

# The conservation status of invertebrates in Canterbury

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Published by  
Department of Conservation  
Head Office, PO Box 10-420  
Wellington, New Zealand

This report was commissioned by Canterbury Conservancy.

ISSN 1171-9834

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Reference to material in this report should be cited thus:

Pawson, S.M., Emberson, R.M., 2000.  
The conservation status of invertebrates in Canterbury. *Conservation Advisory Science Notes No. 320*,  
Department of Conservation, Wellington.

Keywords: endangered invertebrates, identification, research priorities, conservation status, Canterbury.

# 1. Introduction

New Zealand has a very rich terrestrial invertebrate fauna. Watt (1975) estimated there were 9460 described species of insects, which does not include the gastropods and several highly diverse arthropod groups. Current estimates suggest a total insect fauna in New Zealand of between 17 500 and 20 400 species, but probably at least 20 000 species (Emberson 1998). In comparison with other groups, such as plants (2046 indigenous species ((Landcare Herbarium, 1998 cited in Emberson, in press)) the New Zealand insect fauna clearly accounts for the bulk of New Zealand's macroscopic biodiversity. Species level endemism is very high; Lepidoptera 94%, Orthoptera 95%, Coleoptera 96%, Plecoptera, Trichoptera and Ephemeroptera 100%. New Zealand also has several endemic families and many endemic genera (Watt 1975).

The threats faced by invertebrates can, in general, be placed in four broad categories (New 1995);

- (1)The effect of habitat destruction/modification including habitat fragmentation.
- (2)Effects of pollution and pesticides (not currently known to be of major importance in New Zealand).
- (3)The effect of exotic species, particularly predation by introduced terrestrial mammals and social insects.
- (4)Effects of over-exploitation and over-collection, also not known to be of major importance in New Zealand.

The reduction and alteration of many plant communities has led to the decline of host plant availability. This, combined with a suite of introduced predators, has led to many invertebrate species being unable to cope with the radical changes since human settlement. As such, there are many species of invertebrates requiring assistance for survival. There are two main approaches to invertebrate conservation. The species approach, where individual taxa are identified as requiring conservation management, and the habitat approach. Public appeal is often the major factor that determines which species receive attention (New 1995). There is, however, a global trend to overlook invertebrate species when deciding which specific taxa to conserve. New Zealand is no exception, and apart from a few 'flagship' taxa (e.g. weta and land snails), little attention has been focused on our invertebrate fauna. Historically, the habitat approach has also been used to protect the habitat of some threatened taxa, often high-profile bird species (e.g. kokako). Invertebrates and plants have also benefited from the predator control and habitat rehabilitation that goes with their habitat management.

Conservation of flora and fauna in New Zealand, most commonly, has been undertaken using a single-species model, based on 17 criteria outlined by Molloy & Davies (1992). There has recently been a shift to a more ecosystem-based approach using "mainland" islands.

Unfortunately the criteria used by Molloy and Davies (Molloy & Davies 1992) are inadequate for assessing invertebrate conservation requirements and are in need of review. When setting priorities for conservation it is all too easy to assume that there are few threatened invertebrates. This assumption arises mainly from the lack of available information. McKinney (1999) in a global study concluded that understudied classes, such as insects, have an equal, if not greater, number of threatened species than intensely studied groups, such as birds. This conclusion seems to be equally pertinent in New Zealand.

This report uses a species-based approach to identify invertebrates that are threatened/endangered, and, in some cases, needing short- or long-term management to ensure their survival.

The aims of this project were to:

- Collate available information on threatened invertebrates in Canterbury (including that from Molloy & Davies (1992) and Patrick & Dugdale (2000))
- Raise awareness of groups of invertebrates previously not considered and provide a revised list of species considered to be threatened.
- Provide some measure of the conservation status of these threatened species and thus set priorities for action.
- Provide location, biology, taxonomic and ecological information, where available, and highlight areas where further research is necessary.

Unfortunately some groups, for example nematodes and terrestrial gastropods, have been excluded due to resource constraints, or a complete lack of information when compiling the list.

## 2. Format of this report

The list was compiled after an extensive review of available entomological literature. Entomologists in New Zealand, and in some cases from Australia, were consulted regarding their areas of speciality. Five categories of rarity were established using the following criteria and currently available information:

Category A: Species thought to be most endangered and threatened with extinction in the short-term. Most are only known from one, or a very few, isolated populations.

Category B: Species apparently threatened to a lesser extent, extinction possible in the longer term. Less threatened than category A species, but still of concern.

Category I: Species where insufficient information was available from literature, entomologists and collections to make an informed decision regarding their conservation status.

Category L: Species locally threatened, but with substantial populations outside the Canterbury Conservancy.

Category X: Species that have not been seen in over 50 years, and are presumed to be extinct.

### 3. Results

It appears that the number of threatened species included in Molloy & Davies (1994) was a significant underestimate of threatened invertebrate species in Canterbury.

Tables 1-5 list the species included in the five categories (A, B, I, L and X).

Note that some species have been assigned tagged names, i.e. names given in double quotation marks. As such they are undescribed species and the names used are hereby disclaimed (Article 8.3, International Code of Zoological Nomenclature 1999) and are thus not available (International Commission on Zoological Nomenclature 1999). Some names may be used in forthcoming formal descriptions.

In total there are 154 species listed in Tables 1-5.

There is a predominance of Lepidoptera in categories A and B, which is partially a reflection of a greater understanding and targeted research on this order. Diptera, Hymenoptera and most of the minor orders are represented more frequently in category I, which is consistent with the paucity of information available for these groups.

It is interesting to note that 70 % of category A species are thought to be endemic to the Canterbury Conservancy. Canterbury endemics, based on current knowledge, are indicated with an asterisk in Tables 1-5.

Table 1. List of category A species

<i>Acroclita discariana</i> Philpott *	<i>Kupea electilis</i> Philpott *
<i>Aphis cottieri</i> Carver	<i>Lyperobius carinatus</i> Broun *
<i>Asaphodes stinaria</i> (Guenée)	<i>Orocrambus</i> "Mackenzie Basin" *
<i>Brachaspis robustus</i> Bigelow *	<i>Orocrambus fugitivellus</i> Hudson *
' <i>Epichorista</i> ' <i>lindsayi</i> Philpott *	<i>Orocrambus sophronellus</i> Meyrick *
<i>Eurythecta robusta</i> Butler *	<i>Orthoclydon pseudostinaria</i> (Hudson)
<i>Euxoa cerapachoides</i> Guenée *	<i>Paradoxaphis</i> n.sp. *
<i>Gadira petraula</i> Meyrick *	<i>Periegops suterii</i> Urquhart *
<i>Helastia clandestina</i> Philpott	<i>Pseudocoremia</i> n.sp. "Knobby"
<i>Helastia expolita</i> Philpott *	<i>Scythris</i> sp. "stripe" *
<i>Heterocrossa maculosa</i> Philpott *	<i>Stethaspis convexa</i> (Given) *
<i>Holcaspis brevicula</i> Butcher *	<i>Xanthorhoe bulbulata</i> Guenée
<i>Kiwaia</i> "plains jumper" *	<i>Xanthorhoe lophogramma</i> Meyrick
<i>Kiwaia pumila</i> Philpott	

Table 2. List of category B species

<i>Asaphodes obarata</i> (Felder & Rogenhofer)	<i>Mecodema brittoni</i> (Townsend)*
<i>Bityla sericea</i> Butler	<i>Mecodema howiiti</i> Castlenau *
<i>Circoxena ditrocha</i> Meyrick	<i>Meterana exquisita</i> Philpott
<i>Crystallotesta fuscus</i> (Maskell)	<i>Notoreas</i> "Cape Campbell"
<i>Dasyuris enysii</i> Butler	<i>Odontria subnitida</i> Given *
<i>Deinacrida elegans</i> Gibbs	<i>Ooperipatellus viridimaculatus</i> Dendy
<i>Deinacrida pluvialis</i> Gibbs *	<i>Orocrambus sophistes</i> Meyrick
<i>Elachista helonoma</i> Meyrick *	<i>Peripatoides novaezealandiae</i> (Hutton)
<i>Ericodesma aerodana</i> Meyrick	<i>Pseudocoremia cineracia</i> Howes
<i>Glyphipterix euastera</i> Meyrick	<i>Pyrgotis</i> sp. "olearia"
<i>Hemianthus ricta</i> Hutton	<i>Samana acutata</i> Butler
<i>Kiwaia jeanae</i> Philpott *	<i>Xanthocnemis sinclairi</i> *
<i>Maoricrambus oncobolus</i> Meyrick	<i>Zealandobius wardi</i> McLellan *
<i>Mecodema allani</i> Fairburn	<i>Zelleria sphenota</i> Meyrick

Table 3. List of category I species

Species of highest priority	<i>Crisius baccatellus</i> (Broun)
<i>Aphis healyi</i> Cottier	<i>Crisius fulvicornis</i> (Broun)
<i>Aphis nelsonensis</i> Cottier	<i>Crisius variellus</i> (Broun)
<i>Novothybris pollux</i> Knight	<i>Crisius obscurus</i> (Broun)
<i>Odontria regalis</i> Given	<i>Declana griseata</i> Hudson
<i>Orocrambus lindsayi</i> Gaskin	<i>Discobola dicycla</i> Edwards
<i>Priesneriella gnomus</i> Mound and Palmer	<i>Ectinorhynchus furcatus</i> Lyneborg
<i>Psilochorema folioharpax</i> McFarlane	<i>Eodrillus annectens</i> Beddard
<i>Theoxena scissaria</i> (Guenée)	<i>Eodrillus montanus</i> Lee
<i>Xanthorhoe firigida</i> Howes	<i>Eodrillus paludosus</i> Beddard
<i>Zealandobius jacksoni</i> McLellan	<i>Eriococcus detectus</i> Hoy
	<i>Eriococcus kowhai</i> Hoy
<i>Anabarhynchus albipennis</i> Lyneborg *	<i>Eriococcus montifagi</i> Hoy
<i>Anabarhynchus atratus</i> Lyneborg *	<i>Gadira</i> "black-brown"
<i>Anabarhynchus embersoni</i> Lyneborg *	<i>Gynoplistia canterburiana</i> Edwards
<i>Anabarhynchus indistinctus</i> Lyneborg *	<i>Gynoplistia speighti</i> Edwards
<i>Anabarhynchus olivaceus</i> Lyneborg *	<i>Helastia angusta</i> Craw
<i>Anabarhynchus simplex</i> Lyneborg *	<i>Holcaspis odontella</i> (Broun)
<i>Aphenochiton chionochloae</i> Henderson and Hodgson *	<i>Izatha psychra</i> Meyrick
<i>Aphenochiton inconspicua</i> (Maskell)	<i>Kalasisis paradepressa</i> Henderson & Hodgson
<i>Archyala lindsayi</i> (Philpott)	<i>Leioproctus</i> n.sp.
<i>Austragoniodes waterstoni</i> Cummings	<i>Maoridrilus dissimilis</i> Beddard
<i>Austrocidaria lithurga</i> (Meyrick)	<i>Maoridrilus modestus</i> Michaelsen
<i>Colobocerus alchymicus</i> Parent	<i>Maoridrilus parkeri</i> Beddard
<i>Crisius bicinctus</i> (Broun)	<i>Maoridrilus purusa</i> Ude

<i>Maoridrilus smithi</i> Beddard	<i>Plutellus parvus</i> Lee
<i>Maoridrilus suteri</i> Michaelsen	<i>Pollenia commensurata</i> Dear
<i>Maoridrilus wilkini</i> Lee	<i>Prodontria matagouriae</i> Emerson
<i>Megadromus "omarama"</i>	<i>Prodontria minuta</i> Emerson
<i>Megadromus antarcticus</i> subspecies 1 & 2	<i>Psilodontria viridescens</i> Broun
<i>Megadromus</i> n.sp.11	<i>Pyrgotis pyramidias</i> (Meyrick) [ <i>sensu stricto</i> ]
<i>Melanostoma apertum</i> Miller	<i>Rhododrilus minutus</i> Beddard
<i>Microcryptorhynchus albistrigalis</i> (Broun)	<i>Rhypodes brevipilis</i> Eyles
<i>Naufraga hexachaeta</i> Parent	<i>Samana acutata</i> Butler
<i>Neodrilus campestris</i> Hutton	<i>Stegococcus oleariae</i> Hoy
<i>Octochaetus antarcticus</i> Beddard	<i>Syntormon aotearoa</i> Bickel
<i>Octochaetus huttoni</i> Beddard	<i>Tatosoma agrionata</i> (Walker)
<i>Odontria aurantia</i> Given	<i>Thectophila acmotypa</i> Meyrick
<i>Orchymontia banksiana</i> Ordish	<i>Tiphobiosis childella</i> Ward
<i>Pantolytomyia polita</i> Naumann	<i>Tiphobiosis hinewai</i> Ward
<i>Paradorydium westwoodi</i> (Buchanan White)	<i>Trinodicalles altus</i> (Broun)
<i>Parentia nova</i> Parent	<i>Xylota montana</i> Miller
<i>Plagiochaeta sylvestris</i> Hutton	<i>Zeacalles estriatus</i> Broun
<i>Platycheirus atkinsoni</i> Miller	<i>Zeacalles igneus</i> (Broun)
<i>Plumichiton punctatus</i> Henderson & Hodgson	<i>Zealandobius peglegensis</i> McLellan
	<i>Zizina oxyleyi</i> (Felder & Felder)

Table four. List of category L species.

<i>Androporus discedens</i> Sharp
<i>Anthicus otagensis</i> Werner & Chandler
<i>Holloceratognathus cylindricus</i> (Broun)
<i>Lenax mirandus</i> Sharp
<i>Lyperobius huttoni</i> Pascoe
Hymenoptera, undescribed family
<i>Zeadelium gratiosum</i> (Broun)

Table 5. List of category X species.

<i>Euxoa cerapachoides</i> Guenée
<i>Hadramphus tuberculatus</i> Pascoe
<i>Megacolabus sculpturatus</i> Broun



## 4. Conclusions and recommendations

Management and/or research of all the species mentioned in this report is obviously not financially feasible in the short term. Immediate priority should be given to category A species. Seventy percent of these species are thought to be endemic to Canterbury, and therefore the Canterbury Conservancy has sole responsibility for the survival of these species. Extensive surveying is needed to locate extant populations. These populations should then be monitored using standard methodologies (Green 1996). Research is then needed to identify threats and recommend recovery strategies.

It is important not to forget the very large category I list and where possible research should be coordinated to include these species. Current species recovery programmes target only a limited number of our highly threatened species (DOC and MfE 2000). It is definitely better and fiscally more responsible to take a proactive approach to conservation. Spending a little money now to prevent further decline of a species may eliminate the need for intensive, expensive conservation management in the future. A short-term survey should also be initiated in an attempt to locate category X species again. If populations are located they should be reassigned to category A.

It is not intended that the reader should wade through the extensive amounts of information in Appendix A. Tables 1-5 are designed to raise awareness of which species require research and management. Appendix A should then be used as a resource providing information on a species-by-species basis. Some species have been placed at the top of the extensive category I species list. We consider these to be the most urgent category I species, because what little is known about them suggests very limited populations exist.

## 5. Acknowledgements

The research that led to the production of this report has been a lengthy process. It would have been a much more arduous task had we not received help from numerous people that we would like to acknowledge. Brian Patrick and John Dugdale for their contributions on the Lepidoptera and revising certain portions of the manuscript. Dr Graeme White for his input on Lepidoptera, loan of specimens and review of sections of the report. Ms Rosa Henderson, Dr Diane Gleeson, Dr Richard Leschen, Dr Trevor Crosby, Dr Jo Berry from Landcare Research for their contributions in their areas of speciality. Peter Johns, Dr Rod McFarlane, John Ward, Mark Walker and Dr Simon Pollard from the Canterbury Museum for assistance with some taxa and the loan of certain specimens. John Early and Keith Wise from the Auckland Museum for assistance with Hymenoptera and Collembola respectively. Ian McLellan, Dr Alan Eyles and Dr Beverly Holloway for their contributions on stoneflies, Hemiptera and Coleoptera. Anthony Harris, Keith Wise and Dr Warrick Don for eliminating some taxa from the report. Dr David Teulon and Marlin Stufkins from Crop and Food Research for their help with native aphids. Dr David Bickel from the Australian Museum for help on dolichopodids. MAF Plant Pest Laboratory for the use of their digital camera. John Marris for help with facilities at Lincoln. Samuel Brown for image editing. Dr Adrian Paterson, Dr Barbara Brown and Cor Vink for help with certain taxa and Dr Eric Scott for editing the manuscript.

## 6. References

- Berry, C. (1999). Potential interactions of hedgehogs with Northern Island brown kiwi at Boundry Stream Mainland Island. *Conservation Advisory Science Notes* 268.
- Bickel, D.J. (1992). Sciapodinae, Medeterinae (Insects: Diptera) with a generic review of the Dolichopodidae. *Fauna of New Zealand* 23, 74.
- Britton, E.B. (1949). The Carabidae (Coleoptera) of New Zealand part III. *Transactions of the Royal Society of New Zealand* 77(4), 533-581.
- Broun, T. (1880). *Manual of New Zealand Coleoptera*, 1. 7 vols, Wellington.
- Broun, T. (1893). *Manual of the New Zealand Coleoptera: parts 5, 6 and 7*, Colonial Museum and Geological Survey Department, Wellington.
- Broun, T. (1909). Descriptions of new genera and species of New Zealand Coleoptera. *Annals and Magazine of Natural History* 8(4), 51-71, 130-161, 275-291.
- Broun, T. (1914). Descriptions of new genera and species of Coleoptera. *Bulletin of the New Zealand Institute* 1(2,3), 79-142, 143-266.
- Broun, T. (1915). Descriptions of new genera and species of Coleoptera. *Bulletin of the New Zealand Institute* 1(4), 267-346.
- Broun, T. (1917). Descriptions of new genera and species of Coleoptera. *Bulletin of the New Zealand Institute* 1(5), 347-474.
- Broun, T. (1921). Descriptions of new genera and species of Coleoptera. *Bulletin of the New Zealand Institute* 1(6, 7), 475-590, 591-665.
- Brown, B., Townsend, J. A. (1994) A distribution survey of *Hemideina ricta* on the Banks Peninsula, 1993/94. Department of Conservation: Canterbury Conservancy.
- Bull, R. M. (1967). A study of the large New Zealand weevil *Lyperobius huttoni* Pascoe, 1876 (Coleoptera: Curculionidae). Masters, University of Victoria.
- Butcher, M. R. (1984). A revision of the genus *Holocaspis* (Coleoptera: Carabidae). *Journal of the Royal Society of New Zealand* 77(4), 533-581.
- Carver, M. (2000). A new indigenous species of *Aphis* Linnaeus (Hemiptera: Aphididae) on *Muehlenbeckia* (Polygonaceae) in New Zealand. *New Zealand Entomologist* 22, 3-7.
- Colless, D.H., McAlpine, D.K. (1991). Diptera. In *The insects of Australia, a textbook for students and research workers* 2nd edit. CSIRO.
- Collier, K.J. (1992). Freshwater macroinvertebrates of potential conservation interest. *Science and Research Series* 50, 45.
- Department of Conservation and Ministry for the Environment. (2000). *The New Zealand Biodiversity Strategy: Our chance to turn the tide Whakakohukihukitia Te Tai Roroku Ki Te Tai Oranga*, Wellington.
- Craw, R.C. (1987). Revision of the genus *Helastia* sensu stricto with description of a new genus (Lepidoptera: Geometridae: Larentiinae). *New Zealand Journal of Zoology* 14, 269-293.
- Craw, R.C. (1999). Molytini (Insecta: Coleoptera: Curculionidae: Molytinae). *Fauna of New Zealand Series* 39.
- Dear, J.P. (1985). Calliphoridae (Insects: Diptera). *Fauna of New Zealand Series* 8.
- Delgado, J.A., Palma, R.L. (2000). Taxonomic review of the genus *Orchymontia* (Coleoptera: Hydraenidae). *New Zealand Entomologist* 22, 23-32.
- Dugdale, J.S. (1988). Lepidoptera - annotated catalogue and keys to family-group taxa. *Fauna of New Zealand* 14, 262.

- Dugdale, J.S. (1999). Rarangi foreshore and wetland/ridge entomological values. Manaaki Whenua-Landcare Research NZ Ltd.
- Emberson, R.M. (1998). The size and shape of the New Zealand insect fauna. In *Ecosystems, entomology and plants proceedings of a symposium held at Lincoln University to mark the retirement of Bryony Macmillan, John Dugdale, Peter Wardle and Brian Molloy*. The Royal Society of New Zealand, Wellington.
- Emberson, R.M. (in press). *Proceedings of the Xth International Symposium on Biological Control of Weeds, Bozeman, Montana*.
- Emerson, B.C., Barratt, B.I.P. (1997). Descriptions of seven new species of the genus *Prodontria* Broun (Coleoptera: Scarabaeidae: Melolonthinae). *The Coleopterists Bulletin* 51(1), 23-36.
- Eyles, A. C. (1990). A review and revision of the genus *Rhyodes* Stal (Hemiptera: Lygaeidae). *New Zealand Journal of Zoology* 17, 347-418.
- Fairburn, E. (1945). A new beetle of the genus *Mecodema*. *Transactions of the Royal Society of New Zealand* 74(4), 408-410.
- Forster, R. R. (1995). The Australasian spider family Periegopidae Simon, 1893 (Araneae: Sicarioidea). *Records of the Western Australian Museum Supplement* 52, 91-105.
- Fraser, P.M., Williams, P.H., Haynes, R.J. (1996). Earthworm species, population size and biomass present under different cropping systems across the Canterbury Plains. *Applied Soil Ecology* 3, 49-57.
- Gaskin, D.E. (1975). Revision of New Zealand Crambini (Lepidoptera: Pyralidae: Crambinae). *New Zealand Journal of Zoology* 2(3), 265-363.
- Gibbs, G.W. (1999). Four new species of giant weta, Deinacrida (Orthoptera: Anastostomatidae: Deinacridinae) from New Zealand. *Journal of the Royal Society of New Zealand* 29(4), 307-324.
- Given, B.B. (1952). The revision of the Melolonthinae of New Zealand, part I: The adult beetles, part II: Final instar larvae. *New Zealand Department of Scientific and Industrial Research Bulletin* 102.
- Green, C.J. (1996). Survey and monitoring techniques for insects. *Ecological Management* 4, 73-90.
- Hamilton, W.J. (1999). Potential threat of hedgehogs to invertebrates with a restricted range, Otago region. *Conservation Advisory Science Notes* 254, 6.
- Hawke, J. (1995). Scale Insects. In *Riccarton Bush: Putaringamotu* (Molloy, B.P.J., ed.), pp. 279-289. Riccarton Bush Trust, Christchurch.
- Hendra, R. (1999). Seasonal abundance patterns and dietary preferences of hedgehogs at Trounson Kauri Park. *Conservation Advisory Science Notes* 267.
- Hodgson, C.J., Henderson, R.C. (2000). Coccidae (Insecta:Hemiptera:Coccoidea). *Fauna of New Zealand* 41, 264.
- Holloway, B.A. (1961). A systematic revision of the New Zealand Lucanidae (Insecta:Coleoptera). *Dominion Museum Bulletin* 20.
- Holloway, B.A. (1982). Anthribidae (Insecta:Coleoptera). *Fauna of New Zealand Series* 3.
- Howes, W.G. (1946). Plecoptera collecting at the Homer, with descriptions of the species. *Transactions of the Royal Society of New Zealand* 76(2), 139-147.
- Hoy, J.M. (1962). Eriococcidae (Homoptera: Coccoidea) of New Zealand. *New Zealand Department of Science and Industrial Research Bulletin* 146, 1-217.
- Hudson, G.V. (1928). *The butterflies and moths of New Zealand*, Ferguson & Osborn Ltd, Wellington.
- Hudson, G.V. (1939). *A supplement to the butterflies and moths of New Zealand*, Ferguson & Osborn Ltd, Wellington.
- Hudson, G.V. (1950). *Fragments of New Zealand Entomology*, Ferguson & Osborn Ltd, Wellington.

- International Commission on Zoological Nomenclature. 1999. *International Code of Zoological Nomenclature*. (4th edn) International Trust for Zoological Nomenclature, The Natural History Museum, London. 306 p.
- Johns, P.M., Boag, B., Yeates, G.W. (1998). Observations on the geographic distribution of flatworms (Turbellaria: Rhynchodemidae, Bilpaliidae, Geoplanidae) in New Zealand. *Pedobiologia* 42, 469-476.
- Kirby, W.F. (1894). Notes on *Dorydium* (?) *westwoodi*, Buchanan White, with observations on the use of the name *Dorydium*. *Transactions of the Entomological Society of London*, 411-413.
- Knight, W. J. (1973). Hecalinae of New Zealand (Homoptera: Cicadellidae). *New Zealand Journal of Science* 16, 957-969.
- Knight, W.J. (1974). Revision of the New Zealand genus *Novothymbris* (Homoptera: Cicadellidae). *New Zealand Journal of Zoology* 1(4), 453-473.
- Kuschel, G. (1971). Entomology of the Auklands and other islands south of New Zealand: Coleoptera: Curculionidae. *Pacific Insects Monograph* 27, 225-259.
- Lawrence, J.F., Britton, E.B. (1981). Coleoptera (Beetles). In *The insects of Australia, a textbook for students and research workers*. (2nd edn) CSIRO, Canberra.
- Lee, K.E. (1959). The earthworm fauna of New Zealand. *New Zealand Department of Scientific and Industrial Research Bulletin* 130.
- Lyal, C.H.C. (1993). Cryptorhynchinae (Insecta: Coleoptera: Curculionidae). *Fauna of New Zealand* 29.
- Lyneborg, L. (1992). Therevidae (Insecta: Diptera). *Fauna of New Zealand Series* 24.
- May, B.M. (1963). Revision of the genus *Megacolabus* Broun 1893 (Coleoptera: Curculionidae: Rhyarosoninae). *Transactions of the Royal Society of New Zealand. Zoology* 3(15).
- McFarlane, A.G. (1956). Additions to the New Zealand Trichoptera (part three). *Records of the Canterbury Museum* 7(1), 29-41.
- McKinney, M.L. (1999). High rates of extinction and threat in poorly studied taxa. *Conservation Biology* 13(6), 1273-1281.
- McLellan, I.D. (1991). Notonemouridae (Insecta: Plecoptera). *Fauna of New Zealand Series* 22.
- McLellan, I.D. (1993). Antarctoperlinae (Insecta: Plecoptera). *Fauna of New Zealand Series* 27.
- Miller, D. (1921). Material for a monograph on the Diptera fauna of New Zealand. Part 2. Family Syrphidae. *Transactions and Proceedings of the New Zealand Institute* 53, 289-333.
- Molloy, J., Davies, A. (1992). *Setting priorities for the conservation of New Zealand's threatened and plants and animals*, Department of Conservation, Wellington.
- Molloy, J., Davis, A. (1994). *Setting priorities for the conservation of New Zealand's threatened plants and animals, compiled by Christine Tisdall*. (2nd edn) Department of Conservation, Wellington.
- Morgan-Richards, M., Townsend, J.A. (1995). Hybridisation of tree weta on Banks Peninsula, New Zealand, and colour polymorphism within *Hemideina ricta* (Orthoptera: Stenopelmatidae). *New Zealand Journal of Zoology* 22, 393-399.
- Mound, L.A., Walker, A.K. (1986). Tuberlifera (Insecta: Thysanoptera). *Fauna of New Zealand* 10.
- New, T.R. (1995). *An introduction to invertebrate conservation biology*. Oxford University Press.
- Ordish, R.G. (1984). Hydraenidae (Insecta: Coleoptera). *Fauna of New Zealand Series* 6, 56.
- Parent, O. (1933). Etude monographique sur les dipteres dolichopodides de Nouvelle Zelande. *Annales Societe Scientifique Bruxelles (b)* 53, 325-441.
- Patrick, B.H. (1989). Lepidoptera of Central Otago salt pans. Department of Conservation, Dunedin, 43 p.

- Patrick, B.H. (1994). Lepidoptera of Kaitorete Spit, Canterbury. *New Zealand Entomologist* 17, 52-63.
- Patrick, B.H. (1992). Supplement to the Lepidoptera of the Mackenzie country with recommendations on the conservation. *New Zealand Entomologist* 15, 48-57.
- Patrick, B.H. (1994b). Valley floor Lepidoptera of Central Otago. *Department of Conservation. Miscellaneous series 19.*
- Patrick, B.H. (1994c). Lepidoptera of the southern plains and coast of New Zealand. *Department of Conservation Miscellaneous series No 17.*
- Patrick, B.H. (In press a). Conservation status of two rare New Zealand geometrid moths. *Science for Conservation.*
- Patrick, B.H. (In press b). Lepidoptera of small-leaved divaricating Olearia in New Zealand and their conservation. *Science for Conservation.*
- Patrick, B.H., Dugdale, J.S. (1997). Mistletoe moths. In: de Lange, P.J., Norton, D.A. (eds) *New Zealand loranthaceous mistletoes. Proceedings of a workshop hosted by Threatened Species Unit.* p. 125-132. Department of Conservation, Wellington.
- Patrick, B.H., Dugdale, J.S. (2000). Conservation status of the New Zealand Lepidoptera. *Science for Conservation* 136.
- Pilgrim, R.L.C., Palma, R.L. (1982). A list of chewing lice (Insecta: Mallophaga) from birds in New Zealand. *OSNZ News* 29, 1-32.
- Rognes, K., Keilin, D. (1987). The taxonomy of the *Pollenia rudis* species-group in the Holarctic Region (Diptera: Calliphoridae). *Systematic Entomology* 12(4), 475-502.
- Rowe, R. (1987). *The dragonflies of New Zealand.* University of Auckland Printing Services, Auckland.
- Teulon, D.A.J., Stufkens, M.A.W. (1998). Current status of New Zealand indigenous aphids. *Conservation Advisory Science Notes* 216, 23.
- Theischinger, G. (1991). Plecoptera (stoneflies). In: *The insects of Australia, a textbook for students and research workers.* (2nd edn) CSIRO, Canberra.
- Ward, J.B. (1995). Nine new species of New Zealand caddis (Trichoptera). *New Zealand Journal of Zoology* 22, 91-103.
- Ward, J.B., MacFarlane, R.P., Quinn, P.J., Morris, S.J., Hitchings, T.R., Green, E.H., Early, J.W., Emberson, R.M., Fenwick, G.D., Henderson, I.M., Henderson, R., Johns, P.M., Lariviere, M.-C., Marris, J.W.M., Matile, L., McLellan, I.D., Patrick, B.H., Smithers, C., Stufkens, M.A.W., Cink, C.J., Wilson, H.D. (1999). Insects and other arthropods of Hinewai Reserve, Banks Peninsula, New Zealand. *Records of the Canterbury Museum* 13, 97-121.
- Watt, J.C. (1975). The terrestrial insects. In: Kuschel, G. (ed.) *Biogeography and Ecology in New Zealand.* p. 507-535. Dr W. Junk B.V., Hague.
- Wells, S.M., Pyles, R.M., Collins, M.N. (1983). *The IUCN invertebrate red data book.* IUCN, Mages.
- Werner, F.G., Chandler, D.S. (1995). Anthicidae (Insecta: Coleoptera). *Fauna of New Zealand Series* 34.
- White, E.G. (1994). Ecological research and monitoring of the protected grasshopper *Brachaspis robustus* in the Mackenzie Basin. *Science and Research Series* 77.
- Wilson, H. (1992). *Banks Ecological Region: Port Hills, Herbert and Akaroa Ecological Districts.* New Zealand Protected Natural Areas Programme, Department of Conservation, Canterbury Conservancy, Christchurch.

# Appendix A

## Index to species in Appendix A

<b>A</b>		<b>E</b>	
<i>Acroclita</i> (s.l.) <i>discariana</i> Philpott	53	<i>Ectinorhynchus furcatus</i> Lyneborg	40
<i>Anabarhynchus albipennis</i> Lyneborg	39	<i>Elachista helonoma</i> (Meyrick)	44
<i>Anabarhynchus atratus</i> Lyneborg	39	<i>Eodrilus annectens</i> Beddard	17
<i>Anabarhynchus embersoni</i> Lyneborg	39	<i>Eodrilus montanus</i> Lee	17
<i>Anabarhynchus indistinctus</i> Lyneborg	39	<i>Eodrilus paludosus</i> Beddard	17
<i>Anabarhynchus olivaceus</i> Lyneborg	39	<i>Epichorista lindsayi</i> Philpott	53
<i>Anabarhynchus simplex</i> Lyneborg	39	<i>Ericodesma aerodana</i> Meyrick	54
<i>Androporus discedens</i> Sharp	28	<i>Eriococcus detectus</i> Hoy	26
<i>Anthicus otagensis</i> Werner & Chandler	28	<i>Eriococcus kowhai</i> Hoy	26
<i>Aphenochiton chionochloae</i> Henderson and Hodgson	27	<i>Eriococcus montifagi</i> Hoy	26
<i>Aphenochiton inconspicua</i> (Maskell)	27	<i>Eurythecta robusta</i> Butler	54
<i>Aphis cottieri</i> Carver	24	<i>Euxoa cerapachoides</i> Guenee	51
<i>Aphis cottieri</i> Cottier	24	<b>G</b>	
<i>Aphis healyi</i> Cottier	24	<i>Gadira</i> "black brown EGW"	42
<i>Aphis nelsonensis</i> Cottier	24	<i>Gadira petraula</i> (Meyrick)	42
<i>Archyala lindsayi</i> (Philpott)	53	<i>Glyphipterix euastera</i> Meyrick	45
<i>Asaphodes obarata</i> (Felder & Rogenhofer)	46	<i>Gynoplistia canterburiana</i> and <i>Gynoplistia speighti</i> Edwards	40
<i>Asaphodes stinaria</i> (Guenee)	46	<b>H</b>	
<i>Austragoniodes waterstoni</i> Cummings	24	<i>Hadramphus tuberculatus</i> Pascoe	33
<i>Austrocidaria lithurga</i> (Meyrick)	47	<i>Helastia angusta</i> Craw	48
<b>B</b>		<i>Helastia clandestina</i> (Philpott)	48
<i>Bityla sericea</i> Butler	51	<i>Helastia expolita</i> (Philpott)	48
<i>Brachaspis robustus</i> Bigelow	22	<i>Hemiandrus</i> "Timaru"	22
<b>C</b>		<i>Hemideina ricta</i> Hutton	22
<i>Circoxena ditrocha</i> Meyrick	41	<i>Heterocrossa maculosa</i> (Philpott)	41
<i>Crisius baccatellus</i> (Broun)	31	<i>Holcaspis falcis</i> Butcher and <i>Holcaspis brevicula</i> Butcher	30
<i>Crisius bicinctus</i> (Broun)	31	<i>Holcaspis odontella</i> (Broun)	30
<i>Crisius fulvicornis</i> (Broun)	31	<i>Holloceratognathus cylindricus</i> (Broun)	34
<i>Crisius obscurus</i> (Broun)	32	<b>I</b>	
<i>Crisius variellus</i> (Broun)	32	<i>Izatha psychra</i> Meyrick	52
<i>Crystallotesta fuscus</i> (Maskell)	27	<b>K</b>	
<b>D</b>		<i>Kalasisiris paradepressa</i> Henderson and Hodgson	27
<i>Dasyuris enysii</i> Butler	47	<i>Kiwaia</i> "plains jumper"	45
<i>Declana griseata</i> Hudson	47	<i>Kiwaia jeanae</i> Philpott	45
<i>Deinacrida elegans</i> Gibbs	21	<i>Kiwaia pumila</i> (Philpott)	45
<i>Deinacrida pluvialis</i> Gibbs	21	<i>Kupea electilis</i> Philpott	42
<i>Discobola dicycla</i> Edwards	40	<b>L</b>	
		<i>Leioproctus</i> n.sp	56
		<i>Lenax mirandus</i> Sharp	35



<i>Lyperobius carinatus</i> Broun	33	<i>Paradorydium westwoodi</i> (Buchanan White)	25
<i>Lyperobius huttoni</i> Pascoe	33	<i>Paradoxaphis</i> undescribed species	25
<b>M</b>		<i>Parentia nova</i> Parent	37
<i>Maoricrambus oncobolus</i> (Meyrick)	43	<i>Periegops suterii</i> Urquhart	19
<i>Maoridrilus dissimilis</i> Beddard	18	<i>Peripatoides novaezealandiae</i> (Hutton)	19
<i>Maoridrilus modestus</i> Michaelsen	18	<i>Plagiochaeta sylvestris</i> Hutton	18
<i>Maoridrilus parkeri</i> Beddard	18	<i>Platycheirus atkinsoni</i> Miller	38
<i>Maoridrilus purusa</i> Ude	18	<i>Plumichiton punctatus</i> Henderson & Hodgson	26
<i>Maoridrilus smithi</i> Beddard	18	<i>Plutellus parvus</i> Lee	18
<i>Maoridrilus suteri</i> Michaelsen	18	<i>Pollenia commensurata</i> Dear	37
<i>Maoridrilus wilkini</i> Lee	18	<i>Priesneriella gnomus</i> Mound and Palmer	28
<i>Mecodema allani</i> Fairburn	29	<i>Prodontria matagouriae</i> Emerson	36
<i>Mecodema brittoni</i> Townsend	29	<i>Prodontria minuta</i> Emerson	36
<i>Mecodema howiiti</i> Castlenau	29	<i>Pseudocoremia cineracia</i> (Howes)	49
<i>Megacolabus sculpturatus</i> Broun	34	<i>Pseudocoremia</i> n.sp. "Knobby"	49
<i>Megadromus</i> "omarama"	30	<i>Psilochorema folioharpax</i> McFarlane	40
<i>Megadromus antarcticus</i> subspecies 1	31		
&2	31	<i>Psilodonthia viridescens</i> Broun	36
<i>Megadromus</i> n.sp.11	31	<i>Pyrgotis pyramidias</i> (Meyrick) [ <i>sensu stricto</i> ]	55
<i>Melanostoma apertum</i> Miller	38	<i>Pyrgotis</i> sp. "olearia"	55
<i>Meterana exquisita</i> Philpott	52	<b>R</b>	
<i>Microcryptorhynchus albistrigalis</i> (Broun)	32	<i>Rhododrilus minutus</i> Beddard	18
<b>N</b>		<i>Rhypodes brevipilis</i> Eyles	27
<i>Naufraga hexachaeta</i> (Parent)	37	<b>S</b>	
<i>Neodrilus campestris</i> Hutton	18	<i>Samana acutata</i> Butler	49
<i>Notoreas</i> 'Cape Campbell'	49	<i>Scythris</i> sp. "stripe"	52
<i>Novothybris pollux</i> Knight	25	<i>Stegococcus oleariae</i> Hoy	26
<b>O</b>		<i>Stethaspis convexa</i> Given	36
<i>Octochaetus antarcticus</i> Beddard	17	<i>Sympycnus</i> (s.l.) <i>alchymicus</i> Parent	38
<i>Octochaetus huttoni</i> Beddard	18	<i>Syntormon aotearoa</i> Bickel	38
<i>Odonthria aurantia</i> Given	35	<b>T</b>	
<i>Odonthria regalis</i> Given	35	<i>Tatosoma agrionata</i> (Walker)	49
<i>Odonthria subnitida</i> Given	35	<i>Thectophila acmotypa</i> Meyrick	41
<i>Ooperipatellus viridimaculatus</i> Dendy	19	<i>Theoxena scissaria</i> (Guenee)	50
<i>Orchymontia banksiana</i> Ordish	34	<i>Tiphobiosis childella</i> Ward	40
<i>Orocrambus</i> "Mackenzie Basin"	44	<i>Tiphobiosis hinewai</i> Ward	40
<i>Orocrambus fugitivellus</i> (Hudson)	43	<i>Trinodicalles altus</i> (Broun)	32
<i>Orocrambus lindsayi</i> Gaskin	44	<b>U</b>	
<i>Orocrambus sophistes</i> (Meyrick)	44	Undescribed Hymenopteran family	56
<i>Orocrambus sophronellus</i> (Meyrick)	44	<b>X</b>	
<i>Orthoclydon pseudostinaria</i> (Hudson)	48	<i>Xanthocnemis sinclairi</i> Rowe	20
<b>P</b>			
<i>Pantolytomyia polita</i> Naumann	56		

<i>Xanthorhoe bulbulata</i> Guenee	50	<i>Zeadelium gratiosum</i> (Broun)	37
<i>Xanthorhoe frigida</i> Howes	50	<i>Zealandobius jacksoni</i> McLellan	20
<i>Xanthorhoe lophogramma</i> Meyrick	50	<i>Zealandobius peglegensis</i> McLellan	20
<i>Xylota montana</i> Miller	38	<i>Zealandobius wardi</i> McLellan	20
Z		<i>Zelleria sphenota</i> Meyrick	55
<i>Zeacalles estriatus</i> Broun	32	<i>Zizina oxleyi</i> (Felder and Felder)	51
<i>Zeacalles igneus</i> (Broun)	32		

Continue to next file: casn320a.pdf