Phylum Annelida

Class Oligochaeta

The New Zealand oligochaete fauna is divided into two families, the introduced Lumbricidae (common throughout pastoral and urban areas) and the largely endemic Megascolecidae. Megascolecids are normally associated with relatively undisturbed native environments, many of which are slowly being modified (Lee, 1959). Habitat modification is most extreme in lowland communities, particularly shrubland, lowland forests and inter-montane basins. The east coast of the South Island is characterised by low species diversity with historically wide earthworm distributions (Lee, 1959). Native worms live in a variety of habitats including soil, leaf mould, under logs, beneath bark, mud, swamps and in the water of deep lakes (Lee, 1959).
Little research has been done on the New Zealand earthworm fauna since Lee (1959) completed his manuscript entitled "The Earthworm Fauna Of New Zealand". A survey of Canterbury farms by Fraser et al. (1996) found only introduced lumbricids. Many changes have occurred in the last 40 years that will have altered native earthworm populations. Most of the available information is out of date and the Canterbury oligochaete fauna needs revision. The information available in Lee (1959) on the Canterbury native earthworm fauna will be briefly summarised. Specific information on the identification of each species can be found in Lee's book. Earthworm taxonomy is difficult at the best of times, often involving complex dissections. Dr Patricia Fraser (Crop & Food Research, Lincoln) is an earthworm specialist. It would be advisable to approach Dr Fraser for assistance.

Earthworms are very sensitive to environmental change. Probably the greatest threat to their survival is fragmentation and modification of their habitat (Patricia Fraser, pers. comm. 2000). The effect of predators is most likely to be a secondary impact, the extent of which is unknown. Possible predators include: birds (both introduced, e.g., blackbird, or native, e.g., kiwi), rodents, mustelids, hedgehogs (Berry, 1999; Hendra, 1999), beetles, parasitic Diptera (Rognes & Keilin, 1987) and flatworms (Johns *et al.,* 1998). Initial requirements include a resurvey of Canterbury to determine the distribution of extant native earthworm populations. This will provide the necessary information to make management decisions, such as the need for fencing of certain habitats, small-scale predator control or a long-term monitoring programme.

Family Megascolecidae

Eodrilus annectens Beddard
The type locality was unspecific, recorded only as the Canterbury Plains. A note from 1887 indicated it was collected from tussockland, in moist earth near watercourses and swamps.

Eodrilus montanus Lee
Type locality is the peak on the south side of Lindis Pass in topsoil beneath snow tussock (*Chionochloa* sp.). Six specimens were collected on the Mackenzie Country and three specimens from south of Lake Pukaki from topsoil beneath fescue tussock (*Festuca novae-zelandiae).*

Eodrilus paludosus Beddard
The type locality is specified as a marsh on the Canterbury Plains. *E. paludosus* has also been collected from Central Otago and Marlborough. The last record on the Canterbury Plains was 1901.

Octochaetus antarcticus Beddard
Mentioned only from the type locality of Ashburton.

Octochaetus huttoni Beddard
Type locality is the banks of Albury Creek, South Canterbury. *O.huttoni* has also been recorded from Caswell Sound, Southland, and Stewart Island. Apart from the type locality (where the habitat is not specified), all specimens are recorded from either the topsoil or subsoil beneath beech trees.

Rhododrilus minutus Beddard
Is known from the Ashley Downs, Glenroy and the Port Hills. In all cases it was found in topsoil beneath pasture.

Plutellus parvus Lee
Originally described from Akaroa, in leaf mould collected in a forest in 1949. Since then, it is also been collected at Hickory Bay, also on Banks Peninsula.

Maoridrilus dissimilis Beddard
Type locality is unknown, but records include Marlborough, Mackenzie Country, Central Otago and the Canterbury Plains. In all cases, *M. dissimilis* is associated with tussock grassland communities.

Maoridrilus modestus Michaelsen
The type locality is Christchurch or Dunedin (it is unclear from the literature which is the type locality), further specimens are recorded from Akaroa, Kaituna Valley, Bealey, Porters Pass and one specimen from Bluff. In most cases, this species is associated with leaf mould or topsoil of beech forest.

Maoridrilus parkeri Beddard
There are no details on the type locality. Two specimens were collected from leaf mould in a forest at Rakaia Gorge, April 1950.

Maoridrilus purusa Ude
The type specimen is reportedly from the Port Hills but was never located by Lee (1959). Nine other specimens are known, four from Lake Taylor (under moss) and five specimens from leaf mould and moss at Porters Pass.

Maoridrilus smithi Beddard
The type specimen came from Albury, South Canterbury in tussock land. Since then, 14 specimens were found in leaf mould at Kakahu.

Maoridrilus suteri Michaelsen
Known only from Christchurch. No information is available about its habitat.

Maoridrilus wilkini Lee
The type specimen was recorded from the Wilkin River Valley in topsoil beneath *Nothofagus.* It has also been recorded in the Mackenzie Country collected from leaf mould.

Neodrilus campestris Hutton
The type specimen was collected in Dunedin. The only other record is from Mount Peel in 1877.

Plagiochaeta sylvestris Hutton
The type specimen was collected in Dunedin and most other specimens are recorded from Southland or the West Coast. One collection record indicates the species was present in the Peel Forest. In most cases, this species is associated with leaf mould in forests.

Phylum Onychophora (velvetworms)
Peripatoides novaezealandiae (Hutton) and *Ooperipatellus viridimaculatus* Dendy
Two species are recognised in Canterbury, *Peripatoides novaezealandiae* (15 pairs of legs, ovoviviparous reproduction) and *Ooperipatellus viridimaculatus* (14 pairs of legs, oviparous reproduction) (Dianne Gleeson, pers. comm. 2000). Current work indicates that Canterbury specimens of *P. novaezealandiae* are not true *P. novaezealandiae* and possibly represent a new species (Dianne Gleeson, pers. comm. 2000). Two threatened populations of Onychophora exist, one at Kakahu Bush (three females, 18th August 1962) and Rocky Ridge near Geraldine (one female 18th August 1962) (Dianne Gleeson, pers. comm. 2000). Despite two independent searches by Gleeson, no specimens have been seen since their original collection. Populations of Onychophora at Peel Forest and Lake Sumner appear relatively stable.
Removal of suitable habitat (fallen logs, often taken for firewood) represents a threat to any population of Onychophora (Dianne Gleeson, pers. comm. 2000). The initial priority for research is a survey of Kakahu Bush and Rocky Ridge to determine the status of any remaining populations. Further taxonomic research is required to determine the species status of Canterbury 15 leg-pair Onychophora.

Phylum Arthropoda
Class Araneida
Family: Periegopidae
Periegops suterii Urquhart
Any search of the literature would reveal many endemic spiders known from either one or a few specimens. In most cases this is just a reflection of collection effort (Cor Vink, pers. comm.. 2000). One species, *Periegops suterii*, is definitely rare (Forster, 1995). Forster (1995) believed it is probably the rarest and most geographically restricted taxon known from our present-day spider fauna. *P. suterii* was first collected in 1892 on Banks Peninsula. Recent collecting indicates that it is restricted to 4-5 small remnant forest patches and Riccarton Bush (Forster, 1995).
The adult female has been found in thin silken tubes beneath logs. They have a paucity of silk glands and are probably active predators (Forster, 1995). Total length (from a female specimen, which is of similar size to the male) is 7.7 mm, carapace 3.97 mm long and 2.31 mm wide, abdomen 3.98 mm long and 2.75 mm wide. The carapace is reddish brown with black lines extending from the mid posterior slope to the eyes. The abdomen is yellowish brown with six narrow black chevrons down the dorsal surface.
P. suterii is of very high conservation importance. The family Periegopidae is represented by only three species, one in Australia the other in Canterbury and a third undescribed species is known from a single specimen collected on the east coast of the North Island (Forster, 1995). Collection data indicate that the species was more abundant in the early 1900s and was originally endemic to Banks Peninsula (Forster, 1995). Initial research requirements include a comprehensive survey of Banks Peninsula and lowland Canterbury Plains forest remnants (particularly Riccarton Bush). Once the distribution of this species is known, measures to protect the most abundant populations can be initiated. It is unknown whether introduced predators, either arachnid or mammalian, have had any great impact on *P. suterii* (Forster, 1995). The effect of predators and the influence of habitat fragmentation and degradation need to be quantified.

Class Insecta
Order Odonata (dragonflies)
Xanthocnemis sinclairi Rowe
X. sinclairi is restricted to a few tarns in the headwaters of the Louper Stream, Whitcombe Pass (Collier, 1992; Rowe, 1987). *X. sinclairi* is 32-34 mm long, head is orange with red eyes while the rest of its body is bronze/black (Rowe, 1987). Wing venation is reddish and the thorax is bronze/black with lateral orange stripes. The presence of a sclerotised subapical tooth on the lower lobe of the male superior appendage is characteristic of *X. sinclairi* (Rowe, 1987).
Larval *X. sinclairi* exhibit unusual behaviour in that they swim freely in the alpine tarns (Collier, 1992). Current knowledge indicates it is a highly restricted species known only from a few alpine tarns. A brief investigation should be undertaken to fully examine the distribution of *X. sinclairi* in alpine tarns of Arthurs Pass. Initially it would be best to concentrate on the area around the Whitcombe Pass. Information acquired can then be used for conservation management decisions.

Order Plecoptera (stoneflies)
The Plecoptera is a relatively small order of aquatic insects. Adults are associated with streams or lakes, nymphas are generally found in streams where they can be collected by turning over rocks (Theischinger, 1991). New Zealand has several interesting terrestrial or partially terrestrial species (Theischinger, 1991). All New Zealand genera apart from the *Notonemoura* are endemic (McLellan, 1991).
Sixty-seven of the 95 recognised species were described by McLellan, who identified key areas, notably the east coast of the South Island, that have not been well collected (McLellan, 1991). A few species described in the literature are known from either one specimen, the type series, or from one or two restricted locations.

Zealandobius jacksoni McLellan
As of 1993, *Z. jacksoni* was known only from the holotype collected in the Edwards Valley 1965 (McLellan, 1993). *Z. jacksoni* is unusual because its wings are a colourful reddish/brown. The usual wing colour for *Zealandobius* is an almost transparent hind wing and pale to transparent forewing (McLellan, 1993). Only known from a single female specimen that has a body length of 10 mm, antenna 9.5 mm, forewing 12 mm, hind leg 9 mm, pronotum length 1.44 mm, width 1.92 mm. The female is distinguished by a dark subrectangle on the subgenital plate containing a white semicircle anteriorly (McLellan, 1993).

Zealandobius peglegensis McLellan
Originally described from the holotype and two other specimens collected from Pegleg Creek, Arthur's Pass October 1986. A further three specimens have been collected from the Seaward Kaikoura Range. The male has a body length of 7 mm, antenna 6 mm, forewing 7.75 mm, pronotum length 0.72 mm, width 1.12 mm and hind leg 5 mm (McLellan, 1993). The first segment of the antennal flagellum is approximately as long as the scape. The male can be identified by its long well tapered epiproct tip and paraproct with a large curved apical spine.

Zealandobius wardi McLellan
Described by McLellan (1993) from 12 specimens (holotype, Hinewai Reserve), it is apparently restricted to the Banks Peninsula. Adults were collected during September and November. The male has a body length 9.5 mm, antenna 9 mm, and forewing 10.5 mm, hind leg 7.25 mm, pronotum length 1.12 mm and width 1.36 mm. The female has a body length 11.5 mm, antenna 9 mm, forewing 11 mm, hind leg 9 mm, pronotum length 1.2 mm and width 1.6 mm. The nymph has a final instar body length of between 11 and 11.5 mm. The adult has a dark brown head with a black patch between the ocelli; the flagellum has the first segment shorter than the scape

(McLellan, 1993).

Very little is known about these three species. *Z. wardi* has an unknown distribution on Banks Peninsula, but Ian McLellan (pers. comm. 2000) has not seen many in his career. The main threat to this order of insects is the lack of available information, which stems from the relative lack of interest in stoneflies compared with other insect orders.

Threats to New Zealand Plecoptera are largely unknown. Other stoneflies (*Stenoperla* species and *Notonemoura* species), dobsonflies *(Archicauliodes diversus),* native and introduced fishes are known predators of the aquatic larval stages of these insects (Ian McLellan, pers. comm. 2000). Since most species mentioned above are found in national parks it is unlikely that water quality or pollution is having a detrimental effect on the survival. Direct detrimental effects induced by humans are unlikely, except for *Z. wardi* on Banks Peninsula (Ian McLellan, pers. comm. 2000). Habitat modification including the removal of forest and scrubland surrounding streams has probably had a negative impact on stonefly populations.

The main research requirement is to ascertain the distribution of these species. Adults are collected relatively easily in spring and summer. Malaise traps work well and light trapping can also be effective for some species. By far the easiest method is sweeping vegetation alongside streams and lakes (McLellan, 1991). Nymphs can be collected by the careful examination of the dry underside of stones near rapids and accumulations of dead leaves and driftwood (McLellan, 1991). Population distributions may identify key species requiring further investigation. Any work initiated on the Canterbury Plecoptera (or New Zealand Plecoptera, in general) should be done in consultation with Ian McLellan since his considerable experience would be invaluable to any project.

Order Orthoptera

Family Anastostomatidae (giant wetas, tree wetas, ground wetas)

Deinacrida pluvalis Gibbs

D. pluvalis is a moderate sized brown/yellow-brown weta with smooth abdominal terga and pale brownish-white legs (Gibbs, 1999). Its current known distribution includes the crest of the Southern Alps to the west of the main divide between Mt Alexander and Cleddau Cirque at 700-1850 m (Gibbs, 1999). Originally collected in 1946, it has been described in the past as rear. Subsequently, it was included by Molloy and Davis (1994) as a category I species. Recent work indicates that *D. pluvalis* is better described as inaccessible, than rare. In one place, 43 were found in three person-hours of searching (Gibbs, 1999). *D. pluvalis* is generally found in extremely high rainfall, alpine environments normally beyond the effects of introduced rodents. The lack of rodent predators combined with the high-level of habitat protection (Mt Cook National Park) suggests that populations of *D. pluvalis* maybe stable. To affirm this hypothesis, the effect of introduced predators needs to be quantified.

Deinacrida elegans Gibbs

D. elegans is the most distinctive of New Zealand's giant wetas. It is moderately large, steel-grey with red-black-white-banded femora. *D. elegans* inhabits rocky bluffs of the drier ranges of Mid Canterbury (Mt Somers) and Marlborough (five locations) (Gibbs, 1999). *D. elegans* is restricted to protected land, but inhabits areas that support rodent predators. The main threat to *D. elegans* is probably probation. However the steep cliffs it inhabits may provide some protection. The main requirement for *D. elegans* is a long-term monitoring plan to detect any reductions in population size. A detailed initial study is necessary to gather baseline data for future comparisons. Any indication of population decline should be followed

by immediate action. In the case of a rapid increase in rodent populations, predator control should be considered.
The Pinnacles, Mt Somers, support one of the largest remaining populations of *D. elegans* and are used extensively by rock climbers. It would be advisable to quantify the impact of rock climbers on *D. elegans*. If considerable, restrictions on climbing should be imposed to exclude areas occupied by *D. elegans*.

Hemiandrus "Timaru"
This undescribed species of *Hemiandrus* was included as a category I species by Molloy and Davis (Molloy & Davis, 1994). It appears to be more widespread then originally thought and is a relatively common occurrence in gardens of the greater Timaru area (Peter Johns pers. comm. 2000). No conservation management is recommended for this species though, from a scientific perspective needs to be formally described.

Hemideina ricta Hutton (Banks Peninsula tree weta)
H. ricta is restricted to an area 200 km2 to the east and north of Akaroa (Brown & Townsend, 1994; Morgan-Richards & Townsend, 1995). *H. ricta* is morphologically very similar to *Hemideina* femorata, and the relatively common Canterbury tree weta. The two species can be distinguished morphologically by the greater number of tergal files, 20 or more in *H. ricta* and, fewer than 16 in *H. femorata* (Morgan-Richards & Townsend, 1995). The distribution of *H. ricta* was mapped by Brown and Townsend (Brown & Townsend, 1994). Its presence was confirmed at 16 sites east of Akaroa harbour and seven sites North of Akaroa. *H. ricta* was found at a wider range of elevations than *H. femorata* and was the dominant species between 400 and 700 m above sea level (Brown & Townsend, 1994). Kanuka and totara/broadleaf species appear to be the most important *H. ricta* habitat.
The main threats to *H. ricta* appear to be the removal of habitat and predation by rodents. Good baseline data are available on *H. ricta* (Brown & Townsend, 1994) that allow follow-up surveys to detect changes in the population. The main management requirements for this species are the protection of kanuka, totara, broadleaf vegetation on Banks Peninsula. This includes fencing of certain areas to prevent stock grazing. Rodent control in localised areas that have a high *H. ricta* population should be initiated if continued monitoring detects a decrease in population size. The production of hybrids between *H. ricta* and *H. femorata* occurs in a small hybrid zone.

Family Acrididae
Brachaspis robustus Bigelow
B. robustus currently has a Molloy and Davis category A rating (Molloy & Davis, 1994). There is only one moderately large population (250-300 adult recruits per year) and all populations suffer periodic heavy mortality from predators (indigenous and introduced) and river populations are at risk from hydroelectric river releases (White, 1994). White (1994) conducted an extensive reconnaissance of the Mackenzie region to map the distribution of *B. robustus*. The bulk of *B. robustus* were observed in the Pukaki River, Sawdon Stream, Mackenzie River, Snow River, and the Ohau River Delta. Minor populations also occurred at Tekapo Canal, Grays Hills and the Tekapo River. Faecal analysis indicate a preference for *Elymus rectisetus, Poa pratensis, Achillea millifolium* and unidentified mosses and lichens (White, 1994). *B. robustus* inhabits areas of very sparse vegetation; there is often as much as 80-90% gravel/stones. In most cases preferred food plants are less than 1% of groundcover. It appears to have a preference for four micro-habitat types (White, 1994);

1. diverse loose-stone aggregates, found in braided riverbeds; and
2. lichen-covered stone pavements, found on stable terraces and fans; and

3. fractured non-fluvial stones produced by downcutting from recent flood disturbances; and
4. eroded banks of loose stone, i.e., gullies on high terrace rises.

It is likely that *B. robustus* has a minimum life cycle of two years, though a three-year life cycle is also possible (White, 1994). *B. robustus* has an activity threshold of 14 degrees at 1 cm above the ground (White, 1994). There are four distinct characteristics of the pronotum that can be used to distinguish between *B. robustus* and other acridids in the field (White, 1994);

1. The upper surface is distinctly broader than long.
2. The upper surface is rounded towards the sides.
3. The surface is notably irregular, especially in adults.
4. The hind margin is more or less straight from the centre towards the sides, i.e., not wavy.

Given the low numbers of *B. robustus,* it is difficult to monitor relation. Faecal examinations suggest predation of *B. robustus* is varied and considerable, especially amongst later juveniles and adults (White, 1994). The only known invertebrate predators are spiders and mites. Spiders are likely to kill juvenile individuals; mites are unlikely to be a source of mortality. The Mackenzie basin has a wide variety of *Leiolepisma* spp. Faecal analysis indicates skinks are predators of other grasshoppers and there is no reason why *B. robustus* would not be eaten when encountered (White, 1994). The wide variety of bird species present in the Mackenzie Country are major predators of *B. robustus.* Both hedgehogs and feral cats are confirmed predators of grasshoppers (White, 1994). Evidence from other sites suggests hedgehogs have a negative impact on invertebrate species in general (Hamilton, 1999). Lower rabbit densities may result in prey switching by ferrets and cats to include more skinks and invertebrates (White, 1994). The impact of RCD may be highly detrimental to populations of *B. robustus.* The effect of hydroelectric releases from Gate 22 in the Ohau River Delta was monitored by White (1994) who concluded a peak flow of 450 cumecs would kill most *B. robustus* and a lower flow of 350 cumecs would ensure better survival probabilities.
White (1994) *believes* the greatest threat to the survival of *B. robustus* is the heavy predation of adult females before breeding. Four recommendations were outlined in White's (1994) report. They are:

1. Formal protection of the largest known contiguous population on the Snow River outwash fan.
2. Formal protection of the Pukaki River population.
3. Close liaison between the Department of Conservation and hydroelectric dam operators to control, and time, hydro-releases to maximise survival of *B. robustus.*
4. The Department of Conservation to undertake a two-year trial of feral cat control before the December-January recruitment of new *B. robustus* adults to ascertain the effect of predators on the adult female survival and breeding success.

At present none of the four recommendations has been action. Project River Recovery is aware of its responsibilities regarding the robust grasshoppers. Immediate implementation of recommendations one and three is necessary. However, recommendation three may be less critical if Ohau River populations have failed to re-establish following previous water releases. A few recent sightings suggest *B. robustus* is still present at the Ohau River (See Appendix B, Figure 1).

Order Phthiraptera
Mallophaga (Lice)
Austragoniodes waterstoni [*sensu stricto*] Cummings
The white flippered blue penguin (*Eudyptula minor albosignata*) is currently restricted to Banks Peninsula and is host to a species of louse *Austragoniodes waterstoni* (Pilgrim & Palma, 1982). *A. waterstoni* is currently known from several species of blue penguin. Detailed taxonomic work is likely to show that *A. waterstoni* [*sensu stricto*] is restricted to the white flippered blue penguin (Adrian Paterson, pers. comm. 2000). The main threat to *A. waterstoni* is its endangered and restricted host. Low population numbers of the host species are just as dangerous as it extinction. Low host numbers reduce lice transmission between individuals to such an extent that it can cause extinction of the parasite (Adrian Paterson, pers. comm. 2000). Work is currently being carried out on the lice fauna of *E. minor albosignata* at Lincoln University and will provide information on its taxonomy and distribution.

Order Hemiptera
Family Aphididae
The size of the New Zealand native aphid fauna is estimated at 12-16 species. New Zealand Aphididae are a taxonomic distinct group; at least two genera are endemic and they support an indigenous parasitoid fauna of unknown size (Teuton & Stufkins, 1998). Only three species are considered relatively common; most indigenous aphids are known from one or two populations, and many have not been seen recently. Little is known about the biology and ecology of this group apart from its very patchy but aggregated distribution of the *Aphis/Paradoxaphis* group (Teuton & Stufkins, 1998).

Aphis healyi Cottier
First collected from Mt Cass this large (2-2.2 mm) dark-green/black aphid has not been seen in Canterbury since the 1940s. *A. healyi* feeds on *Carmichaelia australis*, where it congregates on the terminal parts, especially new growth, flowers and seed pods (Teuton & Stufkins, 1998). Both winged and wingless viviparous females have been collected in January, May and November. It was recently collected from two populations in Southland where dark brown mummies indicate a parasitoid attacks this species (Teuton & Stufkins, 1998).
The main threat to *A. healyi* is probably habitat alteration. *Carmichaelia australis* has a patchy distribution in Canterbury; grazing by stock prevents regeneration and significantly affects adult plants. Other threats include the unidentified parasitoid that may be an introduced species (See Appendix B, Figure 2).

Aphis nelsonensis Cottier
This small (1.3 mm) aphid feeds on the leaves and stems of *Epilobium* spp. *A. nelsonensis* was originally collected at Nelson and subsequently from Cass, 1965 (Teuton & Stufkins, 1998). Recent aphid surveys of *Epilobium* indicated the presence of an introduced species *Aphis* nr *epilobii* that has possibly displaced *A. nelsonensis* (Teuton & Stufkins, 1998). *Epilobium* is a large species complex, most diverse in the Nelson region. It is generally associated with dry riverbed and is usually highly localised in its distribution and overtopping by adventive weeds is a problem. Modifications of *Epilobium* habitat by introduced weeds and competition from introduced aphids are probably the two main threats to this species.

Aphis cottieri Carver
This large brown-black aphid is known from *Muehlenbeckia complexa* and *M. australis* (Carver, 2000). Originally collected in Fiordland in 1972, it has since been collected from Kaitorete Spit, December 1998 and June 1999. A single specimen is also recorded from Springburn 1967 (Carver, 2000). It occurs as both alate (2.32-

2.55 mm long), apterus viviparous females (2.17-2.64 mm long) and oviviparous females (1.5-1.71 mm long) (Carver, 2000). Natural enemies include a Braconidae parasitoid wasp, *Aphidius* sp. near *ervi* introduced to New Zealand in 1977-78 as a biocontrol agent (Carver, 2000). The effect of the parasitoid needs further investigation (Carver, 2000), but also highlights the need for more extensive host specificity testing of introduced species (See Appendix B, Figure 3).

Paradoxaphis undescribed species
This small to medium-sized (1.3-2 mm) oval brown aphid has a characteristic dorsal green stripe on the abdomen (Teulon & Stufkins, 1998). It feeds on the new growth of *Plagianthus regius* and has been collected only from the Christchurch Botanic Gardens and Riccarton Bush (malaise trapping of winged adults). Threats to the survival of the species have not been ascertained.

Two further species are relatively common. They are: *Neophyllaphis totarae* Cottier, which is associated with podocarps and has a wide distribution in both the North and South Islands, and an undescribed species that appears to be relatively common on *Dracophyllum* north of Arthur's Pass (Teulon & Stufkins, 1998).

The main threat to New Zealand's indigenous aphids is habitat modifications. Due to the patchy distribution of native aphids, even small-scale destruction of habitat may cause localised extinction (Teulon & Stufkins, 1998). Grazing by stock removes the young growing shoot tips that are the favoured habitat for aphids. Introduced aphids are commonly found on native plants in natural habitats, displacement by introduced species is possibly important for *Aphis nelsonensis* (Teulon & Stufkins, 1998), but its effect needs to be quantified. Introduced parasitoids attack and kill indigenous aphids in the laboratory (Teulon & Stufkins, 1998). The introduced predator *Coccinella undecimpunctata* L. has displaced native predators in large areas of New Zealand and feeds on aphids.
The main research requirements for New Zealand's indigenous aphids is continued surveys to ascertain the distribution of each species and further taxonomic work to define the species relationships within the group. The effect of predators and parasitoids needs to be quantified and limiting factors to population expansion identified.

Family Cicadellidae
Novothymbris pollux Knight
Described from a single specimen, *N. pollux* is restricted to McClellan's Bush, Canterbury (Knight, 1974). A short robust species identified by a broad, transverse, dark-brown band at the level of the antennae, extending laterally beneath the eyes. Its wider distribution remains unpublished and is probably a reflection of collector effort (Alan Eyles, pers. comm. 2000). A brief survey of McClellan's Bush and surrounding forest remnants is recommended to establish the distribution of this species.

Paradorydium westwoodi (Buchanan White)
A Canterbury endemic *P. westwoodi* is known from a few specimens distributed around Christchurch the Port Hills and Banks Peninsula (Knight, 1973). *P. westwoodi* is identified by its straw colour and a long tapered head that mimics a grass seed. *P. westwoodi* appears to inhabit rushes, especially *Poa caespitose* (Knight, 1973). *P. westwoodi* was reported as a rare with a restricted distribution as early as 1894 (Kirby, 1894). *P. westwoodi* could be threatened and a survey to ascertain its wider distribution on Banks Peninsula is recommended

Superfamily Coccoidea

The scale insects comprise a large group of sap feeding Hemiptera, belonging to the superfamily Coccoidea. The Coccoidea is a group of 20 families, eight of which are present in New Zealand (Hawke, 1995). A number of endemic scale insects, are known from only a few specimens, often from original collections. These are:

Eriococcus detectus Hoy

E. detectus is known from only the 13 adult female specimens used in the original description (Hoy, 1962). Locality data indicate it was collected from *Nothofagus solandri solandri/cliffortiodes,* which is not native to the reported type locality of Christchurch. *E. detectus* is possibly locally extinct but may occur elsewhere in *Nothofagus* patches (Henderson, pers. comm. 2000). It is 2.18 mm long, a rotund body that is very convex on the dorsum. Segmentation is not conspicuous. The female apparently does not form a sac and is brown to green. (See Appendix B, Figure 7). A survey of *Nothofagus* in the greater Christchurch region is necessary to locate any extant populations.

Eriococcus kowhai Hoy

Described by Hoy (1962) from a single specimen, no further material has been collected. The type locality (Kennedys Bush) remains in reasonable condition and supports a population of kowhai *(Sophora tetraptera).* It is tempting to assume that this species was a misidentification by Hoy. However, Rosa Henderson (pers. comm. 2000) has found further material of two species previously also described by Hoy from single specimens. Therefore one should assume that Hoy's description of *E. kowhai* is of a distinct species. Hoy (1962) described *E. kowhai* as being 1.6 mm long, elongate, oval, with inconspicuous segmentation (See Appendix B, Figure 8).

Eriococcus montifagi Hoy

E. montifagi was described from a single specimen collected on *Nothofagus solandri* var. *cliffortiodes* at Arthur's Pass, 1914. It is unknown whether the specimen came from the leaves, bark or stem of the tree. Rosa Henderson (pers. comm. 2000) found specimens near Ohakune that are similar to *E. montifagi.* The species was described by Hoy (1962) as being 1.97 mm long, with a rotund body shape that is very convex in the dorsal area. Females apparently do not form a sac (See Appendix B, Figure 9).

Stegococcus oleariae Hoy

S. oleariae has been collected from Stewart Island and Waipara (Rosa Henderson, pers. comm. 2000). Adult females are known to form galls on the leaves of *Olearia macrodonta* and *Olearia paniculata,* with an opening on the upper leaf surface (Hoy, 1962). It was described by Hoy (1962) as having a body length of 0.94 mm, and an elongate/oval body shape tapering to anal lobes with conspicuous segmentation on the abdominal segments (See Appendix B. Figure 10). The Waipara population is probably under threat from a lack of suitable habitat, see *Plumichiton punctatus* for research needs.

Plumichiton punctatus Henderson & Hodgson

Known only from two female specimens and one crawler collected in December 1915 from *Olearia macrodonta* (Hodgson & Henderson, 2000). Described by Henderson and Hodgson (2000) as 2.57 mm long and 2.1 mm wide, *P. punctatus* is readily differentiated from other *Plumichiton* by the numerous large concave dorsal macropores found throughout the dorsum in all dorsal reticulation lines (Hodgson & Henderson, 2000) (See Appendix B, Figure 11). The main threat to *P. punctatus* is probably the lack of *Olearia macrodonta* in the Waipara region. There is a definite

need to survey the area for remaining patches of *Olearia*, to identify relic populations of *Plumichiton punctatus* and *Stegococcus oleariae*.

Kalasiris paradepressa Henderson and Hodgson
K. paradepresse is known from only four specimens collected in 1967 on *Hebe brachysiphon* and *Hebe odora* at Lincoln (Hodgson & Henderson, 2000). Described by Henderson and Hodgson (2000) as 3-5 mm long, 2.1-3.6 mm wide, adult females have no large macropores on the dorsum, reticulate pattern is in seven longitudinal rows. Distinct segmentation or pseudo-segmentation of the long "third" segment produces a seven segmented antenna (See appendix B, figure 12).

Aphenochiton chionochloae Henderson and Hodgson
A. chionochloae was collected from *Chionochloa flavescens* at Mt Oxford (1060 m) in 1955 (Hodgson & Henderson, 2000). It was described by Henderson and Hodgson (2000) as being 4.2-6.3 mm long and 2.0-2.7 mm wide (See appendix B, figure 13). *A. chionochloae* has not been seen for 45 years and a search of the area for this species is needed to confirm whether it is extant. Such a survey could provide baseline monitoring data and give an indication of population size and distribution to enable further management decisions to be made.

Aphenochiton inconspicuous (Maskell)
This rare species has been recently found on *Coprosma propinqua* at Kaitorete Spit (Rosa Henderson, pers. comm.. 2000). Its distribution covers a small area of private land and the Coprosma surrounding the aerials at the northern end of Kaitorete Spit. This is a vulnerable site, affected by stock grazing and the ever present threat of housing development. Any further developments in this area of Kaitorete Spit should be monitored by the department to avoid destruction of the Coprosma. *A. inconspicuous* is described by Hodgson and Henderson (2000) as 2-5 mm long and 1.35-2.45 mm wide, elongate and oval (See Appendix B, Figure 14).

Crystallotesta fuscus (Maskell)
C. fuscus was originally collected from ngaio (*Myoporum laetum*) at Lyttelton. The only recent record in Canterbury is from Okuti Valley Scenic Reserve (on *Melicytus ramiflorus*) (1983) . Its habitat at Lyttelton may well be lost as could other early recorded locations (Rosa Henderson, pers. comm. 2000). It is a species worth monitoring to detect and prevent any further contractions in its range. A resurvey of Okuti Reserve is necessary to confirm its presence and provide baseline data for future monitoring.

Most scale insects are very small (<3 mm) and require specialist taxonomic skills for accurate identification. Ms Rosa Henderson (Landcare, New Zealand Arthropod Collection) has done most of the recent work on New Zealand scale insects. It would be wise to consult Ms Henderson when considering surveys, monitoring and management decisions concerning New Zealand scale insects.

Lygaeidae

Rhypodes brevipilis Eyles
Described from two male specimens collected on *Hebe subalpina,* Kea Point walk, at the Hermitage, Mt Cook National Park . *R. brevipilis* is characterised by its slender femora, short first rostral segment and the shape of the pronotum (sides sinuate, flaring to postero-lateral corners) (Eyles, 1990). The head is black with narrow orange stripes on the edge of the vertex with the remainder of the body around. Insufficient information is available to complete a conservation assessment of *R. brevipilis*. Further collecting on *Hebe* at Mt Cook and further afield is necessary to

make an accurate assessment of the status of this species.

Order Thysanoptera (thrips)

Priesneriella gnomus Mound and Palmer

P. gnomus is a member of a small genus containing eight species, four from south Europe, three from southern USA and the eighth is known from a single specimen collected in Canterbury (Mound & Walker, 1986). Species of *Priesneriella* are small (1.5mm) and nothing is known about their biology worldwide (Mound & Walker, 1986). The unique female apterous specimen was collected at Kowai Bush from a dead *Griselinia littorelis* branch in September. The body is brown and paler on the inner margin of the fore femora. The tube is yellow in the proximal two-thirds, there are no ocelli and the compound eyes have approximately five ommatidia ventrally. *P. gnomus* is possibly an introduced species, given the Northern Hemisphere distribution of the rest of the genus (Mound & Walker, 1986). Indigeneity aside, it is still the only record of this species in the world, further material may indicate the need for a new genus. Its restricted distribution places it at risk from stochastic events. A survey of Kowai Bush and surrounding remnant forest patches is needed to collect further material to clarify the taxonomic status of this species. Information on distribution and population size can then be used to reassess conservation priorities.

Order Coleoptera

Family Anthicidae

Anthicus otagensis Werner & Chandler

A. otagensis has a wide distribution in Central Otago. However, one specimen was collected in Ashburton. *A. otagensis* was first recorded from the Cromwell Beetle Reserve in 1975, where it has a high level of protection. *A. otagensis* is commonly associated with *Raoulia australis* mats (Werner & Chandler, 1995). Most of Canterbury's lowland *R. australis* habitat is now highly modified intensive pasture. *A. otagensis* is a low priority for research since it already has a high level of protection in the Cromwell Beetle Reserve. A preliminary survey of *Raoulia* centred on the Ashburton region would be beneficial to ascertain the wider distribution of *A. otagensis.*

Family Anthribidae

Androporus discedens Sharp

A. discedens is relatively widespread in the North Island, but known from only two specimens in the South Island. One specimen is from the Conical Hills (Southland) and the second from an unknown location in Canterbury (Holloway, 1982). *A. discedens* is easily recognised by its very long antennae and a sensory pit on the hind femur of the male, which is unique amongst New Zealand anthribids (Holloway, 1982). The larvae feed on fungus-infected wood. Most rearing records are from conifers.

A. discedens represents a low priority since it is well established in the North Island. However, an investigation of the highly restricted South Island populations would be beneficial (especially to investigate the possibility of a subspecies). No further specimens of *A. discedens* are known to have been collected from Canterbury since Holloway's (1982) review of the New Zealand anthribid fauna (See Appendix B, Figure 5).

Family Carabidae
Tribe: Broscini
The Broscini are large beetles (10-40 mm). All are dark brown or black. However, some are slightly aeneous. Two characteristic features of this tribe are: the distinct waist between the pronotum and elytra and an incomplete border to the elytra (Britton, 1949).

Mecodema allani Fairburn
M. allani is one of Canterbury's largest carabids. In the literature it is known only from the type series collected in the valley adjacent to Mt Horrible and three specimens from Mt Cedric, Nelson. Lincoln University has four specimens from Nelson Lakes, three from the Lewis Pass (two had been dead for a considerable time when collected) and two recently collected specimens from Cragieburn (1992, 1996). *M. allani* is a predator that lives under large dead logs in *Nothofagus* forests as adults and larvae . *M. allani* ranges from 32-35 mm long, its head/pronotum are black and slightly aeneous while the elytra are dark chocolate brown (Britton, 1949). There are two large depressions on the head and the basal depressions in the prothorax are large and deep, with a dense minute sculpture (Fairburn, 1945).
M. allani is not a high priority for conservation since it is so widespread. It probably suffers heavily from predation by introduced rats, cats and hedgehogs and is possibly in decline. Habitat modification is unlikely to be a problem since this species lives in the widespread *Nothofagus* forests of the upper eastern South Island. A survey of Mid Canterbury would be beneficial to identify remaining populations that could then be incorporated into predator control plans for the region (See Appendix B, Figure 4).

Mecodema howiiti Castlenau
M. howiiti is restricted to the Banks Peninsula. It ranges from 26-31 mm long, is black, smooth with very faint punctures, the striae are not impressed, but indistinctly marked by punctures (Britton, 1949). Susan Anderson a masters student at Lincoln University is currently surveying the distribution of *M. howiiti* on Banks Peninsula. Her thesis should be finished by August 2000, survey data to date indicates that the species is relatively widespread in remnant bush patches. Management decisions pertaining to *M. howiiti* should be made following the completion of her thesis.

Mecodema brittoni Townsend
Hanmer is reputedly the type locality for *M. brittoni.* However, only one specimen is known from that locality. All other records are from South Canterbury. It seems likely that the Hanmer record is the result of a mistaken locality label since there are specimens of other South Canterbury species also labelled Hanmer collected by Fairburn. *M. brittoni* was (in the 1960s and early 1970s) widely distributed in the limestone country inland of Pleasant Point. The Lincoln University collection has records from Frenchman's Gully, Kings Cave and Raincliff, in addition to the material collected from Kakahu Hill and Mackenzie Pass listed in the original description. Nothing has been collected since 1973-74.
Habitat fragmentation and predation by introduced rodents, cats and hedgehogs are possible threats to *M. brittoni.* South Canterbury has been significantly altered and the last vestiges of habitat are bush-covered gullies, most of which have no formal protection. The primary recommendation for *M. brittoni* is a survey of the South Canterbury region with the aim of formerly protecting relict patches of suitable habitat (See Appendix B, Figure 6).

Tribe: Pterostichini

Genus *Holcaspis*
The genus *Holocaspis* is uniformly black, between 10-26 mm long, the mentum is toothed and as a pair of deep pits. The lack of seta on the seventh elytral interval distinguishes it from the other common genus *Megadromus* (Butcher, 1984).

Holcaspis falcis Butcher and *Holcaspis brevicula* Butcher
Holcaspis falcis is listed in Molloy and Davis (1994) from the Eryewell Forest. This is an error, *H. falcis* is from the Mackenzie Country, where it is reasonably common. *H. brevicula* is recorded from Eryewell Forest and is known from only two specimens, both males collected in June 1961 (Butcher, 1984). It can be identified by lightly impressed striae with no setiferous punctures and 17 setiferous punctures present in the elytral margin, grouped 5:1:11. *H. brevicula* needs immediate attention. *H. brevicula* has been collected only once (from a known precise location) and is relatively large/conspicuous. Therefore it is unlikely to have been overlooked by collecting in other areas. Eyrewell Forest is currently managed as a highly modified exotic conifer plantation with small remnants of former *Leptospermum,* fern and short tussock grasslands. A survey is required of Eyrewell Forest and other remnant bush patches close by. *Holcaspis* spp. are relatively easily collected by looking under logs or by pitfall trapping. Note: *Holocaspis brevicula* is a high priority species and a survey of suitable remnant habitat should be initiated as soon as possible.

Holcaspis odontella (Broun)
H. odontella is known from only three specimens, one from the North Island (Taranaki), one from the South Island (Broken River) and one from an unknown locality. Most species from the genus *Holcaspis* are known from either the North or South Islands, but generally not both . *H. odontella* can be identified by the following characteristics: 17-19 mm long, the pronotum has four setiferous punctures in the lateral margins, elytral striae are deeply impressed, there are 16 setiferous punctures variably grouped in the lateral margins and all femora are swollen in comparison with other *Holcaspis* species (Butcher, 1984).
H. odontella represents a conservation dilemma; the label data maybe incorrect. However, if genuine, the three specimens may in fact represent two or three different species. Clearly research into the taxonomy of these specimens is necessary. If the label data are not correct, then one is left unsure of the distribution of this/these species. To be certain of the species relationships it is necessary to collect more material from Broken River and Taranaki. Extensive recent collecting has failed to relocate *H. odontella,* therefore initial collecting is probably best pained at the Taranaki region. Once further material is collected, the taxonomic uncertainty that surrounds this species may be resolved. A survey would also provide necessary information to make decisions on conservation issues for this species. *H. odontella,* like *H. brevicula,* should be easily collected by looking under logs or pitfall trapping.

Genus *Megadromus*
Megadromus "omarama"
M. "omarama" is known from only the original series. Populations are found in relic *Nothofaguslscrub* patches in the Quail Burn/Omarama region (Peter Johns, pers. comm. 2000). The Omarama region is highly modified and the remaining *Nothofagus* forest is highly fragmented. Habitat modification, combined with predation pressure from introduced vertebrates, means an assessment of its current distribution is warranted. Fresh material from a survey could be used in a taxonomic revision to determine species relationships.

Megadromus n.sp.11

Megadromus n.sp 11, is an alpine species found on Benmore Peak. Little is known about this species. It is an alpine *Megadromus* and, as such, is afforded slightly more protection from vertebrate predators (e.g., rats) than its lowland relatives. This species should be incorporated into an assessment of other *Megadromus* in the Mackenzie Basin such as *M.* "omarama" mentioned in the previous paragraph.

Megadromus antarcticus subspecies 1 & 2

Included as category I species by Molloy and Davis (1994) nothing further is known about these possible subspecies. Each is recorded from only a single collection in South Canterbury (Peter Johns pers. comm. 2000). A survey of South Canterbury is necessary to collect further material for a taxonomic revision of *Megadromus antarcticus* in the area. It is possible there are some undescribed subspecies that may be threatened. Threats to these subspecies are unknown, but possibly linked to habitat fragmentation and introduced predators.

Family Curculionidae

Subfamily: Cryptorhynchinae

The Cryptorhynchinae is one of the largest subfamilies of New Zealand weevils. As of 1993, there were 42 genera and 316 known species (Lyal, 1993). Most of the New Zealand larval Cryptorhynchinae feed either on, or in, dead wood (whether they are feeding on the dead wood or associated fungi is not determined) (Lyal, 1993). The feeding habits of adult Cryptorhynchinae are currently unknown.

From a taxonomic viewpoint, the Cryptorhynchinae still require a lot of work. Lyal (1993) went a long way by producing annotated lists, including all current known information, and producing a useful key to genera. The main research requirements are extensive collecting and examination of currently known material to produce a comprehensive review of this subfamily. Some species may require conservation management. However, the lack of information is currently the largest barrier these species face.

Note all lengths exclude the rostrum.

Crisius baccatellus (Broun)

This was originally described by Broun (1917) from a single specimen collected at Scarcliff, near Mt Algidus, September 1913 (with a note that it was apparently rare). Broun (1917) described *C. baccatellus* as 3.5 mm long and 2 mm wide, oblong, moderately convex covered with depressed, small, more or less brownish squamae. A stout rostrum about a third shorter than the thorax, elytra double the length of the thorax. The ventral surface is thickly covered with tawny scales with darker scales at the edges.

Crisius bicinctus (Broun)

This species was described by Broun (1915) from a unique female specimen collected from Mt Hutt, January 1914 (4500 feet). The female is 7 mm long and 2 mm wide, has an elongate body with an approximately square thorax that bears a large obtusely rounded prominence on each side. The scutellum is large, pubescent and the elytra are broader than the thorax and three times its length. *C. bicinctus* is separated from closely related species by the lack of thoracic tubercles and the slight basal elevations of the elytra.

Crisius fulvicomis (Broun)

Described by Broun (1914) from three specimens found in decaying vegetable matter at Curiosity Gully, Rakaia Gorge, it is 2.3 mm by 1.5 mm, oblong, with a stout rostrum as long as the thorax. Elytra are truncate at the base and twice as long as the thorax.

Crisius obscurus (Broun)
Described by Broun (1921) from a single specimen collected September 1912 at the Rakaia Gorge, *C.. obscurus* is 4.5 mm long and 2.25 mm wide, oblong-oval and moderately convex. The tarsi and antenna are chestnut red, the rostrum is arched and slightly narrower towards the middle and the legs are elongate.

Crisius variellus (Broun)
Described by Broun (1914)from a single specimen collected in leaf mould at the Rakaia Gorge, October 1912, *C. variellus* is 4.3 mm long by 2 mm wide, convex and rather elongate. The rostrum is barely as long as the thorax. Elytra are oblong and moderately, coarsely serate-punctate.

Zeacalles estriatus Broun
This species was collected from McClellan's Bush, near Methven, April 1912. It was described by Broun (1914) as 3 mm long and 1 mm wide, opaque, fuscous and lacking elytral striae. It is distinguished from Zeacalles carinellus by the absence of the thoracic carina, opaque rostrum and elytral sculpture.

Zeacalles igneus (Broun)
This species was described from two specimens collected at Broken River. *Z. igneus* is most easily recognised by its fiery red scales. The rostrum is approximately the same length as the thorax. The elytra are convex and obviously striate. The basal portion and median spot on the elytra are black, whereas the rest is covered with fiery red scales (Broun, 1909).

Trinodicalles altus (Broun)
The only literature records for this species are from Broken River. It is described as compact, very convex and densely covered in obscure greyish scales. The thorax is noticeably longer than broad. The rostrum is thick and a pitch red in colour. The rostrum gradually narrows towards the middle at the point where the antennae articulate (Broun, 1909).

Microcryptorhynchus albistrigalis (Broun)
This species is recorded from Broken River where it was found in forest litter (Lyal, 1993). Described as moderately convex with red tarsi. The rest of the body is covered in depressed dark/obscure greyish scales. The rostrum is short and broad. This species is most easily identified by its short rostrum and relatively long thorax that possesses a pair of whitish basal streaks (Broun, 1909).

Tribe Molytini
The Molytini is a group of large flightless weevils. There are two genera (*Hadramphus* and *Lyperobius*) with 12 described species. The general biology of both *Lyperobius* and *Hadramphus* is reasonably well known. Larvae feed on the roots and stolons of herbaceous perennials from the families *Apiaceae* and *Araliaceae* (*Hadramphus stilbocarpa*) (Craw, 1999). *Hadramphus* adults are nocturnal, whereas *Lyperobius* are often diurnal; both feed on leaf tissue, flower stems and developing seeds. Feeding damage is easily recognised by holes in the leaves or notches chewed into the edge of leaves (Craw, 1999). *Lyperobius* and *Hadramphus* may have occurred in geographical proximity in Canterbury. However, they are separated along an altitudinal cline. *Lyperobius* species make use of the subalpine to alpine *Aciphylla*, whereas the Canterbury *Hadramphus* species was found on lowland *Aciphylla* (Craw, 1999).

The Cragieburn Range is (was) home to 19.8% of New Zealand's known Molytini fauna, third equal as the most taxonomically diverse habitat for New Zealand Molytini (Craw, 1999). Yet the Lincoln University Entomology Collection's last record of a molytine in the Cragieburn Range was 1975, even though collecting trips are made nearly annually.

The usual threats to large flightless invertebrates in New Zealand apply to the Molytini. Bull (1967) gave empirical evidence of mice preying on *Lyperobius huttoni* adults and Kuschel (1971) attributed the local extinction of *Hadramphus stilbocarpae* to the colonisation of Big South Cape Island by rats. Habitat degradation, destruction, reduction and fragmentation have probably played an equal part in the decline of the New Zealand Molytini fauna. The lack of recent collections from the Cragieburn Range would indicate a reduction in the population of Molytini in this area. Disregarding particular species, all the ranges surrounding the Castle Hill Basin should be thoroughly surveyed for the presence of isolated molytine populations. As a follow-up to this, other eastern ranges in Canterbury should also be surveyed.

Hadramphus tuberculatus Pascoe

Described by Pascoe in 1877, living *H. tuberculatus* have not been seen since 1922 at Waimate. It was reported from Banks Peninsula (Wells *et al.,* 1983), (Molloy & Davis, 1994)), however, the closest collection records are from Christchurch. *H. tuberculatus* is a lowland species, the host plant is likely to be *Aciphylla subflabellata* or *Aciphylla glaucescens* (Craw, 1999). It has been recorded from scattered locations at Waimate, in the south, to Oxford, in the north, and as far inland as Mt Oakden (Rakaia River). Easily identified by its size and location (on *Aciphylla*), it is 11.7-16.3 mm long and is brown with paler tubercles on its elytra. *H. tuberculatus* represents one of the highest priorities for conservation action in Canterbury. It has not been seen in nearly 80 years whereas 120 years ago it had a relatively wide distribution throughout lowland Canterbury. The close association between *H. tuberculatus* and lowland *Aciphylla* suggests the decline of both species are linked. A survey of all known remaining lowland *Aciphylla* is critical, as well as the identification of previously unknown suitable habitats. One prime location to check is Lees Valley (See Appendix B, Figure 15).

Lyperobius carinatus Broun

First described in 1881, this large (20.4-24.8 mm) brown/black weevil with white/yellowish scales is known from a few specimens collected in the east of the South Island from the Seaward Kaikoura Range to Mt Cook. Like other *Lyperobius* it feeds on *Aciphylla,* yet its populations seem to be highly fragmented. It is necessary to define optimum conditions for survival of this species followed by a search of suitable habitats. This would require an examination of locations from the Kaikoura to Mt Cook National Park to establish its present distribution (See Appendix B, Figure 16).

Lyperobius huttoni Pascoe

L. huttoni is a relatively widespread species from Wellington to the Hunters Hills in South Canterbury. Populations in Marlborough are probably stable. In Canterbury, however, the last recorded specimen in the Lincoln University collection is from the late 1960s (S.M Pawson recently observed a single specimen adjacent to Lake Lyndon, March 2000). In the last 40 years, the combined effects of habitat degradation and rodent predation have probably caused a decline in *L. huttoni,* the magnitude of which is unknown. A survey of suitable habitat in the Canterbury region is necessary to determine the stability of Canterbury *L. huttoni* populations. *L. huttoni* may be present in highly isolated populations, the size of which remain unknown (See Appendix B, Figure 17).

Subfamily: Rhyparosominae

Megacolabus sculpturatus Broun

M. sculpturatus belongs to an unusual genus to (seven species) concentrated in the North Island. Only two of the seven species occur in the South Island (May, 1963). *M. sculpturatus* has been collected only once, and was described by Broun (1893) from a single specimen (female) with type locality "Akaroa". Members of this genus are known to be nocturnal feeders of low growing ferns. May (1963) observed two species climb fern fronds shortly after dusk and proceed to chew on the ventral surface of the leaf. Barbara Brown (Lincoln University Ecology and Entomology Group) collected *Megacolabus garviensis* in 1998 after midnight at Piano Flat, Central Otago by beating the prickly shield fern (*Polystichum vestitum*). Other known host plants include *Pteris macilenta* and *Pteris tremula*, both are either regionally rare or endangered (Wilson, 1992). On Banks Peninsula Pteris macilenta is known from only one population, and *Pteris tremula* is known from 12 locations.. It is possible that habitat reduction could have caused the extinction of *M. sculpturatus* in the last 100 years.

M. sculpturatus is 7.5 mm long, 3.8 mm wide and has yellowish/greyish scales that are considerably more dense on the head, elytra and legs (May, 1963). It is possible that *M. sculpturatus* is now extinct. However, little effort has been given to searching for this species. Now that more information is known on the host plant and biology of this genus a comprehensive night survey of suitable habitat locations on the Banks Peninsula is a priority.

Family Hydraenidae

Orchymontia banksiana Ordish

First discovered in March 1973, *Orchymontia banksiana* is known only from Kaituna Valley (Delgado & Palma, 2000; Ordish, 1984). There are reasonable numbers of *O. banksiana*, held in the New Zealand Arthropod Collection; all belong to the type series. Judging from available literature, *O. banksiana* has been collected only on this one occasion (Delgado & Palma, 2000). Hydraenidae are known to feed on algae in aquatic, riparian habitats, streams, waterfalls and wet rock faces (Lawrence & Britton, 1981). Hydraenidae are usually found in forest streams with overhanging branches and can be collected by scooping leaf litter out of a stream and leaving it in a vessel with an incandescent light placed above it.

Since *O. banksiana* is known only from one location, it is important to establish its wider distribution. A brief survey of the other southern streams on Banks Peninsula, especially in Prices and Okuti valleys is recommended. If *O. banksiana* is indeed restricted solely to Kaituna Valley, then further action may be necessary to ensure the stability of the Kaituna population.

Family Lucanidae

Holloceratognathus cylindricus (Broun)

H. cylindricus has an unusual distribution. It has been a collected from a number of localities in the North Island (Holloway, 1961), 12 specimens from Nelson (Beverley Holloway, pers. comm. 2000) and one specimen from the Hooker River, Mt Cook, (1928). *H. cylindricus* is a fully winged species, therefore there is no reason why it should be restricted in Canterbury to the Hooker river. *H. cylindricus* is attracted to light and is a species to be aware of when light trapping. *H. cylindricus* is recognised by its very small, compact, reddish-brown body, which is uniformly dense, punctate and bears yellow scales (Holloway, 1961). It is 6.3-9.3 mm long with the females being slightly larger (Holloway, 1961).

Family Rhizophagidae

Lenax mirandus Sharp
L. mirandus is a small, probably fungus-feeding beetle. There is a single South Island record of *L. mirandus* in the Lincoln University collection from Mesopotamia, South Canterbury. It is a relatively widespread but rarely collected species in the North Island. Broun (1880) described *L. mirandus* as 4.75 mm long, 1 mm wide, head short and broad as the thorax. A deep large irregular depression on either side of the head separates the eye and the portion of the head behind it from the middle. The elytra and thorax are both very elongate. The elytra have four grooves within which are coarse punctures. Broun (1880) described *L. mirandus* from a specimen collected by Wakefield, March 1874, at Peel Forest. The lack of specimens is possibly a reflection of collector effort and this distinctive species should be watched for during other collecting.

The Family Rhizophagidae is a relatively understudied element of the New Zealand biota. Richard Leschen (coleopteran systematist, Landcare Research, Mt Albert) is currently working on the family.

Family Scarabaeidae

One of the main subfamilies of the New Zealand scarabaeid fauna the Melolonthinae was reviewed by Given (1952). There are some distinct gaps in our knowledge, e.g., the genus Prodontria (Bruce Given, pers. comm. 2000) and alpine scarabaeids. In his revision Given (1952) mentioned seven species known from only a few specimens or from one locality.
These are:

Odontria subnitida Given
At the time of Given's review *O. subnitida* was known only from the holotype and paratype, collected Broken River, March 1935. It has subsequently been collected elsewhere; two specimens in the Lincoln University collection were collected from the Rakaia Gorge and Lake Self. *O. subnitida* is dull light brown, approximately 11 mm long and 6.5 mm wide with fine elytral punctations (Given, 1952). It is difficult to distinguish between *O. subnitida* and closely related species; the only morphological characters are genitalia (Given, 1952). It is unlikely that *O. subnitida* is threatened, but is probably distributed throughout the mid-eastern inland ranges and basins. However, due to a paucity of information, it is a species that should be looked for during light trapping. Based on the morphology of larval mouthparts, it is thought *O. subnitida* could feed on Cassinia (Bruce Given, pers. comm. 2000) (See Appendix B, Figure 18).

Odontria aurantia Given
O. aurantia was initially collected at Tarndale, December 1931. It is also known from two paratypes collected on the Port Hills. Given (pers. comm. 2000), believes the lack of specimens is probably a reflection of collection effort. The Tarndale area is highly under collected and could represent a relatively safe haven for *O. aurantia*. The main research requirement is a survey of Tarndale and surrounding areas to ascertain the abundance of *O. aurantia*.

Odontria regalis Given
O. regalis is known from only the type specimen collected in October 1931 from the Port Hills. No other information can be located concerning this species. It is readily distinguished from closely related species by its long golden hairs on the pronotum

and elytra (Given, 1952).

Psilodontria viridescens Broun
P. viridescens is known in the literature from only two males collected at Moa Basin in the upper Rakaia and one specimen from Dunedin. Given (pers. comm. 2000) believes *P. viridescens* feeds on *Muehlenbeckia axilaris* and is probably widely distributed in the upper Rakaia region. Two further specimens are present in the Lincoln University collection and one at MAF Lincoln.

Stethaspis convexa Given
S. convexa is the rarest member of a quite conspicuous group of large green Melolonthinae. The genus *Stethaspis* can be conveniently subdivided into two groups. First, those with rather smooth clypeal services and shallow elytral striae that are probably all forest inhabiting species. The second group is mostly alpine or subalpine species, which are darker green with coarsely punctate, deeply impressed elytral striae (Given, 1952). *S. convexa* has the characteristics of the latter group with coarse, dense punctation of the elytra. *S. convexa* is known only from a very restricted number of specimens. The literature indicates that *S. convexa* has not been collected since the 1920s. Locality data for these specimens is merely Oxford, Canterbury. Further specimens have been collected more recently in the Waiau Valley.
The larvae of *S. convexa* are likely to be root feeders, like other members of the genus. They probably feed on tussocks or at the bush margin. Current information indicates November to December would be the best time of year to collect them. They may be collected by sweep-netting tussocks in the early evening or by malaise-trapping on bush edges.
S. convexa is identified by its pink iridescent clypeus and coarse dense punctation, which is absent from the scutellum. The elytral striae are very deep and coarsely punctured while the sternal surface has dense long greyish white hairs (Given, 1952).
S. convexa is a high priority for research/conservation management.. It is imperative that a survey is conducted to locate remaining populations of this distinctive element of the North Canterbury fauna. This would be best achieved by malaise-trapping in the Oxford ranges and Lees Valley in combination with dusk sweepnetting of tussock grasslands.

Family Prodontria

Prodontria matagouriae Emerson
This species is known from a number of locations in the Mackenzie Basin. Like its name suggests it is associated with matagouri (*Discaria toumatou)* where adults were found in soil adjacent to the roots and observed feeding on the foliage at night. It is 11.8-13.5 mm long and 6.5-7.2 mm wide. The clypeus sometimes red, whereas the frons and vertex are dark brown (Emerson, 1997).

Prodontria minuta Emerson
This species is known from only a single site near the Tekapo River Delta, Mackenzie Basin. It is 8.7-10.5 mm long and 4.3-5.4 mm wide (Emerson, 1997).

Little is known about the distribution of these two species of *Prodontria.* Both are flightless and therefore have reduced dispersal abilities. They are probably vulnerable to changes in land use. Further knowledge about their biology and distribution would be valuable to ensure the stability of the species

Little further information has been gathered since 1952 on the Melolonthinae and many species are in need of further research. Bruce Given (pers. comm. 2000)

believes there are at least 7-8 undescribed species of Prodontria, most uncollected, a lot flightless and usually local endemics. The Melolonthinae, especially the *Prodontria* need further collecting to allow sound management decision-making.

Family Tenebrionidae

Zeadelium gratiosum (Broun)
Z. gratiosum is widely distributed in the higher rainfall regions of North-Waste Nelson, Arthur's Pass and south to Hokitika. Three specimens are known from Banks Peninsula where it has not been collected since the 1960s. The Banks Peninsula population appears to have been restricted to the remnant *Nothofagus* forests bordering the Hinewai Reserve. Larvae are probably detritivores whereas adults possibly feed on algae/lichens. *Z. gratiosum* is not rare, since it has stable populations in the wetter ranges of the Central South Island. However, the Banks Peninsula population is threatened, if not already extinct. It would be beneficial to survey relict *Nothofagus* patches, especially on the southern flanks of Banks Peninsula, to locate any surviving populations of *Z. gratiosum*. If located, management of these populations should be considered (See Appendix B, Figure 19).

Order Diptera
Family Calliphoridae

Pollenia commensurata Dear
P. commensurata was collected once from Mt Somers, January 1958 (Dear, 1985). *P. commensurata* has a body and wing length of 6 mm, wings are yellowed and the abdomen is black with metallic blue-green reflections (Dear, 1985). The mesonotum is distinctly dusted in appearance, bears a presutural median seta and a pair of lateral setae. Information from other members of the genus suggests *P. commensurata* is likely to be a parasite of earthworms (Colless & McAlpine, 1991). The decline in habitat suitable for native worms (see oligochaete section) is a possible threat to *P. commensurata*. The main research requirement for *P. commensurata* is to confirm its presence at Mt Somers, and investigate adjacent ranges/habitats to locate other populations.

Family Dolichopodidae

The family Dolichopodidae is one of New Zealand's largest fly family. Bickel (1992) recorded 132 species and speculated a further 50 % of that number are yet to be described. Dolichopodids are small insects, slender in build with long legs. Their colour is often metallic blue-green. Dolichopodids favour moist habitats, where adults are predatory on other soft-bodied invertebrates (Bickel, 1992). Dolichopodids are easily collected by sweep netting, malaise-trapping or yellow pan traps. Their taxonomy is based mainly on elaborate secondary sexual characters of the males (Bickel, 1992).

Parentia nova Parent
P. nova is known from five specimens collected at two locations on Banks Peninsula (Purau Creek and Rhodes Scenic Reserve). *P. nova* is unusual; the male lacks strong secondary sexual characters of the legs, apart from those on tarsal segments 3-5 of its hind legs (Bickel, 1992).

Naufraga hexachaeta (Parent)
N. hexachaeta belongs to a monotypic genus, known from five specimens collected in Christchurch and the Waiau Valley. Daniel Bickel (pers. comm. 2000) described

N. hexachaeta as rare, and distinguishes it from *Parentia* spp by the dorsocentral setae and the tibia I seta. The main requirement for this genus is further collecting to more accurately establish its distribution

Sympycnus (s.l.) *alchymicus* Parent
Described from a Christchurch specimen by Parent (1933), *S. alchymicus* has very distinctive antennae. This is a monotypic genus. Nothing further is known about this species apart from its original description. It would be valuable to check Riccarton Bush for this species.

Syntormon aotearoa Bickel
This species is known from one specimen collected from the wetlands adjacent to the shores of Lake Forsyth.

Dolichopodids, like most Diptera are relatively understudied. The basic research requirements are increased collecting effort and taxonomic work. The information provided from these studies can then be used for conservation management decisions. This family, however, is most diverse in moist habitats that are often drained for developmental purposes. The protection of these biotypes may help some species. The taxonomy of Dolichopodidae, like most Diptera, is difficult and requires specialist skills. Any work on the New Zealand Dolichopodidae should be done in consultation with Dr Daniel Bickel (Australian Museum, Sydney).

Family Syrphidae
Miller (1921), in his monograph on New Zealand syrphids, identified three species from the Canterbury region known from restricted locations. The number of specimens of each species in collections around New Zealand is unknown.

Melanostoma apertum Miller
Originally described from Christchurch, nothing more is known about this species.

Platycheirus atkinsoni Miller
Originally collected from Devils Punch Bowl, Arthur's Pass, nothing further is known apart from the original description.

Xylota montana Miller
Originally collected from Arthur's Pass, there is no further information following its original description.

Family Therevidae
The New Zealand therevid fauna is very rich, Lyneborg (1992) described 69 species and estimated there are probably 100 species in the country. The main diversity of therevids is in coastal scrub and on sandy beaches, which is typical of therevids worldwide (Lyneborg, 1992). What is unusual, is the diversity present on inland lake shores, riverbeds, open swampy mountainsides and tussock country (Lyneborg, 1992). Adults are generally diurnal. They don't appear to be predaceous and probably imbibe only water and honeydew (if available) (Lyneborg, 1992). Larval therevids are active predators feeding on insect larvae and earthworms. Therevids are relatively easy to collect by sweep-netting and malaise-trapping (Lyneborg, 1992).
Like most Diptera, therevids are relatively understudied. It is tempting to assume that the lack of specimens is merely a reflection of collecting effort. They are relatively large flies (in most cases > 10 mm) and many have not been collected for at least 30-40 years. One would assume that these relatively large species, which are easily collected, would have shown up more frequently in collections if they were common

widespread members of the New Zealand dipteran fauna.
The main research/management requirements should be a resurvey of the Canterbury Conservancy to determine the distribution of therevids. The easiest method would be a series of malaise traps supplemented by sweep-netting. Acquired distribution and abundance information could then be used to reassess the conservation priority of Canterbury therevids. Introduced mammalian predators may not be, but should not be discounted as major threats to therevids since larvae are soil dwellers. The most immediate threat is probably habitat modification. However, its impact is yet to be quantified. Below is a list of Canterbury's therevids known from very few collections and in most cases not seen recently;

Anabarhynchus albipennis Lyneborg
Known from only a single male specimen collected at Lake Pukaki, March 1964 (Lyneborg, 1992), *A. albipennis* is 10 mm long with a wing length of 7.5 mm. The eyes are separated in front of the anterior ocellus by approximately twice its width. The wings are whitish hyaline with traces of brown along the veins. Nothing is known about the biology of *A. albipennis* apart from the fact that it inhabits inland lake shores.

Anabarhynchus atratus Lyneborg
Known from only a single male specimen collected at Arthur's Pass, 1922 (Lyneborg, 1992), *A. atratus* is 10 mm long with a wing length of 7.5 mm. The eyes are separated in front of the anterior ocellus by 4.5 times its width. The wings are grey-brown hyaline with narrow brownish streaks along the veins in the proximal half. Nothing is known about the biology of this species apart from its collection data. Recorded from Arthur's Pass, it probably inhabits wet mountainsides or inland riverbeds (Lyneborg, 1992).

Anabarhynchus embersoni Lyneborg
Known from two specimens collected at Mt Wall, Cragieburn 1972 (Lyneborg, 1992), *A. embersoni* is 10-12 mm long with a wing length of 9.5 mm. The eyes are separated in front of the anterior ocellus by 4 times its width. The wings are grey-brown hyaline, with pale brownish stigma and brown to brown-black veins. The abdomen was entirely discoloured in the holotype. Therevids larvae were common in soil samples under *Nothofagus* forest, on Mt Wall, dug for collection of Melolonthinae larvae (Emberson, unpub. data).

Anabarhynchus indistinctus Lyneborg
A. indistinctus is known from only a single male specimen, collected at Andrews Stream, Arthur's Pass, November 1977(Lyneborg, 1992). *A. indistinctus* is 7 mm long with a wing length of 6.5 mm. The eyes are separated in front of the anterior ocellus by 2.4 times its width. The wings are uniformly grey-brown hyaline, veins in the stigma are brown-black.

Anabarhynchus olivaceus Lyneborg
Known from only two female specimens collected at the Bealey River, December 1958, *A. olivaceus* is 8-9 mm long with a wing length of 6.8-7.0 mm. The eyes are separated in front of the anterior ocellus by about 5 times its width. The wings are strongly maculated with broad dark brownish streaks along the veins. The centre of the wing cells is whitish hyaline.

Anabarhynchus simplex Lyneborg
A. simplex is known from a single male specimen collected on the Port Hills, October 1919. It is by far the smallest *Anabarhynchus* in New Zealand being 5 mm long with a wing length of 3.7 mm. The eyes are separated in front of the anterior ocellus by

2.8 times its width. The wings are very dark greyish-brown in the distal half, especially in streaks along the veins (See Appendix B, Figure 20).

Ectinorhynchus furcatus Lyneborg
Known from a single male collected at Lake Tennyson (1220 m) January 1976, it is 10 mm long with a wing length of 8.6 mm. The eyes are separated in front of the anterior ocellus by 4.5 times its width. The wings have a markedly brownish ting, areas around the stigma and cross-veins are brown-black.

Family Tipulidae

Discobola dicycla Edwards
Originally described from Christchurch very little is known about this species. It is possibly rare, but in definite need of research (Peter Johns, pers. comm. 2000). Research should include a survey of the greater Christchurch region to determine the distribution and habitat requirements for this species. Once more information is known, further decisions may be made on conservation priorities.

Gynoplistia canterburiana Edwards and *Gynoplistia speighti* Edwards
Restricted to North Canterbury hill country (Peter Johns, pers. comm. 2000) and originally described from Mt Grey little else is known about these species. Like *D. dicycla,* distribution information and habitat requirements need research.

Order Trichoptera

Adult Trichoptera are terrestrial , they look similar to moths but bear hairs instead of scales on the wings. The larvae are aquatic. Some species build fixed shelters or portable cases from which they feed (Ward et al., 1999).

Family Hydrobiosidae

Tiphobiosis childella Ward
This species has been recorded only from its type locality, Hinewai Reserve (Ward, 1995; Ward et al., 1999). It has a forewing length of 5-5.5 mm. Hind wings are pale grey, forewings are black and lack the erect hairs. The eyes are blacked with a brilliant green metallic iridescence. *T. childella* inhabits first-order streams shaded by forest (Ward, 1995).

Tiphobiosis hinewai Ward
T. hinewai is a second species whose known range so far is restricted to Hinewai Reserve. It has a forewing length of 6.7 mm +/- 0.5 mm. Forewings are yellow-brown and lack erect hairs whereas the hind wings are paler (Ward, 1995).

Both *T. hinewai* and *T. childella* are known only from Hinewai Reserve and exemplify the value of Hinewai to invertebrate conservation on Banks Peninsula. A brief survey of similar streams on Banks Peninsula would be valuable to determine their wider distribution.

Family Rhyacophilidae

Psilochorema folioharpax McFarlane
This species is known from only two locations, the type locality, Andrews Stream, Arthur's Pass and Glentanner. It has not been caught at the type locality since its original collection in 1953. All four specimens in the type series have abberant wing veination. In some individuals the right and left forewings differ (Fluctuating

asymmetry) (McFarlane, 1956). Further collection is necessary to ascertain the wider distribution of this species.

Order Lepidoptera

Patrick and Dugdale (2000) recently completed their conservation assessment of New Zealand Lepidoptera. Although 34 of New Zealand's "at risk" Lepidoptera inhabit forest communities, the majority inhabit lowland shrub/grassland, riverbeds, bluffs and coastal plant communities (Patrick & Dugdale, 2000). This reflects a lack of specialist herbivores in lowland forests, the richness of monophagous or specialist herbivores and destruction of large areas of shrub and grassland communities (Patrick & Dugdale, 2000). Very few lowland Canterbury shrub and grassland communities have any formal protection, yet Patrick and Dugdale recognised 49 species at risk within conservancy boundaries. The establishment of small reserves and re-evaluation of the impact of high-intensity farming practices on the remnants of Canterbury's shrub and grassland communities is a priority, not only for Lepidoptera, but all invertebrates and many native plants. Fencing is a priority for the protection of our remaining lowland forests. However, careful consideration should be given to the management of shrub and grassland communities. Fencing exclosures may lead to unfavourable shifts in the invertebrate habitat. The following annotated list is based on Patrick and Dugdale's assessment of Lepidoptera. It includes most current ¡nformation regarding biology and phenology, which in most cases is limited.

Family Blastodacniidae

Circoxena ditrocha Meyrick
This relatively widespread species is recorded from Auckland to Invercargill but is uncommon and rarely collected (Patrick & Dugdale, 2000). The host plant is unknown, though it may be a seed borer (Patrick & Dugdale, 2000). *C. ditrocha* has a wing span of 12.5 mm, narrow forewings with an acute apex, brown ish-ochreous with golden reflections. The entire wing is broadly streaked dark brownish-black, with two large clear white fine ring shaped markings. The hindwings are greyish-ochreous with cilia of the same colour. The adult has been found in December and March, and collected from the edges of forest or scrub. It is most easily obtained by sweeping foliage, especially *Psuedopanax arboreus* (Hudson, 1928: 331-332, PI. 28, Fig. 19) (See Appendix B, Figure 21).

Thectophila acmotypa Meyrick
This is an alpine species of a monotypic genus, known from only the type locality (Arthur's Pass, 1300 m). Nothing is known about its biology or host plant. *T. acmotypa* has a wing span of 12.5 mm, all wings are lanceolate, with acutely pointed apices. The forewings are creamy white, narrowly edged with ochreous, a black streak at the apex terminates in a tuft of black cilia. The remaining cilia are whitish. The adult appears in February and was found amongst rough herbage on a mountainside (Hudson, 1928: 302, PI. 52, Fig. 18).

The main research need for this species is to determine its distribution, and host plant affinities. This information will help reassess its conservation priority. Its habitat already has a high level of protection being part of Arthur's Pass National Park.

Family Carposinidae

Heterocrossa maculosa (Philpott)
This species belongs to a small distinct group of Heterocrossa that feeds on *Hoheria angustifolia* and *Plagianthus regius* (Patrick & Dugdale, 2000). It is currently known from only the type locality (Coopers Knob), Lyttelton Hills and Otago. *H. maculosa*

may be a local population of a more common eastern South Island species, the larvae of which have been found feeding in fruit and are also known to take advantage of tree wounds and bore into actively growing shoots (John Dugdale, pers. comm. 2000). *H. maculosa* has a wing span of 17 mm, the forewings are very pale brownish-cream with conspicuous black dots. The hind wings are almost white. The adult emerges in November (Hudson, 1928: 218, PI. 27, Fig. 28).
Habitat loss and fragmentation are probably the main threats to *H. Mecca maculosa.* However, lack of knowledge is a critical problem. Research requirements include: the need for further collecting at the type locality and surrounding areas, e.g., Kennedys Bush, the Sign of the Bellbird and other adjacent reserves. Information on the phenology, wider distribution and taxonomic status of *H. maculosa* are also required. These requirements are necessary to make appropriate management decisions.

Family Crambidae

Gadira "black brown EGW"
Known from only two degraded sites in Mackenzie Basin, the species possibly feeds on moss like other *Gadira* spp. (Patrick & Dugdale, 2000). Unfortunately, most areas in the Mackenzie Basin are highly modified for farming. A taxonomic description and research into the biology and ecology of this species are necessary as well as locating further populations in the dry eastern regions (See Appendix B, Figure 22).

Gadira petraula (Meyrick)
G. petraula inhabits the lichen/moss-covered volcanic rocks on the Port Hills around Lyttelton and the Seaward Kaikouras. It is sympatric with *Gadira leucophthalma* on Banks Peninsula and the females are morphologically similar (Patrick & Dugdale, 2000). The Seaward Kaikoura population needs to be examined to ascertain its species status (Patrick & Dugdale, 2000). The female has a wing span of 12.5 mm and the male's slightly greater. The male forewings are rather elongated, triangular, with an oblique termen. Forewings are white with blackish-grey markings, very slightly tinged with ochreous. There is a large irregular discal patch, darker on the costa, surrounding a single, clear white, reniform spot. The female has very narrow oblong forewings, while the hind wings are proportionally shorter and rounded, markings resemble those in the male but are cramped and obscured. The larva is moderately stout, cylindrical, wrinkled, very sluggish, dark greyish-brown on the dorsal surface, lighter on the sides, with minute blackish obscure spots (setal pinacula). The head is brown. Adult insects appear in March, but there is probably a succession of generations. The female runs freely, and appears incapable of flight (Hudson, 1928: 172, Pl. 19, Fig. 34). The main threat to this species is probably alteration of habitat through urbanisation. However, rock climbers cleaning rock faces with wire brushes could be a cause of high mortality where climbers and moths come into contact (See Appendix B, Figure 23).

Kupea electilis Philpott
Despite extensive searching, this species is known only from Kaitorete Spit where it is associated with *Raoulia* (Patrick & Dugdale, 2000). The female has never been collected and is assumed to be flightless (Gaskin, 1975). The male has a wing span of 20-23 mm, elongate narrow forewings with an acute apex and rather oblique termen. The forewings are brassy-ochreous, the discal and terminal areas are suffused with grey. There are two incomplete oval white blotches and one well-defined round white spot. The hind wings and cilia are pale brownish-ochreous (Hudson, 1939: 420, P1.56, Fig.37). The adult emerges between March-April and can be collected from the hind-dune/inter-dune grasslands (Patrick, 1994). Patrick (pers. comm. 2000) has collected reasonable numbers of *K. electilis,* but on only one occasion. High-intensity farming and housing developments are two key threats to

this species (Patrick & Dugdale, 2000). Its highly restricted location and specific habitat requirements make it a very vulnerable species. Main management/research requirements are the identification of habitat areas followed by fencing and long-term protection from development (See Appendix B, Figure 24).

Maoricrambus oncobolus (Meyrick)
This taxonomically very distinct species (monotypic genus) is associated with braided riverbeds in Canterbury and has been found at riverside grasslands in Southland (Oreti Beach (Patrick, 1994c)) (Patrick & Dugdale, 2000). As yet, nothing is known about its biology or host plant affinities. It has a wing span of 25 mm, forewings are dark greyish-ochreous, the basal stalk of the median vein and its branches are all clearly marked reddish-ochreous. There is a conspicuous black and white central stripe extending almost from the base to midway along. There are two short stripes (orange, black and whitish lines) on the sides of the thorax. The hind wings are dull greyish-ochreous. Hudson recorded the adults as rarely met, flying December-January (Hudson, 1928:169, PI. 20, Fig.35).
The main threat to this species is probably the modification of inter-montane grasslands by intensive pastoral farming and riverbeds by invasion of adventive weeds and shrubs. The main research requirements are the location of remaining populations and identification of host plants leading to the ultimate protection of habitat areas.

Orocrambus fugitivellus (Hudson)
The host and biology of this highly restricted species are still unknown (Patrick & Dugdale, 2000). Yet another example of speciation in the dry eastern shrub/grasslands, *O. fugitivellus* is known from only one population in an isolated, slightly swampy area of Holden Road, Mackenzie Basin (Graeme White, pers. comm. 2000 Patrick, 1992). The rapidly dwindling and degraded plant communities have probably led to the decline of this species to its present status. Research further south in the Mackenzie Basin by Dr Graeme White has failed to locate other populations.
The female is brachypterous (Brian Patrick, pers. comm. 2000), which would undoubtedly limit its dispersal capability. The main priority for this species is to identify host plants and possible threats.
O. fugitivellus (male) has a wing span of 18 mm, the crown of the head is white, face, antennae, palpi and anterior legs are pale greyish-ochreous. The forewings are bronze-ochreous-brown much paler towards the base, elongated with an acute apex and very oblique termen. They have a moderate, broad white streak along the edge of the costa becoming very narrow just before the apex and a very conspicuous longitudinal snow-white streak from base to termen slightly above the middle of the wing. The hind wings are white, with a faint brownish tinge (Hudson, 1950: 99, PI. 4, Fig. 2). The adult appears during January and February (Patrick, 1992) (See Appendix B, Figure 27).

Orocrambus sophronellus (Meyrick), *Orocrambus sophistes* (Meyrick) and *Orocrambus lindsayi* Gaskin form a distinctive, possibly conspecific, group within the genus *Orocrambus* (Patrick & Dugdale, 2000). They are all uncommon and rare, and apart from emergence data and one host record, little is known about their biology. The genus *Orocrambus* is very species rich in the Mackenzie Basin. Research is needed to separate the distributions of each species and ascertain host plants. This information can then be used for further important conservation decisions such as protection and rehabilitation of habitat.

Orocrambus lindsayi Gaskin
Described from Mount Ida, Otago, nothing is known about the biology, host plant associations or male of the species (Gaskin, 1975; Patrick & Dugdale, 2000). Wing span of the female is 22 mm. The eye lacks a nude circumorbital strip. Forewings are very elongate with a few subterminal and discal dark markings (Gaskin, 1975). The main research priority is the identification of populations and host plants. Both these are needed before any further management decisions can be made.

Orocrambus sophistes (Meyrick)
O. sophistes feeds on *Festuca novaezealandiae;* the female is flightless and stenopterous (thin winged) (Patrick & Dugdale, 2000). Originally collected in the Ida Valley, it is possibly extinct at this location (Patrick & Dugdale, 2000). Like several other *Orocrambus* it is present in the short tussock grasslands of the Mackenzie Basin. The flightless nature of the female prevents long-distance dispersal and predisposes this species to the problems associated with a fragmented, degraded habitat. It has a wing span of 27 mm, the forewings are very narrow/elongated, dull brownish-grey and glossy. There are two small black marks near the middle of the wing and a curved series of black dashes on the veins about three-quarters of the way along the wing (Hudson, 1928:169, PI. 29, Fig. 24). Hudson noted that *O. sophistes* closely resembles some scopariines, but can be immediately distinguished by the labial palps (See Appendix B, Figure 25-26).

Orocrambus sophronellus (Meyrick)
O. sophronellus is thought to be a short tussock grasslands species (John Dugdale, pers. comm. 2000). Like many tussockland species, select it is probably affected by habitat reduction and degradation principally due to pastoral farming. It has elongate-triangular forewings with a span of 22 mm. They are white, very finely speckled with greyish-ochreous and bear a group of terminal black dots. The cilia are white, and broadly barred with blackish-grey. The adult is reported by Hudson to be attracted to light and occurs, very rarely, in March (Hudson, 1928: 169, PI. 20, Fig. 43)

Orocrambus "Mackenzie Basin"
This undescribed species is known from a localised area in the Mackenzie Basin (Graeme White, pers. comm. 2000). The female is flightless and low dispersal ability makes this species susceptible to disturbance. Adults emerge in late summer to early autumn (Patrick & Dugdale, 2000). The host plant is unknown. There is an urgent requirement to ascertain the host plant and distribution of this undescribed species. From a scientific point of view this species needs describing (See Appendix B, Figure 29-30).

Family Elachistidae

Elachista helonoma (Meyrick)
E. helonoma was first collected on the Port Hills. It is a member of a complex that includes *E. exaula* Meyrick and *E. ochroleuca* Meyrick, that is found exclusively in short tussock grasslands (Patrick & Dugdale, 2000). The host is probably *Poa cita* from which adults are usually collected. The larvae are leaf miners, which are almost impossible to detect (John Dugdale, pers. comm. 2000). The type locality (Port Hills) is now highly modified with large areas urbanised and the remainder used largely for pastoral farming. In many localities, the short tussock grasslands are being out-competed by adventive species. When described by Hudson, it was common on the Port Hills. It is currently not uncommon in the Mackenzie Basin (Graeme White, pers. comm. 2000). It has a wing span of 6 mm, pale whitish-ochreous forewings speckled with numerous blackish dots. There is a dense chain of larger dots forming

a streak from the base to about the halfway point, and another streak from above this to the apex. The hind wings are greyish-ochreous. The adults are present January-March (Hudson, 1928: 8319, PI. 28, Fig. 14).

Family Gelechiidae

Kiwaia jeanae Philpott
Known from Kaitorete Spit and also originally reported from Leithfield Beach, it feeds on Raoulia mats on sandy/stony storm beaches (Patrick & Dugdale, 2000). The main threat to this species at Kaitorete Spit is stock trampling of Raoulia and commercial shingle removal (Patrick & Dugdale, 2000). It is relatively common at Kaitorete spit (Patrick, 1994). However, the Leithfield Beach population needs resurveying to check its stability (Patrick & Dugdale, 2000). It has a wing span of 8 mm, lanceolate, pale whitish-ochreous forewings speckled with dark grey on the male, females have a small blackish mark near the base, a large blotch before the middle and cloudy spots at two-thirds and near the apex. The hind wings are greatly reduced in both sexes. In the male they are clothed with numerous long, fine, hair like scales radiating in all directions (Hudson, 1939: 437-438, PI. 58, Fig. 9-10). Adults have been collected from January until late March-mid April in the foredunes and hind dunes.
A closely related species, Kiwaia "Cloudy Bay" is associated with damaged Raoulia pads, often growing in open ground disturbed by vehicles (Dugdale, 1999). Therefore, the impact of stock on K. jeanae at Kaitorete spit requires further investigation. It may be that the high-intensity farming methods practised over much of Kaitorete Spit are more of threat (See Appendix B, Figure 28).

Kiwaia "plains jumper"
"Plains jumper" is an undescribed species known from McLeans Island, Kaitorete Spit and near Tekapo where very rare (Patrick, 1992). The adult is diurnal, brachypterous, found jumping around on shingly ground with *Raoulia* spp., mosses and sorrel (Patrick & Dugdale, 2000). The main threat faced by this species is the modification of its habitat by urbanisation or pasture establishment. The plant community that supports "plains jumper" and other distinctive invertebrates is now largely destroyed (Patrick & Dugdale, 2000). The main research requirements are the identification of remaining populations and formal description of the species.

Kiwaia pumila (Philpott)
This fully winged *Kiwaia* sp is associated with damp patches in grass swards. Collected occasionally by Dr Graeme White in the Mackenzie Basin, it is also known from beneath the electricity pylons at the end of Conservators Rd, McLeans Island (John Dugdale, pers. comm. 2000). It is a member of a poorly understood complex best distinguished by its genitalia. The genus has an unusual New Zealand/Nepal biogeographic distribution (Patrick & Dugdale, 2000).
It has a wing span of 13 mm, very pale brown ish-ochreous forewings with a rather narrow black longitudinal streak in the middle from the base towards (but not reaching) the apex. It is distinguished from Kiwaia monophragma by its smaller size, less distinct markings, shorter longitudinal streak, speckling of forewings and pale hind wings. The adult appears in March (Hudson, 1939: 439, Pl. 58, Fig. 4). Research is needed to locate extant populations and identify host plants before any management decisions can be made (See Appendix B, Figure 31).

Family Glyphipterigidae

Glyphipterix euastera Meyrick
G. euastera is a day-flying moth associated with damp patches of original short

tussock grasslands (John Dugdale, pers. comm. 2000). The host plant is unknown but is likely to be a sedge or grass (Patrick & Dugdale, 2000). The type locality is probably the Bridle or Rapaki Track (Patrick & Dugdale, 2000). Further records include Kaitorete Spit, Hinewai Reserve and the margins of Sutton (salt Lake), Otago (Brian Patrick, pers. comm. 2000). It is an uncommon species whose main threat is probably the continued modification of its habitat. Browntop and other adventive weeds are encroaching on short tussock grasslands especially in damper areas.
It has a wing span of 6 mm, the forewings are black on the basal third, heavily sprinkled with white scales except on the costa which is deep orange-yellow. The forewings bear a highly developed apical lobe. It is easily recognised by the orange-yellow ground colour of the discal area, heavy sprinkling of white scales on the basal and apical areas and the absence of a black tornal patch. The adult appears from October until January and is found in grassy places (Hudson, 1928: 315-316, PI. 34, Fig. 21).

Family Geometridae

Asaphodes obarata (Felder & Rogenhofer)
A. obarata is a widespread but rare species (historically uncommon (Patrick, In press a)) found in both the North and South Islands. Canterbury populations are known from Akaroa (Hudson, 1928) and other locations. *A.oberata* was not recorded in the Mackenzie Basin during a survey by Patrick (1989). Two records exist of *A. obarata* in Otago in the last 50 years and it is thought to be locally extinct in Southland (Patrick, 1994c). The host plant of *A. obarata* is unknown.
It has a wing span of 25 mm, forewings are dull ochreous-green with a short transverse black-mark. Most noticeably the middle of the wing is white, with very pale blue marbling beyond and a broad black band wavy towards the termen. The hind wings are pale ochreous-brown with several fine blackish transverse lines near the base, cilia are whitish-ochreous barred with black. Adults emerge in December and January and are associated with forest margins, but always very localised (Hudson, 1928: 117, PI. 13, Fig. 40).
Specific threats have not been defined. Habitat alteration, particularly the loss of damp herb fields by the burning of grasslands and other farming practices, has probably reduced the abundance of host plants (Patrick, In press a). Research is needed to identify host plants and locate breeding sites. Initial places to survey include damp forest margins on Banks Peninsula and remaining bush patches on the Canterbury Plains.

Asaphodes stinaria (Guenee)
A. stinaria was once widespread in New Zealand; records include both the North and South Islands. Originally described from an unknown locality in Canterbury, the only recent records are from Western and Central Otago and Westland (Patrick, In press a; Patrick & Dugdale, 2000). The distribution of *A. stinaria* has contracted to such an extent that it is possibly extinct in eastern and southern South Island (Patrick, 1994c; Patrick & Dugdale, 2000). *A. stinaria* possibly feeds on *Ranunculus* spp. which have suffered heavily from intensive grazing and pasture improvement programmes. Records indicate it inhabits rough herbage in the vicinity of forests, tussock country and grassy openings in scrubby forest (Patrick, In press a).
A. stinaria has a wing span just less than 25 mm, bright ochreous-brown forewings with an oblique dark edged white line running from the dorsum near the base, towards the middle of the wing. A second slightly wavy dark-edged white line is located roughly three-quarters of the way down the wing. Between these lines the colour is often considerably darker, the hind wings are ochreous without markings. The female is paler and more uniform in colour than the male (Hudson, 1928: 122, PI. 13, Fig. 14). Adults emerge from November until March; 74% of specimens were

caught in December (Patrick, In press a).
Research is needed to establish the remaining distribution and host plant affiliations of this species. Management decisions cannot be made until more is known regarding host plant affiliations and the distribution of extant populations (See Appendix B, Figure 32).

Austrocidaria lithurga (Meyrick)
Recorded from Wellington and Mid Canterbury it is a member of a species complex that feeds on divaricating Coprosma (Patrick & Dugdale, 2000). It is usually associated with open shrubland but is rarely collected (Patrick & Dugdale, 2000). *A. lithurga* has a wing span of just over 25 mm, forewings are pale greyish-ochreous with the basal patch and median band clouded with brown. There is an elongate black discal dot near the first line, a distinct pale apical patch and a wavy greyish subterminal line. The hind wings are whitish-ochreous, with several very faint greyish transverse lines (Hudson, 1928: 103, PI. 12, Fig. 39). The pupae have been found enclosed in a loose cocoon amongst *Muehlenbeckia* (Hudson, 1928). However, it is possible that the *Muehlenbeckia* vines were supported by a *Coprosma* species. Adults emerge in October and November; records are concentrated around coastal areas (Hudson, 1928). Preliminary research is required to identify host plant taxa and remnant populations.

Dasyuris enysii Butler
This species was first collected near Lake Lyndon. Other specimens have also been collected from Marlborough and Kaikoura. It is uncommon and belongs to a poorly understood complex of species (Patrick & Dugdale, 2000). Host plant affiliations are unknown but could possibly be a member of the Apiaceae (speargrass) family. *D. enysii* has a wing span of 25 mm, forewings are dark brown. The basal patch and median band are slightly darker brown with fine whitish lines. The hind wings are bright orange, densely speckled with black from the base to one-third. There is an almost straight oblique black line one-third of the way along the wing. The adult emerges in January and is day-flying (Hudson, 1928: 128-129, Pl. 15, Fig. 46).
More information is needed on the biology and ecology of this species. Management needs are more complex since most populations are on Crown Land where they enjoy relatively high levels of protection. *D. enysii* appears to be declining for unknown reasons (Brian Patrick, pers. comm. 2000). Possible threats include decline in abundance of lowland *Aciphylla*, parasitoids, predators or climatic changes. Research into the biology and ecology of *D. enysii* may highlight appropriate management actions (See Appendix B, Figure 33).

Declana griseata Hudson
This stout bodied geometrid feeds exclusively on leafy Loranthaceae. Endangered and possibly extinct in some areas of the North Island, it remains relatively abundant in parts of the South Island (Patrick & Dugdale, 2000). There are probably two generations per year; emergence peaks have been identified between August and early November and March-May (Patrick & Dugdale, 1997). Dark purplish-black larvae (up to 38 mm long) feed on the foliage of Loranthaceae, and bear a large wart-like process on the thorax and a posterior dorsal wart, and a ridge on abdominal segment 8 (Patrick & Dugdale, 1997). Adults have a forewing span of 31 mm, dull slatey-grey with a paler band about one-third of the way along the wing. Numerous minute black streaks are thickly scattered over the wing especially near the base and termen. Hind wings are pale grey (Hudson, 1928: 151, PI. 18, Fig. 15-16.). *D. griseata* is a monophagous specialist dependent on Loranthaceae for survival. Any work on Loranthaceae in the Canterbury Conservancy should include a survey for *D. griseata*.

Helastia angusta Craw

Little is known about *H. angusta.* It forms a distinct subgroup with *H. expolita* (Philpott), *H. triphragma* Meyrick and *H. siris* Hawthorne (Patrick & Dugdale, 2000). Its separation from *H. expolita* by current characters is controversial. Graeme White (pers. comm. 2000) suggests the size of the discal dot in *angusta* is comparatively smaller than that of *expolita,* whereas Craw (1987) stated *expolita* has narrower forewings with a more evenly rounded outer basal line than in *angusta* where it is distinctly pointed.

H. angusta has a wing span of 13.5-14.1 mm, whitish, purplish, brown forewings with darker transverse basal lines. The postmedial line has a distinct double toothed median projection (Craw, 1987). The host plant is unknown but could possibly be a shrub species. Closely related species feed on *Helichrysum lanceolatum* (Brian Patrick, pers. comm. 2000). The only known ecological information is that it inhabits montane areas (Craw, 1987) (See Appendix B, Figure 34).

Helastia clandestina (Philpott)

H. clandestina was originally collected at Arthur's Pass and is assumed to be an upland/intermontane basin species that probably inhabits stony riverbed ecosystems such as the Waimakariri River flood plain north of Cass (John Dugdale, pers. comm. 2000). Julia Davies collected one specimen recently (1999) from Cass (Graeme White, pers. comm. 2000) another specimen was collected from Cass in 1997 (Otago Museum collection).

It has a wing span of 15.5-17.5 mm, triangular forewings with a slaty grey base colour (Craw, 1987). The adult emerges in February (Hudson, 1928: 113, PI. 12, Fig. 38). There is no definite information regarding the biology/ecology of *H. clandestina.* Craw (1987) noted that it is an extremely rarely collected species known from a few localities adjacent to Arthur's Pass. Research requirements include identification of host plants and location of extant populations.

Helastia expolita (Philpott)

There is little information about *H. expolita* except that it is an inland species found in the rapidly dwindling and degraded, short tussock grasslands of inland Canterbury to which it appears to be restricted to (see section on *H. angusta* about morphological separation of these species). It has a forewing expansion of 13-14.5 mm, purplish-grey with dark oblique apical streak, strongly developed double toothed median projection of the postmedial line (Craw, 1987).

Decline in both area and quality of habitat is the most likely threat to this species. Research requirements include surveys to identify current populations and host plant associations. This information can then the used for further management decisions (See Appendix B, Figure 35).

Orthoclydon pseudostinaria (Hudson)

Although conspicuous and present over a wide range, *O. pseudostinaria* is rarely encountered and nothing is known regarding its host or biology (Patrick & Dugdale, 2000).

It has a wing span of 28 mm. Forewings are cream-coloured with bright brown markings and have a straight, oblique, very strongly marked line from near the apex to the dorsum at three-quarters. Hind wings are cream-coloured with a conspicuous brown line across the middle (Hudson, 1928: 107, PI. 14, Fig. 12). Hudson noted the adults appear in December and frequent forests. Specimens have been recovered from Mount Grey and White Rock, North Canterbury (Hudson, 1928).

A comprehensive survey is required of the type locality (Whitcombe-Arthur's Pass), surrounding areas and similar habitat types to locate extant populations. Further research is required to determine host plant associations and phenology. This information can then be used for conservation decision-making.

Notoreas 'Cape Campbell'
This undescribed species of *Notoreas* was originally known from three populations (Cape Campbell, Cloudy Bay and Gore Bay). The Gore Bay population, discovered in 1994, is now believed extinct along with its host plant, *Pimelea `urvilleana'*. It appears there is little tolerance for disturbance of this intricate host plant/herbivore interaction (Patrick & Dugdale, 2000). The main priority is a wider survey of Gore Bay to locate any extant populations of the host and its herbivore.

Pseudocoremia cineracia (Howes)
P. cineracia is recorded from the Mackenzie Basin and five locations in Otago. Its larvae feed on *Olearia odorata* (Patrick, 1994b; Patrick & Dugdale, 2000). The reliance of *P. cineracia* on *O. odorata* has resulted in concurrent decline closely correlated with the destruction of Olearia communities. The larvae are grey and the adults well camouflaged when resting on the bark of *O. odorata* (Patrick, In press b). *P. cineracia* has been trapped from August till June with a peak in September at the Kawarau Gorge (Patrick, In press b).
The only ecological information available is that it inhabits montane shrublands and feeds on *O. odorata*, between 150-850 m altitude (Patrick, In press b) (See Appendix B, Figure 36).

Pseudocoremia n.sp "Knobby"
This species is known from only brachypterous females collected on *O. odorata* and *O. laxiflora*. Light-trapping has attracted one fully winged male that may or may not belong to the same species (Patrick, In press b). The larvae are distinct, red-brown line and feed on the foliage. The low dispersal capabilities of the female make re colonisation of a fragmented habitat difficult, at best. Once lost from a site it seems improbable that this species would be able to recolonise (Patrick, In press b). Further collection is necessary to confirm the male of the species and locate other populations.

Samana acutata Butler
S. acutata was originally recorded from Christchurch and the type locality is now incorporated in the city. Patrick and Dugdale (2000) stated the plant host (*Carmichaelia* spp.) has largely been destroyed by the expansion of farming on the Canterbury Plains. However, *Carmichaelia* spp is still common on the Port Hills and truncated bases of ridges radiating from Banks Peninsula near Lake Ellesmere. Records from the Otago Museum indicate it has been collected from Kaitorete Spit, Danseys Pass and Otago. Larvae were collected from *Carmichaelia appressa* at Kaitorete Spit (Patrick, 1994).
It has a wing span of 28 mm, forewings are very pale ochreous, speckled with grey. It is characterised by an oblique, transverse streak that has a very acute angulation inwards at about one-third its length before it reaches the dorsum. The adult emerges in September and October. It is reportedly attracted to light (Hudson, 1928: 133 PI. 15, Fig. 39). Hudson noted an associated with gorse and manuka (*Leptospermum*). It is more likely that small patches of *Carmichaelia* were surviving in the vicinity. The main research need is to identify relic populations of *S. acutata* (See Appendix B, Figure 39).

Tatosoma agrionata (Walker)
T. agrionata is another geometric that feeds exclusively on leafy Loranthaceae. Still reasonably abundant in the South Island, it is now rare in the North Island (Patrick & Dugdale, 1997), and possibly extinct (Patrick & Dugdale, 2000). There are probably two generations a year; adults emerge from July-May. The larvae are yellow-green, possess few markings and are slightly paler on the ventral surface (Patrick &

Dugdale, 1997). *T. agrionata* has a forewing span of 30 mm. Forewings are green with distinctive cream bands especially in the basal and outer thirds. The green is concentrated around the wing veins (Hudson, 1928: 85-86, PI. 12, Fig. 6-7). Hudson recorded specimens of *T. agrionata* from Christchurch. Any survey of leafy Loranthaceae in Canterbury should include a survey for *T. agrionata* to determine its wider distribution and abundance.

Theoxena scissaria (Guenee)
Originally described from Christchurch, *T. scissaria* is now possibly locally extinct on the Canterbury Plains. The host plant is unknown, but the biology appears to include a generation emerging in late winter, or early spring (Patrick & Dugdale, 2000). It has also been collected in December and January (Hudson, 1928). It has a wing span of 25 mm; forewings are white and have a longitudinal slightly curved black line extending from a little beyond the base almost as far as the termen (Hudson, 1928: 133, PI. 15, Fig. 38). The lack of records may just be a reflection of the timing of collection. Dr Graeme White noted that *T. scissaria* was relatively abundant during early spring in the Mackenzie Basin, September 1999. A second undescribed species from this endemic genus has recently been collected in the Mackenzie Basin at higher altitudes. Again, nothing is known about its host plant.
Renewed surveying for both *T. scissaria* and *Theoxenna* n.sp. would be beneficial during late winter, early spring to confirm the wider distribution of these species (See Appendix B, Figure 37-38).

Xanthorhoe bulbulata Guenee
Originally collected from eastern areas of the South Island, *X. bulbulata* has been recorded only twice in the last 50 years (Hudson, 1928). Local extinction is probable in many areas and almost certain in Eastern Southland (Patrick, 1994c). The host plant is unknown but maybe *Ischnocarpus* (Brassicaceae) that is also in decline due to introduced herbivores (Patrick, 1994b; Patrick, In press a). It has a wing span of 25 mm. The forewings are pale, brown ish-ochreous with darker brown markings. There are often several oval pale bars in the middle of the median band (Hudson, 1928: 111 PI. 13, Fig. 11). The most characteristic feature are the bright orange hindwings with pale brown cilia (Patrick, In press a). Adults appear from September-March and frequent open grassy places from sea level to 600-900 m.
There is an urgent need to survey remaining possible habitats for this species (Patrick, In press a). Once remaining populations are identified, protection of host plants and the surrounding community should be considered (See Appendix B, Figure 40).

Xanthorhoe frigida Howes
X. frigida is a subalpine-alpine species that feeds on *Cheesemania wallii* (Brassicaeae). Only eight specimens have been collected from five localities. Both the host and moth species are uncommon (Patrick & Dugdale, 2000). The adult has a wing span of 35 mm; forewings are grey, faintly brown tinged and crossed with grey-white lines. Most noticeably, there are distinct dark brown X markings at the vein endings on the termen (Howes, 1946). The type specimens were attracted to light in December 1944 (Howes, 1946). A survey is necessary to locate extant populations.

Xanthorhoe lophogramma Meyrick
X. lophogramma was first collected in the Castle Hill basin. The host plant is unknown but probably a low growing herb from the family Brassicaceae (Patrick & Dugdale, 2000). In the past, it has been recorded from Marlborough, Canterbury, Mackenzie country and Central Otago. Most lowland sites are highly modified by introduced plants. *X. lophogramma* closely resembles *Xanthorhoe semifissata,* but it

differs in its lack of the distinct lines on the orange hind wings characteristic of *X. semifissata.*
It has a wing span of 28 mm, forewings are pale pink with several wavy brown lines. The hind wings are bright orange without any transverse markings. The adult appears in January and frequents dry beech scrub (Hudson, 1928: 110, PI. 13, Fig. 45-46). The main research requirement for *X. lophogramma* is a survey to locate remaining populations in the dry eastern foothills of Canterbury and Marlborough, and ascertain host plants (See Appendix B, Figure 41).

Family Lycaenidae

Zizina oxleyi (Felder & Felder)
This species feeds on low growing Fabaceae including introduced clovers, medics and lotus. It has suffered heavily from invasion and genetic replacement by an introduced Australian species *Zizina labradus* Godart(Patrick & Dugdale, 2000).

Family Noctuidae

Bityla sericea Butler
B. sericea was originally recorded from as far north as Thames (Hudson, 1928) and as far south as Queenstown (Kawarau Gorge, January-April, (Patrick, 1994b)).. The reduction in *Muehlenbeckia* in the past 100 years is probably responsible for the present low numbers of *B. sericea*. It is not common but has been collected in small numbers of at five sites on the Benmore Range from a range of altitudes (Graeme White, pers. comm. 2000). The lack of specimens is possibly a reflection of collector effort and/or timing of collection. It is usually associated with Bityla defigurata Walker (Patrick & Dugdale, 2000) and is distinguished from this species by the pale fringe of the forewing in *B. sericea* (Graeme White, pers. comm. 2000). The taxonomic distinction between these two species is yet to be resolved (John Dugdale, pers. comm. 2000). *B. sericea* appears to have become much less common following European settlement (Patrick, 1994b).
B. sericea has a wing span of 45 mm, the forewings are very dark greyish-bronze, darker near the termen and very glossy. There are several isolated white scales towards the base of the wing and a very obscure transverse line at about three-fourths of the way along the wing. The cilia are cream and very conspicuous. The hind wings are dark grey and glossy with pale grey cream tipped cilia (Hudson, 1928: 76, PI. 10, Fig. 11).
This species should be sought when collecting near *Muehlenbeckia* between February and May. Research requirements include accurate distribution information and confirmation of *Muehlenbeckia* as the host plant (See Appendix B, Figure 42).

Euxoa cerapachoides Guenee
Known, for certain, only from Mid Canterbury, this relatively large moth has not been collected recently. The host is unknown but the habitat (similar to that of *Eurythecta robusta*) is now largely modified by the development of lifestyle blocks (Patrick & Dugdale, 2000). The possibility of an extant populations remains at the Ministry of Defence rifle range, West Melton, and McLeans Island (Patrick & Dugdale, 2000). Hudson recorded it from Rakaia and Porters Pass. *E. cerapachoides* has a wing span of 37.5 mm, the forewings are bluish-grey, dotted and streaked with darker grey. The hind wings are grey, paler towards the base. Adults have been collected in the months of February, July, August and September (Hudson, 1928: 47, P1.6, Fig. 1).
The main research requirement for *E. cerapachoides* is to locate remaining populations, identify the host plant and verify its species status (a similar noctuid is recorded from Nelson) (See Appendix B, Figure 43).

Meterana exquisita Philpott

M. exquisita is a widespread species restricted by the abundance of its host plant. It feeds on small-laid, usually deciduous *Olearia*, including *Olearia hectorii* and *Olearia odorata* (Patrick, In press b; Patrick & Dugdale, 2000). Most Canterbury *Olearia* shrubland has been largely destroyed. The lack of host plant has led to the considerable decline of *M. exquisita*, which is now locally extinct in Invercargill, possibly as early as the 1920s (Patrick, 1994c; Patrick, In press b). Graeme White (pers. comm. 2000) found *M. exquisita* travelled at least 800 m from the nearest host plant, therefore dispersal is not the limiting factor.

It has a wing span of 25 mm; forewings are milky green with numerous brownish-black markings. There are three blackish blotches situated on the subterminal line, with each blotch containing one or two white spots. The cilia are greenish-white with heavy blackish brown bars (Hudson, 1928: 63-64, PI. 8, Fig. 1). The larvae are large, green with thin red and white lines and distinctly angular but well camouflaged amongst the foliage they feed on (Patrick, In press b). Adults emerge from August to December (one record from May) with a peak flight in late September early October (Patrick, In press b).

The main management requirement for *M. exquisita* is the protection of remaining *Olearia* and possibly replanting in some of the shrublands of Canterbury (See Appendix B, Figure 44).

Family Oecophoridae

Izatha psychra Meyrick

This species is known only from a very worn type specimen. The type locality is either Porters Pass or Castle Hill (Dugdale, 1988). From information available on the genus it is likely that the larvae feed in dead wood (Patrick & Dugdale, 2000). It has a wing span of 22 mm, elongate, slightly dilated with flat, broad whitish forewings. A small, cloudy darker spot is present towards the termen in the middle of the wing. A minute black dot in the disc one third of the way along the wing, and another slightly above it. The cilia are whitish with two cloudy grey lines. Hind wings are whitish (Hudson, 1928: 277). Hudson's description was based on that by Meyrick. Since he never personally saw the only known specimen, there is no illustration.

The main research/management requirements are renewed collecting effort to obtain more specimens. With more material its species status can be adequately ascertained and further decisions made on its possible conservation needs. Dugdale (pers. comm. 2000) suggests collecting early in the season.

Family Scythridae

Scythris sp. "stripe"

This undescribed species is known from a unique specimen collected at Birdlings Flat, Kaitorete Spit, in October (Patrick & Dugdale, 2000). It is a striking species having a chocolate stripe on a cream background that differentiates it from other, more dappled grey or black New Zealand scythrids (Patrick & Dugdale, 2000). The Birdlings Flat site has recently been developed into a pig farm (1996). These pigs, will, in a short time, largely destroyed this unique biotic community. The host plant is unknown but is possibly a *Carmichaelia* spp. Kaitorete Spit is a unique area in Canterbury probably of equal conservation importance as any relict bush patch on Banks Peninsula. However, very little of the taller shrub community has been afforded legal protection. Indeed, large areas have already been developed for housing, farming or gravel extraction.

The main research requirement is a survey of Birdlings Flat to locate remaining populations. The protection of this unusual ecological community that *Scythris* sp.

"stripe" is a member of would go a long way in preserving numerous threatened plants and insect species. Note: *Scythris* 'stripe' was not recorded by Patrick (1994) in a survey of Kaitorete Spit.

Family Tineidae

Archyala lindsayi (Philpott)
A. lindsayi is known only from the type specimen collected at Mount Grey, Canterbury (Patrick & Dugdale, 2000). It has a wing span of 11 mm; forewings are elongate-oblong, dull greyish with numerous ill-defined brownish/black transverse streaks. Pale, purplish-grey scales cloud the space between streaks in the apical third of the wing. There are two obscure dull golden brown transverse bands. Hind wings and cilia are brown. The face and palpi are shining white while the rest of the head and body are dark brown (Hudson, 1928:347, P1.52, Fig. 32).

Biological information about Archyala suggests *A. lindsayi* is a subcortical dead woodborer as larva, probably feeding on dead fungus-infected wood (Patrick & Dugdale, 2000). A comprehensive field search of the Mount Grey region is required to locate extant populations. At this stage, no threats have been established, but those to be considered include habitat alteration, parasitoids and predators (possibly other invertebrates, e.g., spiders) (See Appendix B, Figure 45).

Family Tortricidae

Acroclita (s.l.) *discariana* Philpott
Originally collected from the Cragieburn/Torlesse region, its type locality is the Porter River. *A. discariana* is easily identified in the larval stage by very tough, distinctive white webbing in the stem axils of *Discaria toumatou* (matagouri). The webbing may encompass an area exceeding 30 cm diameter. *A. discariana* has a very patchy distribution including Motunau/Gore Bay Beach (Brian Patrick, pers. comm. 2000), Porters Pass (Patrick and Dugdale, 2000, Pawson, pers obs), Cass (1962, Ribbonwood fan, Graeme White pers. comm. 2000), Jacks Pass and Lees Beach (Hudson, 1939) and Rag and Famish Stream, Upper Wairau Valley (John Dugdale, pers. comm. 2000) despite matagouri having a wide distribution in the eastern and central South Island. Threats to *A. discariana* have not been established. Certainly, it doesn't suffer from a lack of host plant.
A. discariana as a distinct species with a 15-16 mm wing span; grey, finely speckled with deep brown markings on the forewings (Hudson, 1939:436 PI. 57, Fig. 11-12). Adults are diurnal. *A. discariana* is endemic (Dugdale, 1988) and is unlikely to be a true *Acroclita*, which is a European genus. Research requirements include a survey of matagouri in Canterbury to establish the moth's population distribution. Formal protection of at least some part of its habitat should be considered as almost no matagouri is informally protected areas (See Appendix B, Figure 47, 51).

Epichorista lindsayi Philpott
Only recorded from areas in the vicinity of Little River, very little is known about this species. *E. lindsayi* probably feeds on herbs in the shrubland surrounding the shores of Lake Forsyth and Kaitorete Spit (Patrick & Dugdale, 2000). At present, there are insufficient specimens to allow accurate placement of *E. lindsayi* in the genus *Epichorista*. *E. lindsayi* has pale ochreous-brown forewings/cilia, with a distinct black dot beyond the middle, and a few irregularly scattered blackish dots densest in the terminal half. The hind wings and cilia are grey. Adults emerge in January and have a wing span of 16 mm (Hudson, 1939: 435, PI. 57, Fig. 26).
The main threat to *E. lindsayi* is the development/destruction of its known habitat (Brian Patrick, pers. comm. *2000).* A full survey of the Lake Forsyth/Kaitorete Spit region is needed to establish the distribution of *E. lindsayi* (not found by Patrick's

(1994) survey of Kaitorete spit). Habitat protection should be considered for land containing remaining populations (See Appendix B, Figure 48).

Ericodesma aerodana Meyrick

E. aerodana is monophagous and dependent on the mat-forming *Pimelea* spp., including *P. arenaria* (Patrick & Dugdale, 2000). In Canterbury, *E. aerodana* is known from Kaitorete Spit (found in the hinddune areas) and the shores of Lake Forsythe (Patrick, 1994) where it is locally common but declining with the degradation of Pimelea prostrata by stock. The only other populations in the South Island are at Cloudy Bay, Marlborough, and Cape Campbell (Brian Patrick, pers. comm. 2000). *E. aerodana* was described from Hamilton, North Island, and is coastally widespread, with inland populations on frost flats (John Dugdale, pers. comm.. 2000). The eastern South Island populations lack orange scaling on the forewing and may be a distinct entity (Patrick & Dugdale, 2000). It is possible that the Cloudy Bay population is distinct from the Birdlings Flat population (Dugdale, 1999).

E. aerodana is described by Hudson (1928) as having pale greyish-white, narrow forewings with a very oblique termen that lack distinct markings and have a 10 mm wing span. The hind wings are brownish-grey. The adult emerges from October-January (Patrick, 1994).

The impact of high-intensity farming practices needs to be ascertained and, where necessary, ameliorated. The taxonomic status of South Island populations, with respect to those in the North Island, needs to be resolved (See Appendix B, Figure 49).

Eurythecta robusta Butler

E. robusta was originally collected in Christchurch and is endemic to Canterbury. The type locality is unknown, but probably somewhere in the region of Yaldhurst/West Melton (Patrick & Dugdale, 2000). Populations are known from Kaitorete Spit, Gore Bay, foot of Porters Pass and McLeans Island, and appears to be surviving at the Ashburton, Rangitata and Hinds river mouths (Brian Patrick, pers. comm. 2000). *E. robusta* probably feeds on low mat forming herbs and turf plants that are characteristic of the open shingle ground of the Old West Coast Road (Patrick & Dugdale, 2000). Females are flightless making *E. robusta* highly susceptible to disturbance due to its poor dispersal capabilities. At Kaitorete Spit, larvae were found on low growing herbs and cushion plants amongst the foredunes. Adults emerged from September until January (Patrick, 1994).

E. robusta males have a wing span of 9.5 mm, the forewings are lanceolate, rather narrow with a very oblique termen, pale grey, ochreous or reddish/ochreous/brown with or without well-defined dark brown/blackish markings. The hind wings are pale brown and the adult emerges from October until April (Hudson, 1928:224, Pl. 26, Fig. 10). Hudson noted that it frequents grassy situations.

The main threat to this species is the destruction of its original habitat by the urban sprawl and lifestyle conversions surrounding Christchurch (Patrick & Dugdale, 2000) and the modification of indigenous lowland coastal grasslands for farming. The main management/research requirement is to assess the impact of intensive farm practices at Kaitorete Spit and McLeans Island. A lighter grazing regime may be sufficient to allow adequate recovery of populations. A survey of coastal river mouth habitats is also recommended (See Appendix B, Figure 50).

Pyrgotis pyramidias (Meyrick) [*sensu stricto*]
P. pyramidias in its strict sense is known from only two populations one in Southland the other at Rotorua. In both cases the host plant was *Cyathodes fasciculatus*. It is doubtful that these two populations are conspecific with a more brightly coloured, patterned entity, that is associated with *Nothofagus menziesii* (Patrick & Dugdale, 2000). Further work is needed to gain a greater understanding of the taxonomy of the species complex.

Pyrgotis sp. "olearia"
This is an undescribed species of tortricid recorded from eight localities in the Mackenzie Basin and Central/West Otago (Patrick, In press b; Patrick & Dugdale, 2000). There are three colour forms. On the whole, males tend to be duller and the females more patterned, though this distinction is not exclusive (Brian Patrick, pers. comm. 2000). The pale green-grey larvae appear to be restricted to *Olearia odorata*, *Olearia fimbriata* and *Olearia bullata* as host plants (Patrick, 1994b; Patrick, In press b; Patrick & Dugdale, 2000). Like *Acroclita* (s.l.) *discariana* it is present over only a small portion of the geographical range of its hosts. It is at risk from the destruction of its host plant communities (Patrick, In press a).
Research requirements include the identification of remaining populations and a taxonomic description to confirm its taxonomic status. Prevention of any further destruction/degradation to remaining *Olearia* communities should be vigorously pursued. Fencing of the few extensive groves of *Olearia* remaining in Canterbury and Otago may help protect some of the many invertebrate species that rely on it as a host plant.

Family Yponomeutidae

Zelleria sphenota Meyrick
Z. sphenota is probably extinct in North Island due to possum browsing of its host mistletoes (Loranthaceae). This species is not yet threatened in many South Island sites but the type locality (Riccarton Bush) needs reassessing (Patrick & Dugdale, 2000). It has a wing span of 13 mm, the forewings are very elongate, narrow, parallel-sided, long-pointed, acute; pale ochreous thinly and irregularly speckled with dark fuscous and whitish. The hind wings are pale, whitish-grey, and the cilia are ochreous-grey-whitish in colour (Hudson, 1928: 321). Adults emerge from August-February and have a distinctive resting stance; head down tail up, at a sharp angle to the surface (Patrick & Dugdale, 1997).
Work is needed to establish the distribution of the species in Canterbury. Initially they should begin with a search of the type locality.

Order Hymenoptera

The Order Hymenoptera is one of the most poorly understood orders of invertebrates in New Zealand. There are currently 600 described species, though the taxonomy of many groups is very poorly known (Jo Berry, pers. comm. 2000). A conservative approach is required for conservation decision-making (especially with micro-hymenoptera), since distribution patterns cannot be relied on because Hymenoptera are often overlooked during collection (Jo Berry, pers. comm. 2000). Of the 600 described species, little is known about hosts, biology or ecology (John Early, pers. comm. 2000). Many Hymenoptera are parasitoids, present in the adult form for only short periods of the year. The main requirement for most New Zealand Hymenoptera is further detailed research into their taxonomy, biology, ecology and distribution. With this information, decisions can then be made regarding the conservation priorities of this very diverse group.
Small portions of New Zealand Hymenoptera have been worked on intensively and

detailed information is available.

Superfamily Apoidea

Leioproctus n.sp
A single specimen of an undescribed *Leioproctus* species was collected in Dallington during the 1960s (Barry Donovan, pers. comm 2000). *Leioproctus* spp. are solitary ground nesting bees. This genus is very species rich in Australia. Donovan (pers, corn 2000) has studied a large portion of the Australian Leioproctus fauna and is yet to find a species matching that collected from Dallington. It is unusual that this species has not been recollected. One cannot disregard the possibility that it was a one-off import from Australia that failed to establish here. Alternatively, it may have been associated with a habitat that has been modified so extensively that it has resulted in its extinction.

Two species of Leioproctus inhabit the saline sands surrounding Lake Ellesmere and the coastline to the south. Both highly depend on, and are restricted to, this particular habitat (Barry Donovan, pers. comm 2000). Consideration of these two species is necessary when considering any future proposed land changes.

Family Diapriidae

Pantolytomyia polita Naumann
P. polita is known from a single collection in Canterbury, swept from ferns in podocarp/broad leaf forest at Akaroa and seven specimens from other locations in the South Island. The lack of specimens is probably a reflection of collection effort. Its distribution could be ascertained on Banks Peninsula by sweet-netting. Extensive collecting by Early (pers. comm. 2000) failed to find *P. polita* in Prices Valley.

Undescribed family
An undescribed endemic New Zealand family of Hymenoptera is known from two species. One species is known from two specimens in Canterbury. However, it is common in some other locations. A single specimen from Prices Valley was collected from 15 months of continuous pan trapping compared with 100 specimens from eight days pan trapping on Cuvier Island (Early, pers. comm. 2000). The reason for the rarity of this species in Canterbury is unknown but could be a reflection of host availability or climatic conditions.

Continue to next file: casn320b.pdf