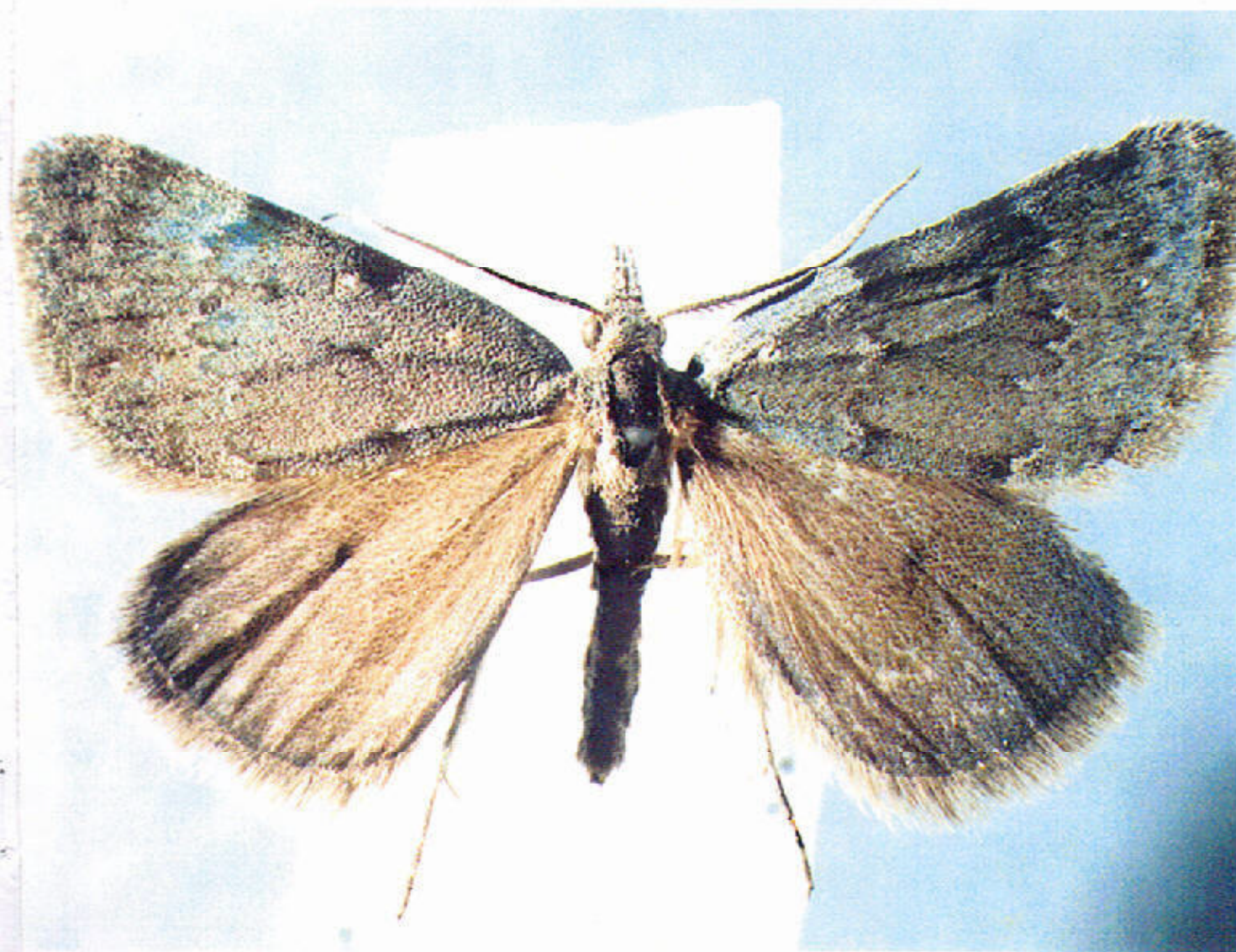




Cloudy Bay Coastal Habitats

Entomological Values of the Foreshore
and Associated Inland Habitats

Nelson August 2001



Department of Conservation
Te Papa Atawhai

Occasional Publication No. 49

Cover photo : *Dichromodes* sp. A new species of moth
from Cloudy Bay foreshore, found during this survey.

All photographs I Millar

May 2001, Department of Conservation

ISSN 0113-3853

ISBN 0-478-22083-9

PM9020

Cloudy Bay Coastal Habitats

Entomological Values of the Foreshore and Associated Inland Habitats

J. S. Dugdale

(Research Associate, Manaaki Whenua - Landcare Research NZ Ltd)

Published by
Department of Conservation
Nelson/Marlborough Conservancy
Private Bag 5
Nelson, New Zealand

CONTENTS

SUMMARY	1
INTRODUCTION	3
DESCRIPTION OF SITES	3
SAMPLING METHODS AND TIMES	8
Sampling Methods	8
Deposition of Specimens	10
Times	10
RESULTS	11
1. Local Endemic Species or Populations	11
1.1 <i>Antipodalycaena boldenarurni</i> (White), Lepidoptera: Lycaenidae. Boulder Copper, Boulder Butterfly	11
1.2 <i>Dichromodes</i> sp. cf. <i>sphaeriata</i> Felder & Rogenhofer, Lepidoptera: Geometridae [Stone Moth]	11
1.3 <i>Ericodesma</i> sp. cf. <i>aerodana</i> (Meyrick), Lepidoptera: Tortricidae [<i>Pimelea</i> leafroller]	13
1.4 <i>Gulira leucophthalma</i> (Meyrick), Lepidoptera: Crambidae [Beaked moss moth]	13
1.5 <i>Kiwaia</i> sp. cf. <i>jeanae</i> Philpott, Lepidoptera: Gelechiidae [Cloudy Bay mat daisy jumper]	14
1.6 <i>Notoreas</i> sp. "Cape Campbell", Lepidoptera: Geometridae [<i>Pimelea</i> looper]	14
1.7 <i>Orocrambus callirrhous</i> (Meyrick), Lepidoptera: Crambidae [Hard tussock grassmoth]	16
2. Other Taxa, Other Orders	16
2.1 <i>Anabarhynchus</i> spp., Diptera: Therevidae, siletto flies	16
2.2 <i>Brounopsis hudsoni</i> Blair, Coleoptera: Cerambycidae [tauhinu longhorn beetle]	18
2.3 <i>Mecodema oblongum</i> (Broun), and <i>Megadromus compressus</i> Broun, Coleoptera: Carabidae. Predatory groundbeetles	19
2.4 <i>Mimopeus</i> sp. cf. <i>clarkei</i> Watt, <i>M. neglectus</i> Watt, Coleoptera: Tenebrionidae. Darkling beetles	19
DISCUSSION	19
RECOMMENDATIONS	22
REFERENCES	22
APPENDIX: List of <i>Lepidoptera</i> spp., Cloudy Bay, Oct 1998 - March 1999	23

Summary

From October 1998 to March 1999, three areas were surveyed along Cloudy Bay: the Rarangi Foreshore (the immediate coastal strip with the inner and outer off-road vehicle tracks), Area A, a lens of low forest over a bog in an inter-ridge hollow about 150m west of Trig KK, and Area B, in a much longer and wetter hollow stretching for nearly 2km from the Wairau diversion in the direction of the east-west portion of Rarangi road. Beating and sweeping visits were made to the tauhinu community on Wairau Bar. A malaise trap (to catch flying insects) was set up in shrubby forest at area B, along with lizard-proof pitfall traps (for ground-dwelling insects). At area A, light-trapping was done at each monthly visit by JSD and IRM; on one occasion the landowner also visited. Beating, sweeping and hand-collecting were done at all areas and pitfall traps were also installed at the Rarangi foreshore site.

A total of 167 Lepidoptera species were found, 36 of which were found on the foreshore. Seven of these (listed below) are either endemic to Cloudy Bay or not previously known from there. These seven species were found only on the foreshore, and are highly specific either to a site (habitat) or a specific foodplant. They are (endemics marked with an asterisk):

- boulder copper (*Antipodalycæna boldenarum*), with larvae feeding on the shore *Muehlenbeckia*, *M. ephedroides* [new locality record, new host record];
- *stone moth *Dichromodes* sp. nr *sphaeriata* [new species, new locality, new habitat niche];
- pimelea leafroller, *Ericodesma* sp. cf. *aerodana* [new locality, probably new species, also known from Birdlings Flat];
- open-country moss moth, *Gadira leucophthalma* [extension of range, at Cloudy Bay only seen on foreshore];
- *Cloudy Bay mat daisy jumper, *Kiwaia* sp. cf. *jeanae* [new species, taking on the role of the Birdlings Flat mat daisy jumper; but morphologically distinct];
- pimelea looper, *Notoreas* sp., cf. "Cape Campbell" population [new record, new population, undescribed; differs from Birdlings Flat population]
- hard/sand tussock grassmoth *Orocrambus callirrhous* [new locality record; host sand tussock *Austrofestuca littoralis* threatened].

The most important at-risk species are the two that are endemic to Cloudy Bay:

1. The Cloudy Bay mat daisy jumper, which so far is only known from disturbed *Raoulia* pads between the outer (seaward) off-road vehicle track and HWS (highwater spring). A delicate balance will need to be kept between usage and abuse; monitoring adult populations is necessary to see effects of each year's vehicle use.
2. The stone moth, which differs from all other New Zealand species in the genus in its association with lichen encrusted shingle beds. Such shingle beds are likely to be at risk of being "mined" for roading or other uses.

These two presumed Pleistocene relics have survived past and current human usage levels in the area since moa-hunter days. They, and other open-country species, may still be spreading within the reserve now the pine plantation has been felled.

The other species on the foreshore are represented by populations elsewhere (boulder copper and *Pimelea* leafroller at Birdlings Flat, *Pimelea* looper at Cape Campbell, moss-moth by a string of populations between Cloudy Bay and Banks Peninsula, hard/sand tussock moth with eastern populations from Invercargill to the Wellington coast, but important at Cloudy Bay because of the diminished (diminishing?) sand tussock populations.

The two wetland areas, although seemingly grossly modified and, in Area B, invaded by willows, barberry and old man's beard, retain all important insect species characteristic of forest and of the indigenous tree/shrub species in or fringing the wetlands. Species present include a large tenebrionid beetle, a large predatory ground (carabid) beetle, the long-winged clapping cicada, and various moth and butterfly species are associated with *Coprosma*, *Cordyline*, *Kunzea*, *Leptospermum*, *Ileostylus*, *Melicytus* (*Hymenantha*), *Muehlenbeckia*, *Pittosporum*, *Urtica*. While there are no Lepidoptera species restricted to the region, the wet shrublands and their fringing shrubland on the better-drained shingle ridges support a varied community of species each specific to a plant species. As each wetland is an island surrounded by exotic grassland, they are refugia for a now threatened and once characteristic New Zealand biota and their continued presence is desirable as an example of what used to be on the Wairau Plains.

Of the two wet shrubland areas, Area A is regarded as having a greater value only because it has a large population of mistletoe, *Ileostylus*. Both Areas A and B have vigorous communities of shingle-ridge shrubland (and lichen-encrusted shingle at Area A) but these both lie outside any proposed reserve boundaries (just as at Kaitorete Spit).

From what we have found I recommend:

1. current levels of vehicle use along the foreshore can be maintained, but off-track driving be discouraged (for *Kiwaia*, *Notoreas* + *Ericodesma*, *Orocrambus*, *Gadira*);
2. that disturbance of the shingle-beds between the two vehicle tracks be discouraged (for *Dichromodes*);
3. that at least one vigorous shingle ridge community with *Coprosma*, *Discaria*, *Ileostylus*, *Melicytus*, and *Muehlenbeckia* be conserved along with an associated wet shrubland-low forest (for specialist Lepidoptera on these plant genera);
4. that monitoring of the mat daisy jumper population be undertaken, as possibly this is the most restricted Lepidoptera species in New Zealand;
5. that the foreshore *Pimelea* community be monitored as there are indications that this plant is susceptible to damage by vehicles.

Introduction

The coastal area of the Wairau Plains is an area of possible contention between conservation and development interests. There are conflicting views regarding land-use, and coastal reserve "amelioration". This rather featureless, bleak landscape, while overpoweringly, if sparsely, clad in exotic plants from herbs to trees, has communities of indigenous plants, most of which are known to support specialist groups of insects elsewhere. In an attempt to refine information on some of the conservation values, the Department of Conservation contracted me to survey for entomological values, particularly, because of my background, those relating to Lepidoptera.

The immediate purpose of this report is to interpret the fauna of Lepidoptera, and some other insects, that were found during this survey, and to suggest any courses of action that might serve to either protect or enhance populations considered to be at risk. It has to be kept in mind that Cloudy Bay (including Wairau Bar) has been modified by man since the advent of the moa-hunters.

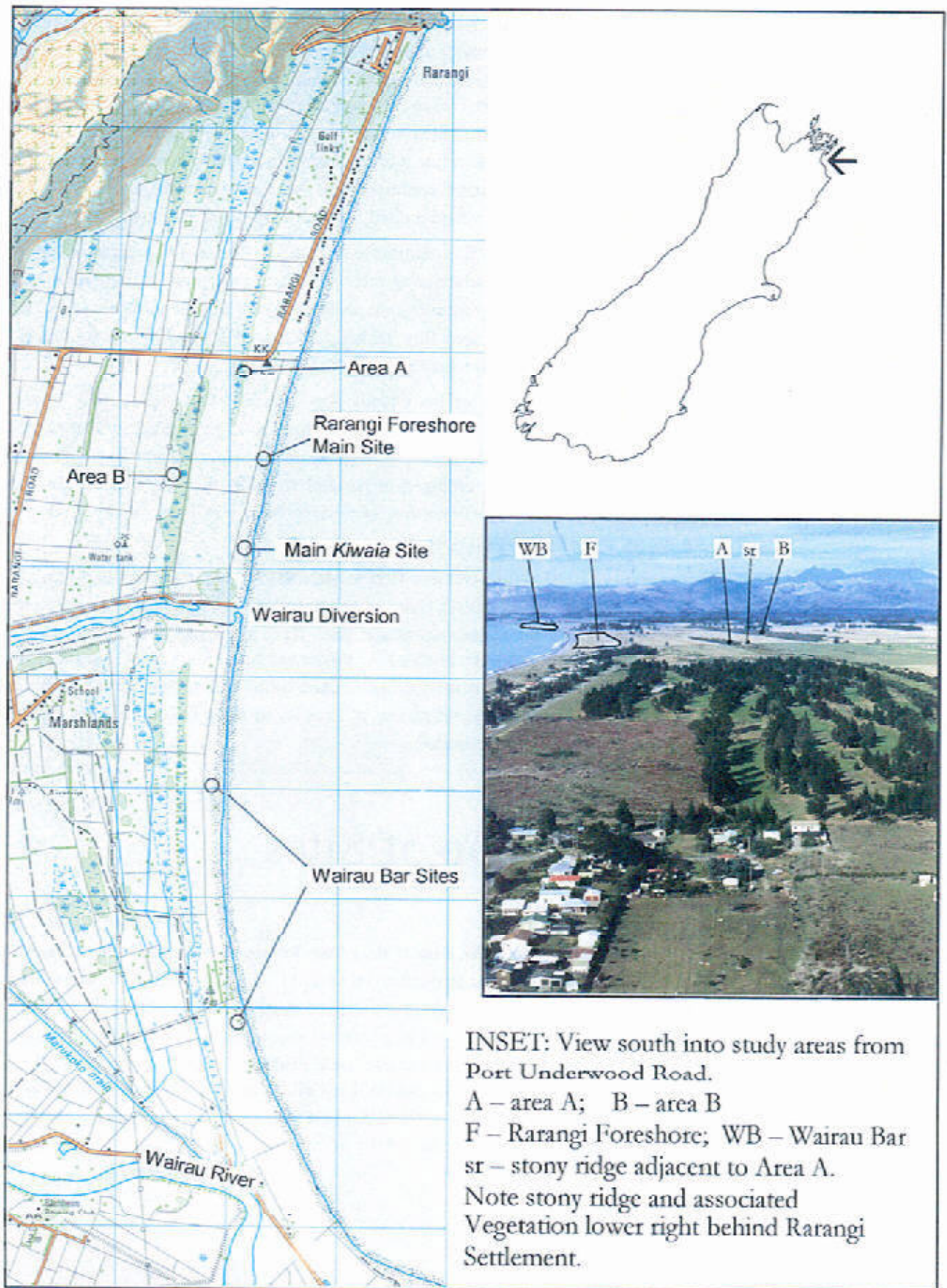
There are many features of the Cloudy Bay coastline that superficially resemble Kaitorete Spit (Birdlings Flat) immediately south of Banks Peninsula. Similarly exposed to the east, similarly with a steeply dipping pebbly storm beach and with similar vegetation growth forms arranged in parallel strips marking successive shorelines (Patrick 1994), it would be interesting to compare the Lepidoptera fauna of each. Such a comparison will be reported on later.

The survey extended from October 1998 to March 1999, and involved monthly visits by myself and Ian R. Millar (DOC, Nelson), and fortnightly (roughly) servicing of pit traps in two areas and a malaise trap at one site. Trap servicing was organised by Jan Clayton-Greene, and done by Messrs John Baxter and Bill Warner (DOC Renwick), to all of whom Ian Millar and I are most grateful. Land-owner consent for work at Areas A and B, and in one instance, participation, at Area A, in night collecting, was smoothly organised by Jan Clayton-Greene.

Description of Sites

The Cloudy Bay area is the coastal strip from Rarangi settlement at the north to the mouth of the Wairau River at Wairau Bar (Fig. 1). It can be thought of as a series of parallel strips. From the sea, there is a strip of storm beach; beyond spring highwater (HWS), there is a rather disturbed area (storms) which (north of the Wairau diversion) is bounded inland by an off-road vehicle track. Inland of this is a relatively flat and undisturbed (but weedy) strip bounded by an "inland" vehicle track and by the boundary fence which largely follows the first major old shoreline. Collectively, we called this the "Rarangi Foreshore"

FIG. 1: STUDY AREAS



It includes two beach lines, the youngest (current) beach, and the next youngest at about the boundary fence. It excludes the older beach lines west of the fence line, which are all now in private ownership. These successively older beach fronts are distinguished as parallel ridges of coarse shingle, supporting a distinctive, linear community of deep-rooted endemic shrubs (*Coprosma*, *Discaria*, *Melicytus* [*Hymenanthera*]) and the scrambling liane, *Muehlenbeckia complexa*. There are also lenses of exposed coarse shingle, most of which are coated with crustose lichens. Between the third and fourth parallel ridge, and about 150m W of Trig KK (grid reference: P28 963 759) there is a strip bog/wetland with a low forest of cabbage trees, manuka and tall *Coprosma* on it, which supports a flourishing community of mistletoe. A very long and extensive wet shrubland is present between the fifth and sixth parallel ridges, with permanent water, extensive flax fields and currently dominated by barberry and willow. There are vigorous borders of cabbage trees, *Coprosma*, *Pittosporum*, *Muehlenbeckia* (two species) but mistletoes are absent. On the sixth parallel ridge there is a vigorous shrubbery of *Discaria*, *Coprosma*, *Leptospermum*, *Melicytus*, and *Muehlenbeckia complexa*.

Area A (Figs 1, 2): Immediately W of Trig KK, this is a N-S line of tall shrubland enclosing a wetland. The interior is dark and the floor is largely unvegetated under the tallest/densest trees. The trees are cabbage tree, manuka and some kanuka, *Pittosporum tenuifolium*, with *Coprosma crassifolium* forming a relatively hedged margin, supporting a large community of the mistletoe *Ileostylus micranthus* and the climber *Muehlenbeckia complexa* (Fig. 2A). In the wetter areas that have been opened up, there are *Carex* spp., *Juncus* spp., and occasional patches of a large-leaved *Hydrocotyle* (Apiaceae). There is little barberry. To the east, the ground is covered in introduced pasture grasses and weeds, with scattered prostrate wild irishman (*Discaria toumatou* var. "prostrate") and *Melicytus* (*Hymenanthera*) *alpinus* s.s.). To the west, a shingle ridge some 50m away from the forested belt, across poor adventive pasture and *Racomitrium* moss, has bare shingle with lichens, *Coprosma crassifolium*, *Melicytus alpinus* s.s., *Muehlenbeckia complexa* and occasional briar rose (Fig. 2B). Some of this area was burnt on 13-14 February, 1999. Only limited sampling was undertaken on the shingle ridge. The major feature of Area A is the presence of extremely vigorous and abundant mistletoe (*Ileostylus macranthus*). No native nettle was seen (cf. Area B).

Site of light trap collecting, and daytime sweeping and larval collections. Grid reference: P28 961 759.

Area B (Figs. 1, 3): The longer and wider wetland forest line, and more specifically the wetland forest/shrubland N of the newly created road/causeway that bisects the original belt. This area encloses a deep flax (*Phormium*) swamp, fringed by cabbage trees, *Pittosporum*, *Muehlenbeckia* and adventive barberry, willow (abundant) and scattered large *Pinus radiata*. The exotic liane, old man's beard, is extremely common. Around the malaise trap/pitfall trap site on the western side of this belt, and about 200m N of the new roadway, there are cabbage trees, willows, tall manuka, a large old man's beard vine, and hedged *Pittosporum*, *Coprosma crassifolia* and *Muehlenbeckia complexa*, with, in Spring, a luxuriant stand of the rare swamp nettle, *Urtica linearifolia*. The whole site is in a moist hollow, bordered by a shrubland emergent from introduced grasses, of *Melicytus alpinus* s.s., erect *Discaria toumatou*, *Coprosma crassifolia*, briar rose, bramble, and the occasional barberry, marking one of the parallel shingle ridges. The path to the site traverses four more or less bare shingle areas. In Spring, the grassland area is covered in "wildflower" flowers.

FIG. 2: AREA A AND ADJACENT HABITATS



Fig. 2A: View of Area A from Rarangi Road.

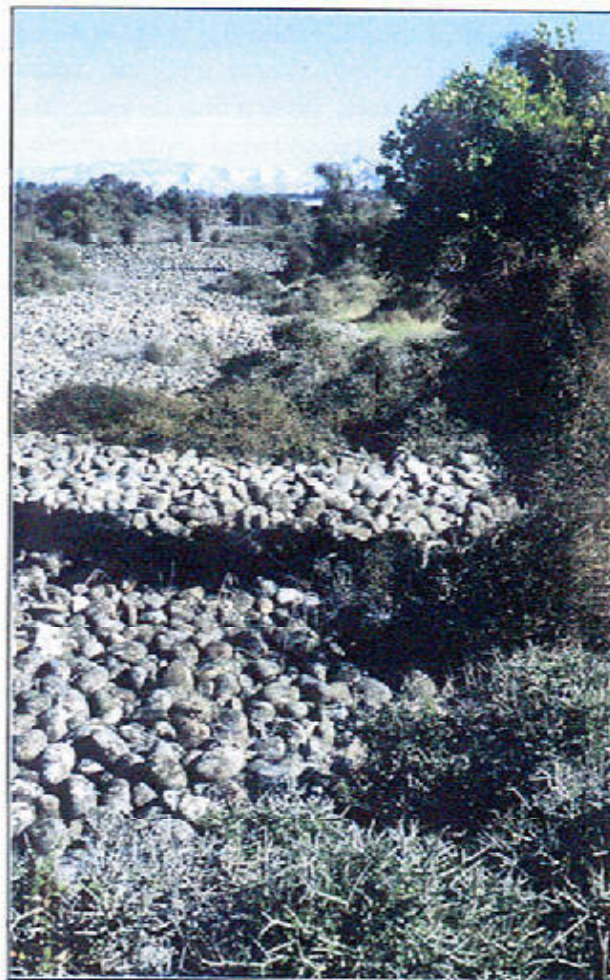


Fig. 2B: Shingle ridge west of Area A. Note crustose lichens on shingle and mistletoes (*Heastylus macranthus*) in shrubs.

FIG. 3: AREA B



Fig. 3A: Ridge and lullow vegetation at Area B, adjacent to wetland.



Fig. 3B: Willow-dominated wetland, south of Area B. The causeway through this wetland was made of shingle recovered from quarrying on adjacent shingle ridge.

Site of malaise trap and five pitfall traps; also extensive larval collecting. Grid reference: P28 955 749.

Rarangi Foreshore (S of Trig KK, N of Wairau Diversion; Figs 1, 4). Highly modified short grassland/low (mat or mound) shrubland, with considerable areas of exposed sand and shingle, and considerable pine-tree debris (trunks, branches). Most of the area is now largely colonised by exotic weeds, such as evening primrose, viper's bugloss (blue borage), burrs of one sort and another, marram, coastal poppy, Californian poppy, all colourful in late Spring/early summer. Indigenous plants include *Calystegia soldanella*, *Pimelea urvilleana*, *Austrofestuca littoralis*, *Raoulia* sp. "hookeri coast", spinifex, two plants of *Ozothamnus leptophylla* (tauhinu) and scattered mats and low mounds of prostrate wild irishman (*Discaria toumatou* var. "prostrate"), *Melicytus alpinus*, and *Muehlenbeckia complexa*. In some shingly areas and close to the beach the prostrate, diffusely and loosely matted, virtually leafless *Muehlenbeckia ephedroides*, though often overlooked, is abundant. Further in from the beach, there are large areas of *Rhytidosperra racemosum* often associated with a thin moss layer, and emergent rounded stones. Nearer the western (inland) boundary there are more rush communities. Older exposed shingle is covered with one or more crustose lichen species. There were numerous signs of disturbance to the plant communities along both the inland (western) and the beachside (eastern) vehicle pathways, with piles of garden debris and vehicle tracks to the beach not uncommon. Trackside *Pimelea* showed signs of damage, with some dead plants.

Site of pitfall traps (4), monthly sweeping and intensive searching on mat plants. Grid reference: P28 963 750; for scabweed jumper colony [19 March]: P28 962 743 (approx.).

Wairau Bar Foreshore (S of Wairau Diversion): Highly modified along the same lines as north of the Diversion, but with a sandier substrate. The area concentrated on was the community of tauhinu about 3-4km south of the Wairau Diversion mouth. North of this area was visited twice; the main differences with Rarangi foreshore area are the occasional area of exposed coarse pebbles covered in a brown crustose lichen, with fringing communities of a surprisingly lush lucerne-like medick, the preponderance of sandy substrates and exotic grasses. Otherwise, there was less *Pimelea*, but abundant *M. ephedroides*. In both areas, a *Racomitrium* moss covered the ground extensively. There was very little sign of damage by 4WD (recreational) vehicles or trail bikes.

The area was visited largely to see what is associated with the tauhinu. Grid reference [tauhinu]: P28 962 699, approx.; [old shingle beds]: P28 959 720.

Sampling Methods and Times

SAMPLING METHODS

A combination of light trapping, using both ultra-violet (over a container of water with a few drops of detergent) and a blended light (hand collecting of insects attracted to the light, on a white sheet), sweeping with a net both during the day and at night, and hand collecting (for larvae, and for many foreshore insects).

FIG. 4: RARANGI FORESHORE



Fig. 4A: View of foreshore area looking north. Rarangi beach settlement in distance.



Fig. 4B: *Pimelea urvilleana*, host plant for *Ericodesma* sp. cf. *aerodama* and *Notoreas* sp. "Cape Campbell". The stones, with light lichen encrustation, provide habitat for the stone moth *Dichromodes* sp.

Fig. 4C: Mat daisy pads of an undescribed species of *Raoulia*. These appear to be the major habitat for the Cloudy Bay mat daisy jumper, *Kiwaitia* sp.



Light trapping, sweeping and hand collecting were carried out once a month from October to March (see below) at Areas A, B, foreshore and Wairau Bar, by I.R. Millar and J.S. Dugdale.

Area B and the foreshore at P28 963750 ("black stump") were continuously sampled by set pitfall traps, five at Area B, four at the foreshore site; these proved invaluable. At Area B, a malaise trap was erected, and serviced, along with the pitfall traps about every two weeks by Renwick staff, Messrs John Baxter and Bill Warner. In December, we had difficulties with the Malaise trap, but only Lepidoptera were lost (rotted) and two samples were of low quality. Otherwise, all the material collected was in good condition. Isopropyl alcohol was used in the malaise trap, and Galt's preservative in the pitfall traps.

DEPOSITION OF SPECIMENS

Specimens were compared with material at NZAC; a sample collection has been prepared for DOC Renwick, and the rest will be lodged with NZAC at Mt Albert, Auckland, currently under the aegis of Manaaki Whenua-Landcare Research N.Z. Ltd.

TIMES

1. **Light trap and General collecting:** 1998: 20/21 September (JSD, IRM, reconnaissance); 13/14 October (JSD, IRM, JC-G, JB, WW, set-up); [4/5 November visit by BH Patrick & Hamish Patrick]; 11/12 November (JSD, IRM); 8/9 December (JSD, JB); 1999: 14/15 January (JSD, IRM); 8/9 February (JSD), 25/26 February (JSD, RJB Hoare); 18/19 March (JSD, IRM). Light-trapping (area A, Rarangi foreshore) was done on the first night of each visit, using blended light at Area A and UV light (black-light) at Rarangi foreshore (except in November, where the light trapping was reversed).
2. **Malaise and Pitfall trapping:** (I) 13 Oct - 27 Oct; (II) 27 Oct - 11 Nov; (III) 11 - 27 November; (IV) 27 Nov - 8 Dec; (V) 8 - 27 Dec; (VI) 27 Dec 1999 - 14 Jan 1999; (VIIa) 14 Jan - 22 Jan [MT sample rotted]; (VIIb) 22 Jan - 1 Feb; (VIII) 1 Feb - 15 Feb; (IX) 15 Feb - 1 March; (X) 1 - 18 March 1999. Mostly serviced by John Baxter and Bill Warner, DOC, Renwick.
3. **B & H Patrick's visit, 4/5 November, 1998:** Brian and Hamish Patrick visited the Rarangi foreshore south of Trig KK over 4-5 November, 1998, and collected both day and night. They recorded 34 spp of Lepidoptera, including five spp of scopariine Crambidae. They recorded an elachistid from rushes, larvae of *Zermizinga indocilisaria* (Geometridae) from *Pimelea* flowers, *Homohadena fortis* (Noctuidae) [larvae of which I had previously found on *Melicytus alpinus*]. They noted that "natural values increase towards the south", i.e. towards the Wairau Diversion mouth.

Results

1. LOCAL ENDEMIC SPECIES OR POPULATIONS

All species thought to be endemic, or with populations different in structure or colour pattern from others, are found only on the foreshore. They are:

1.1 *Antipodalycaena** *boldenarum* (White), Lepidoptera: Lycaenidae. [Boulder Copper, Boulder Butterfly] (Figs 5A, 5B)

[*This name may supersede *Boldenia* (B.H. & H. Patrick, *in litt.*)]

The Boulder Copper is generally associated with inland and upland riverbeds and shingle or rubble areas where its major host, *Muehlenbeckia axillaris* grows. Gibbs (1980: 155- 160) gives a most useful account of its biology and distribution (as '*Lycaena*' *boldenarum*), and notes that another host is *Rumex flexuosus*, and that in captivity the caterpillar "can be induced to feed on the other" [unspecified] "species of *Muehlenbeckia*." (Gibbs 1980:159). While its South Island distribution is less restricted than in the North (Gibbs 1980:155, fig. 53), it has not been reported coastally in Cloudy Bay before. At Kaitorete Spit, Patrick (1994: 56) records the Boulder Copper as "very common", and under "Ecology, Biology" he states: "widespread, larvae on *Muehlenbeckia axillaris*". There is no *M. axillaris* on the foreshore of Cloudy Bay (and probably not at Kaitorete Spit), but at both localities there are extensive communities of *M. ephedroides* with which the adult butterflies are now known (at Cloudy Bay) to be associated. Referring to populations on *M. axillaris*, Gibbs (1980:157) states that the butterfly does not fly far from the larval foodplant, "usually no more than about 10 metres"; this was found to be the case also at Cloudy Bay.

The Cloudy Bay population, and probably that at Kaitorete Spit as well, is associated with the extensive communities of *M. ephedroides*, in the absence of *M. axillaris*. A collection in October yielded at least one caterpillar and one hatched egg., and last instar larvae were found on November 12 at the Wairau Bar, about 2km S of the Wairau Diversion (GR P28 960722). In the laboratory, one larva pupated just under the surface of the deep layer of grit in the bottom of the container. Larval and pupal colour patterns agree well with the illustrations in Gibbs (1980). While many adults were seen over October 13/14, few were seen in November, December and January; none were seen in February.

It should be noted that Brian Patrick considers this population to represent a distinctive entity within the genus *Antipodalycaena*, at present being revised by Brian and Dr Robin Craw, Otago Museum.

1.2 *Dichromodes* sp. cf. *sphaeriata* Felder & Rogenhofer, Lepidoptera: Geometridae [Stone Moth] (Fig. 5C)

This entity was totally unexpected as members of *Dichromodes* in New Zealand are only known to be associated with rock faces, bluffs, tors and rock fields where the larvae browse crustose lichens. Until the discovery of the Cloudy Bay population, stable, lichen-encrusted shingle fields were not considered as a possible *Dichromodes* habitat by collectors. One adult was collected in a pit trap in December, but most adults were collected in late February. Only three females were collected, all fully winged.

FIG. 5: SOME LEPIDOPTERA OF THE
FORESHORE



Fig. 5A: *Antipodalycaena holdenarum* (White), the boulder copper, male on left

Fig. 5B: Caterpillar of *Antipodalycaena holdenarum* on *Muehlenbeckia ephedroides*



Fig. 5C: *Dichromodes* sp. cf. *sphaeriata* Felder and Rogenhofer, etruscan moth (scale in mm)

Fig. 5D: *Ericodesma* sp. cf. *aerosana* (Meyrick), the pinelea leafroller (scale in mm). Note lack of orange scales on forewings.



Only two individuals were collected in the daytime, with all other specimens attracted to UV light.

The Cloudy Bay population differs from all known *D. sphaeriata* populations (the only other entity with elongated labial palpi) in its peppering of whitish scales on the dark stone-grey forewings, and consistently smaller size; all others have these scales yellow. At present because of these differences, and the “unusual” habitat, this population is regarded as a Cloudy Bay endemic.

1.3 *Ericodesma* sp. cf. *aerodana* (Meyrick), Lepidoptera: Tortricidae [*Pimelea leafroller*] (Fig. 5D)

This small grey moth is a member of a group that are specialists on [restricted to] *Pimelea* species in coastal, lowland to upland open [non-forest] situations in the North Island, and coastal *Pimelea* communities in the South Island. All species and species groups in this genus are specialists on certain plants, with species restricted to *Gleichenia dicarpa* (2), *Dracophyllum* spp. (3), *Leucopogon fasciculatus* (1), *Corokia cotoneaster* (1), and *Pimelea* spp. (1). The taxonomic status of the Cloudy Bay and Kaitorete spit foreshore populations vis-a-vis those in North Island coastal and inland (frostflat) sites is uncertain but they can be distinguished from the North island species by their lack, on the forewing, of the orange scales that characterize *E. aerodana*.

In the South Island this species is known from Kaitorete Spit (Birdlings Flat), Canterbury Conservancy (as *Ericodesma aerodana* (Meyrick), Patrick 1994: 55). Its presence on *Pimelea* communities at Farewell Spit is unknown; larvae collected at Punakaiki off *Pimelea prostrata* growing on coastal cliffs yielded only the distantly related *Merophyas leucaniana* (Walker).

It is absent from the Chatham Islands, despite the presence there of large communities of *Pimelea arenaria*, and of two other *Ericodesma* species on the bog-fern *Gleichenia dicarpa* and *Dracophyllum arboreum*, respectively.

Larvae web two shoots together, or web a series of leaves on a stem. Damage is easily seen in September, when middle-to-fully grown larvae, pupae and some adults can be found. Adults disturbed from the *Pimelea* mat will struggle back to the plant against the wind.

The fortunes of the population on Cloudy Bay foreshore are ineluctably fused with those of its hostplant, *Pimelea urvilleana*. Existence of other populations of herbivore and host on shingle beaches in Marlborough south of Cloudy Bay cannot be discounted.

1.4 *Gadira leucophthalma* (Meyrick), Lepidoptera: Crambidae [Beaked moss moth] (Fig. 6A)

This little-known species with very long labial palpi is highly variable for colour pattern and size in both sexes at Cloudy Bay. Adults were most abundantly encountered in the areas of bristle-grass plus moss carpet, inland of the coastal vehicle track. Females were variable for relative wing length, with some showing slight brachyptery. This species appears confined to the current beach terrace, as it was not encountered at the more inland sites, Areas A and B. A few individuals were collected to UV light, but most were seen readily flying by day. Larvae are thought to be moss feeders; areas where we encountered this species had extensive moss carpets or these were nearby.

As this highly distinctive species is little known (other localities are on the slopes of the Seaward Kaikoura Range, and on Banks Peninsula) and the degree of size and colour pattern variation is so great, the Cloudy Bay population is worth maintaining.

**1.5 *Kiwaia* sp. cf. *jeanae* Philpott, Lepidoptera: Gelechiidae
[Cloudy Bay mat daisy jumper] (Fig. 6B)**

This flightless, blue-grey, jumping moth is similar in size (ca 3mm body length + wings), colour pattern and time of emergence to *Kiwaia jeanae*, but differs in the male having short dark grey scales dorsally on the hindwing and a short buff fringe, not the buff scales and long buff fringe that distinguish *K. jeanae*. It differs from *K. glaucoterma* in having short hindwings, and long, saltatorial (jumping) hindlegs. Adults, though flightless, can achieve leaps to a height of about 4cm., and are concolorous with the coarse grit surrounding the mats. Like *K. jeanae*, this species is found on mat daisy pads (*Raoulia* sp.) within 100m of HWS and is so far known only from the Rarangi foreshore north of the Wairau Diversion. For both species, the larval biology is unknown. Both species are distinctive in being brachypterous in both sexes, and are two out of the five New Zealand species (three in *Kiwaia*) now known to have this condition (cf. Battler 1991: 269). Only *K. jeanae* has been formally described.

Presence of a flightless, autumn-emerging gelechiid was thought likely, given the presence of mat daisy and the resemblance of the locality to Kaitorete Spit. The species was first found in late February at the more northern site, (1km SE of trig KK) and on March 19, six were seen around disturbed pads at the more southern site about 1km N of the Wairau Diversion; in early April, Ian Millar saw one at the northern-most site, and 10 at the more southern site in early April, out of 10 search areas each approximately 100m long. All specimens seen were associated with pads that were damaged in some way, or were growing in open ground disturbed by vehicles. No adults were found on the large mat daisy communities on exposed shingle/sand lenses on undisturbed ground between the coastal and inland vehicle tracks, despite intensive searching by JSD, IRM, and the discoverer of the first specimen, R.J.B. Hoare (New Zealand Arthropod Collection, Landcare Research NZ Ltd).

**1.6 *Notoreas* sp. "Cape Campbell", Lepidoptera: Geometridae
[*Pimelea* jumper] (Figs 6C, 6D)**

Notoreas has over 24 species, of which only 17 are described. All are known to feed on Thymeleaceae, with some on *Pimelea* and others (mostly alpine) on *Kelleria*. There is a large and mostly undescribed group of species on coastal *Pimelea* species allied to *P. prostrata* (Patrick 1998).

This brightly coloured, diurnal, butterfly-like moth is a member of that group; the Cloudy Bay population appears to be of the same species as that at Cape Campbell and, formerly, Gore Bay (Patrick and Dugdale, 2000).

Adults - mostly females - were seen in September 17, most were seen in October, and a few were seen during visits over November to March. Larvae were first found in November, with most larvae less than 10mm long. A few last instar larvae were caught in pitfall traps beside *Pimelea* mats. Only one male was caught, and that in October. One female caught in September, and another caught in November have a wider white outer discal band than usual on the forewing.

FIG. 6: SOME LEPIDOPTERA OF THE
FORESHORE



Fig. 6A: *Gadira leucophthalma*, the beaked moss moth.

Fig. 6B (right): *Kiwata* sp., the mat daisy jumper. Body length c. 5mm. Note the short, fringed hind wings, still folded on the abdomen.



Fig. 6C (above): Caterpillar of *Notoreas* sp.

Fig. 6D: *Notoreas* sp. "Cape Campbell", the pinelea looper. Male (top left) and 2 females (scale in mm).



Larvae are found by turning back the plant mat or parting and raising the branches; the larvae are exposed on the mat of dead leaves. They are patterned like the stems of the host plant. According to Brian Patrick, larvae start life by mining leaves while still in bud.

This group is being revised by B.H. Patrick and Dr R.C. Craw at Otago Museum. Until its status is clarified, and its relationship to the population at Cape Campbell (B.H. & H. Patrick, *in litt.*) elucidated, the Cloudy Bay population is best regarded as a possible endemic. As with *Ericodesma*, the pimelea looper's future is totally dependent on that of its host.

1.7 *Orocrambus callirrhous* (Meyrick), Lepidoptera: Crambidae [Hard tussock grassmoth] (Fig. 7A)

Many *Orocrambus* species as larvae feed on grasses, and *O. callirrhous* has been reared from hard tussock, *Festuca novae-zelandiae* near Cass, MC (White 1963). At Cloudy Bay *O. callirrhous* adults were only encountered around the few groups of sand tussock (*Austrofestuca littoralis*) towards the northern part of the foreshore. This moth is known from coastal Whangarei and Wellington and from eastern South Island (Gaskin 1975) south to Shag Point (Gaskin 1987). There is no information on the current state of the Whangarei population(s), and the Wellington populations are probably dependent of the fate of the hard/sand tussock hosts. *Austrofestuca* colonies in the Waitemata Harbour AK have not yielded this moth. *O. callirrhous* at Cloudy Bay is uncommon and was collected very late in the season, in March. Because of its reliance on hard/sand tussock species, it is threatened at this site. The presence of any nearby colonies has yet to be demonstrated; if there are other foodplant communities in the area, they are likely to be hard tussock on farmland and imperilled by pasture improvement.

2. OTHER TAXA, OTHER ORDERS

2.1 *Anabarhynchus* spp., Diptera: Therevidae, stiletto flies (Fig. 7C)

This genus of flies with predatory soil/sand-inhabiting wire-like, white, active larvae is of great interest because of the number of species represented in the foreshore area here. Currently, seven species have been collected, viz:

- *Anabarhynchus arenaria* Lyneborg, 1992: On sandy areas; abdomen conspicuously shining white tomentose, thorax grey, eyes in male very narrowly separated (nearly holoptic); present from November. Widely distributed on sandy beaches throughout NZ.
- *Anabarhynchus completus* Lyneborg, 1992 This grey stiletto fly is present on sandy areas of the foredune north and south of the Wairau Diversion. It was previously known from Puketa Beach KA. The Cloudy Bay population agrees exactly with Lyneborg's published description, and can be distinguished from the equally grey *A. arenaria* by the male eyes being widely separated. More abundant in October than in November.

FIG. 7: SOME MOTHS AND A STILETTO FLY



Fig. 7A: *Orozrambus callierhous* (Meyrick), the hard tussock and sand tussock grass moth (scale in mm).



Fig. 7B: *Marova subfasciata* Walker, a stem-galler, here on *Muehlenbeckia complexa*.



Fig. 7C: *Anaburthynchus arcuatus* Lynceborg, a stiletto fly.

- *Anabarhynchus ?fluviatilis* Lyneborg, 1992: Two male specimens on sand in the foreshore area (identified by Richard Toft, Landcare). There are slight differences from Lyneborg's description, but the male genitalia are as described. Lyneborg described the species from only two specimens, from Kowhai River, Kaikoura.
- *Anabarhynchus limbatinervis* Kröber 1932: One male in a pitfall trap on the Rarangi foreshore; the clouded, streaky wings are distinctive. Widely distributed in open areas throughout NZ.
- *Anabarhynchus longipennis* Kröber, 1932: One specimen from malaise trap, Area B (identified by Richard Toft, Landcare).
- *Anabarhynchus ?macfarlanei* Lyneborg, 1992: Swept off tauhinu on Wairau Bar. Known only from the type. A brown, smallish species.
- *Anabarhynchus spiniger* Lyneborg, 1992: a very distinctive species so far only known in the area from a stable stone-field on Wairau bar about 2km S of Wairau Diversion. The stones were lichen-covered, and though surrounded by vegetation, the stone-field was bare. This species is widely distributed, in localities with stable stone or rockfields.

A female of one other species was caught in the malaise trap at Area B but I could not identify it; on Lyneborg's (1992) key, it is closest to *A. farinosus* Lyneborg from Southland.

2.2 *Brounopsis hudsoni* Blair, Coleoptera: Cerambycidae [tauhinu longhorn beetle]

This live-stem boring longhorn species is the only described member of a small genus of basically allopatric species that are all restricted to *Ozothamnus* (*Cassinia*), and found only in the South Island. Adults, about 15mm long, are entirely black, or black with yellow-brown stripes. The yellowish *Brounopsis* larva rarely if ever cuts through the branch it is feeding in, unlike larvae of related genera (eg. *Gastrosarus*), which cut through the branch which then either breaks off or bears wilting or dead foliage and breaks off easily. Current attack by *Brounopsis* on *Ozothamnus* is difficult to detect, although because of the reduced translocatory tissue, foliage on the affected branches may be sparser than on unaffected branches. Emergence holes in the stem indicate previous attack.

Brounopsis hudsoni is the eastern South Island species on tauhinu (or tawhinny), and is already known from Dashwood Pass (MB) (a large series in NZAC collected by E.S. Gourlay). The type locality for the species is Lawrence (DN/CO).

Cloudy Bay is the northern-most eastern record for this species, and the first coastal record. While there is substantial old (vacated) damage, current damage was hard to find (October 14, November 11). Parasitism by *Xanthopimpla albopicta* (Hymenoptera: Ichneumonidae) was found (November 12), and this species was abundant in malaise trap samples from the wet shrubland Area B, where the probable host was *Oemona hirta* (so-called lemon tree borer).

2.3 *Mecodema oblongum* (Broun), and *Megadromus compressus* Broun, Coleoptera: Carabidae. Predatory groundbeetles (Figs 8A, 8B)

One specimen each of these large (>15mm body length) species, otherwise known from forested areas in the hills around Picton, were collected, *M. oblongum* in a pitfall trap on the Rarangi foreshore, 4km (at least) south from any forested or hilly area, and *M. compressus* at Area B. For *M. oblongum*, presence of this species is regarded as an unusual event, but for *M. compressus*, presence may be relictual. We are indebted to J.I. Townsend for confirming the identities.

2.4 *Mimopeus* sp., cf *clarkei* Watt, *M. neglectus* Watt, Coleoptera: Tenebrionidae. Darkling beetles (Fig. 8C)

While a small coastal species of *Mimopeus* on the foreshore (*M. neglectus* Watt, 1989) was expected, the presence of a large species in the wet shrublands was a surprise. Three specimens were caught in pitfall traps in Area B. The identity of this large (17mm body length), somewhat rugose dark grey darkling beetle has not yet been established, but it resembles *M. clarkei* in Watt's (1992) key and specimens in the New Zealand Arthropod Collection, Mt Albert, Auckland. The genus *Mimopeus* is flightless, and the presence of this large species at Area B indicates that at least tall shrubland has been there for a considerable time. Unlike the majority of the shrubs or trees, it could not have been spread by birds, but could have been deposited nearby by floods that would bring debris and beetles from Boundary Stream, the only Wairau Valley locality it was known from (Watt 1989). Its distribution northwards to the more extensive wet shrubland and the forest at the foot of the hills is unknown.

Discussion

Brian Patrick (*in litt.*) noted that the Cloudy Bay area was rather rich, as he and his son had collected 34 species of Lepidoptera. In all the whole survey yielded 167 Lepidoptera species, representing 18 families. This compares with Kaitorete Spit, which yielded 130 species, with a much larger representation of Oecophoridae and Psychidae in the shrubland at Kaitorete, as well as presence of species restricted to *Carmichaelia* (absent from Cloudy Bay). Of the 167, two are vagrants, 20 are adventive or introduced species, and 145 are endemic (133) or indigenous (12) to New Zealand, with two local endemic species. Kaitorete Spit is comparable (130 total, two vagrant, three adventive, 126 indigenous/endemic to New Zealand including six local endemic species; Patrick, 1994). The larger number of local endemics at Kaitorete Spit is in part influenced by either hostplants absent from Cloudy Bay or more extensive shrublands with more complex niches for such groups as Oecophoridae and Psychidae, two families prone to local endemism.

The foreshore and the wet shrubland (separated by about 500m of adventive dry grassland) have approximately 26 species in common; the foreshore has about 33 species restricted to it, and the two wet shrublands have about 106 species not found living on the foreshore. However, on calm warm nights, adults of fully flighted species were everywhere, indicating that many shrubland species and some foreshore species have a high level of dispersability. This is also seen in their distribution within New Zealand (in some instances including Australia, e.g., *Chloroclystis filata*, *Helicoverpa armigera*).

While the major surprise was the discovery of seven very restricted, host or niche-specific species on the foreshore (listed and discussed above), there were other surprises, as follows:

- the presence of a large flightless darkling beetle in the wet shrublands;
- a large ground beetle in the foreshore sand/shingle, and another in the wet shrubland;
- all three species of copper butterflies on *Muehlenbeckia complexa*;
- New Zealand's only thyridid moth, with galls abundant on *M. complexa*; males are dark orange and fly in hot sunshine, females come to light (Fig. 7B);
- presence of species in the "wet shrubland" usually considered to be characteristic of forest (e.g. *Lycaena feredayi*, the glade copper; *Amphipsalta zelandica*, the long-winged clapping, or chorussing, cicada).

While the number of local endemics (2) is low compared with Kaitorete Spit, they are nevertheless important as one (the Cloudy Bay jumper) indicates that the group it belongs to may have been widely spread along the South Island eastern coast, and the other exploits a niche previously not known for its genus (the Cloudy Bay stone moth).

The presence of several species elsewhere characteristic of forest cover in the wet shrublands is also noteworthy and may represent relicts able to "hang on" in the presence of suitable, even if currently mostly exotic cover. Area A is remarkable in the presence there of a mistletoe, *Ileostylus*, and the microlepidoptera species restricted to it. All in all, even though all the Lepidoptera associated with the two shrublands are found elsewhere, firstly there are faunal differences between the two, and secondly their faunal make-up may be of significance to the study of quaternary events.

FIG. 8: SOME BEETLES FROM THE STUDY



Fig. 8A: *Mecodema oblongum* (Brown).



Fig. 8B: *Megadromus compressus* (Brown).

Fig. 8C: *Mimopens* sp. cf. *clarkei* Watt.



Note:

All scales in mm.

Extrusion of organs from the posterior end is an artefact of collection in Galts preservative.

Recommendations

From what Ian Millar and I have found, I recommend the following:

1. That current levels of vehicle use along the two foreshore tracks can be maintained, but that off-track driving be discouraged, both between tracks and from the seaward track and the beach (for *Kiwaia*, *Notoreas* + *Ericodesma*, *Dichromodes*, *Gudira*).
2. That lichen encrusted shingle-bed disturbance be discouraged (for *Dichromodes*)
3. that at least one vigorous shingle ridge community with *Coprosma*, *discaria*, *Loranthus*, *Melicytus*, and *Muehlenbeckia* be conserved along with an associated wet shrubland -low forest (for specialist Lepidoptera at these sites and on those hostplants).
4. That monitoring of populations of Cloudy Bay mat-daisy jumper be undertaken, as this is possibly the most restricted Lepidoptera species in New Zealand.
5. That monitoring the health of the *Pimelea urvilleana* population be done to gauge the health of *Notoreas* + *Ericodesma*. as this plant does not seem to withstand traffic, and it is the only host of the distinctive populations of these two moths in the area.

References

- Gaskin, D.E. 1975: Revision of the New Zealand Crambini (Lepidoptera: Pyralidae: Crambinae). *New Zealand Journal of Zoology* 2(3):265 - 363.
- Gaskin, D.E. 1987: Supplement to New Zealand Crambinae (Lepidoptera: Pyralidae) — corrections, descriptions of females of two species, and notes on structure, biology, and distribution. *New Zealand Journal of Zoology* 14 (1): 113-121.
- Gibbs, G.W. 1980: New Zealand butterflies: identification and natural history. William Collins, Auckland. 207p., 144 pl, 63 fig.
- Patrick, B.H. 1994: Lepidoptera of Kaitorete Spit, Canterbury. *New Zealand entomologist* 17: 52-63
- Patrick, B.H. 1998: Coastal moths: in place of butterflies. *New Zealand Forest and Bird* No. 289 (August 1998): 24-27.
- Sattler, K. 1991: A review of wing reduction in Lepidoptera. *Bulletin of the British Museum of Natural History (Entomology)* 60(2): 243-288.
- Patrick, B.H., Dugdale, J.S. 2000: Conservation status of New Zealand Lepidoptera. *Science for Conservation* 136. 34p. Department of Conservation, Wellington.
- Watt, J.C. 1989: A revision of the genus *Mimopeus* (Tenebrionidae): pt II. *Records of the Auckland Institute and Museum* 26: 39 - 81.
- Watt, J.C. 1992: Tenebrionidae (Insecta: Coleoptera): catalogue of types and keys to taxa. *Fauna of New Zealand* Number 26, 64pp.
- White, E.G. 1963: A survey and investigation of the insect fauna associated with some tussock grasslands. Unpublished M.Sc. thesis, Lincoln College [now University] Library.

Appendix

LIST OF LEPIDOPTERA SPP, CLOUDY BAY, OCT 1998 - MARCH 1999

Arctiidae (1):

Nyctemera annulata (Boisduval). Adventive/indigenous
Senecioinae (Asteraceae). Foreshore

Batrachedridae (2):

Batrachedra agaura Meyrick. Scale insect predator. Shrubland B.

Batrachedra litterata Philpott. Probably dying plant parts. Foreshore

Carposinidae (2):

Heterocrossa rubophaga Dugdale. Blackberry, lawyer. Shrubland A,B

Heterocrossa sp.? Shrubland B

Choreutidae (1):

Tebenna micalis (Mann). *Raoulia* and adventive Asteraceae. Foreshore

Cosmopterigidae (1):

Pyroderces apparitella (Walker). Dead branches/twigs. Shrubland A, B

Crambidae (28):

Achyra affinitalis (Lederer). Field Fabaceae; (also reported elsewhere on thistles). All sites

Deana hybreasalis (Walker). Ranunculaceae; here *Clematis vitalba*. Shrubland B

Eudonia chalara (Meyrick). ?Mosses. BHP

Eudonia cymatias (Meyrick). Mosses. All sites

Eudonia dinodes (Meyrick). Mosses, on ?trunks. Shrubland A, B

Eudonia leptalaea (Meyrick). Mosses, low tussocks. All sites

Eudonia octophora (Meyrick). Swards; here, in rush areas. BHP Foreshore

Eudonia philerga (Meyrick). Mosses. Shrublands A, B

Eudonia sabulosella (Walker). Pasture sward. All sites

Eudonia sp. cf. *submarginalis* (Walker). ?Swards Shrubland A

Eudonia submarginalis (Walker). Swards. All sites

Eudonia steropaea (Meyrick). Mosses in dry open sites. Shrubland B

Gadira acerella Walker ?Mosses. Shrubland A, B

Gadira leucophthalma (Meyrick). ?Mosses, open sites. Foreshore

Hygraula nitens (Butler). Aquatic Shrubland B

<i>Orocrambus callirrhous</i> (Meyrick). Here, associated with sand tussock.	Foreshore
<i>Orocrambus flexuosellus</i> (Doubleday). Swards.	Shrublands A, B
<i>Orocrambus ramosellus</i> (Doubleday). <i>Juncus</i> spp.	Foreshore
<i>Orocrambus vittellus</i> (Doubleday). Pasture grasses.	All sites
<i>Orocrambus vulgaris</i> (Butler). Swards.	Shrubland B
<i>Scoparia chalicodes</i> Meyrick. Open, dry grassland. BHP	?Foreshore
<i>Scoparia diphtheralis</i> Walker. Swards.	Shrubland A, B
<i>Scoparia exilis</i> Knaggs . Dry grassland. BHP	?Foreshore
<i>Scoparia petrina</i> (Meyrick). Swards.	Shrublands A, B
<i>Scoparia rotuella</i> (F&R). Swards.	Shrubland A, B
" <i>Scoparia</i> " sp. cf. <i>asaleuta</i> Meyrick??	Foreshore
<i>Udea flavidalis</i> (Doubleday). Hrbs, pohuehue.	Shrubland A, B
<i>Uresiphita maorialis</i> (F&R). Tree lupins, here.	Foreshore
Depressariidae (2):	
<i>Eutorna phaulacosma</i> Meyrick. Blackberry.	Shrubland B
<i>Eutorna symmorpha</i> Meyrick. Miner in <i>Selliera</i> and other wetland low plants.	Shrubland B
Elachistidae (2):	
<i>Elachista archaeonoma</i> Meyrick. Miner in grasses.	Shrubland A, B
<i>Elachista gerasmia</i> Meyrick. Miner in <i>Juncus</i> .	Foreshore
Gelechiidae (4):	
<i>Helcystogramma</i> sp. nr <i>phryganitis</i> Meyrick. Convolvulaceae.	Shrubland B
<i>Kiwaia</i> sp. cf. <i>heterospora</i> (Meyrick)??	Shrubland A
<i>Kiwaia</i> sp. "mat daisy jumper". Mat-daisy pads.	Foreshore
<i>Phthorimaea operculella</i> (Zeller). Potato tuber moth. Adventive.	All sites
Geometridae (33):	
<i>Anachloris subochraria</i> (Doubleday). Asteraceae flowers.	Foreshore
<i>Asaphodes aegrota</i> (Butler)? Hrbs.	Shrubland A, B
<i>Asaphodes</i> sp. <i>indet</i> ??	Foreshore
<i>Austrocidaria gobiata</i> (F&R). <i>Coprosma</i> spp (here <i>crassifolia</i>).	Shrublands A, B
<i>Austrocidaria similata</i> (Walker). As above.	Shrublands A, B
<i>Chloroclystis filata</i> (Guenée). Polyphagous, flowers; adventive.	All sites
<i>Chloroclystis inductata</i> (Walker). Polyphagous, mostly flowers.	Shrubland A, B
<i>Chloroclystis testulata</i> (Guenée). Polyphagous, flowers.	Shrubland A, B
<i>Declana junctilinea</i> (Walker). Polyphagous, small-leaved shrubs, trees.	Shrubland A, B

<i>Declana leptomera</i> (Walker). Polyphagous, shrubs, trees.	Shrubland A, B
<i>Dichromodes sp cf. sphaeriata</i> (F&R). Crustose lichens	Foreshore
<i>Epicyme rubropunctaria</i> (Doubleday). <i>Geranium, Haloragis.</i>	Shrubland A
<i>Epiphryne verriculata</i> (F&R). <i>Cordyline australis.</i>	Shrubland A, B
<i>Epyaxa lucidata</i> (Walker). Polyphagous, herbs.	Shrubland A
<i>Epyaxa rosearia</i> (Doubleday). Polyphagous, herbs.	All sites
<i>Epyaxa venipunctata</i> (Walker). Polyphagous, herbs.	All sites
<i>Gellonia dejectaria</i> (Walker). Polyphagous, trees, shrubs.	Shrubland B
<i>Helastia cinerearia</i> (Doubleday). ?Mosses.	Shrubland B
<i>Helastia corcularia</i> (Guenée) ?Moss.	Shrubland A
<i>Homodotis megaspilata</i> (Walker). Litter in forest.	Shrubland A,B
<i>Notoreas sp.</i> "Cape Campbell". <i>Pimelea</i> foliage, flowers	Foreshore
<i>Pasiphila sandycias</i> (Meyrick). <i>Coprosma</i> flowers	Shrubland A, B
<i>Phrissogonus laticostatus</i> (Walker). Flowers.	All sites
<i>Poecilasthena schistaria</i> (Walker) ?Kanuka.	Shrubland A, B
<i>Poecilasthena subpurpureata</i> (Walker). Manuka, kanuka.	Shrubland A, B
<i>Pseudocoremia indistincta</i> Butler. <i>Muehlenbeckia complexa</i> foliage.	Shrubland A,B
<i>Pseudocoremia leucelaea</i> (Meyrick). Conifer foliage.	Shrubland B
<i>Pseudocoremia lupinata</i> (F&R). Kanuka.	Shrubland B
<i>Pseudocoremia productata</i> (Walker). Polyphagous, trees, shrubs.	Shrubland A
<i>Pseudocoremia suavis</i> Butler. Polyphagous, trees/shrubs.	Shrubland A, B
<i>Scopula rubraria</i> (Doubleday). Plantains.	All sites
<i>Xyridacma ustaria</i> (Walker). <i>Pittosporum.</i>	Shrubland B
<i>Zermizinga indocilisaria</i> Walker. Polyphagous (<i>Discaria, Lupinus, Pimelea, Ozothamnus</i>)	Foreshore
Glyphipterigidae (2):	
<i>Glyphipterix scintellella</i> Walker. Miner in sedge tillers.	Shrubland B
<i>Glyphipterix tungella</i> F&R. Miner in small sedges.	Shrubland A,B
Gracillaridae (1):	
<i>Dialectica scalariella</i> Zeller. Echium miner.	All sites
Hepialidae (2):	
<i>Wiseana copularis</i> (Meyrick). Damp soil porina.	Shrubland A, B
<i>Wiseana signata</i> (Walker). Sandy soil porina.	Shrubland A
Lecithoceridae (1):	
<i>Lecithocera micromela</i> Lower. Pasture litter.	Shrubland A, B

Momphidae (1):

Zapyrastra calliphana Meyrick. Miner in *Muehlenbeckia* leaves. Shrubland A, B

Lycaenidae (5):

Antipodalycaena boldenarum (White). On *Muehlenbeckia ephedroides*. Foreshore

Lycaena feredayi (Bates). On *Muehlenbeckia australis*, *M. complexa*.

Lycaena rauparaha (Fereday). As above. Shrubland A, B

Lycaena salustius (Fabricius). As above. Shrubland A, B

Zizina labradus (Godart). Pasture Fabaceae. All sites

Noctuidae (22):

Agrotis innominata Hudson. Sand agrotis, polyphagous. Females fully winged. Foreshore.

Agrotis ipsilon (Rottemberg). Greasy cutworm. All sites

Aletia moderata (Walker). Low herbs, including mat-daisy. Foreshore

Andesia pessota (Meyrick). *Melicytus (Hymenanthera)*. Shrubland A, B

Bityla defigurata (Walker). *Muehlenbeckia complexa*. All sites

Ectopatria aspera (Walker). Indigenous. Chenopodiaceae. Foreshore

Euxoa admirationis (Guenée) ??herbs, open country. Foreshore

Graphania omoplaca (Meyrick). Recorded by BHP. Shrubland

Graphania phricias (Meyrick) ?herbs. All sites

Graphania ustistriga (Walker). Polyphagous, herbs and shrubs. Shrubland A, B

Homohadena fortis (Butler). *Melicytus (Hymenanthera)*. Shrubland A, B

Meterana coelena (Hudson). *Muehlenbeckia complexa*. Shrubland B

Meterana ochthistis (Meyrick). *Muehlenbeckia*, *Coprosma*. Shrubland A, B

Persectania aversa (Walker). Grasses. Foreshore

Proteuxoa comma (Walker). Pasture swards. Shrubland A, B

Rhapsa scotosialis Walker. Litter. Shrubland A, B

Tmetolophota atristriga (Walker). Pasture swards. Shrubland B

Tmetolophota steropastis (Meyrick). On *Phormium*. Shrubland B

Nymphalidae (3):

Danaus plexippus Linnaeus. Vagrant. Asclepiadaceae.

Vanessa itea (Fabricius) on *Urtica lineafolia* here. Shrubland B

Vanessa kershawi (McCoy). Vagrant; garden/weed Asteraceae.

Oecophoridae (18):

Barea exarcha (Meyrick). Adventive. Dead wood. Shrubland A, B

Gymnobathra parca (Butler). Litter, case-bearer. All sites

<i>Gymnobathra sarcoxantha</i> Meyrick. Litter, case-bearer.	Shrubland B
<i>Gymnobathra tholodella</i> Meyrick. Litter, case-bearer.	Shrubland A, B
<i>Izatha picarella</i> (Walker). Dead wood.	Shrubland A, B
<i>Izatha convulsella</i> (Walker). Dead wood.	Shrubland A, B
<i>Leptocroca</i> "grey". Litter.	Shrubland A, B
<i>Leptocroca</i> "big". Litter.	Shrubland A, B
<i>Leptocroca</i> "pink" Litter.	Shrubland B
<i>Phaeosaces apocrypta</i> Meyrick. Lichen feeder.	Shrubland A, B
<i>Phaeosaces coarctatella</i> (Walker). Lichen feeder.	Shrubland A, B
<i>Stathmopoda coracodes</i> Meyrick. Scale insect predator.	Shrubland A, B
<i>Stathmopoda skelloni</i> (Butler). Dying plant parts, arboreal.	Shrubland A, B
<i>Tingena actinias</i> (Meyrick). Litter.	Shrubland A, B
<i>Tingena</i> "basella group". Litter.	Shrubland B
<i>Tingena chloradelpha</i> (Meyrick). Litter.	Shrubland A, B
<i>Tingena melanamma</i> (Meyrick). Litter.	All sites
<i>Trachypepla conspicuella</i> (Walker) ?Litter.	Shrubland A, B
<i>Trachypepla euryleucota</i> Meyrick; ?Litter. BHP record.	Shrublands
Psychidae (1):	
<i>Scoriodyta</i> sp. Micro-bagmoth on algae on tree trunks.	Shrubland A, B
Pieridae (1):	
<i>Pieris rapae</i> (Linnaeus). Adventive. Brassicaceae.	All sites
Plutellidae (1):	
<i>Plutella xylostella</i> (Linnaeus). Possibly indigenous. Brassicaceae	All sites
Pterophoridae (2):	
<i>Pterophorus furcatalis</i> (Walker). <i>Pittosporum</i> foliage.	Shrubland A, B
<i>Pterophorus innotatalis</i> Walker. Convolvulaceae.	Foreshore
Pyralidae (3):	
<i>Crocydopora cinigerella</i> (Walker). Possibly indigenous. Open sites.	Foreshore
? <i>Cryptoblabes</i> sp. Adventive; possibly domestic. Only one recorded.	Shrubland A
<i>Patagoniodes farinaria</i> (Turner). Adventive. Stem-borer, weed Asteraceae.	Foreshore
Thyrididae (1):	
<i>Morova subfasciata</i> Walker. Stem-galler, <i>Muehlenbeckia complexa</i> here.	Shrubland A, B

Tineidae (6):

<i>Erechthias fulguritella</i> (Walker). Dead wood.	Shrubland A, B
<i>Erechthias chasmatias</i> Meyrick. Dead branches.	Shrubland A, B
<i>Monopis ethelella</i> (Newman). Adventive, fur, wool.	All sites
<i>Monopis crocicapitella</i> (Clemens). Adventive, feathers and plant litter.	Shrubland A, B
<i>Opogona comptella</i> (Walker). Adventive, dead wood.	Shrubland A, B
<i>Opogona omoscopa</i> (Meyrick). Adventive, damp litter and wood.	Shrubland A, B

Tortricidae (20):

<i>Bactra noteraula</i> Walsingham. Stem/tiller borer in Cyperaceae.	Shrubland A, B
<i>Capua intractana</i> (Walker). Adventive, leafyer in perched litter.	All sites
" <i>Capua</i> " <i>semiferana</i> (Walker). Leafyer in litter.	All sites
<i>Catamacta lotinana</i> (Meyrick). Leafminer/tyer on cabbage tree.	Shrubland A, B
" <i>Cnephasia jactatana</i> " (Walker). Polyphagous leafyer.	Shrubland A, B
<i>Crociosema plebejana</i> Zeller. Adventive, shoot and bud borer, Malvaceae.	Foreshore.
<i>Ctenopseustis herana</i> (F&R). Polyphagous leafyer.	
<i>Epiphyas postvittana</i> (Walker). Adventive; polyphagous leafyer.	All sites
<i>Ericodesma</i> sp. cf. <i>aerodana</i> (Meyrick). Leafyer on <i>Pimelea</i> .	Foreshore
<i>Harmoloba amplexana</i> (Zeller). Leafyer on shrubs.	Shrubland A, B
<i>Harmoloba</i> "hymenantha". Undescribed leafyer on small-leaved shrubs.	Shrubland A, B
<i>Harmoloba oblongana</i> (Walker). Leafyer on small-leaved shrubs, lianes.	Shrubland A, B
<i>Harmoloba scoliastis</i> (Meyrick). Leafyer on <i>Muehlenbeckia</i> , <i>Ileostylus</i> .	Shrubland A
<i>Harmoloba sisyra</i> Meyrick. Leafyer on tauhinu.	Foreshore
<i>Holocola zopherana</i> (Meyrick). Leafyer on kanuka.	Shrubland A, B
<i>Merophyas divulsana</i> (Walker). Leafyer on Fabaceae herbs.	Foreshore
<i>Merophyas leucaniana</i> (Walker). Leafyer on herbs, mat plants.	Foreshore
<i>Planotortrix notophaea</i> (Turner). Leafyer on hard, narrow-leaved trees, shrubs.	Shrubland A, B
<i>Planotortrix octo</i> Dugdale. Leafyer on broadleaved trees, shrubs.	Shrubland A, B
<i>Strepsicrates ejectana</i> (Walker). Leafyer on Myrtaceae.	Shrubland A, B

Yponomeutidae (1):

<i>Zelleria sphenota</i> (Meyrick). Leaf-miner/tyer on mistletoes.	Shrubland A
--	-------------