae arise from deep semicircular excisions in front of eyes.

Punctation and vestiture of pronotum and elytra like that of head, but blunt bristles longer, especially towards sides, and decumbent pubescence much longer, and on elytra coarser. On each elytron there are 6 diagonal tufts comprised of dense groups of blunt bristles, in addition to the relatively sparse, evenly spaced clothing. Scutellum visible, small, triangular. Elytra without trace of striae, epipleura very short, metepisterna covered by ventral inflections of dorsal surface of elytra behind epipleura (Fig. 19).

Femora almost glabrous dorsally, bearing a few blunt bristles recurved backwards, and finer decumbent pubescence. Tibiae densely clothed on outer and ventral faces with curved blunt bristles, and a patch of finer decumbent setae near apex. Outer surface of anterior tibia slightly excavate near apex. Segment 3 of tarsi with ventral lobe very short.

Thoracic sterna as illustrated (Fig. 19), normally closely co-adapted, coarsely and closely punctured, most punctures almost 2 × diameter of facets of eyes, mostly separated by their own diameter; bearing decumbent pubescence which is longer towards sides of metasternum. Middle coxae widely separated. Visible abdominal sternites bearing some fine decumbent pubescence, and numerous blunt, recurved, almost decumbent bristles. First visible sternite with large glabrous crural depressions laterally for reception of retracted femora (Fig. 19), occupying entire length of sternite laterally, with rounded carina along posterior margin.

♂. Aedeagus as in Fig. 19, 20. Tergite 9 bluntly acuminate at apex (shovel-shaped), bearing some fine setae near margin.

♀. Genitalia shown in Fig. 24. Coxite and valvifer of each side quite independant of other side, not united by membranes, articulated at base of valvifer. Paraprocts small, not strongly sclerotised. Tergite 8 bears short, fine, rather sparse pubescence dorsally. Internal chitinous parts not sclerotised. Spermatheca large, coiled at apex, larger than bursa.

Dimensions. Holotype ♂ 4.4 × 3.1 mm. Range 4.4–5.3 × 3.1–3.5 mm.

Larva. Unknown.

Types. Holotype ♂ "Snares Is. (Subantarctic) Coll. Dr R. A. Falla, XI.1947, from tussock roots and debris, A. E. Brookes Collection" (ED). Paratypes: with same data as holotype (♀ ED); "Station Pt., Snares Is., P. M. Johns, 8.I.1967, on moss at *Olearia* roots at night" (4 UC; 1 DM; 1 BP; 1 ED).

Material examined. SNARES IS. Types.

Remarks. The most closely related species, from Fiordland, is apparently undescribed. The latter is smaller, with longer decumbent pubescence, more elongate terminal anternnal segment, different pattern of tufts on elytra, different ♂ genitalia, etc.

Family PTINIDAE

The single species of this family recorded from subantarctic islands, *Ptinus tectus*, is an obvious

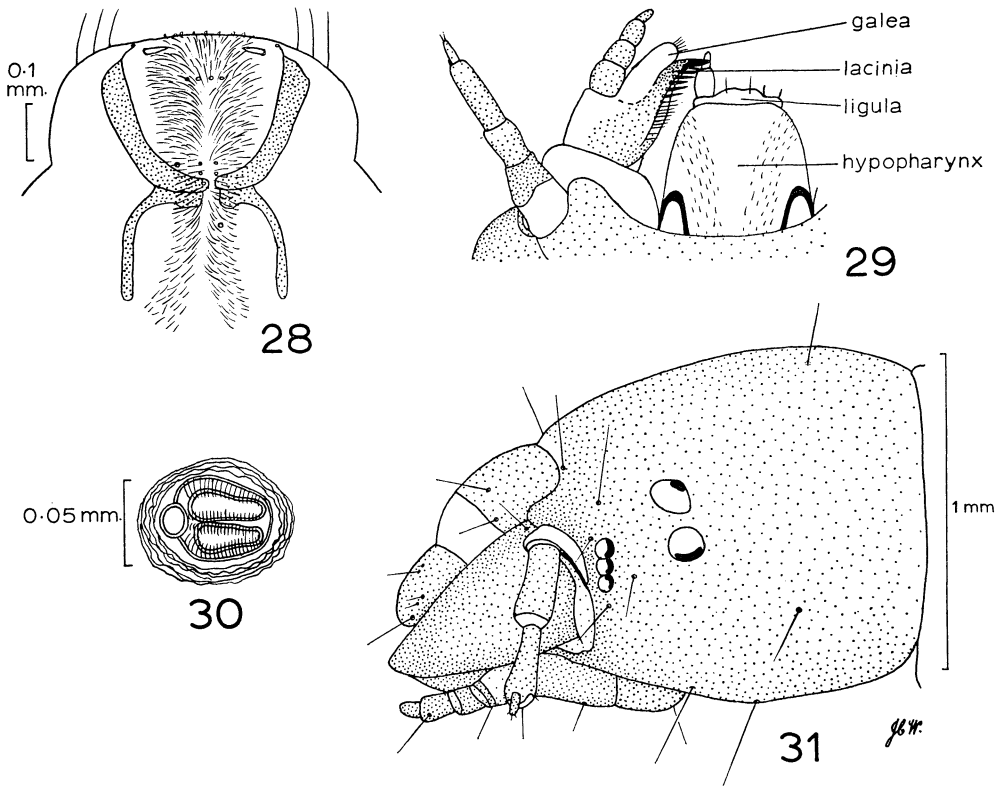

Fig. 28–30. BYRRHIDAE, larvae. Fig. 31. TENEBRIONIDAE, larva. Fig. 28. *Epichorius sorenseni*, epipharynx; Fig. 29, same, dorsal view of mouthparts and antenna after removal of mandibles, labrum-epipharynx and clypeus; Fig. 30, same, abdominal spiracle 3 (anterior on left); Fig. 31, *Pseudhelops l. liberalis*, lateral view of head.

introduction. All specimens which have been collected or observed were found in stored foods such as flour, biscuits and dried peas. It is unlikely that the species would be able to survive indefinitely on the islands without stored foods.

Ptinus tectus Boieldieu

Boieldieu, 1856, *Ann. Soc. ent. Fr.* (3)**4:** 652.—Hinton, 1940, *Bull. ent. Res.* **31:** 357–60, fig. 36–39.—Wise, 1964, *Pacif. Ins. Monogr.* **7:** 395.

Hinton (loc. cit.) gives a good taxonomic description and a useful summary of this cosmopolitan pest's habits. Wise (loc. cit.) has recorded it from stored foods and bread on Auckland and Campbell Is. The following are new subantarctic records.

ANTIPODES IS. Reef Point, ex biscuits in castaway shed, 31.I.1969, G. Kuschel (1 ED) [Reported to be fairly common before shed was cleaned out]. SNARES IS. Station Point, 15.I.1967, P. M. Johns, flour stock in hut (31 UC, 2 ED).

Family TENEBRIONIDAE

Two genera have been recorded from New Zealand's subantarctic islands, namely *Pseudhelops* and *Uloma*. Recognisably distinct populations of *Pseudhelops* occur on each island except Macquarie,

but the *Uloma* record is based on a single specimen of an apparently undescribed species from Campbell Island.

The *Uloma* specimen is recorded by Kaszab (1964) from Tucker Cove, Malaise trap, 5–8.XII. 1961, Gressitt. It is not closely related to *Uloma tenebrioides*, the only member of the genus occurring on the New Zealand mainland, and even there confined to the North Island. As the species of *Uloma* are mainly subtropical, and the species has not been recollected on Campbell Island, it is unlikely that it is part of the natural fauna. It is almost certainly a recent introduction, or was wrongly labelled. Dr Gressitt writes (in litt.) that it is possible, but unlikely, that the specimen was wrongly labelled. He states that the Malaise trap was set up on an old rubbish dump, which lends support to the idea that the *Uloma* specimen represents a recent introduction. The literature on *Uloma* is poor, and certainly not adequate to identify this specimen (a ♀). Kaszab (1964) states that it it closest to an undescribed species from SE Australia, but similar species occur on New Caledonia and other Pacific islands, and the Campbell species may be conspecific with one of them.

Pseudhelops has not been studied critically before, and its correct tribal placement is still a matter of doubt. Its closest relationship is with the New Zealand genus *Cerodolus*, while more distant relationships with such genera as *Thesilea*, *Chariotheca* and *Artystona* are likely. The latter three genera are listed by Gebien (1938–42) near the end of the tribe Cnodalonini, which is a diverse, poorly defined, and almost certainly polyphyletic group. *Cerodolus* and *Pseudhelops* were listed by Gebien (1942–44) in the tribe Adeliini, which on larval and adult characters is related to Pycnocerini, Lypropini (="Heterotarsini" except *Heterotarsus*) and the old family Lagriidae (cf Watt 1967). The latter 4 groups may conveniently be regarded as tribes of a SUBFAMILY LAGRIINAE, whose diagnotic characters in the adult are: penultimate tarsal segments lobed below at least weakly (except in Pycnocerini), epipharynx longer than broad, elytra if striate with 10 striae and scutellary striole, aedeagus normal in orientation (not inverted), wings without subcubital flecks, and intersegmental membranes exposed between visible sternites 3, 4 and 5. Larvae of Lagriinae are readily recognised by their 2-segmented, pubescent antenna, separated from base of mandible by a clearly visible, although narrow, strip of head capsule.

Cerodolus and *Pseudhelops* are excluded from Lagriinae by lacking lobed tarsi, the elytra each have 9 striae, and the epipharynx is strongly transverse. The larvae have 3-segmented antennae which are not pubescent. In all characters they agree with the subfamily Tenebrioninae as recognised by me (Watt 1965, and in preparation), which is equivalent to Blapimorpha + Ulomimorpha + Tenebriomorpha + Diaperimorpha except Diaperini of Skopin (see Watt 1967).

Pseudhelops was placed by Lacordaire (1859) in his group Misolampides of the tribe Helopides. It differs in several important respects from *Misolampus*, and in Lacordaire's key may be run to the couplet containing Cnodalonides and Cyphaleides, and would be placed in the latter group according to the key character (mandibles bifid at apex). The Cyphaleini are a reasonably clearly defined Australian tribe with which *Pseudhelops* does not agree. Thus it appears that, while *Pseudhelops* could find a place in Gebien's ramshackle Cnodalonini (which includes several genera with apically bidentate mandibles), it would be better in a new tribe with *Cerodolus*, *Chariotheca* and other genera. There is little point, however, in attempting to define new tribes until the present chaotic tribal classification within the Tenebrioninae has been reviewed critically.

Genus **Pseudhelops** Guérin

Guérin-Méneville, 1841, *Revue Zool.*: 124.—Lacordaire, 1859, Gen. Col. **5:** 441.—Enderlein, 1909, Dt. Südpol-Exped. **10:** 503 (*Pseudohelops*).—Broun, 1909, Subantarct. Is. N.Z. **1:** 406.—Gourlay, 1950, *Trans. Roy. Soc. N.Z.* **78:** 193–94.

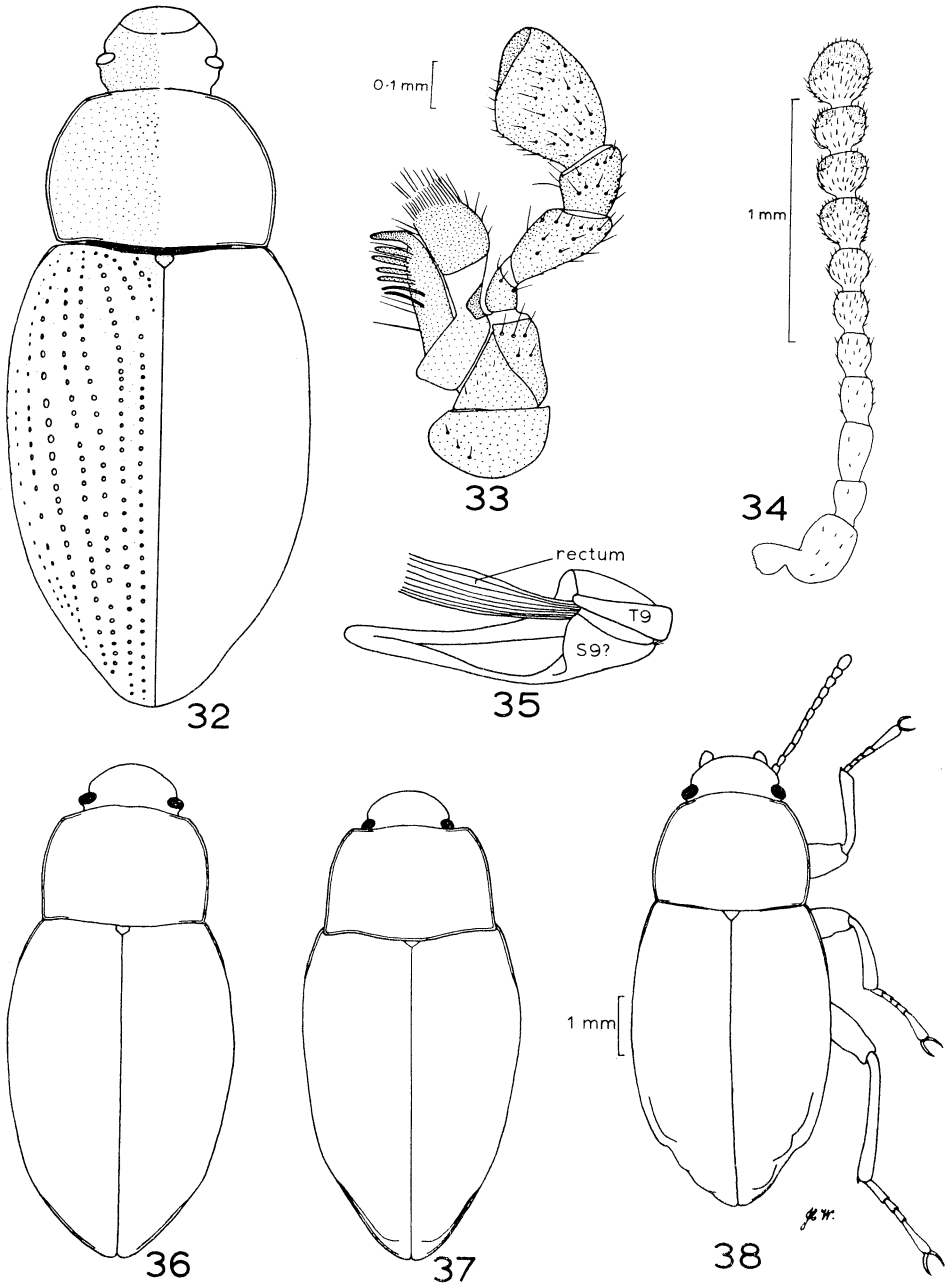

Fig. 32–38. TENEBRIONIDAE. Fig. 32, *Pseudhelops l. liberalis*, ♂; Fig. 33, *Ps. t. tuberculatus*, left maxilla, ventral; Fig. 34, Same, right antenna; Fig. 35, same, abdominal segment 9, dorso-lateral (T9 = tergite 9, S9? = paraprocts and spiculum gastrale, which appear to be derived from sternum 9); Fig. 36, *Ps. t. antipodensis*, ♂; Fig. 37, *Ps. quadricollis*, ♀; Fig. 38, *Ps. t. tuberculatus*, ♂ (from Ranui Cove).

Type-species: *Pseudhelops tuberculatus* Guérin, 1841 (by monotypy).

Antennae 11-segmented, with indistinct, loosely articulated, 4-segmented club (Fig. 34). Clypeus fairly prominent, basal membrane of labrum concealed. Frons produced on each side into a prominent canthus which encroaches slightly onto front margin of reniform eye. Epipharynx strongly transverse. Each mandible bidentate at apex; molar parts heavily sclerotised, lacking prominent cusps, with numerous transverse ridges. Maxillae approximately as in Fig. 33, galea with terminal fringe of fine setae, coarser setae dorsally, lacinia with prominent sclerotised finger-like process and row of about 6 stout, peg-like bristles on inner edge, and finer bristles on dorsal surface. Terminal segment of maxillary palp weakly securiform, that of labial palp broadly fusiform. Mentum small, trapeziform, with a pair of deep foveae near sides.

Prothorax with lateral carinae, pronotum with narrow submarginal grooves, sides not explanate. Elytra convex, each with a more or less distinct scutellary striole and 9 striae, epipleural carina not prominent, visible only near shoulder and apex in dorsal view, epipleura extend almost to apex. Hind wings vestigial. Prosternal intercoxal process relatively broad. Front coxal cavities closed behind externally, parly closed internally (Fig. 50). Middle and hind coxae moderately separated, meso- and metasternum short. Mesosternum lacks median keel. Middle coxae with exposed trochantins, closed laterally partly by mesepimera, which are fused with mesepisterna, although a weak superficial groove indicates line of fusion. Metendosternite with very short stalk and long slender arms, without laminae, anterior tendon arises about half way between base and apex of arm. Tarsal segments simple, clothed below with moderately long, fine setae; claws simple. Basal 3 tarsal segments of front and middle tarsi about equal in length, segment 4 slightly shorter. Basal segment of hind tarsi approximately equal to 2 and 3 together. Front tarsi expanded in ♂ of one species.

Intercoxal process of abdomen rounded, fairly broad. Visible sternites 1–4 each slightly shorter than preceding sternite, sternite 5 about equal in length to 3.

♂. Aedeagus as in Fig. 39, 40, 42, 43, normally orientated when retracted, penis simple (Fig. 41, 44). Tergites 7, 8 and 9, and sternites 8 and 9 as illustrated (Fig. 53–58).

♀. Ovipositor moderately elongate (Fig. 59, 61, 62). Segment 9 membranous except for margins of apically acuminate proctiger, and paraprocts, which form slender rods (baculi). Segment 10 with sclerotised valvifers, distinctly separated from coxites (Fig. 61). Coxites divided into 3 parts: in addition to the normal incomplete division at about mid-length, their apices are heavily sclerotised and divided off from remainder of coxites by membranous areas, with the result that superficially the styli appear to be 2-segmented. Styli fusiform, strongly sclerotised. Internal chitinised structures (Fig. 59) entirely membranous. Vagina elongate, cylindrical; bursa small, campanuliform, with spermathecal duct opening at its apex; spermatheca long and tubular. Opening into base of spermathecal duct is a fine, tubular, usually branched, accessory gland. Tergites 7 and 8, and sternite 8 as illustrated (Fig. 45, 47–49, 51).

Larva. (See also Skopin 1964). Cylindrical, moderately elongate. Head and tergites strongly sclerotised, dark brown, ventral areas less strongly sclerotised, yellowish. Entire dorsal surface distinctly punctured and with moderate to strong microsculpture. Antennae 3-segmented (Fig. 31), bearing a few short setae, not pubescent, sensorium at apex of second segmented not at all projecting, reniform. Labrum with a pair of discal setae and a few marginal setae. Clypeus with 2 prominent discal and 2 lateral setae. Frons with 1 seta on each side near anterior angles. Other setae as in Fig. 31. Mouthparts as described by Skopin (1964), mala without uncus, hypopharyngeal sclerome slightly concave anteriorly.

Pronotum with 2 pairs of discal setae (1 anterior and 1 posterior), and 3 pairs of marginal setae; other thoracic nota and abdominal tergites except 9 with 1 pair of discal setae near posterior margin (often small, occasionally absent on tergite 7), and 3 (rarely 2) pairs of lateral setae (2 just above laterotergal line, 1 near posterior margin). Precoxale (cf Watt 1970, fig. 1) of pro-, meso- and metathorax distinct and sclerotised, remainder of ventral thoracic area lacking distinct sclerotisations. Legs as described by Skopin (1964), claws not subdivided, each claw bearing a pair of equal setae arising on inner face near base.

Laterotergites indistinctly separated from tergites by line of flexure; mesothoracic and abdominal laterotergites 1–8 bear the spiracles near their anterior borders. Spiracles (Fig. 60) incompletely bicameral, peritreme not crenulate except in smaller chamber of thoracic spiracle.

Tergite 9 with divergent upturned urogomphi (Fig. 64), setae of dorsal surface as illustrated, setae of

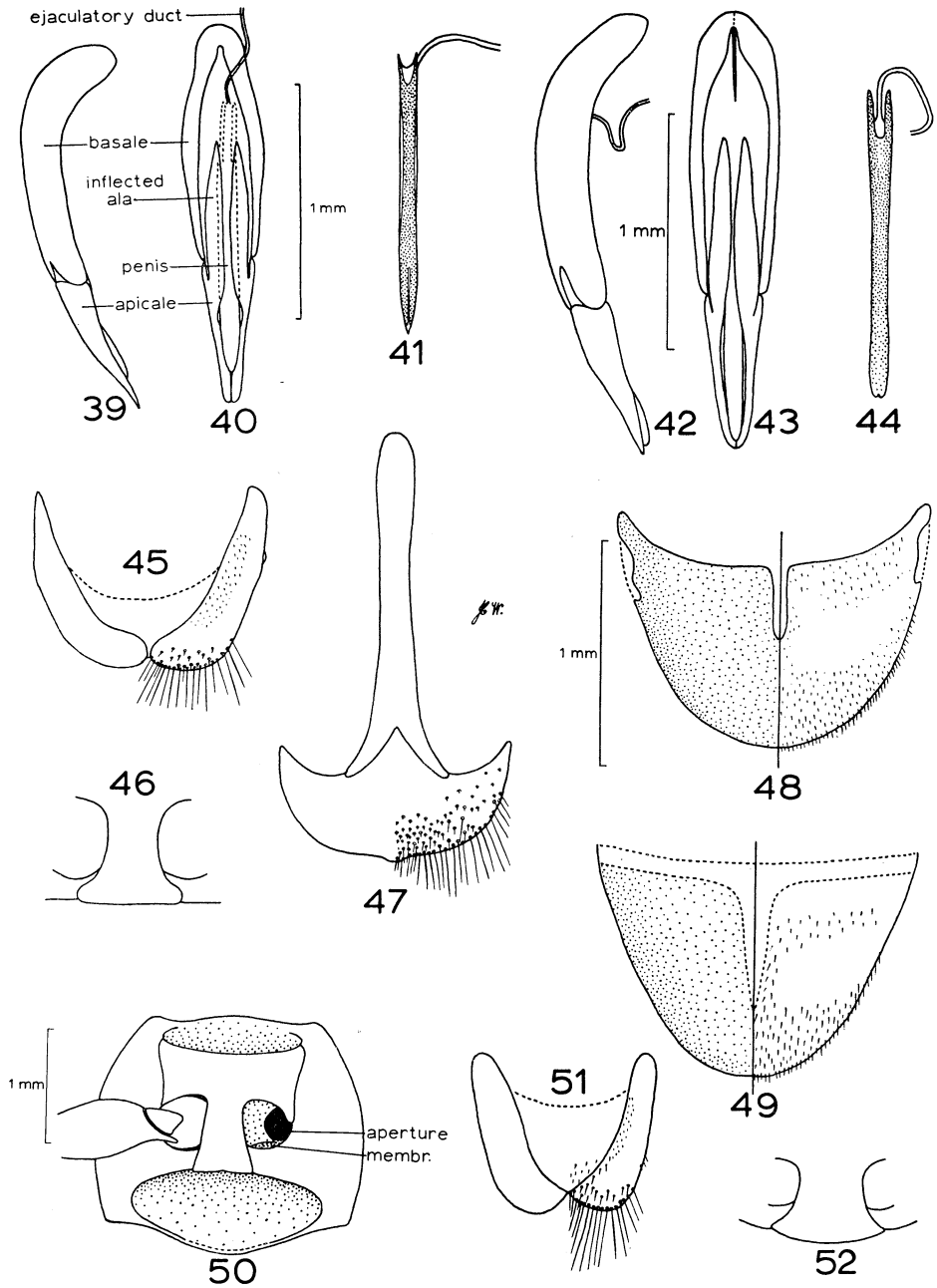

Fig. 39–52. TENEBRIONIDAE. Fig. 39, *Ps. t. tuberculatus*, ♂ aedeagus, lateral; Fig. 40, same, ventral; Fig. 41, same, penis, ventral; Fig. 42, *Ps. l. liberalis*, ♂ aedeagus, lateral; Fig. 43, same, ventral; Fig. 44, same, penis, ventral; Fig. 45, *Ps. t. tuberculatus*, ♀, tergite 8; Fig. 46, *Ps. l. liberalis*, prosternal intercoxal process; Fig. 47, *Ps. t. tuberculatus*, ♀, sternite 8; Fig. 48, same, ♀, tergite 7; Fig. 49, *Ps. quadricollis*, ♀, tergite 7; Fig. 50, *Ps. t. tuberculatus*, prothorax, ventral, left coxa removed; Fig. 51, *Ps. quadricollis*, ♀, tergite 8; Fig. 52, same, prosternal intercoxal process.

ventral surface as described by Skopin (1964). Sternite 9 short, with a transverse row of about 10 setae. Sternite 10 forming a pair of pygopods (frequently retracted in preserved specimens), membranous except for posterior surface, which is lightly sclerotised and bears a few fine, short setae.

First instar larvae with egg-bursting spines at base of dorsal setae on pronotum (2 pairs), mesonotum, metanotum and abdominal tergites 1–8 (1 pair).

Distribution. Confined (as defined here) to the subantarctic islands of New Zealand, Big South Cape I and Stewart I.

Discussion. The original spelling is *Pseudhelops*, not "*Pseudelops*" as stated by Gebien (1942–44).

The genus has had a chequered history, having been placed in various tribes, as discussed previously, and having had synonymised with it by Gemminger & Harold, the unrelated genera *Coripera* and *Pheloneis* (both true Adeliini). The nearest relative is undoubtedly the New Zealand genus *Cerodolus*, which is distinguishable from *Pseudhelops* by the prosternal intercoxal process, which is considerably narrower, and is almost plane longitudinally; by the mesosternum, which is much more strongly depressed anteriorly, with a curved transverse ridge where the prosternum normally meets it; and by the ovipositor, in which the coxite (excluding the valvifer) is divided into 2 parts, instead of 3 in *Pseudhelops*. Larvae of *Cerodolus* are easily distinguished from those of *Pseudhelops* by the very large punctures on the side of the head, thoracic and most abdominal tergites; and the 9th tergite, which is convex in front of the urogomphi.

Eight New Caledonian species were placed in *Pseudhelops* (sensu lato) by Fauvel (1904, *Revue Ent.* **23:** 191–93). For 3 of these (plus some from other genera) Carter (1908, *Proc. linn. Soc. N.S.W.* **33:** 259) proposed the genus *Neoadelium*. Gebien (1911: 513) listed these 3 species under *Neoadelium*, but the other 5 remained in *Pseudhelops*, where they were again listed by Gebien (1942: 760). I have not yet been able to examine any of these species, but from Fauvel's descriptions it is clear that they cannot remain in *Pseudhelops*. They are probably referrable to *Neoadelium* and/or *Cymbeba*.

Through the courtesy of Dr P. Ardoin, I have been able to examine a ♀ of "*Pseudhelops*" *fasciatus* Allard from India. This species cannot be retained in *Pseudhelops*, although it may belong in the same tribe. There are numerous genera listed by Gebien (1938–42) under "Cnodalonini" which have Oriental representatives, but in the absence of adequate comparative material, keys to genera, or definition of the tribe, I am not prepared to guess at the generic affinities of "*Ps.*" *fasciatus*. It differs from true *Pseudhelops* in having a rather more distinct, 5-segmented antennal club, with sensilli on the last 5 segments, much more prominent and thicker pronotal lateral carina, with larger submarginal channels, more strongly securiform maxillary palpi, no peg-like structures on the lacinia, and wider elytral epipleura with more prominent epipleural carina. There are also marked differences in the ♀ genitalia, e.g., the ovipositor has no division in the coxites, and the spermatheca is a bulbous structure with a short duct. On the other hand, several probably important characters are shared with *Pseudhelops* (the mandibular mola bears fine transverse ridges, the relative lengths of the tarsal segments and tarsal clothing are similar, the prosternal intercoxal process is very similar, the mentum has deep lateral foveae, the basal membrane of the labrum is concealed, etc.).

Decisions concerning what rank to assign to the various distinct allopatric populations have been based on their degree of divergence from each other, and analogy with sympatric species in *Pseudhelops* and *Cerodolus*. Using these criteria, the races on Auckland, Campbell and Antipodes Islands are regarded as subspecies of *Ps. tuberculatus*, a second species has subspecies on Bounty and Antipodes Islands, while those on Snares and Stewart Is are regarded as separate species. The Bounty-Antipodes species *Ps. liberalis* is the most distinctive. *Ps. quadricollis* and *Ps. capitalis* are more closely related to each other than to the remaining species. *Ps. capitalis* is not strictly subantarctic,

and therefore has not been included in this study except in the key to species. It is redescribed and illustrated by Watt (1970).

Key to Species and Subspecies (Adults)

1. Pronotum widest at hind angles, narrowed to anterior angles (Fig. 37). Prosternal intercoxal process almost plane longitudinally, broad or very broad posteriorly (Fig. 52). Upper surface black or dark brown with slight metallic green reflections.....2

   Pronotum widest in front of hind angles, sides more strongly curved (Fig. 32, 36, 38). Prosternal intercoxal process convex longitudinally and depressed posteriorly, shape different (Fig. 46, 50). Upper surface dark or light brown; metallic reflections, if present, not green.....3

2. Body somewhat depressed, shape characteristic (Fig. 37). Prosternal intercoxal process very broad posteriorly (Fig. 52). Base of pronotum with continuous distinct submarginal groove (sometimes faint on disc). Ratio width/length of penultimate antennal segment exceeds 1.5. Snares Is.....**quadricollis**

   Body more convex, shape different. Prosternal intercoxal process narrower posteriorly. Base of pronotum with submarginal lines cofined to lateral quarters. Ratio width/length of penultimate antennal segment less than 1.3. Stewart I, Big South Cape I.....**capitalis**

3. Elytra with distinct striae and large strial punctures, most of which are visible to naked eye. Body strongly convex, shape characteristic (e.g. Fig. 32). Basal 4 segments of anterior tarsi expanded in ♂. Prosternal intercoxal process strongly convex longitudinally, depressed and expanded behind coxae (Fig. 46). In ♀, spermathecal gland a very fine, unbranched tube (Fig. 59).....**liberalis**—4

   Elytra with striae weakly impressed or obsolete, strial punctures small, not visible to naked eye. Body less convex, shape different (Fig. 36, 38). Tarsi not expanded in ♂. Prosternal intercoxal process less convex, less depressed and expanded behind coxae (Fig. 50). In ♀, spermathecal gland a much thicker, branched tube (Fig. 62).....**tuberculatus**—5

4. Microsculpture of upper surface of head and prothorax moderately strong, visible at 25 × magnification; punctures small, but clearly visible at 12 ×. Length exceeding 9.5 mm., width exceeding 4.1 mm. Bounty Is.....**l. liberalis**

   Microsculpture of upper surface of head and pronotum very strong, clearly visible at 12 × magnification; punctures minute, barely visible at 25 ×. Length not exceeding 8.0 mm., width not exceeding 3.7 mm. Antipodes Is.....**l. clandestinus**

5. Upper surface of head and pronotum with fine shallow punctures, diameter of largest much less than 1/2 diameter of facets of eyes. Microsculpture of head and pronotum very strong, producing a shagreened appearance.....6

   Upper surface of head and pronotum with larger, deeper punctures, diameter of largest 1/2 of more diameter of facets of eyes. Microsculpture of head and pronotum weaker, not producing a shagreened appearance. Auckland Is.....**t. tuberculatus**

6. Shape approximately as in *t. tuberculatus* (Fig. 38), sides of pronotum fairly strongly curved, posterior angles not prominent. Strial punctures and often striae distinct. Each elytron with 3 more or less prominent tubercles on hind slope. Campbell I.....**t. posticalis**

   Shape different (Fig. 36), sides of pronotum less strongly curved, posterior angles more prominent. Strial punctures and striae obsolete. Tubercles of hind slope of elytra obsolete. Antipodes Is.....**t. antipodensis**

Key to Late Instar Larvae

[Larvae of *Ps. capitalis*, which is not strictly subantarctic, are unknown.]

1. Urogomphi stout and moderately separated at base (Fig. 64). Dorsal surface of tergite 9 with

a characteristic yellow median area (Fig. 64). Abdominal sternite 8 with 3 setae on each side near posterior margin.....**liberalis**—2

Urogomphi more slender and narrowly separated at base (Fig. 63). Color pattern of dorsal surface of tergite 9 different. Abdominal sternite 8 with 4 (occasionally 5) setae on each side near posterior margin. (except in *Ps. quadricollis*).....3

2. Color of abdominal tergites 1–8 fairly uniform, gradually becoming darker posteriorly. Bounty Is.....**l. liberalis**

Abdominal tergites 1–5 each with a series of 6 fairly small, dark brown, laterally elongated patches near anterior margin, and a pair of longitudinally elongated lateral patches; tergites 6–8 much darker than 1–5. Antipodes Is.....**l. clandestinus**

3. Punctures of dorsal and lateral surfaces of head large and deep, diameter of largest exceeding 1/2 width of terminal antennal segment. Abdominal sternite 8 with 3 setae on each side near posterior margin. Snares Is.....**quadricollis**

Punctures of dorsal and lateral surfaces of head small and shallow, diameter of largest much less than 1/2 width of terminal antennal segment.....**tuberculatus**—4

4. Dorsal microsculpture very strong, visible at 12 × magnification. Dark blackish brown dorsally, lighter ventrally but not yellowish. Antipodes Is.....**t. antipodensis**

Dorsal microsculpture weaker, not visible at 12 × magnification. Light to dark reddish brown dorsally, yellowish or yellowish brown ventrally.....5

5. Dorsal setae of abdominal tergite 7 minute or absent. Campbell I.....**t. posticalis**

Dorsal setae of abdominal tergite 7 almost as stout as those of tergite 8, although shorter. Auckland Is.....**t. tuberculatus**

Pseudhelops tuberculatus

Color light to dark brown, frequently with slight bronze reflections. Moderately convex, shape approximately as in Fig. 36, 38. Pronotum widest in front of basal angles, sides moderately to strongly curved. Elytral striae weakly impressed or obsolete, strial punctures small, not visible to naked eye. Tarsi not noticably expanded in ♂. Prosternal intercoxal process convex longitudinally and depressed posteriorly, only slightly expanded behind coxae (Fig. 50).

♂. Terminal segments and genitalia as illustrated (Fig. 39–41, 53, 55, 57).

♀. Terminal segments and genitalia as illustrated (Fig. 45, 47, 48, 62). Spermathecal gland (illustrated before unravelling in fig. 62) has usually 4 branches, 2 of which are major; diameter 1/2 to 2/3 that of spermatheca.

Larva. Dorsal color fairly uniform without pronounced markings, dark reddish- or blackish brown, underside lighter, usually yellowish. Punctures present on head and tergites, fairly small and shallow. Abdominal sternite 8 with 4 (occasionally 5) setae on each side near posterior margin, consisting of a transverse row or 3 prominent setae as in other species, in front of which is one, or occasionally 2, shorter fine setae.

Distribution. Auckland, Campbell and Antipodes Is, with one subspecies on each group.

Pseudhelops tuberculatus tuberculatus Guérin-Méneville

Guérin, 1841, *Revue Zool.:* 125.—White, 1846, Voy. Ereb. Terr. Ins., 11.—Blanchard, 1853, Voy. Pol Sud **4:** 175.—Kiesenwetter & Kirsch, 1887, *Dt. ent. Zs.* **21:** 156, 166.—Enderlein, 1909, Dt. Südpol-Exped. **10:** 503 (*Pseudohelops*).—Hudson, 1934, N.Z. Beetles: 202 (syn *substriatus* in error).—Gourlay, 1950, *Trans. Roy. Soc. N.Z.* **78:** 194 (syn. *substriatus* and *nodosus* in error).—Brookes, 1951, *Bull. Cape Exped. Ser.* **5:** 40.

eastoni Brookes, 1951, *Bull. Cape Exped. Ser.* **5:** 42–3, fig. 9. **New Synonymy.**

wenhami Brookes, 1951, *Bull. Cape Exped. Ser.* **5:** 41, fig. 8. **New Synonymy.**

Shining dark brown, frequently with slight bronze reflections. Moderately convex, shape as in Fig. 38. Punctures of dorsal surface of head mostly exceeding 1/2 diameter of facets of eyes, separated by about their own diameter except on vertex, where they are sparser. Punctures of pronotum similar, usually slightly smaller

and shallower, than those of head. Microsculpture of head and pronotum rarely visible at 25 × magnification. Striae of elytra variably developed, never strongly impressed, usually with distinct rows of medium punctures. On hind slope at or near apices of interstices 3, 5, 7 and 9 are usually distinct, prominent tubercles. Microsculpture of elytra variable, but rarely visible at 25 × magnification. Prosternal intercoxal process approximately as in Fig. 50, slightly convex, usually with slight longitudinal depressions.

Variation. There is some individual variation in shape, size, punctation and microsculpture, and considerable geographical variation in this subspecies. On Adams I, specimens from lowland forested localities (e.g., Magnetic Station Cove) average smaller, and have weaker microsculpture, more distinct elytral striae, strial punctures and tubercles than those from alpine habitats (Mt Dick, above 210 m). At Fairchild's Garden, where alpine vegetation occurs at sea level, both forms and intermediate specimens are found. The holotype and paratype of *Ps. wenhami* ("below Mt. Dick, 300 ft.") approximate to the higher altitude form.

On Auckland I itself, and the small islands at its northern end, the lowland populations are similar to the lowland Adams I form. The few specimens from higher altitudes differ in averaging slightly larger, and in having usually less prominent elytral tubercles and weaker microsculpture, as in the higher altitude form from Adams I. In addition, the pronotum is more convex with more strongly curved sides, and punctures tend to be slightly smaller than in the lowland form, while the striae and strial punctures remain moderately distinct. The holotype of *Ps. eastoni* (Mt Easton, 2039 ft) is a somewhat abraded and damaged specimen, apparently dead when collected, so that its apparent differences from ordinary *tuberculatus* are not significant.

Thus it appears that there is a certain amount of altitudinal zonation, which is probably didirectly related to zonation of vegetation. The pattern of geographical variation and its relation to vegetation is not yet clear, and should be more fully investigated by future entomological visitors to the islands.

Dimensions. ♂♂ 6.4–8.1 mm × 2.7–3.5 mm. ♀♀ 6.8–9.2 mm × 3.3–4.1 mm.

Egg. Featureless oblong-ovoid, 1.8–2.0 mm × 0.7–0.9 mm.

Larva. Very similar to that of *Ps. t. posticalis* (see Skopin 1964), differing in having long stout dorsal setae on abdominal tergite 8. L_1 have the same chaetotaxy as mature larvae, and are recognisable by the presence of egg-bursters. *Dimensions.* Head width 0.52 (first instar)–1.78 mm. Length ca 3–14 mm.

Pupa. Lateral lamellae on abdominal segments 2–8 with rather variable sclerotised armament of a forwardly directed spine and lateral teeth on each lamella of segments 4–7. Functional spiracles on abdominal segments 1–6 each incompletely bicameral. Peritremes of spiracles of segment 7 weakly sclerotised, spiracles probably not functional. Urogomphi moderately elongate, with slender, sharp, divergent apices. Body covered with very fine pubescence (mostly not visible below 100 × magnification); no prominent setae.

Types. tuberculatus: Lectotype ♀ "Auckland; Pseudhelops tuberculatus Guér. R.Z. 1841 (type). iles Auckland" (MN).

wenhami: holotype ♂ "Below Mt. Dick, Adams Is— 300 ft., [90 m], Auckland Is., coll. H. J. Wenham, 20-2-1945, *Pseudhelops wenhami* Brookes, identified by A. E. Brookes, holotype " (DM); paratype ♀ (labelled "♂") with same locality data (ED).

eastoni: holotype ♂ "Mt. Easton, Auckland Is. (Subantarctic), coll. M. G. Easton, 23-4-1945, alt. 2039 ft [610 m], *Pseudhelops eastoni* Brookes, identified by A. E. Brookes, holotype ♂" (DM).

Material examined. (some of the adults listed are in alcohol) AUCKLAND IS. *Rose I,* I. (3 ED; 1, 3L BP), III. (1 DM). *Enderby I,* I. (2 BP), III. (2 DM). *Ocean I,* I. (3, 4L, 1PUPA BP). *Ewing I,* I. (15, 1L, 1PUPA BP; 4 ED). *Auckland I,* Tucker Point, I. (3, 1L, 2Li, 18 EGGS BP; 1Li, 2 EGGS ED); Webling Bay, I. (1 BP); Ranui Cove, Port Ross, XI. (42 ED), I. (16, 1L DM; 7, 11L, 1 PUPA ED; 13 BP); Deas Head, I. (1 ED); Observation Point, XII. (1L ED; 2L BP); Natural Arch, I. (2L BP); Mt Easton, I. (1 BP), IV. (1 DM); Stony Peak, 630 m, IV. (3 ED; 1 DM); Bleak Hill, I. (1 ED); Giant's Archway, I. (8 BP; 3 ED); Summit Trig, NW of Bristow Pt, IX. (1 ED);

Carnley Hrbr, X. (1 ED); Musgrave Pen., II. (7 BP; 4 UC; 3 ED), IV. (1 DM); Camp Cove, I. (5 UC). *Adams I*, Magnetic Station Cove, I. (12 BP; 5 UC; 31, 11L ED); Waterfall Beach, II. (1L BP); Fairchild's Garden, I. (7 UC; 17, 9L ED, 1L BP); West end, top of scrub, I. (15 BP, 3 ED); East Ridge, I. 230–330 m (1 UC; 5L ED), 490–660 m (6, 1 PUPA UC); Mt Dick, NE Ridge, 390–490 m (14 ED). (Collectors: L. J. Dumbleton, M. G. Easton, J. L. Gressitt, G. V. Hudson, P. M. Johns, G. Kuschel, J. H. Sorensen, K. A. J. Wise).

Ecology. Under stones (16, 20 EGGS, 3Li); under logs (6, 1L); on ground in forest (13); under bark of *Olearia* (12); under bark of *Metrosideros umbellata* (9); otherwise associated with *Metrosideros* (18, 8L); *Carex* (1); *Stilbocarpa* (1); sweeping *Bulbinella*, sedge (4); *Hebe ellipica* scrub (1, 5L); *Myrsine divaricata* (1); *Cassinia* rotten wood (3L); *Dracophyllum* (1L, 1 PUPA); under soot fungus (6, 1 PUPA); from various moss samples (14, 6L); from litter samples (2, 1L); tussock (1); fell-field (6, 6, 1 PUPA); lichen on log (1, 2L); on beach (1, 1L); rock pools (1L); at light (26). Adults appear to emerge and feed at night. The above records do not suggest any particular association with lichens, but as adults of the other 2 subspecies are associated with lichens, it seems probable that this relationship applies also in this subspecies.

Pseudhelops tuberculatus posticalis (Broun)

Broun, 1909, Subant. Is. N.Z. **1:** 107 (as full species).—Brookes, 1951, *Bull. Cape Exped. Ser.* **5:** 43 (as full species).—Kaszab, 1964, *Pacif. Ins. Monogr.* **7:** 398–9 (as subsp. of *tuberculatus;* syn. *interruptus*).—Skopin, 1964, op. cit. **7:** 401–5 (larva).

interruptus Broun, 1909, Subant. Is. N.Z. **1:** 108.—Brookes, 1951, *Bull. Cape Exped. Ser.* **5:** 43.

nodosus Broun, 1910, *Bull. N.Z. Inst.* **1:** 47–8. **New Synonymy.**

substriatus Broun, 1901, loc. cit.: 47. **New Synonymy.**

Differing constantly from *Ps. t. tuberculatus* only as follows: Punctures of upper surface of head and pronotum finer and shallower, diameter of largest being much less than 1/2 diameter of facets of eyes. Microsculpture of head and pronotum very strong, clearly visible at 25 × magnification, producing a shagreened appearance. In the other characters listed by Kaszab for separating this subspecies from *tuberculatus*, the supposed differences are completely obliterated by variation, especially in the latter.

Variation. There is less geographical variation than in *tuberculatus*, but specimens from higher altitudes usually have less prominent elytral tubercles than those from near sea level. There is some individual variation in shape, punctation, striation and microsculpture, and relative length of base and apex of tegmen in male.

Dimensions. ♂♂ 6.6–7.3 × 2.7–3.3 mm; ♀♀ 6.9–8.4 × 3.2–3.8 mm.

Larva. Fully described by Skopin (1964). The only noted consistent difference from *tuberculatus* concerns the pair of dorsal setae on abdominal tergite 7, which are minute or absent in *posticalis*, and the other dorsal abdominal setae, which in each case are finer and shorter than in *tuberculatus*. In L_1 all dorsal setae are long, and no satisfactory character has been found for separating first instar *tuberculatus* and *posticalis*. *Dimensions.* Head width 0.64 (L_1)–1.53 mm. Length ca 4–11 mm.

Types. The following have all been examined.

posticalis, holotype ♀, "30, Subantarctic Is., Broun Coll., B.M. 1922-482, Campbell Island, *Pseudhelops posticalis*" (BM).

interruptus, holotype ♂, "31, Subantarctic Is., Broun Coll., B.M. 1922-482, Campbell Island, *Pseudhelops interruptus*" (BM).

nodosus, holotype ♀, "3105, New Zealand, Broun Coll. Brit Mus. 1922-482, Southland, *Pseudhelops nodosus*" (BM).

substriatus, lectotype ♂, so labelled and published here, "3104, New Zealand, Broun Coll.,

Brit. Mus. 1922-482, Southland-A. Philpott, *Pseudhelops substriatus*" (BM); paralectotype ♂ with same data except [A. Philpott] (ED); paralectotype ♀, ditto (BM).

Material examined. CAMPBELL I. Beeman Hill, VIII. (7 ED), X. (1 ED); Beeman Camp, I. (22, 4L ED); Lookout Bay (1L ED); Mt Lyall, I., 180 m (6, 1Li, 3L ED), 350 m (7 ED), V. (1 ED), XI. (1 ED); St Col Peak, I. (3, 3L ED; 3 DM; 300 m 2DM), III. (5 DM), V. (4 ED), IX., 200 m (7 DM), X., 25 m (5 DM; 2 ED); Windlass Bay, XI. (4 ED); Between Mt St Col and Mt Azimuth, XI. (12 ED), XII. (7 DM); Mt Azimuth, XI. (3 DM), 300–520 m, II. (1 DM); Yvon Villarceau, I., 300 m (3 ED), 330 m (2L ED); Tucker Cove Valley, VIII. (5 DM; 5 ED), X. (2 ED), XI. (2 ED), XII. (2 DM); Mt Dumas, 550 m, X. (2 DM); Coast E of Mt Dumas (3 DM); Puiseaux Peak, 270 m, I. (1L ED); Mt Eboulé, VI. (5 DM); Courrejolles Pt, II. (4, 1L DM); Monument Hrbr, II. (6, 1L DM). (Collectors: C. M. Clark, G. Kuschel, J. H. Sorensen, A. Wright).

Ecology. On lichen at night (10); on *Dracophyllum arboreum*, feeding on lichens (12); under lichens on *Dracophyllum* (7); under stones (25); moss and mat plant samples (16, 12L); *Poa littorosa* tussocks (5); in tussock near entrance to 6 ft lake (6, 1L); on surface of water barrel (1L).

Remarks. Kaszab (loc. cit.) recombined *posticalis* as a subspecies of *tuberculatus*, and synonymised *interruptus*. *Ps. nodosus* and *Ps. substriatus* were wrongly synonymised by Gourlay (1950) with *tuberculatus*. I have examined and compared the type material of all these nominal "species," and am able to confirm Kaszab's synonymy. *Ps. nodosus* and *Ps. substriatus* were both described from "Southland," but a meticulous comparison between their types and specimens from Campbell I, including the type of *posticalis*, has failed to reveal any characters that will separate them. Thus, either this subspecies occurs both on Campbell I and in Southland, or the Southland record is incorrect. The population on each island group where *Pseudhelops* occurs is distinct from others at the subspecific or specific level, so the possibility of a single subspecies occurring naturally in both Southland and Campbell Island can be discounted.

Thus, if the Southland record is correct, the subspecies must have been introduced there from Campbell Island. The following reasons support the view that the "Southland" record is incorrect, and that Broun labelled the specimens in error.

1. "The Subantarctic Islands of New Zealand," in which *Ps. posticalis* and *Ps. interruptus* were described, was issued in December 1909, and *Bull. N.Z. Inst.* **1**(1), in which *Ps. nodosus* and *Ps. substriatus* were described, appeared in August 1910. Thus, Broun was probably working on the subantarctic material and Philpott's material at the same time.

2. In *Bull. N.Z. Inst.* **1**(1), 15 species are described from Philpott's material, and a specific locality is quoted for all except *Ps. nodosus* and *Ps. substriatus*, for which only the general area "Southland" is given. (Several other species based on Philpott's material are said to come from "Titahi Bay, Southland," but there is no such locality in Southland, and at least 2 of the species are confined to the North Island. This is further evidence for Broun's carelessness with regard to locality recording.)

3. No *Pseudhelops* have been collected in Southland.

Therefore, it seems best to disregard the Southland record of *Ps. t. posticalis* unless the subspecies is collected there in the future.

Pseudhelops tuberculatus antipodensis Watt, new subspecies

Similar to other subspecies, distinguished by the following characters. Shape as in Fig. 36. Punctures of upper surface of head and pronotum fine and shallow, diameter of largest much less than 1/2 diameter of facets of eyes; microsculpture strong, producing a shagreened appearance. Sides of pronotum less strongly curved, and posterior angles more prominent (Fig. 36) than in other subspecies. Strial punctures and striae

obsolete. Tubercles of hind slope of elytra obsolete. Prosternal intercoxal process slightly broader and less convex than in the other subspecies.

Dimensions. Holotype ♂: 7.6 × 3.3 mm. ♂♂ 7.3–8.1 × 3.2–3.6 mm; ♀♀ 7.3–8.0 × 3.5–3.8 mm.

Larva. Dark blackish brown dorsally, lighter brown ventrally, but not yellowish. Dorsal microsculpture very strong, visible at 12 × magnification. Dorsal setae of abdominal tergite 7 short and slender, but much larger than in *posticalis*. *Dimensions.* Maximum head width 1.74 mm, length ca 15 mm.

Types. Holotype ♂, "Central Plateau, Antipodes Is, 1000 ft, P. M. Johns, 22.II.1969, lichens in crevices" (ED). Paratypes: with same data as holotype (2 ♂♂, 2 ♀♀ UC; ♂, ♀ ED; ♂ BP; ♀ DM); "Middle Flat, Antipodes Is., under stones on rock outcrop, 1000 ft. [300 m], 22.II.1969, P. M. Johns and I. Mannering (L ED; L UC).

Material examined. ANTIPODES IS: Types.

Remarks. This subspecies occurs sympatrically with *Ps. liberalis clandestinus*, from which both adults and larvae are easily recognised, using the key characters. It is surprising that the only known specimens of either subspecies were found on a single rock outcrop.

Pseudhelops liberalis Watt, new species

Diagnostic characters as follows: Strongly convex, shape approximately as in Fig. 32. Elytral striae marked by rows of large, deep punctures, visible to naked eye, their diameter mostly exceeding diameter of facets of eyes. Basal 4 segments of tarsi expanded in ♂. Prosternal intercoxal process (Fig. 46) more convex longitudinally and narrower between front coxae than in other species. Apicale of tegmen in ♂ aedeagus (Fig. 43) relatively narrower at base, less convergent to apex in ventral view, than in other species. Tergites 7 and 8, and sternite 8, each distinctive (Fig. 54, 56, 58). Spermathecal gland in ♀ (Fig. 59) very fine, unbranched.

Larva. Punctures of dorsal and lateral surfaces of head fairly deep, but diameter of largest less than 1/2 diameter of terminal antennal segment. Dorsal setae moderately stout and elongate on all tergites. Dorsal surface of tergite 9 with a characteristic median yellowish area which extends between urogomphi onto ventral surface; much darker laterally. Urogomphi stout and moderately separated at base, only slightly divergent (Fig. 64). Abdominal sternite 8 with 3 setae on each side near posterior margin.

Remarks. This is the most distinct species of the genus. The 2 subspecies differ considerably from each other in size, but no clear-cut structural differences have been noted in the adults, while the larvae appear to differ only in color pattern, so that they are regarded as subspecies rather than species.

Pseudhelops liberalis liberalis Watt, new subspecies

Dark reddish brown, legs and antennae reddish. Shape as in Fig. 32, moderately elongate, strongly convex. Punctures of dorsal surface of head very fine and shallow, diameter of largest about 0.2 × diameter of facets of eyes; microsculpture strong, clearly visible at 25 × magnification; clypeal suture distinct. Pronotum strongly convex, with evenly curved sides (Fig. 32), widest about mid-length, hind angles not prominent; fine submarginal grooves present laterally and on base, although often indistinct in median quarter; punctation and microsculpture of pronotum similar to that of head. Elytra strongly convex, broadly oval, striae marked by large, deep punctures, their diameter usually exceeding diameter of facets of eyes; interstitial punctures similar to those of pronotum, but microsculpture slightly weaker; hind slope without a trace of tubercles. Basal 4 segments of front tarsi expanded in ♂. Prosternal intercoxal process (Fig. 46) narrow between coxae, expanded and depressed posteriorly. Undersurface finely punctured; microsculpture not or scarcely visible at 25 × magnification, strongest on gula, prosternum, lateral parts of other thoracic sclerites, and epipleura.

♂. Aedeagus as in Fig. 42, 43. Tergites 7 and 8 and sternite 8 as in Fig. 54, 56, 58.

♀. Ovipositor and internal genitalia as illustrated (Fig. 59), spermathecal gland very fine and apparently unbranched. Tergite 7 like that of ♂. Tergite 8 similar to that of *Ps. tuberculatus* except that areas of minute pubescence on sclerotised parts are shorter, broader and closer to apex. Sternite 8 not significantly different from that of *Ps. tuberculatus*.

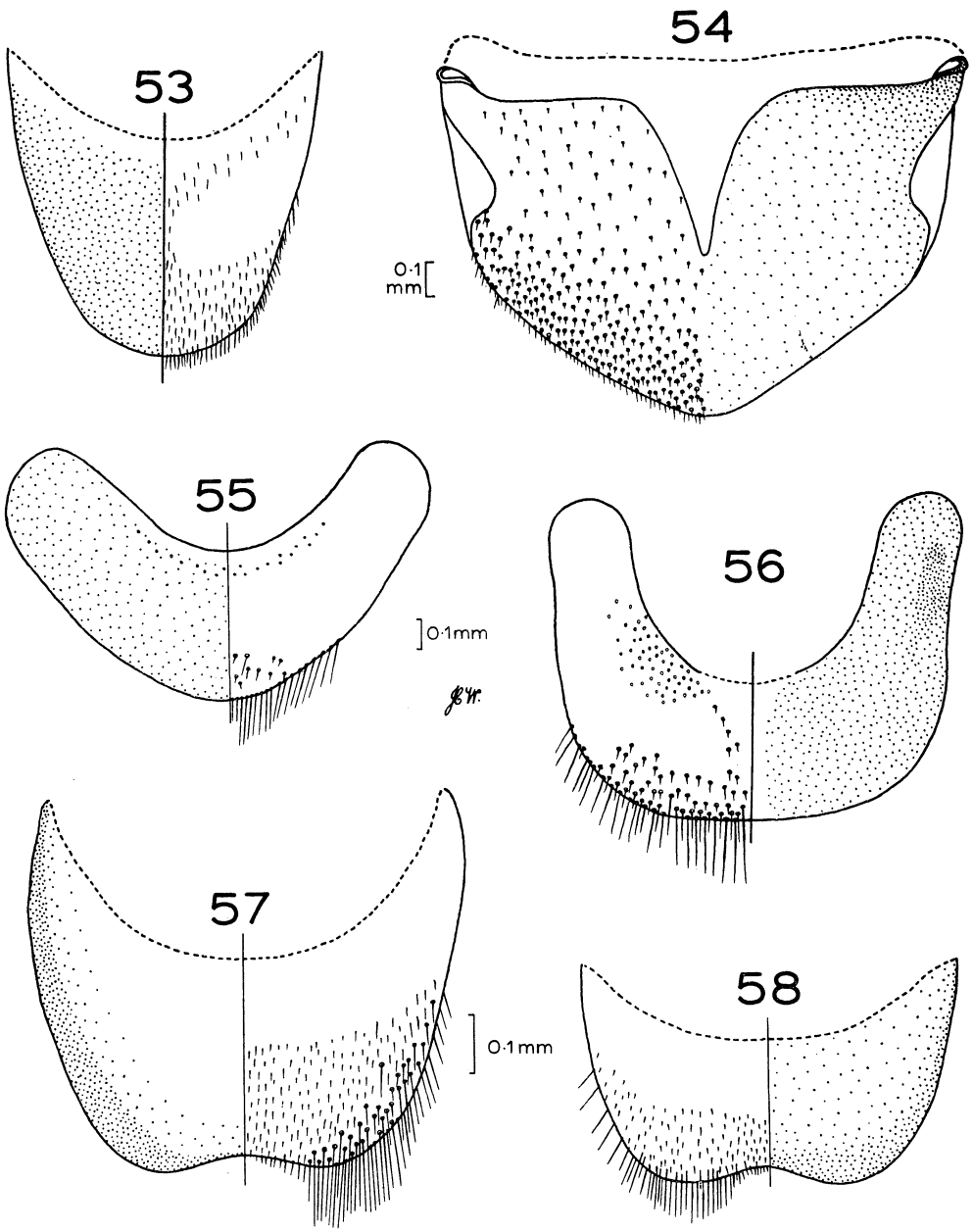

Fig. 53–58. TENEBRIONIDAE. terminal sclerites in ♂♂. Fig. 53, *Ps. t. tuberculatus*, tergite 7; Fig. 54, *Ps. l. liberalis*, tergite 7; Fig. 55, *Ps. t. tuberculatus*, tergite 8; Fig. 56, *Ps. l. liberalis*, tergite 8; Fig. 57, *Ps. t. tuberculatus*, sternite 8; Fig. 58, *Ps. l. liberalis*, sternite 8.

Dimensions. Holotype ♂ 10.7 × 4.6 mm. ♂♂ 9.6–10.8 × 4.2–4.8 mm; ♀♀ 10.5–11.2 × 4.6–5.3 mm.

Larva. Head, tergites and tarsunguli moderate to dark reddish brown, undersurface and legs yellowish. Abdominal tergites fairly uniform reddish brown in color, without small clearly defined dark brown patches; becoming gradually darker posteriorly. Head as in Fig. 31, usually with a dorsolateral seta on temple on each side. Terminal segments illustrate in Fig. 64.

Early (probably 2nd) instar larvae differ from early instars of *Ps. tuberculatus* in having longer urogomphi which are more widely separated at base (but relatively less so than in mature larvae). *Dimensions.* Head width 0.49 (L_2?)–1.85 mm. Length ca 3–18.5 mm.

Types. Holotype ♂ "Bounty Is., 12. I. 1968, M. M. Darby, 'Magga Dan,' in guano-feathers 'soil' amongst colonies of *Diomedea salvini* and *Eudyptes sclateri*" (ED). Paratypes: with same data as holotype (♂, ♀, L ED; ♂ CM); "Bounty Is., 12. I. 1968, M. M. Darby, 'Magga Dan,' dissected from *Diomedea salvini* dry carcase" (2 ♂♂, ♀, 3L CM; L ED); "Bounty Is., under rocks, 11 Nov 1950, E. G. Turbott" (7 ♂♂, 4 ♀♀, L AM; 2 ♂♂, ♀ ED; ♂ BP; ♂ DM; ♂ BM); "Bounty Is., debris from rock crevices, 11.XI.50, E. G. Turbott" (1L AM).

Material examined. BOUNTY IS. Types.

Pseudhelops liberalis clandestinus Watt, new subspecies

Differs from the nominate subspecies as follows: Upper surface of head and pronotum with very strong microsculpture visible even at 12 × magnification; punctures minute, barely visible at 25 × magnification. Submarginal grooves of pronotum at base distinct only on lateral quarters. Elytra less convex, strial punctures slightly smaller. Color lighter brown, with faint bronze reflections. Size substantially less (see dimensions). Styli and disjunct apical parts of coxites of ovipositor relatively smaller.

Dimensions. Holotype ♂ 7.7 × 3.3 mm; paratype ♂ 7.8 × 3.4 mm, ♀ 8.0 × 3.7 mm.

Larva. Head, pronotum, last 3 abdominal tergites, patches on other tergites, and claws blackish brown, remainder various lighter shades of brown, not yellowish. Mesonotum and metanotum each with a dark transverse band near anterior margin, becoming lighter posteriorly. Abdominal tergites 1–5 each with 6 laterally elongated dark spots in row near anterior margin, and a pair of longitudinally elongated spots near lateral margin, remainder of tergites much lighter in color; tergites 6–8 much darker. Tergite 9 with light-colored median patch which extends backwards between urogomphi onto ventral surface. *Dimensions.* Head width (maximum) 1.4 mm; length ca 17 mm.

Types. Holotype ♂ "Central Plateau, Antipodes Is, 1000 ft. [300 m], P. M. Johns, 22.II.69, lichens in crevices" (ED); Paratypes: with same data as holotype (♂, ♀ UC); "Middle Flat, Antipodes Is. N.Z., under stones on rock outcrop, 1000 ft. [300 m], P. M. Johns and I. Mannering, 22.II.69" (L UC; L ED).

Pseudhelops quadricollis Broun

Broun, 1909, Subant. Is. N.Z. **1:** 107.

Black, with slight metallic green reflections, legs dark brown, antennae and tarsi reddish brown. Body elongate oval (Fig. 37), less convex than any other species of the genus. Ratio width/length penultimate antennal segment = 1.56–1.64. Frontoclypeal suture indistinct, often obsolete. Punctures of upper surface of head moderate, distinctly impressed, diameter slightly smaller than facets of eyes; separated by about their own diameter except on clypeus and disc of vertex, where they are more distant. Microsculpture not visible at 25 × magnification but clearly visible at 100 ×. Punctation and microsculpture of pronotum similar to head, except that punctures tend to be slightly smaller and shallower. Pronotum (Fig. 37) widest at basal angles, not strongly convex, submarginal line at base extends across disc. Elytra (Fig. 37) elongate, not strongly convex, interstitial punctures slightly smaller and shallower than those of pronotum, striae represented only by rows of deeper punctures about twice diameter of interstitial punctures. Tubercles of hind slope elongate, not prominent, distinct near apices of interstices 3 and 9, those of 5 and 7 completely coalesced. Prosternal intercoxal process (Fig. 52) flat with slightly upturned posterior margin, very broad posteriorly. Mesosternum excavate anteriorly to receive posterior part of prosternal intercoxal process, pos-

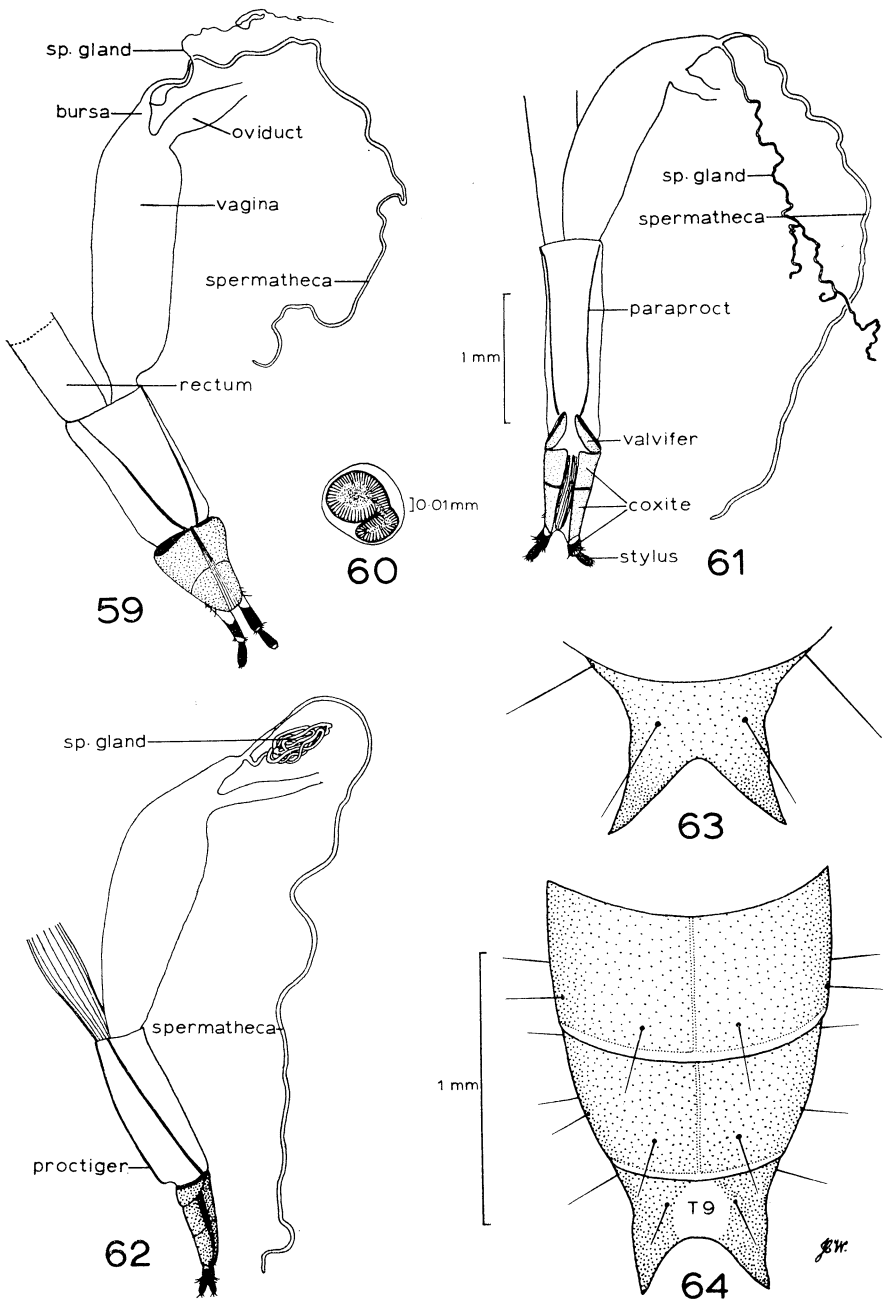

Fig. 59–64. TENEBRIONIDAE. Fig. 59, *Ps. l. liberalis*, ♀ genitalia, ventral (spermathecal gland uncoiled); Fig. 60, *Ps. t. tuberculatus*, larva, first abdominal spiracle (anterior on left); Fig. 61, *Ps. quadricollis*, ♀ genitalia, ventral; Fig. 62, *Ps. t. tuberculatus*, ♀ genitalia, ventro-lateral (spermathecal gland coiled); Fig. 63, *Ps. t. tuberculatus*, larva, tergite 9, dorsal; Fig. 64, *Ps. l. liberalis*, terminal abdominal segments, dorsal.

terior edge of excavation marked by a rounded transverse angulation. Undersurface finely punctate, microsculpture weak, nowhere visible at 25 × magnification, although stronger towards sides than in middle.

♂. Aedeagus and terminal sclerites not significantly different from *Ps. tuberculatus.*

♀. Ovipositor (Fig. 61) elongate, terminal disjunct parts of coxites, and styli, stouter than in other species, ratio length/width of styli = 2.2–2.3; internal chitinised parts as illustrated (Fig. 61), spermathecal gland with 2 short branches. Tergite 7 (Fig. 49) with anterior areas of pubescence less extensive than in *Ps. tuberculatus,* surface covered with reticulate microsculpture clearly visible at 25 × magnification. Tergite 8 (Fig. 51) with pubescence extending onto median membranous area. Sternite 8 as in *Ps. tuberculatus.*

Variation. Slight individual variation occurs in shape, size, punctation and microsculpture.

Dimensions. Holotype ♀ 6.5 × 3.2 mm. ♂♂ 6.8–7.1 × 3.0–3.3 mm; ♀♀ 6.5–7.6 × 3.1–3.5 mm.

Larva. Known only from a single half-grown specimen. Tergites, head and legs light brown, urogomphi dark brown. Punctures of dorsal surface and sides of head relatively large and deep, diameter of largest exceeding 1/2 width of terminal antennal segment. Punctures of pronotum and mesonotum similar to those of head, punctures of other tergites smaller and shallower but still larger than in other species. Urogomphi sharp, slender, narrowly separated at base. Tergites 7 and 8 with moderately long, stout dorso-lateral setae, those of other tergites shorter and finer. Sternite 8 with 3 setae on each side near posterior margin. *Dimensions.* Head width 0.88 mm; length ca 9 mm.

Type. Holotype ♀ "29, Subantarctic Is., Broun Coll., B. M. 1922-483, Snares, Nov 1908, *Pseudhelops quadricollis*" (BM).

Material examined. SNARES IS. Snares, 15.XI.1907, Hudson Collection (4 DM); Sinkhole Gut, P. M. Johns, 2.II.1967, under stones in cliff face (1 ED); Station Point, 3.I.1967, P. M. Johns, *Olearia lyalli* at night (2 BP; 2, 1L ED; 4 UC).

Remarks. The 4 specimens from the Hudson Collection form part of a series of 7 mentioned by Hudson (1909: 58). These seem to have been the only specimens collected until 1967, and the year (1908) on the locality label of the holotype, written by Broun himself, must be regarded as incorrect. This species is fairly closely related to *Ps. capitalis* (Broun) from Stewart I and Big South Cape I (cf Watt 1970), but the latter is more convex, dark reddish brown; with distinct fronto-clypeal suture; less transverse penultimate antennal segment (ratio width/length 1.19–1.26); submarginal line at base of pronotum confined to lateral quarters; prosternal intercoxal process narrower and less transverse; mesosternum without distinct excavation marked posteriorly by transverse angulation; styli of ovipositor more elongate (length/width 2.9–3.1); tergite 7 of ♀ more strongly transverse. There are so many constant structural differences between the two taxa that they must be regarded as full species.

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