

Insects of snow tussock grassland on the East Otago Plateau

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ABSTRACT

An entomological survey was carried out in snow tussock grassland near the Great Moss Swamp and Loganburn Reservoir on the East Otago Plateau. A range of sampling methods was used but most emphasis was placed upon pitfall and light trapping. An annotated insect species list is presented, which includes 464 species in 254 genera. An indication of frequency of trapping and seasonal activity is given for each species as well as information on the wider distribution and host range of each species where possible. The composition of the vegetation in the study area is given and a list of 96 species of the most commonly occurring plants.

Keywords: Insect survey; East Otago Plateau; New Zealand; plant composition; insect checklist; Dermaptera; Orthoptera; Dictyoptera; Hemiptera; Thysanoptera; Coleoptera; Diptera; Lepidoptera; Hymenoptera

INTRODUCTION

Although extensive insect collecting has been carried out in Otago upland areas, most attention has been given to alpine and sub-alpine vegetation zones and comparatively little to altitudes below 1000 m. In addition, there have been few projects which have attempted to characterise the insect fauna of an area of Otago tussock grassland in detail. Patrick (1982) surveyed Lepidoptera from Danseys Pass in Otago. Watt (1980) reported on pitfall trapping of invertebrates at Headlong Peak in Mount Aspiring National Park and Deans & Cadenhead (1984) undertook a preliminary survey of the arthropods in the Dart Valley region of the park in which a number of collecting techniques were employed. White (1964) surveyed the insect fauna associated with tussock grassland at Cass in Canterbury and this was further amplified in Burrows (1977). Swency (1980) produced a species list of the insects of Mount Cook National Park. Johns *et al.* (1980) carried out an arthropod survey at Hanmer State Forest Park which included some tussock grassland sites at Jacks Pass, Mt. Isobel Track and Mt. Captain.

Insect damage to native grasses has been studied by White (1975) who showed that insects were responsible for poor seed set in *Chionochloa* spp. and Kelsey (1957) listed insect species known to feed on *Festuca novae-zelandiae* and *Poa* spp. leaves and roots. Dick (1940) studied factors, including insects which contributed to tussock species mortality. White (1974a, 1974b, 1978) and White & Watson (1972) investigated many aspects of the biology and feeding behaviour of native grasshoppers.

This survey was undertaken as part of an investigation into the role of insects in reducing legume establishment in southern South Island tussock grassland (Barratt 1982; Barratt & Johnstone 1984). The objective of this part of the project was to produce an insect species list for an area where an insect problem relating to legume establishment had been identified on the East Otago Plateau.

METHODS

Study area

The survey was conducted on the East Otago Plateau to the SW of the Rock and Pillar Range and to the NE of the Lammermoor Range (Fig. 1). The sampling sites were located along the Old Dunstan Road running to the SE of the Great Moss Swamp, the lower reaches of which is now flooded forming the Loganburn Reservoir. An altitudinal range of 850-1000 m was covered by the sampling area; the soil type was a Teviot silt loam, with a mean pH for the area of 4.7 and mean annual rainfall was 640 mm.

The vegetation in the study area was undeveloped pastorally apart from periodic burning and set-stocked grazing in summer and autumn. The composition of the vegetation at 20 study sites (see below) was assessed in early January 1983 by point analysis (Lynch 1966). Percentage composition of the inter-tussock vegetation was based on 350 points per site taken from an area close to the pitfall traps. The percentage cover of tussocks and speargrasses was derived from basal circumference measurements. The mean composition for the 20 sites and plant species which were present in the study area but not represented in the point analysis are shown, although this is not an attempt at a complete plant checklist.

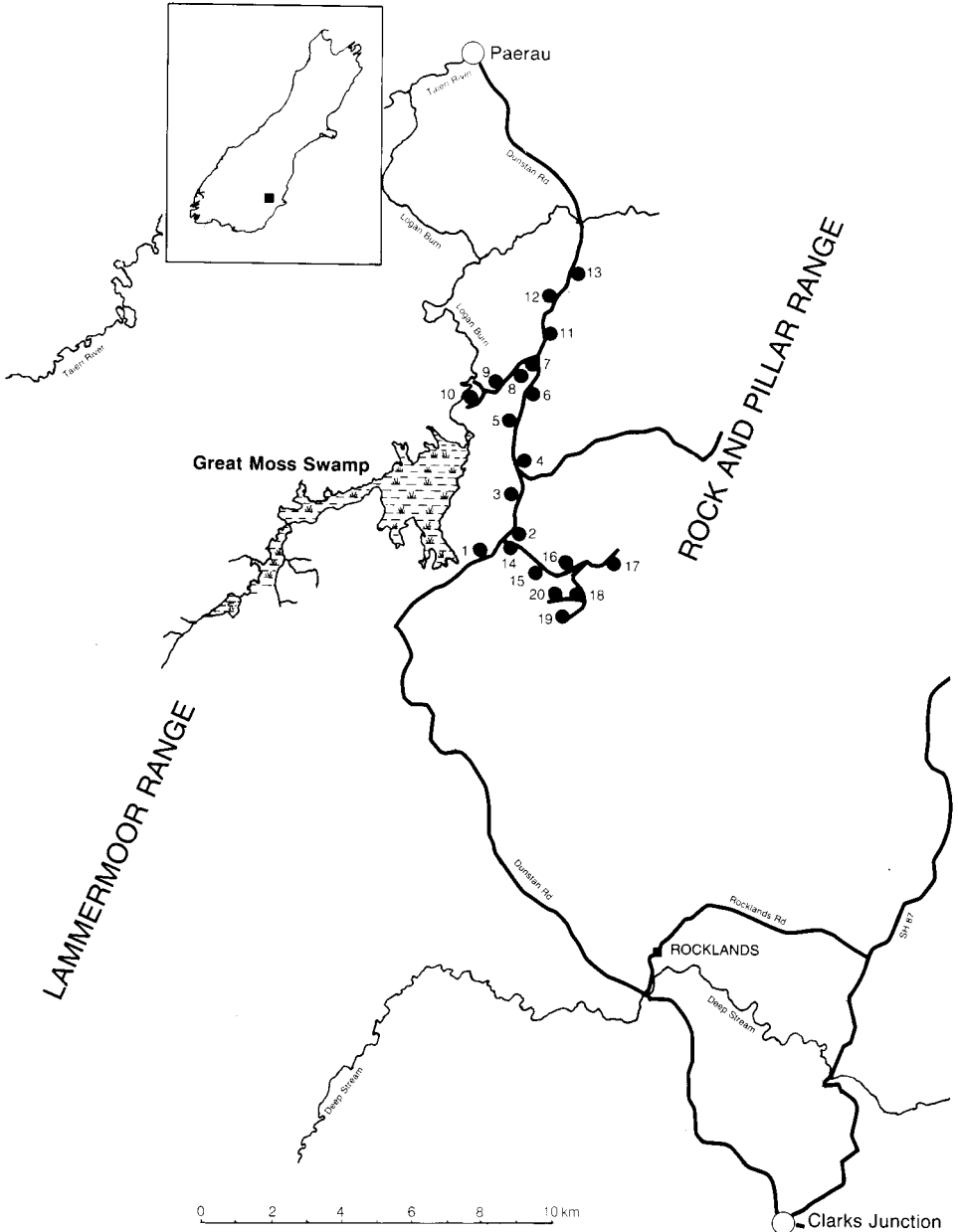


Fig. 1: Map of study area showing the position of the 20 pitfall trapping sites.

Insect sampling techniques

A range of insect sampling methods was used, but the emphasis during this survey for all groups except Lepidoptera, was placed upon pitfall trapping. Five pitfall traps were located at each of 20 sites placed at 1 km intervals on alternate sides of the Old Dunstan Road and 2 of its side tracks (Fig. 1). In this way, the environmental variability of the area could be proportionately represented.

The pitfalls were placed in a line 2 m apart, 20 m from the track and at right angles to it. They were set on 7 October 1982 and emptied and reset at 2-weekly intervals until 25 March 1983. Pitfall trapping in previous seasons (near site 1) is referred to in the checklist only in the case of those species not collected during the 1982-83 season.

The pitfall traps used were plastic containers 10 cm deep with an aperture diameter of 8.5 cm. A solution of picric acid was used as a preservative in the traps with detergent added as a wetting agent. Insects collected in the traps were washed to remove the picric acid and stored in 70% ethanol.

On 13 December 1983, samples of vegetation were taken from the vicinity of most of the sites. Since a pure sample of the plants was required, only those with a mat or cushion growth habit were taken, or those present in an apparently pure sward. Approximately 0.5 m² of plant material was taken for each species to a depth of about 2 cm below the soil surface. The 5-10 sub-samples which made up each sample were taken from sites where they occurred most abundantly. Insects were removed from the samples in a 'Tullgren-type' heat extractor funnel and collected into 70% ethanol. The information from these samples is included in full in the species list.

Table 1: Plant species checklist with mean percentage composition of the main components of the vegetation of 20 sites (January 1983).

<i>Component</i>	% <i>Cover</i>	<i>Component</i>	% <i>Cover</i>
Bare ground	12.3	<i>Galium propinquum</i> A. Cunn.	
Dead matter	7.6	<i>Gentiana bellidifolia</i> Hook.f.	
		<i>Geranium microphyllum</i> Hook.f.	
		<i>G. sessiliflorum</i> Cav.	
GRASSES		<i>Geum leiospermum</i> Petrie	0.2
<i>Agrostis tenuis</i> Sibth	2.6	<i>Gnaphalium mackayi</i> (Buchan.) Ckn.	
<i>Anthoxanthum odoratum</i> L.	12.0	<i>Helichrysum bellidioides</i> (Forst.f.)	0.3
<i>Chionochoia rigida</i> (Raoul) Zotov	9.3	Willd.	
<i>Cortaderia richardii</i> (Endl.) Zotov		<i>Hieracium pilosella</i> L.	0.8
<i>Festuca novae-zelandiae</i> (Hack.) Ckne.	1.1	<i>Hypochoeris radicata</i> L.	10.4
<i>Poa colensoi</i> Hook.f.	11.7	<i>Lagenifera cuneata</i> Petrie	
		<i>Lobelia linnaeoides</i> (Hook.f.) Petrie	
		<i>Ourisia caespitosa</i> Hook.f.	
HERBS		<i>Phyllachne colensoi</i> (Hook.f.) Bergg.	
<i>Acaena caesiiglauca</i> (Bitter) Bergmans		<i>Ranunculus lappaceus</i> Smith	
<i>Aciphylla aurea</i> Oliver	1.7	<i>Raoulia australis</i> Hook.f.	
<i>A. scott-thomsonii</i> Ckn. et Allen		<i>R. grandiflora</i> Hook.f.	
<i>Aciphylla</i> sp. nr. <i>squarrosa</i> J.R.		<i>R. subsericea</i> Hook.f.	3.7
<i>Anemone tenuicaulis</i> (Cheesem.) Parkin et Sledge		<i>Rumex acetosella</i> L.	
<i>Anisotome aromatica</i> Hook.f.	0.2	<i>R. flexuosus</i> Sol. et Hook.f.	
<i>A. flexuosa</i> Dawson	0.4	<i>Scleranthus uniflorus</i> Williamson	
<i>Brachycome sinclairii</i> Hook.f.		<i>Utricularia monanthos</i> Hook.f.	
<i>Brachyglottis bellidioides</i> (Hook.f.) Nordenstam	0.9	<i>Viola cunninghamii</i> Hook.f.	0.3
<i>Celmisia graminifolia</i> Hook.f.	1.5	<i>Wahlenbergia albomarginata</i> Hook.	0.9
<i>C. gracilentata</i> Hook.f.			
<i>C. lyallii</i> Hook.f.		SHRUBS	
<i>Chionochebe densiflora</i> (F. von Muell.) Briggs et Ehrendorfer		<i>Carmichaelia petrei</i> Kirk	
<i>Colobanthus strictus</i> Cheesem.		<i>Cassinia vauvilliersii</i> (Homb. et Jacq.) Hook.f.	0.6
<i>Craspedia uniflora</i> Forst.f.		<i>Coprosma cheesemanii</i> Oliver	
<i>Epilobium angustum</i> (Cheesem.) Raven et Engelhorn	0.2	<i>C. propinqua</i> A. Cunn.	
		<i>C. rhamnoides</i> A. Cunn.	
		<i>Coralospartium crassicaule</i> (Hook.f.) J.B. Amnst.	

Table 1—continued

Component	% Cover	Component	% Cover
<i>Coriaria plumosa</i> Oliver		<i>Luzula leptophylla</i> Buch. et Petrie	
<i>Corokia cotoneaster</i> Raoul		<i>L. rufa</i> Edgar	0.7
<i>Discaria toumatou</i> Raoul		<i>L. banksiana</i> Meyer	
<i>Dracophyllum uniflorum</i> Hook.f.		<i>Oreobolus pectinatus</i> Hook.f.	0.2
<i>Drapetes dieffenbachii</i> Hook.	0.5	<i>Schoenus pauciflorus</i> (Hook.f.) Hook.f.	
<i>D. laxus</i> (Cheesem.) Allan			
<i>D. villosus</i> (Bergg.) Cheesem.		ORCHIDS, LILIES AND AGAVES	
<i>Gaultheria antipoda</i> Forst.f.		<i>Astelia nervosa</i> Hook.f.	
<i>G. depressa</i> Hook.f.	3.2	<i>Bulbinella angustifolia</i> (Ckn. et Laing) Moore	0.2
<i>Hebe odora</i> (Hook.f.) Ckn.		<i>Herpolirion novae-zelandiae</i> Hook.f.	0.6
<i>H. pauciramosa</i> Ckn. et Allan		<i>Microtis oligantha</i> Moore	
<i>H. propinqua</i> (Cheesman) Ckn. et Allan		<i>Phormium cookianum</i> Le Jolis	
<i>H. rakaiensis</i> (J. B. Armstrong) Ckn.		<i>Prasophyllum colensoi</i> Hook.f.	
<i>Hymenantha alpina</i> (Kirk) Oliver			
<i>Leucopogon suaveolens</i> Hook.f.		LYCOPODS AND FERNS	
<i>L. fraseri</i> A. Cunn.	7.7	<i>Lycopodium australianum</i> (Herter) Allan	
<i>Myrsine nummularia</i> Hook.f.		<i>L. fastigiatum</i> R. Br.	
<i>Muehlenbeckia complexa</i> (A. Cunn.) Meissn.			
<i>Olearia odorata</i> Petrie		LICHENS	
<i>O. virgata</i> var. <i>rugosa</i> Simpson		<i>Cladonia</i> sp.	
<i>Pentachondra pumila</i> (J.R. et G.R. Forst.) R. Br.	2.1	<i>Usnea</i> sp.	0.9
<i>Pernettya macrostigma</i> Col.	3.5		
<i>Pimelea oreophila</i> Burrows	0.4	MOSSES	
		<i>Bryum pendulum</i> (Hornsch.) Schimp.	0.2
SEDGES AND RUSHES		<i>Polytrichum juniperinum</i> Hedw.	0.7
<i>Carex coriacea</i> Hamlin		<i>Rhacomitrium lanuginosum</i> (Hedw.) Brid.	0.3
		<i>Sphagnum</i> spp. (3)	

Sweep-netting was carried out at some sites but very few species were caught which did not occur in pitfall traps. Only such new additions are included in the list.

In 1983, 2 light traps were installed and in the 1983-84 season a single light trap was used to collect Lepidoptera. In 1983 the traps were operated from January until May and in 1983-84 the trap ran from November until March. The traps were fitted with a 26 cm long 8w fluorescent tube powered by a 12V car battery. The nightly operation of the traps was regulated by a light sensitive cell included in the circuit which switched the light on at dusk and switched it off approximately 2.5 h later. The traps were emptied at 1-2 week intervals.

Hand-netting of diurnal Lepidoptera was carried out during both the 1982-83 and 1983-84 seasons over the whole study area and not restricted to the vicinity of the pitfall trap sites. Hand collecting continued into the autumn beyond the pitfall trapping dates since the Danseys Pass survey (Patrick 1982) had shown that late-emerging species formed a significant component of the fauna. Larvae were collected from known host plants and reared to maturity where possible. Pitfall trap catches of adult and larval Lepidoptera were identified but details are given only when such records add to the list of species.

The majority of the specimens collected, including arthropods other than insects, are lodged in the New Zealand Arthropod Collection in Auckland. A set of reference specimens is retained in the Invermay Agricultural Centre Insect Collection. Lepidoptera are held in the private collection of Brian Patrick. Spiders collected during the study are held at the Otago Museum in Dunedin.

RESULTS AND DISCUSSION

The number of genera and species recognised for each of the main orders (except Hymenoptera) are shown in Table 2. In some cases the numbers are estimates, e.g. Diptera, where the nematoceran families were not fully identified. The full results of the

insect survey in the form of an annotated species list is shown in Appendix I. The order of presentation for insect orders and families follows that in Waterhouse (1970). For genera and species, Wise (1977) was followed for the smaller orders, and elsewhere, species lists in taxonomic works or revisions have been followed where these are available. For each taxonomic unit (excluding Lepidoptera), the following code has been used to indicate relative trapping frequency and distribution throughout the 20 sites of the study area. The codes are shown in square brackets after each species name.

- (1) relative abundance:
 R = rare (1-4 specimens collected)
 P = present (5-20 specimens collected)
 C = common (21-100 specimens collected)
 A = abundant (101 plus specimens collected)
- (2) distribution:
 F = few sites (1-5)
 M = many sites (6-19)
 E = every site (20)

The months in which each species was trapped within the 6 month pitfall trapping period (Oct-Mar) is shown after the frequency and distribution code for each species. In the case of Lepidoptera, the months in which species were caught is shown and for noctuids, the numbers collected in the light traps is shown for each month. The complete pitfall trap data giving actual numbers of each species for each site collected over each 2-weekly trapping period are available upon request from the senior author.

Table 2: Number of genera and species (or species groups) distinguished for each of the main orders of insects excluding Hymenoptera. Larger orders are subdivided into smaller taxonomic groupings.

<i>Order</i>	<i>No. genera</i>	<i>No. species</i>
Dermaptera	1	2
Orthoptera	5	6
Dictyoptera	1	1
Hemiptera		
Homoptera	19	28
Heteroptera	19	21
Thysanoptera	9	11
Coleoptera		
Carabidae	16	21
Scarabaeidae	3	5
Byrrhidae	3	5
Coccinellidae	5	7
Lathridiidae	5	5
Tenebrionidae	3	6
Chrysomelidae	3	4
Curculionidae	19	32
others	23	29
Diptera		
Nematocera	?	?
Brachycera		
Orthorrhapha	6	9
Cyclorrhapha		
Aschiza	13	20
Schizophora	37	81
Lepidoptera		
Hepialidae	5	6
Tortricidae	5	9
Pyrilidae	10	57
Geometridae	13	32
Noctuidae	7	30
Others	24	37
Total	254	464

Pitfall trapping in the tussock grassland environment proved to be an economical and efficient method of collecting a large proportion of the species present. With the exception of Lepidoptera and Hymenoptera, only 3% of the taxa identified were not represented in pitfall trap collections.

Immature forms of insects have been included in the data only where these could be reliably identified. Consequently these include mostly the later instars especially for the hemimetabolous orders. Remarks in the annotations to the insect checklist relate to these also e.g. immature grasshoppers of *Sigaus* sp. nr. *obelisci* Bigelow and *Paprides dugdali* Bigelow (which were identifiable) were found predominantly in February and March.

Information given relating to plants from which insects were extracted does not necessarily imply that these are host or food plants. In some cases a favoured host plant may be indicated e.g. *Nicaeana cinerea* Broun was far more abundant in *Raoulia subsericea* samples than in the other plants from which it was extracted.

Some points of interest to emerge from the results are discussed below in the order in which families appear in the insect checklist.

Orthoptera

The orthopteran fauna at the sites was dominated by a single species of weta *Hemiandrus palliarsus* (Walker) and the 2 grasshoppers, *Sigaus* sp. nr. *obelisci* and *Paprides dugdali*, the former being trapped more frequently in the drier, open and less grassy sites. *Phaulacridium marginale* (Walker) and the cricket *Pteronemobius bigelowi* Swan are probably near the top of their altitudinal range for this locality. The latter is certainly more audibly present on the lower slopes in this area.

Hemiptera

Of the Homoptera, the cicadas were represented by a single species, *Kikihia angusta* (Walker), although *Maoricicada clamitans* (Dugdale & Fleming) collected further west at 800 m on the Lammermoor Range may also be present. Adult *K. angusta* were first trapped in February and the catches would seem to reflect a preference for the less rocky sites and those with the greatest vegetation cover. The cicadellid fauna was dominated by *Paradorydium sertum* Knight and *Horouta inconstans* Knight, which were commonly trapped at most sites. *Limottetix* sp., *Arahura* sp. nr. *gourlayi* Knight and *Zygina zealandica* (Myers) were abundant at some sites only.

The black bean aphid, *Aphis craccivora* Koch, was the most commonly collected aphid, although the two *Acyrtosiphum* species (normally associated with lucerne) were abundant at most sites from mid-November. They were probably wind-blown to the study area from the lucerne-growing flats of the Strath Taieri.

The Heteroptera were represented mainly by lygaeid species. *Udecoris levis* Eyles was trapped in large numbers from almost all sites. No information on the feeding behaviour of this bug has been found, but if, like the closely related rhyparochromines, it is a seed-feeder, then *U. levis* may be of some economic importance in relation to oversowing. *Nysius huttoni* White, the well known wheat bug, was present in the study area but not trapped in large numbers.

Thysanoptera

The thrips fauna was dominated by *Chirothrips manicatus* (Haliday), especially at the sites with grasses forming a large component of the vegetation. However, pitfall trapping is almost certainly inadequate for any realistic appraisal of this insect group. *Aptinothrips stylifer* Trybom was extracted from sweet vernal in quite large numbers whereas only 5 specimens were recovered from pitfalls throughout the season. *Emprosthiothrips bogong* Mound was the most frequently trapped representative of the tubuliferan group of thrips.

Coleoptera

Twentyone species of carabids were recorded in the study area, some of which were trapped in large numbers probably quite disproportionate to their actual densities.

The larger species such as *Mecodema sculpturatum* (sp. group) Blanchard, *Oregus aereus* White and the *Holcaspis* spp. are very mobile and as predators of other insects, may be attracted into the traps by the odour and movements of freshly caught insects in the pitfalls (A. G. Bremner, pers. comm.). Of particular interest among the carabid fauna was the tiny, blind *Pelodaetus sulcatipennis* Jeannel, which was not trapped in pitfalls, presumably because of its subterranean habit. It was taken with samples of vegetation and soil and probably feeds on members of the soil microfauna.

The leiodid, *Mesocolon crenatellum* Broun was trapped abundantly at some sites and may be associated with carrion (Waterhouse 1970). Pselaphids, which remain largely unidentified in the checklist, were very common in pitfalls at all sites and in some of the vegetation samples. They are probably predatory on the litter-dwelling microfauna.

The most common scarabaeid species was *Pyronota* sp. aff. *laeta* (Fabricius), a small undescribed manuka beetle trapped mainly in January-February, the period of adult diurnal activity common for many of the other species of this genus. Manuka was not present in the study area, so clearly it is not an essential host plant for the species, as was also found at other localities (Barratt 1983).

The byrrhid species, especially *Epichorius* spp. were greatly underestimated in pitfall trap samples. They are relatively immobile, but easily found in very large numbers at night feeding on mosses growing on rock outcrops. Elaterids were commonly trapped at most sites, the undetermined group being represented by 3-4 species. The cantharid, *Asilis* sp. was frequently trapped as was the langurid, Genus 1 *anthracinus* (Broun), which is probably a pollen feeder. Commonly trapped from almost all sites was one of the 2 species of *Holopsis* (Corylophidae). The coccinellids were well represented by 7 spp. including the 2 exotic species of *Coccinella*, but most commonly trapped was the endemic *Stethorus* sp.

The tenebrionid species present included 4 species of 'Pheloneis' with *P. dunedinis* (Sharp) being the most commonly trapped. Of the 4 chrysomelid species present, *Chaetocnema* sp. aff. *littoralis* (Broun) was the most abundantly collected in pitfall traps from most sites.

Weevils were well represented in the study area both in terms of numbers of species and abundance. The moss weevils (*Bryocatus* spp.) of which there were about 6 spp. (W. G. Kuschel, pers. comm.) were typically abundant at all sites. Of those which could be identified to species, it is interesting to note that *B. amplus* Broun occurred frequently in pitfall trap samples, whereas the smaller *B. rugosus* Broun did not, although it was recovered from several vegetation samples. The broad-nosed weevils *Irenimus* spp. and *Nicaeana cinerea* Broun, like the moss weevils, numerically formed a large component of the weevil fauna. *Nestrius* spp., which are small, almost blind weevils were not trapped in pitfalls but collected only from soil and vegetation samples suggesting that they are relatively immobile or active below the soil surface. The 'giant' weevils were represented in the study area by *Anagotus graniger* (Broun) (feeds on *Carex* sp.), another species of *Anagotus* from the *lewisii* group which feeds on tussock species, and *Inophloeus sulcifer* Broun which feeds on speargrass.

Diptera

The nematoceran groups, particularly tipulids, chironomids, and sciarids were very abundantly trapped throughout the area. The predatory dolichopodids and saprophagous phorids were also abundant. The phorid species *Megaselia (Aphiochaeta) castanea* Bridarolli and *M. (A.) impariseta* Bridarolli were the most commonly trapped species, with the former common in collections from mid-December until mid-March with peak numbers trapped in February. The latter was not numerous in collections until February with the peak of activity occurring in early March.

Syrphids were not commonly trapped in pitfalls as might be expected, but they are of interest in that 5 undescribed species were present amongst those collected.

The acalyprate groups were well represented in the area especially the dung-feeding sphaerocerids and leaf-mining agromyzids (the most common being the introduced *Cerodontha australis* Malloch). Of the calyprate Diptera, muscids comprised a large species complex as did tachinids. Especially frequent were tachinid species which parasitise Lepidoptera, and to a lesser extent, those whose larvae are parasitic on scarabaeid and weevil larvae.

Lepidoptera

The Hepialidae were well represented in the study area with 6 species, 3 of which emerge in autumn and often into early winter. Grehan & Patrick (1984) showed that the moss-bog habitat, so prevalent in the area, is an important breeding site for certain species while the surrounding damp tussock vegetation is utilised by others.

The eastern Otago Plateau has a characteristic autumn-emerging fauna, mostly represented by the Tortricidae, Hepialidae and Geometridae, with the Noctuidae and Pyralidae represented by a few such late-emerging species. These constitute a most distinctive component of the fauna and within the Tortricidae and Hepialidae, remain mostly undescribed. Many species in these 2 families have brachypterous females which are relatively immobile but the tortricids, unlike the hepialids are mostly diurnal.

The families Gelechiidae and Oecophoridae, numerous in the lowlands, are poorly represented here, mainly because leaf-litter habitats upon which the larvae of many of these species depend, is lacking in diversity. Extensive shrub-land is absent and litter build-up in tussock grassland is controlled by regular burning. Rock-face feeding larvae which depend upon algae, lichens, mosses or detritus are represented by 5 undescribed species of Psychidae, 1 oecophorid and 3 *Dichromodes* species (Geometridae).

The Pyralidae are numerous both in terms of individuals and species, with the genera *Orocrambus* and *Scoparia* particularly dominant. The study area is a mosaic of grassland and sedge-filled moss bogs, which are ideal habitats for this family. However the strategic location of the study area (discussed below) is probably the major factor which has given rise to great diversity of species in this family.

Among the Geometridae, species with herb-feeding larvae predominated along with the diurnal brightly coloured species. *Asaphodes oraria* (Philpott) and *A. sericodes* (Meyrick) are both at the eastern limit of their ranges at this locality. *A. oraria* occurs around Invercargill and Stewart Island. The females are brachypterous and males occur in 2 colour forms, 90% pale green and 10% red. The most significant record among the geometrids was the rediscovery of *Hydriomena canescens* Philpott in light trap collections.

The Noctuidae recorded from the study area comprise an assemblage of common lowland species mixed with sub-alpine and alpine species. *Aletia sollensis* Meyrick, apparently restricted to eastern Otago, was rare, while *A. obsecrata* Meyrick was the most common species. Several species fly on warm sunny days as well as being typically nocturnal, a feature characteristic of these upland areas.

In comparison with the other insect orders discussed here, the knowledge of the taxonomy of the lepidopteran component of the fauna and its distribution in relation to the surrounding areas is comprehensive. The 171 species recorded from the study area indicate great diversity considering the lack of variety of available habitats and the narrow altitude range covered. A further 49 species are recorded in the checklist from the adjacent Rock and Pillar Range and Lammermoor Range. This combined total would make the whole area as rich as any comparable area in the rest of New Zealand. Patrick (1982) recorded 212 species of Lepidoptera from Danseys Pass, but that survey encompassed a much wider range of habitats and altitude (500-1250 m). However, the species richness characteristic of the study area may be explained by recognising that the area is an integral part of the Lammermoor-Rock and Pillar biogeographic zone which represents a biogeographic node (Croizat 1958) of major significance for southern New Zealand. The ranges are centres of endemism for both plants and insects and, as a node, can also be visualised as a biogeographic cross-roads, where the distribution of species intersect from particular directions. Some species may reach their distributional limit on the node from a single direction (e.g. *Orocrambus scutatus* (Philpott) which reaches its NE limit in the study area) or be confined to it (e.g. distinct new species of *Scoparia*, *Orocrambus*, *Dasyuris* and *Notoreas*). These factors contribute to the considerable species diversity recognised within the study area, which may apply also to groups other than the Lepidoptera.

Hymenoptera

Little information is presented for hymenopteran groups. As in most tussock grassland areas, ants were very common and here dominated by a single species, *Chelaner antarcticus* (White), whose seed-harvesting habit (A. W. Don, pers. comm.) may be of some economic importance.

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APPENDIX I

Annotated insect checklist.

DERMAPTERA**Labiduridae**

Parisolabis spp. [PM] ONDM

These species of native earwigs comprised *P. tapanuiensis* Hudson and *P. forsteri* Hudson, both of which are southern South Island species, and possibly a third undescribed species (pers. comm. A. G. Bremner via Logan Hudson).

ORTHOPTERA**Stenopelmatidae**

Hemiandrus pallitarsus (Walker) [CE] ONDJFM

Immatures trapped mainly Dec-Mar. Ground-burrowing species, apparently synonymous with *Zealandrosandrus maculifrons* (Walker) (G. Ramsay, pers. comm.).

Gryllidae

Pteronemobius bigelowi Swan [RF] FM

Widely distributed in New Zealand; in the study area it was more common below 750 m.

Acrididae

Sigauss sp. nr. *obelisci* Bigelow [PM] ONDJFM

Occurs up to 1450 m in this area then westward to alpine areas around L. Wakatipu.

S. campestris (Hutton) [CM] ONDJFM

Immatures trapped mainly Feb-Mar. Common in Canterbury and Otago; a lowland to low-alpine species.

Paprides dugdali Bigelow [CM] ONDJFM

Immatures trapped mainly Feb-Mar. Type locality Mt. Maungatua; restricted to eastern Otago and Stewart I.; inhabits tussock grassland 400-1100 m (Bigelow 1967).

Phaulacridium marginale (Walker) [RF] M

One of the commonest N.Z. species of open grassland at lower altitudes; rarely found above 900 m. A small proportion of fully winged forms found during the present study.

DICTYOPTERA**Blattidae**

Parallepsidion inaculeatum Johns [PM] ONDJFM

1 ex *Leucopogon suaveolens* (Dec. 1983).

The only alpine member of the genus; confined to Canterbury and Otago (Johns 1966). The distribution of this species is close to that of *Sigauss australis* (Bigelow 1967).

HEMIPTERA**Homoptera****Delphacidae**

Difficulty was experienced in separating these species, especially females. Data on moths trapped and frequency are combined.

Sulix tasmani (Muir) [PE] ONDJFM

Probably widely distributed in N.Z. although only North I. localities given by Fennah (1965).

Sulix sp.

Anchodelphax hagnon (Fennah)

10 nymphs ex *Oreobolus pectinatus* (Dec. 1983).

Type locality Wellington; collected from *Pimelea* (Fennah 1965).

Cicadidae

Kikihia angusta (Walker) [PM] FM

Found in tussock grassland in the South I. and Stewart I.; intermontane distribution but to sea level at more southerly localities.

Cicadellidae

Novolopa sp. [PM] ONDJFM

Myerslophia sp. [RF] FM

Paradorydium sertum Knight [CM] ONDJFM

Nymphs trapped mainly Nov-Mar. Type locality Coronet Peak, Queenstown; occurs up to 1500 m.

Paradorydium sp. [RF] F

Xestocephalus ovalis Evans [RF] FM

European species widely distributed in N.Z.; often associated with *Populus* spp. Collected from grasses at Mt. Cook (Sweney 1980).

Limottetix sp. nr. *harrisi* Knight [CM] FM

Arawa salubris Knight [PM] JFM

Occurs in the east of the South I. and in Wellington; mainly on grasses and low vegetation (Knight 1975).

Arahura sp. nr. *gourlayi* Knight [CM] NDJFM

Nymphs trapped mainly Dec-Jan.

Scaphetus brunneus Evans [RF] N

Occurs throughout N.Z.; recorded from Dunedin city.

Horouta inconstans Knight [CM] DFM

South I. species described from Mt. Cook; recorded from the Hunter Mts. in Southland.

Zygina zelandica (Myers) [CM] ONDJFM

2 adults and 14 nymphs ex *Cassinia vauvilliersii* (Dec. 1983).

Recorded from a wide range of native and exotic host plants (Eyles 1960; Myers 1923); present throughout N.Z. and Australia (Knight 1976).

Psyllidae

Trioza discariae Tuthill [PM] NDFM

Host plant is *Discaria toumatou*

Aphididae

Acyrtosiphon kondi Shinji [CE] NDJFM

A. pisum (Harris) [CE] NDJFM

These 2 aphids (blue-green lucerne aphid and pea aphid) are known only from legumes. They were probably wind-blown from a lower altitude.

Brachycaudus helichrysi (Kltb.) [RF] DJF

Known from *Senecio* spp. and *Aciphylla* and can be a serious pest of red clover in Otago (Cottier 1953).

Capitophorus elaeagni (Del. Guer.) [RM] DJFM

Host plants are mainly thistle species (Cottier 1953).

Lipaphis erysimi (Kltb.) [RM] DJFM

Recorded from brassicas and other host plants (Cottier 1953).

Myzus persicae (Sulz.) [RM] DJFM

A very wide host plant range recorded by Cottier (1931; 1953) a ubiquitous and economically important species.

M. ascalonicus Don [RF] J

Rhopalosiphoninus staphyleae (Koch) [RF] D

Recorded from *Aciphylla* sp. (Cottier 1953).

Aphis craccivora Koch [AE] NDJFM

Recorded mainly from legumes (Cottier 1953).

Rhopalosiphum padi (L.) [RM] DJFM

Recorded from monocotyledonous species (Cottier 1953).

R. rufiabdominalis (Sasaki) [RF] DF

Coccoidea

several spp. [PM] ONDJFM

Heteroptera

Schizopteridae

schizopterid sp.1 [PM] NDJFM

1 ex *Raoulia grandiflora* (Dec. 1983).

schizopterid sp.2 [PF] ONDFM

Ceratocombidae

ceratocombid sp.

Single specimen from pitfall Feb-Mar. 1980.

Nabidae

Nabis maoricus Walker [PM] DJFM

A widespread predatory bug; lays its eggs in plant tissues.

Chaetodus ?reutarianus (Eyles) [RF] FM

Chaetodus ?longiceps (Eyles) [RF] FM

Miridae

Reuda mayri White

Single specimen from pitfall (Jan. 1979)

mirid sp. (brachypterous) [RF] JF

Tingidae*Cyperobia carectorum* Bergroth [PM] ONDJFMRecorded from *Carex* sp. and *Cassinia* sp. (Bergroth 1927); most previous records from the Wellington area (Woodward 1961).**Saldidae***Saldula* sp. [PF] DJFM**Lygacidae***Hudsona anceps* (Buch. White) [PM] ONDJFM

Described from Otago and recorded also from Canterbury; this and the following species attack wheat in the milk ripe stage resulting in 'bugged' wheat.

Nysius huttoni White [CM] ONDJFM6 ex *Raoulia grandifolia*1 ex *Rhacomitrium lanuginosum* (Dec. 1983).

Well known pest of cereals and other crops; widely distributed in N.Z.

Metagerra truncata Malipatil [RM] NDJFM1 ex *Anthoxanthum odoratum*1 ex *Gaultheria depressa*2 ex *Pentachondra pumila*1 ex *Polytrichum juniperinum* (Dec. 1983).*Brentiscerus putoni* (Buch. White) [RF] DJF*Udecoris levis* Eyles [AE] ONDJFM

Peak numbers trapped Nov-Dec.

Cymus novaezelandiae Woodward [RF] NDJFRecorded from *Bromus* sp. (Myers 1926).**Berytidae***Neides wakefieldi* F. B. White [PM] ONDJFM

Distributed throughout N.Z.

Cydnidae*Choerocydnus nigrosignatus* F. B. White [PM] NDJFM**Ancanthosomatidae***Rhopalimorpha lineolaris* Pendergrast [RF] NDJFRecorded from *Carex* spp. (Pendergrast 1950).**Pentatomidae***Cermatulus nasalis hudsoni* Woodward [RF] D

Type locality Arthurs Pass and known also from Mt. Cook.

Dictyolus caenosus (Westwood)

Single specimen from pitfall (Nov. 1979); recorded from exotic grasses and legumes (Myers 1926).

THYSANOPTERA**Thripidae****Terebrantia***Chirothrips manicatus* (Haliday) [PM] NDJFM2 ex *Anthoxanthum odoratum* (Dec. 1983).

European species widespread and common in N.Z.; first recorded from Canterbury in browntop (Mound & Walker 1982).

Limothrips cerealium (Haliday) [RF] F1 ex *Rhacomitrium lanuginosum* (Dec. 1983).

European species widespread in the South I.; wide host plant range; found up to 1500 m on the Pisa Range.

Aptinothrips rufus (Haliday) [RF] DJF1 ex *Anthoxanthum odoratum* (Dec. 1983).

European species found throughout N.Z. on introduced grasses (Mound & Walker 1982).

A. stylifer Trybom [RF] ODJ17 ex *Anthoxanthum odoratum* (Dec. 1983).

Possibly of Scandinavian origin; found in modified high country habitats in the South I. of N.Z. (Mound & Walker 1982).

Pseudanaphothrips achaetus (Bagnall) [RM] NDJF

Australian species found up to 1400 m on grasses and native herbs in N.Z.

P. annettae Mound & Palmer [RF] NDJ

N.Z. species; widespread in the South I. at about 1000 m.

Thrips obscuratus (Crawford) [RM] NDJFM

N.Z. species; wide host range; of some economic importance causing damage to flowers.

Tubulifera

Carienothrips badius (Hood) [RF] NDFM

Widespread Australian species found in sub-alpine tussock grassland throughout N.Z. (A. Walker, pers. comm.).

Emprosthiothrips bogong Mound [PM] ONDJFM

Widespread Australian species. Collected mostly from high country tussock grassland in New Zealand (Mound & Walker 1986).

Apterygothrips kohai Mound & Walker [RF] J

Central Otago species associated with high country tussock grassland (Mound & Walker 1986)

Baenothrips moundsi (Stannard) [RF] DJF

Australian species, common throughout N.Z.; normally in litter of native vegetation (Mound & Walker 1986).

COLEOPTERA

Carabidae

Neocicindela tuberculata (Fabr.) [RF] FM

Widely distributed in both Islands; normally found at lower altitudes.

Oregus aereus White [CE] ONDJFM

A southern South I. species, very common in Otago and Southland and extends into Canterbury; lowland to sub-alpine.

Mecodema sculpturatum Blanch. (sp. complex) [CM] ONDJFM

Common and widely distributed in the south of the South I.; lowland to sub-alpine.

M. morio Cast. [RF] DJFM

Type locality Dunedin.

Zolus sp. [RF] J

Mecyclothorax rotundicollis White [RF] NDJFM

Widespread species often associated with rotting timber.

Euthenaris puncticollis Bates [RF] D

Bembidion rotundicolle rotundicolle Bates [RF] ND

Pelodiaetus sulcatipennis Jeannel

7 ex *Cassinia vauvilliersii*

20 ex *Pentachondra pumila*

16 ex *Oreobolus pectinatus* (13 Dec 1983).

Minute, blind, unpigmented carabids; described from Otago Harbour and found on the Old Man Range; thought to live in the soil presumably feeding on soil microfauna.

Lecanomerus fuliginosus Broun [PF] ONDJF

Described from Otago.

Megadromus bullatus (Broun) [CM] NDJFM

Widespread in the South I. from Mt. Cook south.

M. vagans (Broun) [PM] ONDJFM

Described from Mt. Maungatua.

Holcaspis punctigera Broun [CM] ONDJFM

Found in the South I. south of Mt. Cook (Butcher 1984).

H. placida Broun [CE] ONDJFM

Found in the south and east of the South I.

H. ovatella Chaud. [PF] NDJFM

As above; common in central Otago.

Agonum otagoense Bates [CM] ONDJF

Dichrochile cinctiger Broun

Single specimen in pitfall Jan. 1979.

Demetriida moesta Sharp [CM] ONDJFM

Southern South I. species; common.

Scopodes edwardsi Bates [CM] ONDJFM

Widespread in N.Z.

S. elaphroides (White) [RM] NDJFM

Widespread in N.Z.

Hyarphax australis (Dej.)

Single specimen in pitfall Jan-Feb. 1979; introduced Australian species.

Leiodiidae

Isocolon sp. [PM] NDJFM

3 ex *Gaultheria depressa*

1 ex *Lycopodium fastigiatum* (Dec. 1983).

Mesocolon crenatellum Broun [AM] ONDJFM

Inocatops sp. [RF] JF

Paracatops sp. [RF] F

Scydmaenidae

Sciacharis cf. *fragilis* (Broun)

Two specimens in pitfall Jan. 1979.

2 ex *Rhachomitrium lanuginosum* (Dec. 1983).

Staphylinidae

staphylinid spp. [PM] ONDJFM

Several unidentified species.

Pselaphidae

Eupines sp.

Single specimen in pitfall Jan. 1979.

2 ex *Raoulia subsericea*

1 ex *Lycopodium fastigiatum* (Dec. 1983).

Agatyrus fulvihirtus Broun

Single specimen in pitfall Jan. 1979.

Euplectopsis sp.

Dec. 1978 pitfall.

pselaphid spp. [CE] ONDJFM

3 ex *Anthoxanthum odoratum*

1 ex *Phyllacne colensoi*

1 ex *Raoulia grandifolia*

21 ex *Raoulia subsericea*

10 ex *Cassinia vauvilliersii*

1 ex *Leucopogon suaveolens*

8 ex *Cyathodes fraseri*

10 ex *Gaultheria depressa*

12 ex *Pentachondra pumila*

8 ex *Rhachomitrium lanuginosum*

7 ex *Oreobolus pectinatus*

1 ex *Lycopodium fastigiatum*

2 ex *Usnea* sp.

1 ex *Polytrichum juniperinum* (Dec. 1983).

Scarabaeidae

Odontria striata White [RF] NM

1 adult and 1 2nd instar larvae ex *Cassinia vauvilliersii* (Dec. 1983). Common in Otago and Southland and found also in Canterbury; reaches high population densities in developed tussock grassland up to 600 m (Barratt 1983); found up to 1700 m at Mt. Cook (Sweney 1980).

O. rufescens Given [RF] FM

Pitfall Nov-Dec. 1979. Type locality Te Anau; locally common in Central Otago; often associated with *Discaria toumatou*.

Sericospilus sp.

Several in pitfalls Nov-Dec. 1979; a new undescribed species.

Pyronota punctata Given [RM] JF

1 ex *Leucopogon fraseri* (Dec. 1983).

Type locality Homer.

Pyronota sp. aff. *laeta* (Fabricius) [CM] JFM

1 ex *Phyllacne colensoi*

2 ex *Leucopogon fraseri*

1 ex *Gaultheria depressa*

1 ex *Pentachondra pumila*

1 ex *Lycopodium fastigiatum*

2 ex *Usnea* sp. (Dec. 1983).

Small species found commonly in montane and alpine areas of Central Otago.

Scirtidae

Cyphon sp. [PM] ONDJFM

1 ex *Raoulia subsericea*

1 ex *Leucopogon fraseri*

1 ex *Polytrichum juniperinum* (Dec. 1983).

Byrrhidae*Epichorius* 'sp. 32' [PM] ONDJFM

The species number is designated by NZAC for this species. Feeds on mosses at night.

Epichorius sp. [RF] FM*Curimus zeelandicus* Redt. [RF] FM*Synorthus* sp.1 [RF] ND*Synorthus* sp.2 [PF] NDFM**Elateridae***Betarmonides* sp. [CM] ONDJF

several unidentified spp. [CM] ONDJFM

Cantharidae*Asilis* sp. [CM] DJFM**Melyridae***Dasytes subcyaneus* Broun [RM] DJFM

melyrid sp.

Single specimen in pitfall. Dec. 1978.

Dermestidae*Trogoderma antennale* Broun [RF] D**Nitidulidae***Epurea antarctica* White [RF] J**Languriidae**'Genus 1' *anthracinus* (Broun) [CM] ONDJFM4 ex *Raoulia subsericea*2 ex *Pentachondra pumila*1 ex *Lycopodium fasigiatum* (Dec. 1983).**Corylophidae***Holopsis* sp. 1 [CM] ONDJFM1 ex *Anthoxanthum odoratum*4 ex *Raoulia subsericea*4 ex *Leucopogon fraseri*5 ex *Pentachondra pumila*1 ex *Oreobolus pectinatus*1 ex *Usnea* sp. (Dec. 1983).*Holopsis* sp.2 [RF] DFM**Coccinellidae***Coccinella leonina* Fabricius [PM] ONDJF*C. undecempunctata* Linnaeus [PM] ONDJF

Introduced European species.

Stethorus sp. [CM] ONDJFM1 ex *Anthoxanthum odoratum*3 ex *Raoulia grandifolia*2 ex *Raoulia subsericea*3 ex *Leucopogon fraseri*2 ex *Gaultheria depressa*1 ex *Pentachondra pumila*1 ex *Lycopodium fastigiatum* (Dec. 1983).*Adoxellus prolongatus* Broun [PF] ONDJF*Adoxellus* sp. [RF] ND'*Scymus*' sp. aff. *tristis* [CM] ONDJFM1 ex *Polytrichum juniperinum* (Dec. 1983).

Gen et sp. indet.

Single specimens in pitfalls Dec. 1978, Jan. 1979. Small (1 mm long), black glabrous species with sparse pubescence.

Lathridiidae*Corticaria hirtalis* (Broun) [RF] F*Melanophthalma* sp. [RF] J*Corticaria formicaephila* (Broun) [PM] ONDJFM

Described from Ashburton where it was found in ants' nests.

Bicava sp. aff. *fulgurita* Belon

Single specimen in pitfall Jan. 1979.

Lithostygnus minor Broun

Single specimens in pitfalls Nov. 1978 and Jan. 1979.

Mycetophagidae*Triphyllus integritus* Broun [PM] ONDJF3 ex *Leucopogon fraseri* (Dec. 1983).**Colydiidae***Pristoderus*' sp. nr. *discedens* (Sharp) [RF] DF2 ex *Leucopogon fraseri* (Dec. 1983).*Coxelus* sp.

Pitfall Jan. 1979

1 ex *Anthoxanthum odoratum*4 ex *Raoulia subsericea*3 ex *Pentachondra pumila*1 ex *Lycopodium fastigiatum* (Dec. 1983).

Very common in North Otago near Omarama.

Archeocrypticidae*Archeocrypticus topali* Kaszab

Single specimen in pitfall Feb. 1980. Locally common in dry areas of Canterbury and Otago; often associated with lucerne.

Tenebrionidae*Artystona* sp.

Hand-collected from rocky outcrops Nov. 1983; feed on lichens.

Pheloneis' *dunedinis* (Sharp) [PM] ONDJFM*P.*' *aeratus* (Broun)

Pitfall Nov. 1979-Feb. 1980. Described from Otago.

P.' *nigritulus* (Broun) [RF] N

Pitfall Nov. and Dec. 1979. Type locality Mt. Maungatua.

Pheloneis' sp. [RM] ONJFM*Lorelus tarsalis* Broun [RF] NDFMAdults and larvae recorded living in dead *Aciphylla* flower stems (J. C. Watt, pers. comm.).**Oedemeridae***Selenopalpus rectipes* Broun [RF] FM

Larvae feed and pupate in moist rotten wood.

Cerambycidae*Somatidia spinicolle* (Broun) [RF] ON**Chrysomelidae***Chaetocnema nitida* (Broun) [PM] OND

Type locality Mt. Maungatua.

Chaetocnema sp. aff. *littoralis* (Broun) [CM] ONDJFM1 ex *Anthoxanthum odoratum*1 ex *Raoulia grandifolia* (Dec. 1983).*Adoxia* sp. [PM] NDJFM*Allocharis* sp. [RF] OD**Curculionidae***Tanysona angusta* Broun [PM] ONDJF

Described from Mt. Maungatua.

Cristus sp. [RF] NDJFM*Bryocatus amplus* Broun [CM] ONDJFMThought to be associated with mosses of the Polytrichaceae (G. Kuschel, pers. comm.) but not extracted from *P. juniperinum* in this study although the weevil was very common.*B.* *rugosus* Broun

Pitfalls Dec.-Jan. 1980.

2 ex *Anthoxanthum odoratum*1 ex *Raoulia subsericea*7 ex *Leucopogon fraseri*2 ex *Pentachondra pumila*1 ex *Oreobolus pectinatus*1 ex *Usnea* sp.1 ex *Polytrichum juniperinum* (Dec. 1983).

A very common and widespread moss weevil.

- B. serripes* (Kuschel)
Pitfalls Nov-Dec. 1979. A South I. species first described from Campbell I. specimens; this is the most easterly record (G. Kuschel, pers. comm.).
- Bryocatus* spp. [AE] ONDJFM
1 ex *Anthoxanthum odoratum*
1 ex *Raoulia subsericea*
10 ex *Gaultheria depressa*
3 ex *Pentachondra pumila*
2 ex *Polytrichum juniperinum*
4 ex *Rhacomitrium lanuginosum* (Dec. 1983).
- Eugnomus durvillei* Schon. [RM] ONDJFM
1 ex *Anthoxanthum odoratum* (Dec. 1983).
This species is found commonly on *Aciphylla* spp.
- E. dispar* (Broun) [RF] N
Also associated with *Aciphylla*; adults feed on pollen and larvae mine dying or freshly dead leaves (G. Kuschel, pers. comm.).
- Oreocalus* sp.
Pitfall Dec-Jan. 1980. Adults and larvae feed on *Hebe* spp., the larvae mine the branchlets.
- Colobotelus* sp. [RF] M
- Peristoreus* sp.1 [PM] ONDJFM
1 ex *Oreobolus pectinatus*
3 ex *Usnea* sp.
1 ex *Polytrichum juniperinum* (Dec. 1983).
- Peristoreus* sp.2 [RF] D
- Peristoreus* sp.3
3 ex *Cassinia vauvilliersii*
- Peristoreus* sp.4
1 ex *Leucopogon suaveolens* (Dec. 1983).
- Abantiadinus nodipennis* (Broun) [RF] ONDJFM
- Gromilus impressus* (Broun) [RF] J
- Gromilus* sp. [RM] ONDJFM
- Listronotus bonariensis* Kuschel
Pitfall Dec. 1979, Feb. 1980. South American origin; widely distributed pest of ryegrass in N.Z.; larvae feed within the tiller bases.
- Nestrius* sp.1
1 ex *Phyllacne colensoi*
20 ex *Pentachondra pumila*
2 ex *Lycopodium fastigiatum*
1 ex *Usnea* sp.
3 ex *Rhacomitrium lanuginosum* (Dec. 1983).
- Nestrius* sp.2 [RF] M
- Catoptes* sp.1 [RF] ONDJ
- Catoptes* sp.2
1 ex *Cassinia vauvilliersii* (Dec. 1983).
- Nicaeana cinerea* Broun [AM] ONDJFM
21 ex *Raoulia subsericea*
3 ex *Gaultheria depressa*
1 ex *Oreobolus pectinatus*
1 ex *Usnea* sp. (Dec. 1983).
Type locality Mt. Maungatua; found in Canterbury and Otago; larvae feed on fine roots in soil.
- Inophloeus sulcifer* Broun [RF] NDJ
Recorded from the Liebig Range above 1500 m feeding on *Aciphylla* (Sweney 1980); our record has considerably extended the known southerly distribution of the species (G. Kuschel pers. comm.).
- Irenimus* sp.1 [CE] ONDJFM
3 ex *Gaultheria depressa*
1 ex *Pernettya macrostigma*
1 ex *Lycopodium fastigiatum* (Dec. 1983).
The adults of these 3 species of *Irenimus* and *N. cinerea* have been shown to be damaging to oversown clover seedlings in this area (Barratt 1982); adults utilise a wide range of food plants; larvae feed on roots in soil (A. G. Bremner, pers. comm.).
- Irenimus* sp.2 [PE] ONDJFM
1 ex *Anthoxanthum odoratum*
2 ex *Gaultheria depressa* (Dec. 1983).
- Irenimus* sp.3 [AE] ONDJFM
2 ex *Anthoxanthum odoratum*

- 1 ex *Raoulia grandifolia*
- 1 ex *Leucopogon suaveolens*
- 3 ex *Leucopogon fraseri*
- 9 ex *Gaultheria depressa*
- 5 ex *Pentachondra pumila*
- 1 ex *Oreobolus pectinatus*
- 1 ex *Lycopodium fastigiatum*
- 1 ex *Rhacomitrium lanuginosum* (Dec. 1983).

Sitona discoideus Gyllenhal [RF] N

European species first recorded in N.Z. in 1974; now a widespread pest of lucerne and medicks.

Anagotus grangeri (Broun) [RF] NDFM

Described from Mt. Maungatua; thought to be specific to *Carex* (G. Kuschel, pers. comm.).

A. lewisi (group) (Broun) [RF] N

Described from the Ida Valley; found also at Swampy Summit (near Dunedin) and Danseys Pass; larvae feed in tussock tiller bases.

Nonnotus albicans (Broun) [RF] NFM

Hylastes ater (Paykull) [RF] F

Pitfalls Oct-Dec. 1979. European bark beetle associated with coniferous timber.

DIPTERA

Tipulidae

several spp. [AE] ONDJFM

Peak numbers in Nov-Dec. and Mar.

Psychodidae

psychodid sp. [RF] F

1 ex *Anthoxanthum odoratum*

1 ex *Leucopogon fraseri* (Dec. 1983).

Chironomidae

several spp. [AE] ONDJFM

Peak numbers in Oct-Nov.

Ceratopogonidae

several spp. [PE] ONDJFM

Peak numbers in Feb-Mar.

Simuliidae

Austrosimulium sp. [RF] NDJ

Scatopsidae

Scatopse fuscipes Meigen [RF] N

several spp. [RF] NDJF

Bibionidae

Philia crinita Hardy [RF] N

several spp. [PF] ND

Cecidomyiidae

several spp. [CE] ONDJFM

Sciaridae

several spp. [AE] ONDJFM

Peak numbers Oct-Dec. and late Feb.-early Mar.

Mycetophilidae

several spp. [PE] ONDJFM

Peak numbers in Feb.-Mar.

Acroceridae

Oncodes brunneus Hutton

Eggs found on fence wire, larvae hatched out and identity confirmed. Larvae parasitic on spiders.

Therevidae

Anabarynychus sp. [RM] DJFM

Asilidae

asilid sp. 1 [RM] FM

asilid sp. 2 [RM] FM

Empididae

Ceratomerus sp. [RF] ND
several spp. [CE] ONDJFM

Dolichopodidae

Condylostylus sp. [PM] NJFM
dolichopodid sp.1 [RF] ONJ
dolichopodid sp.2 [CM] DJFM
dolichopodid sp.3 [PF] JFM

Lonchopteridae

Lonchoptera furcata (Fall.) [RF] ON

Phoridae

several spp. [CE] ONDJFM
Species comprise:
Megaselia (Aphiochaeta) impariseta Bridarolli
M. (A.) castanea Bridarolli
M. (Megaselia) hallerata Wood
Aphiura breviceps Schmitz
Diploneura sp.
New genus nr. *Palpocrates*
phorid spp.(2)

Pipunculidae

Pipunculus arthurianus (Tonnoir) [RF] DFM
Type locality Cass.

Syrphidae

Syrphus ropalus Walker [RF] NDJFM
S. ortus Walker
Single specimen netted near site 1 Feb. 1984; found throughout N.Z.
Melangyna (= *Austrosyrphus*) *novaezelandiae* (Macq.) [RF] D
Abundant throughout N.Z.; eggs laid singly on flowers and larvae feed on caterpillars and aphids (Miller 1921).
Melangynus sp.1 [RF] D
Melangynus sp.2 [RF] F
Allograpta (= *Platycheirus*) sp.1 [PF] D
Allograpta (= *Platycheirus*) sp.2 [RF] NDJF
Allograpta (= *Platycheirus*) sp.3 [RF] ND
Melanostoma fasciatum Macq.
Single specimen netted near site Feb. 1984; throughout N.Z.; eggs laid singly or in pairs on plants infested with aphids or caterpillars (Miller 1921).

Tephritidae

Tephritis thoracica Malloch [RM] NDJF
Type locality Queenstown; also from Ben Lomond, Milford and Alexandra (Harrison 1959).
Trypanea longipennis Malloch [RM] ONDM
Type locality Cass and recorded from other Canterbury localities (Harrison 1959).
T. extensa Malloch [RF] O
Trypanea sp. [PF] DJFM

Sciomyzidae

Helosciomyza subspenicosta (Hutton) [PM] DJFM
Found in North and South I. and down to sea level in Otago.
H. subalpina (Tonnoir & Malloch) [RF] O
Described from Cass; known also from Otago Peninsula (Harrison 1959).
Neolimnia obscura (Hutton) [RM] DJFM
Widely distributed throughout N.Z. as far south as mid-Canterbury; only one record from Otago at Franz Josef; larvae predatory on terrestrial snails (Barnes 1976a, b).
Huttonina scutellaris Tonnoir & Malloch [RF] J
South I. species described from The Hump in Southland and known from Dunedin.

Heleomyzidae

Allophylopsis (Allophylella) sp. [RF] ONJM

Sphaeroceridae*Telomerina flavipes* (Meigen) [RF] F

Widespread in many parts of the world; associated with carrion, dung, mammal burrows and decaying fungi (Marshall & Rohacek 1984).

Leptocera (Limosina) sp.1 [PM] ONDJFM*Leptocera (Limosina)* sp.2 [PF] NDF**Agromyzidae***Cerodontha angustipennis* Harrison

Two specimens from pitfall Feb. 1979. Described from the Manuka Gorge in Otago; more local and less numerous than *C. australis*; found up to 1200 m; larvae leaf-mine in grasses (Spencer 1976).

C. australis Malloch [CE] NDJFM

European species; probably the commonest agromyzid in N.Z.; host plants exclusively grasses (Spencer 1976).

Phytomyza costata Harrison [RM] NDJFM

Described from Beebys Knob, Nelson; recorded also from the Hunter Mts; larvae leaf miners of *Ranunculus* (Spencer 1976).

Liriomyza sp. nr. *homeri* Spencer [RF] DJFM*L. wahlenbergiae* Spencer [RF] FM

Described from Mt. Cook and known from Homer Tunnel; larvae mine leaves of *Wahlenbergia albomarginata* (Spencer 1976).

Ephydriidae*Psilopa metallica* (Hutton) [RM] ONDJFM

Widespread and common species.

Hydrellia enderbii (Hutton)

Pitfalls Jan-Feb. 1979. Widespread throughout N.Z.; recorded from Otago Peninsula and Dunedin (Harrison 1959).

H. tritici (Hutton) [RF] FM

Widespread in North and South I.

Neoscatella vittithorax (Malloch) [RF] DF

Only North I. localities given by Harrison (1959).

Parahydina sp.1 [PM] ONDJFM*Parahydina* sp.2 [RF] F**Drosophilidae***Scaptomyza fuscitarsis* Harrison [RM] DJFM

Common throughout N.Z.

Chloropidae*Diplotoxa moorei* (Salmon) [RF] ONDJ

Apterous species; type locality Mt. Grey in Canterbury; larvae found in nests of ants *Monomorium integrum* Ford (Spencer 1977).

D. harrisoni Spencer [RF] J

Described from Stewart I.; closely related to previous species (Spencer 1977).

Tricimba deansi (Malloch) [RF] D

Apterous species; type locality Deans Bush (Cant.) but only 2 specimens recovered (Spencer 1977).

T. watti Spencer [RM] ONDJF

Southern South I. species.

Conioscinella grandis Spencer [RF] OND*C. badia* (Hutton) [PM] DJFM

Type locality Queenstown; most records from alpine localities up to 1680 m; there are a series of colour variants (Spencer 1977); our specimens have a matt grey mesonotum.

Muscidae*Spilogona* (sensu. lat.) spp. [CE] NDJFM

A total of 17 species can be distinguished from the material collected. Representatives of the genus both with and without hairs on the parafacials are present. (R. Harrison pers. comm.).

Calliphoridae

several spp. [PM] NDJFM

Tachinidae*Calcager incidens* (Curran) [RF] D*C. varians* (Malloch) [RF] DFM

Calcager spp. are parasitic on Lepidoptera larvae.

Plagiomyia turbidum (Hutton) [RF] JFM

P. acheta (Malloch) [RF] J

P. longicornis Malloch [PM] NDJFM

Recorded from noctuid caterpillars (Sweney 1980).

Plagiomyia sp. [RF] DJ

Plagiomyia spp. are multiple parasites on Lepidoptera larvae, usually noctuids (J. Dugdale pers. comm.).

Gracilicera politiventris (Malloch) [PF] ND

Gracilicera sp. nr. *pallipes* Malloch [RF] J

Gracilicera spp. are parasitic on crambid larvae.

Procissio cana Hutton [RF] DJFM

P. albiceps (Hutton) [PM] DFM

P. kumaraensis (Miller) [RF] F

Procissio spp. are parasitic on scarabaeid larvae, the 1st and 2nd listed here on *Costelytra* and *Pyronota* respectively.

Pales tecta group [RF] J

Parasitic on Lepidoptera larvae.

Occisor inscitus Hutton [RF] M

Mallochomaquartaria vexata (Hutton) [PF] OND

M. nigrihirta (Malloch) [PM] ONDJF

Mallochomaquartaria sp. [RF] ON

Mallochomaquartaria spp. are parasitic on curculionid larvae.

Zealandotachina nigrifemorata Malloch [RF] JF

Z. varipes Malloch [RF] F

Z. setigera Malloch [RF] ON

Zealandotachina sp. nr. *setigera* [RF] FM

Z. tenuis Malloch [RF] JFM

Heteria appendiculata Malloch [RM] ONDJF

H. plebeia Malloch [RF] NDFM

H. atripes Malloch [RM] NDFM

Heteria sp. nr. *atripes* Malloch [RF] FM

Heteria spp. are parasitic on Scopariinae and Crambinae (J. Dugdale, pers. comm.).

Avibrissina brevipalpis Malloch [RF] F

Parasitic on scarabaeid larvae; reared from *Pyronota* spp. (Given 1945).

Erythronychia australiensis (Schiner) [PF] JF

Pygocalcager defecta (Malloch) [RF] J

Parasitic on Melolonthinae.

'*Peremptor modica* (Hutton) [RF] DF

Tryptherina grisea Malloch [RF] M

? *Tryptherina* or *Neotrypthera* sp. [RF] M

Medinella sp. nr. *albifrons* Malloch [RF] NDF

LEPIDOPTERA

Micropterigidae

Micropterigid sp. N

Specimen observed in the field but not collected.

Mnesarchaeidae

Mnesarchaea paracosma Meyrick D

Diurnal; found in tussock/herbfield 900 m; many South I. localities.

Hepialidae

Aoraia sp. MAM

Despite both sexes having up to 7 cm wing span, females incapable of flight because of large distended abdomen full of eggs at emergence. Thought to breed in damp grassland near moss-bogs. Another species occurs on the Rock and Pillar Range and Lammermoors.

Wisana mimica (Philpott) NDJF

Similar to the early-emerging lowland species; found only rarely in this area and occurs up to 1200 m on the Rock and Pillar Range.

W. umbraculata (Gn) NDJFM

Common in moss-bogs up to 1050 m.

Dioxycanus fuscus (Philpott) DJF

Adults crepuscular; common throughout Otago and Southland ranges in tussock and bog areas, and at sea level at the Awarua Bog near Invercargill.

Cladoxycanus minus (Hudson) AMJ

Larvae feed in moss-bogs; type locality is Ophir, 40 km NW of the study area but the species is widely distributed in the South I. and south of the North I.

Gen. et sp. indet. MAMJ

Males orange in colour with a black-edged broad white stripe; females paler and fly weakly. Found from 800-1200 m in this area. Discovered in 1979 at Danseys Pass, this species also occurs on the Rock and Pillar Range to 1200 m and in many moss-bog areas of eastern Otago and Southland from sea level to 1000 m. Larvae feed in moss-bogs mainly on *Sphagnum*.

Nepticulidae

Stigmella sp. ND

Larvae mine leaves of *Olearia virgata* var. *rugosa* and *O. odorata*; found in gullies up to 850 m. Occurs in central and eastern Otago and Southland sometimes exploiting *O. laxiflora* and *O. lineata* where present.

Tortricidae

'*Capua*' *semiferana* Walker SONDJFM

Collected at 1000 m; larvae probably feed in litter; common lowland species.

Eurythecta sp. nr. *eremana* (Meyrick) MA

Common in damp grasslands, larvae feed on grasses.

Epichorista hemionana (Meyrick) Mar.

Widespread in the South I.; lowland to sub-alpine; frequents damp areas, larvae tie leaves of *Acaena* and other herbs.

E. aspistana (Meyrick) JF

Collected at about 1000 m; common in lowland to sub-alpine damp herbfields; widespread east of the main divide in the South I.

E. tenebrosa Philpott FMA

A rare species collected amongst short tussock, 850-1000 m; the female has shortened wings; type locality Ben Lomond; found also in Naseby State Forest and Roaring Meg (J. S. Dugdale, pers. comm.), and South Rough Ridge Hill.

Eurythecta leucothrinca Meyrick May

Diurnal, late autumn-emerging species; female brachypterous. Occurs from Cass southwards to Eastern Otago; associated with stream and bog margins.

Gen. et sp. indet. MAM

Another diurnal species with a brachypterous female. Distribution similar to the previous species and both reach their southern limit in this area. Distinctive white stripe on the forewings.

Gen. et sp. indet. AM

Similar in habit to the 2 species above but found only in Central Otago and Southland ranges 750-1150 m. Greyish species with a more brightly coloured brachypterous female.

Gen. et sp. indet.

Slender tortricid with long palpi; female brachypterous; larvae are general feeders in damp swards and in shrubs. Adults have been found on Swampy Summit, Mt. Maungatua and the Old Man Range in late November and December, and at sea level at Awarua Bog in October.

Twelve other tortricid species occur higher up on the Lammermoors and the Rock and Pillar Range, 10 of which remain undescribed.

Psychidae

Reductoderces sp. nr. *microphanes* (Meyrick)

Larvae feed on algae and lichens on rock faces and construct lichen and silk cases; females apterous. Adults obtained by rearing only from this area but collected in Aug-Sept. from Nugget Point, Taieri Mouth and Otago Peninsula.

Reductoderces sp.

This species is uncommon here. The larval cases, which are found on rock tors, are longer than those of the previous species and adults are only known from Evansdale Glen, north of Dunedin. Cases are also known from the Garvie Mts. (1600-1800 m), Remarkables (900 m) and Ben Lomond (800 m).

Reductoderces sp. MJJ

Smaller case-bearing larvae feed on algae on vegetation and rock faces; diurnal, females apterous.

Rhathamictis sp. D

Small flat, elongate case-bearer; larvae feed on algae on rock faces at 900 m; female brachypterous; also known from Taieri Ridge.

Scotiodyta sp.

Larval cases found at 950 m on rock face; adults bred from Strath Taieri in Dec. and Jan.; also occurs near Alexandra; females apterous. The much larger *Orophora unicolor* (Butler) occurs higher up on the Rock and Pillar Range.

Gracillariidae

Caloptila linearis (Butler) ONDJFMAM

Widespread species; larvae known from other areas to feed on *Coriaria* spp. including *C. plumosa*.

C. elaeas (Meyrick) ONDJFMAM

Widespread; larvae feed on *Coriaria* spp. including *C. sarmentosa*.

Caloptila sp. ONDJFMAM

Widespread in montane and alpine areas of Otago, larvae feed on *Gaultheria depressa*.

Yponomeutidae

Plutella xylostella (Linnaeus) May

Common lowland crucifer pest found up to 940 m.

P. psammochroa Meyrick NDJFMAM

Widespread in eastern Otago in *Chionochloa* grassland.

P. antiphona Meyrick Apr.

Adults collected 14 April 1984 by J. S. Dugdale.

Phylacodes cauta Meyrick NDJFMAM

Central Otago species found in *Carex*-dominated bogs; type locality Ida Valley.

Choreutidae

Asterivora marmarea (Meyrick) DJ

Widespread in damp herbfields and bogs in lowland to alpine Otago and Southland; larvae feed on *Celmisia gracilentia*. Type locality Ben Lomond.

Asterivora sp.1 N

Larvae mine leaves of *Brachyglottis bellidioides* at 800-900 m.

Asterivora sp.2 D

Larvae feed on *Helichrysum bellidioides*; known elsewhere from Danseys Pass and Mount Cargill. A 3rd undescribed species breeds on *Celmisia prorepens* above 1100 m on the Rock and Pillar Range and the Lammermoors.

Glyphipterigidae

No species found in the study area but 4 are present above 1200 m on the Rock and Pillar Range and Lammermoors, *Circica euastera* (Meyrick), *C. metastica* (Meyrick), *C. scintellella* (Walker) and *C. oxymachaera* (Meyrick).

Elachistidae

Elachista ochroleuca Meyrick Mar.

Found at 940 m.

E. thalophora Meyrick NDJF

Widespread alpine bog-dwelling species.

E. gerasmia Meyrick Apr.

Adults collected 14 April 1984 by J. S. Dugdale.

Oecophoridae

Oxythecta austrina (Meyrick) ONDJF

Common diurnal moth of open dry areas; larvae probably feed in litter. Found up to 1200 m on the Rock and Pillar Range and other Central Otago ranges.

Izatha convulsella (Walker) N

Widespread species; larvae feed around lichens on rock faces behind a silk 'curtain'; up to 950 m.

Gymnobathra sarcocantha Meyrick F

Widespread lowland species found here up to 900 m; case-bearing larvae feed in leaf litter; female brachypterous.

Tingena armigerella (Walker) D

Found in shrubland up to 800 m; larvae found in leaf litter.

T. siderodeta (Meyrick) F

Single specimen of this diurnal, lowland to sub-alpine shrubland species.

T. compsogramma (Meyrick) D

Single specimen of this Otago and Southland lowland to alpine species. Larvae found in leaf litter of shrubs.

Trachypepla sp. D

Collected in herbfield at 800 m.

Gelechiidae

Zeempista heterospora (Meyrick) D

Single specimen of this widespread species; brachypterous female.

Z. sp. nr. hippeis Meyrick Apr.

Adults collected 14 April 1984 by J. S. Dugdale. *Z. plemochoa* (Meyrick) occurs on the

Lammermoors. Two undescribed species occur higher up on the Lammermoor and Rock and Pillar Ranges; both are diurnal; 1 is black and white and the other is grey.

Megacraspedus calamogonus Meyrick NDJFMA

Widespread in *Chionochloa* grassland; larvae feed in seed heads; lowland to alpine species.

Pyralidae

Orocrambus aethonellus (Meyrick) NDJ

A widespread lowland to alpine diurnal grass moth.

O. angustipennis (Zeller) JF

The larvae are found in *Cortaderia*, widespread in damp areas.

O. apicellus (Zeller) JFM

Common in lowland to alpine bogs.

O. corruptus (Butler) DJF

Diurnal moth widespread in lowland to alpine areas of the eastern South I.

O. cyclopicus (Meyrick) Mar.

Mainly lowland grass moth.

O. dicrenellus (Meyrick) JFM

Widespread in alpine areas of Central Otago, female brachypterous.

O. enchophorus (Meyrick) Mar.

Widespread lowland to alpine.

O. ephorus (Meyrick) F

A local South I. species; type locality Arthurs Pass.

O. flexuosellus (Doubleday) JFM

Mainly lowland grass moth.

O. harpophorus (Meyrick) JF

Widespread but uncommon in alpine areas.

O. heliotes (Meyrick) DJF

Diurnal moth associated with montane to alpine moss-bogs.

O. lectus (Philpott) DJFM

Uncommon; frequents damp areas 800-1200 m; South I. species.

O. lewisi Gaskin Jan.

Found in tussock grassland in the east of the South I. and lower North I.; lowland to alpine; larvae feed in *Festuca*.

O. scoparioides Philpott DJFM

Diurnal grass moth found in the vicinity of moss-bogs in many alpine areas of Otago and Southland.

O. scutatus (Philpott) DJFM

Mainly in red tussock areas of alpine to montane Southland. At its north-eastern limit here.

O. tritonellus (Meyrick) ND

Diurnal; found in dry alpine tussock areas of Canterbury and Otago.

O. vulgaris (Butler) Mar

Mainly lowland grass moth.

O. vittellus (Doubleday) JF

Mainly lowland grass moth. *O. machaeristes* Meyrick, *O. catacaustus* (Meyrick), *O. thymiastes* Meyrick, *Orocrambus* n. sp., *O. melampetrus* Purdie and *Tawhitia glaucophanes* (Meyrick) occur higher up on the Rock and Pillar Range and the Lammermoors.

Glaucocharis epiphaea (Meyrick) Mar.

Diurnal; larvae probably feed in mosses; mainly sub-alpine.

G. helioctypa (Meyrick) Jan

Diurnal; larvae probably feed on mosses; lowland to alpine.

Heliothela atra (Butler) F

Recovered from pitfall traps only. Diurnal moth associated with dry tussock grasslands.

Diasemia grammalis Doubleday JF

Diurnal; dry tussock grassland; lowland to alpine.

Mnesictena flavidalis (Doubleday) MA

Mainly lowland; found here near the edges of moss-bogs.

M. notata (Butler) Apr.

Found in damp areas; lowland to sub-alpine areas of the South I.

M. adversa Philpott Apr.

Found in damp areas; more local than the previous species.

Nymphula nitens (Butler) F

Larvae aquatic; lowland species also.

Antiscopa elaphra (Meyrick) N

Widespread lowland species; several specimens recovered here.

Delogenes limodoxa (Meyrick) Apr.

Usually in moss-bogs over 1000 m; lowland in the vicinity of Invercargill and Portobello.

Eudonia psammitis (Meyrick) NDJ

Common in lowland to alpine wetlands.

E. sabulosella (Walker) Jan.

As above.

E. octophora (Meyrick) MA

As above.

E. paltomacha (Meyrick) NDJFM

Mainly southern alpine grasslands.

Scoparia chalara Meyrick ND

Larvae of all species of this genus are thought to feed on mosses. This species is widespread; lowland to alpine.

S. claranota Howes JF

Widespread in alpine areas of Otago and Southland.

S. colpota Meyrick F

One specimen collected from a rock face at 800 m; mainly a lowland species.

S. critica Meyrick F

Diurnal; found in alpine shrubland areas.

S. cyptastis Meyrick N

Widespread in Otago and Southland; lowland to alpine in moss-bogs.

S. petrina (Meyrick) MA

Widespread in alpine tussock grassland.

S. deltophora Meyrick FMA

Female has reduced wings; common in tussock grassland and cushion vegetation up to 1300 m.

Scoparia sp. nr. *dryphactis* Meyrick AM

A distinct new species; female brachypterous; found in damp tussock grassland.

S. ergatis Meyrick Jan.

Lowland to alpine; found in damp tussock grassland.

S. exilis Knaggs N

Lowland to alpine; found on dry hillsides.

S. feredayi Knaggs FM

Female has reduced wings; widespread lowland to alpine.

S. legnota (Meyrick) DJ

Lowland to alpine; damp areas.

S. steropaea Meyrick F

Coastal to alpine; locally distributed; found here on dry hillsides.

S. trivirgata (Felder) ND

Widespread lowland to alpine tussock grassland.

S. oculata Philpott JFM

Lowland to alpine tussock grassland of the South I.; single specimen found.

S. oreas Meyrick FMA

Adults found on rock faces 700-900 m; type locality nr. Lake Wakatipu, occurs also in other alpine areas of Central Otago and lowland areas around Dunedin.

S. panopla Meyrick May

Alpine distribution in eastern Otago.

S. fumata Philpott ND

Widespread in alpine areas of Otago and Southland; type locality Longwood Range.

S. trapezophora Meyrick D

Local alpine species found especially in damp shrubland.

S. niphospora (Meyrick) F

Widespread but local in tussock grassland.

S. cymatias Meyrick F

Single specimen found at 900 m; widespread in the South I.; lowland to alpine.

S. autochroa Meyrick D

Single specimen found; local Otago-Southland species of lowland to alpine wetland tussock.

S. xysmatias Meyrick N

Found in moss bogs at 850 m but more common above 1200 m on the Rock and Pillar Range, above 1100 m on the Lammermoors and Rough Ridge, also on the Old Man and Dunstan Ranges.

Scoparia sp. DJF

Common on Old Man Range and Takitimu Mts. in alpine grassland.

S. nomeutis Meyrick, *S. sideraspis* Meyrick, *Scoparia* sp. nr. *subita* (Philpott) occur higher up on the Rock and Pillar Range and on the Lammermoors.

Pterophoridae*Stenoptila orites* (Meyrick) NDJFM

Widespread in alpine areas of Otago and Southland; found here 850-950 m; larvae feed in seed heads of *Brachyglottis bellidioides*. *S. epotis* occurs at 1300 m on the Rock and Pillar Range.

Platyptilia repletalis (Walker) Apr.

Single specimen found; widespread lowland to alpine species.

Pieridae*Pieris rapae* (Linnaeus)

Introduced species; vagrant to this area; ubiquitous brassica pest.

Nymphalidae*Bassaris gonerilla* (F.)

A vagrant species to the area. Larvae feed on nettle which is not found in the study area but the butterflies are strong fliers.

Satyridae*Argyrophenga antipodum* (Doubleday) NDJFMA

Common in summer in tussock grassland up to 1300 m on the Rock and Pillar Range. Larvae feed on *Chionochloa* spp. and probably other native and introduced grasses. *A. janitae* Craw may also occur here (not collected) since it is found commonly nearby on the Lammermoors.

Lycanidae*Lycena salustius* (Fabricius) DJF

Very widespread species, breeds on *Rumex* spp. growing on the margins of moss-bogs. *L. boldenarum* White occurs in gullies at 800 m at this locality.

Geometridae*Chloroclystis filata* Guen. F

Single specimen found; Tasmanian species now common in New Zealand, lowland to alpine.

C. nereis Meyrick DJF

Diurnal; widespread lowland to alpine; larvae feed in *Celmisia* flower heads.

Pasiphila humilis (Philpott) F

Single specimen collected; larvae feed on *Dracophyllum* flowers. Widespread where the host plant is found in lowland to alpine areas; type locality Queenstown.

P. rubella (Philpott) FM

Larvae feed on *Hebe odora*; found in alpine areas of Otago and Southland; type locality Bold Peak.

Pasiphila sp. ON

New species; diurnal; common; larvae feed on *Celmisia*, *Hebe* and *Gentiana* flowers; discovered at Danseys Pass (Patrick, 1982). Another new species of *Pasiphila* occurs at 1300 m on the Rock and Pillar Range; also diurnal. *P. halianthes* (Meyrick) occurs on the Rock and Pillar Range.

'*Hydriomena*' *canescens* Philpott FM

Collected (3 specimens) at light; type locality is Queenstown; this is the first time it has been recollected.

Cidaria deltoidata (Walker) F

Herb-feeding larvae; more common at lower altitudes.

Asaphodes abrogata Walker Mar.

Diurnal; more common in lowland wet tussock grassland.

A. clarata (Walker) FM

Diurnal; larvae feed on *Ranunculus* spp. up to 1300 m.

A. oraria (Philpott) Mar.

Female brachypterous; larvae feed on herbs in wet tussock grassland; known from coastal areas near Invercargill and mountainous areas around Wakatipu.

A. dionysias (Meyrick) MA

Female brachypterous; larvae feed on herbs in wet tussock grassland areas.

A. helias (Meyrick) Mar.

Widespread in montane to alpine Otago; type locality Dunedin area; larvae on herbs.

A. sericodes (Meyrick) FMA

Type locality is Mt. Earnslaw, occurs on the Garvie Mts. and may be the same species as *A. frivola* (Meyrick) from coastal areas near Invercargill. *A. cinnabari* (Howes) occurs on the Lammermoors.

Arctesthes calapyrrha Butler

Widespread species of open areas from coastal to alpine locations. Larvae feed on herbs including *Plantago*. *A. siris* (Hudson) occurs at higher altitudes at this locality.

Xanthorhoe' occulta Philpott ND

Females have reduced pointed wings; larvae feed on herbs; widespread lowland to alpine.

Helastia orophyla (Meyrick) FM

Widespread in South I. alpine areas; larvae feed on cruciferous herbs.

H. corcularia (Guenee) DJFMA

More common in lowlands; nocturnal or diurnal; larvae on herbs.

Notoreas hexaleuca (Meyrick) DJF

Diurnal; found in Otago and Southland but not Fiordland; 800-1200 m; larva feed on *Drapetes*.

N. galaxias Hudson JFMA

Diurnal; larvae feed on *Drapetes*; found in tussock areas of Otago above 600 m.

N. paradelpha (Meyrick) NDJ

Diurnal; larvae feed on *Pimelea oreophila*; widespread in alpine areas.

N. perornata (Walker) NDJFM

Diurnal; larvae feed on *Pimelea oreophila*; widespread in alpine areas. Coastal forms may be distinct.

Aponotoreas anthracias (Meyrick) DJF

Diurnal alpine species; larvae probably feed on *Dracophyllum*.

A. insignis (Butler) JFM

Diurnal; found in the east of the South I. in alpine areas 600-1300 m; larvae feed on *Poa*. *Notoreas ortholeuca* Hudson, *Notoreas* n. sp., *N. regilla* (Philpott), *N. chioneres* Prout, and *Aponotoreas orphnaea* (Meyrick) occur higher up on the Rock and Pillar and Lammermoor Ranges.

Paranotoreas brephosata (Walker) NDJF

Diurnal; lowland to alpine; larvae feed on *Epilobium*.

P. zopyra Meyrick D

Single specimen found at 800 m; widespread sub-alpine species; larvae on *Helichrysum bellidioides*.

Dasyuris anceps (Butler) JFMA

Diurnal; widespread above 900 m; larvae on *Anisotome*.

D. transaurea Howes OND

Diurnal; widespread in low alpine areas especially eastern and Central Otago; type locality Garvie Mts; larvae feed on *Anisotome aromatica*.

D. partheniata Guen. FM

Diurnal; widespread lowland to alpine; larvae feed on *Aciphylla* spp.

Dasyuris callicrena (Meyrick) NDJ

Diurnal; common in alpine areas of Otago and Southland; larvae feed on *Hebe odora*. *D. austrina* Philpott, *D. sp. nr. micropolis* Meyrick and *D. leucobathra* (Meyrick) occur higher up on the Rock and Pillar Range and Lammermoors.

Dichromodes gypsotis Meyrick DJF

Diurnal; larvae feed on lichens on rocks; widespread in the eastern South I. and Central Otago; lowland to alpine.

D. sphaeriata (Feld.) NDJ

Diurnal; larvae feed on lichens on rocks; widespread in montane to alpine areas but typical of Central Otago.

D. ida Hudson ON

Diurnal moth with lichen-feeding larvae; frequents larger rocks with black lichens. Type locality is Ida Valley; also found on Cairnmuir Mts., Taieri Ridge and localities east to the Strath Taieri.

Arctiidae*Metacrias strategica* (Hudson) DJ

Diurnal; widespread in Southland, eastern and Central Otago and south Canterbury in lowland to montane areas; female brachypterous; larvae polyphagous. Only larvae were found but it generally emerges in Dec-Jan. A species near *M. huttoni* (Butler) occurs commonly above 1100 m on the Rock and Pillar Range.

Noctuidae**Monthly light trap catch totals**

	N	D	J	F	M	A
<i>Ichneutica ceraunias</i> Meyrick	0	0	4	2	0	0
Widespread mainly alpine species; lowland around Invercargill; females brachypterous in this locality; larvae thought to feed on <i>Chionochloa</i> .						
<i>I. nervosa</i> Hudson	0	0	2	1	0	0
Usually found above 700 m; occurs in many South I. alpine areas but uncommon except in eastern Otago.						
<i>I. cana</i> Howes	8	1	0	0	0	0
Diurnal and nocturnal; distinctive Otago grassland species found 900-1000 m; type locality Garvie Mts.						

	N	D	J	F	M	A
<i>Homohadena fortis</i> (Butler)	0	0	0	1	0	0
Uncommon at this locality although common elsewhere in Central Otago; larvae feed on <i>Hymenanthera alpina</i> ; found in coastal to montane areas from Wellington southwards.						
<i>Persectania aversa</i> (Walker)	0	0	4	26	2	0
The southern armyworm; a widespread lowland species although found here up to 900 m and up to 1200 m on the Rock and Pillar Range.						
<i>Tmetolophota</i> sp. nr. <i>alopa</i> (Meyrick)	0	0	0	1	0	0
A single specimen of this rare species found at 1000 m; widespread lowland to alpine.						
<i>T. arotis</i> (Meyrick)	1	0	1	2	0	0
Widespread lowland to montane species; uncommon at this locality.						
<i>T. lissoxyla</i> (Meyrick)	0	0	1	9	39	0
Common in alpine areas of Otago.						
<i>T. propria</i> (Walker)	0	3	48	37	4	0
Widespread and common in alpine areas; also occurs in lowlands.						
<i>T. semivittata</i> (Walker)	0	1	1	3	0	0
Typically lowland species; larvae feed on grass species.						
<i>T. stulta</i> (Philpott)	0	0	0	1	0	0
Single specimen found; a rare species known only from Otago and Southland; type locality West Plains near Invercargill.						
<i>T. atristriga</i> (Walker)	0	0	1	3	0	0
Abundant lowland species; larvae feed on native and exotic grasses.						
<i>T. acontistis</i> (Meyrick)	0	1	0	0	0	0
Widespread species; single specimen found here at 1000 m.						
<i>Aletia cuneata</i> Philpott	0	0	0	2	0	0
Often diurnal; widespread in montane to alpine areas; found up to 1350 m on the Rock and Pillar Range; type locality Ophir, Central Otago.						
<i>A. longstaffi</i> (Howes)	0	0	0	0	10	6
Widespread nocturnal and diurnal species; larvae feed on herbs; lowland to alpine distribution.						
<i>A. moderata</i> (Walker)	6	3	18	34	6	0
Common lowland to alpine species; larvae feed on <i>Raoulia</i> and other herbs.						
<i>A. obsecrata</i> Meyrick	65	8	20	40	0	0
The most abundant noctuid in this area found up to 1200 m; different forms are found in other alpine areas.						
<i>A. sollennis</i> Meyrick	0	1	0	4	0	0
Five specimens of this rare species recovered; type locality Waipori which is less than 35 km from the study area. Found up to 1000 m. <i>Aletia panda</i> Philpott occurs on the Lammermoors at 1150 m.						
<i>Graphania agorastis</i> (Meyrick)	0	0	1	11	22	0
Lowland to alpine species found particularly in damp habitats up to 1000 m.						
<i>G. disjungens</i> (Walker)	1	3	59	9	4	0
Common Central Otago species which occurs up to 1300 m on the adjacent Rock and Pillar Range.						
<i>G. homoscia</i> (Meyrick)	0	0	0	1	0	0
Single specimen trapped at 1000 m; rare in Otago and Southland although more common elsewhere; larvae feed on <i>Cassinia</i> .						
<i>G. lithias</i> (Meyrick)	0	0	0	2	1	0
Widespread but uncommon in montane to high alpine zones; larvae feed on <i>Hymenanthera alpina</i> , occurs up to 1300 m on the Rock and Pillar Range.						
<i>G. mollis</i> (Howes)	0	0	0	1	0	0
Single specimen found; widespread and common in lowlands.						
<i>G. nullifera</i> (Walker)	0	0	1	21	3	0
Largest noctuid in the New Zealand fauna; widespread lowland to alpine; larvae bore into and feed on the root of <i>Aciphylla</i> spp.						
<i>G. paracausta</i> (Meyrick)	6	1	1	0	0	0
The distinctive Central Otago form of this species present here and up to 1200 m on the Rock and Pillar Range.						
<i>G. prionistis</i> (Meyrick)	0	0	0	1	0	0
Found at 100 m; occurs sporadically throughout Otago.						
<i>G. rubescens</i> (Butler)	0	1	1	16	0	0
Lowland to alpine distribution; bright green larvae feed on many herb species especially <i>Luzula</i> .						
<i>G. ustistriga</i> (Walker)	0	0	0	1	0	0
Common lowland species; single specimen found at 1000 m; larvae are general feeders of herbs and shrubs.						
<i>G. mutans</i> (Walker)	1	4	1	5	0	0
Ubiquitous species uncommon in this area; larvae are general herb feeders in lowlands mainly.						

***Rictonis comma* (Walker)**

Common lowland species, sometimes diurnal and only found by day on a cushion bog in Dec. in this study. Larvae general feeders on grasses and herbs.

HYMENOPTERA**Chalcidoidea**

Material from 1979-80 pitfall traps examined by J. Noyes and species list given below: 1982-83 material not identified.

Eulophidae

Tetrastichus sp.

Hemiptarsemus semialbiclava Griault

Cosmopolitan parasite of leaf-miners.

Enderstichus sp.

Elasmidae

Elasmus sp.

Mymaridae

Gen. et sp. indet.

Pteromalidae

Eupteromalus sp.

Aphobetus sp.

undetermined microgasterine sp.

Leaf-miner parasite.

Encyrtidae

Antipodencyrtus sp.

Austrochoreia sp.

? *Adelencyrtoides* sp.

Parasite of diaspid scales.

? *Chinchilla* sp.

encyrtid genus A

Parasite of mealybugs associated with grasses (not tussock).

encyrtid genus B

As above

encyrtid genus C

Parasite of mealybugs in tussock.

Apidae

Bombus terrestris L. [RF] ON

Formicidae

Chelaner antarcticus (White) [AE] ONDJFM

Prolasius advena (Fr. Smith)

Collected in the area by G. B. Patterson.

Other hymenopteran families represented in the area include:

Trigonalidae

Ichneumonidae

Braconidae

Agriotypidae

Proctotrupidae

Scelionidae

Diapriidae

Cynipidae

Eurytomidae

Pompilidae

Halictidae

(pers. comm. G. B. Patterson)