



Terrestrial invertebrate biosystematics research and events at the New Zealand Arthropod Collection (NZAC), Auckland

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Welcome to *NZAC News*. This electronic newsletter appears 3 times a year, with the purpose of highlighting recent biosystematics research and publications on terrestrial invertebrates at NZAC, and NZAC activities.

Website Guide to larger moths of New Zealand now available

The goal of this new online *Guide* is to allow anyone in New Zealand to identify the larger moths they may encounter anywhere in the country. With experience, it can be used to build up local lists of moths for reserves, restoration plots, gardens, or any other area of interest. All users will find it an authoritative source of images for N.Z. larger moth species.

Moth identification in New Zealand is hampered by the lack of coverage in available field-guides. The only comprehensive, fully illustrated account is that of G. V. Hudson in his 'Butterflies and Moths of New Zealand' and its Supplement (Hudson 1928, 1939; available at www.bugz.org.nz). These two volumes are rare and out of date, many names have changed, and new species have been described. Hudson's beautiful coloured illustrations vary in their scientific accuracy, and sometimes it is hard to recognise a moth from his painting alone.

This first version of the online *Guide* (March 2011) covers the 52 described species of the subfamily Ennominae of the looper family Geometridae. Other families and subfamilies will be added as the *Guide* progresses.

For nearly all species there are images for both the males and females. All images have been taken and edited by **Birgit Rhode** from specimens selected by **Alan Emmerson** and **Robert Hoare**. **Marie-Claude Larivière** assisted with the project planning and website development, and Landcare Research webmaster **Karen Scott** (Lincoln) provided web-design expertise. All specimens are in the Synoptic Lepidoptera Collection in NZAC, unless otherwise indicated.

The images are of pinned moths with their forewings and hindwings spread in the standard position for museum specimens. When alive, most moth species rest with their hindwings concealed under the forewings, so initially some difficulty may be encountered in reconciling the appearance of the live specimen with these images. However, if the moth can be captured in a transparent container and the forewing lined up so that it corresponds with the orientation in the photograph, comparison should be made relatively easy.

New Zealand Ennominae

Although there is no simple way of recognising an ennomine as such, all New Zealand Ennominae are medium-sized relatively robust moths (although not as robust as Noctuidae), and the males in most genera have feathery antennae.

Chalastra males have feathery antennae; *C. aristarcha* and *pellurgata* are medium-sized moths with distinctive white markings. '*Chalastra ochrea*' is more *Pseudocoremia*-like and



Ischalis fortinata, male.

does not really belong with the other 2 *Chalastra* species. *Gellonia* and *Cleora* are large brown moths, with feathery antennae in the males, and scalloped edges to the wings. *Cleora scriptaria*, the kawakawa looper, is especially variable in pattern. *Zermizinga indocilisaria* is a small, grey, rather atypical ennomine, with an eastern distribution in New Zealand. The female is short-winged (brachypterous).

In the genus *Pseudocoremia*, the hindwings are often yellowish and much brighter than the forewings under which they are concealed when the moth is at rest. *Declana* contains robust noctuid-like species, most exhibiting lichen-like or bark-like patterning. Some, like *D. floccosa*, are very variable in colour pattern. The fern loopers in the genera *Ischalis*, *Sarisa*, and *Sestra* have scalloped or hook-tipped forewings, usually with strong dark lines running across them; males have simple, non-feathery antennae (Weintraub & Scoble, 2004, *Fauna N.Z.* 49).

New Zealand moth diversity

There are well over 1650 species of moths, and of these approximately 85% are endemic to New Zealand; in contrast, only 24 species of butterflies are currently recognised, of which only 13 are native, the rest being introductions or immigrants.

A major problem is that we are still a long way from understanding the true diversity of the moth fauna of New Zealand, because detailed up-to-date taxonomic studies of most groups have not been undertaken. In effect, this means that we do not know for certain what species some of the older scientific names refer to, or whether certain groups of variable and similar-looking populations of moths from different localities represent one species or several. Many new, unnamed species await formal description — a time-consuming process. The result is that even 'experts' are unable confidently to put a name to many New Zealand moths!

The problem is particularly acute with the smaller moths, the so-called 'Microlepidoptera'. Identifying these is a specialised task even in countries, e.g., the U.K., with well understood

faunas, and more so in New Zealand, where many of the smaller moths have never been critically studied by modern methods.

This website therefore deals only with the better (but still incompletely) known ‘macro-moths’. In general, this means all the more conspicuous, broad-winged moths most likely to attract attention. For these ‘macro-moths’ this website will be a near-comprehensive guide. However, we have not included undescribed species at this stage. In practice, since most unnamed species are rare and local (many are restricted to the Alpine zone of the South Island), they are unlikely to be encountered by most people.

A hard-copy **Field Guide to Larger Moths of New Zealand** is in preparation by Alan Emmerson, Robert Hoare, and Birgit Rhode. It is intended that this will be fully comprehensive in its coverage of the families included on the website. It will also show a greater range of variation for the very variable species, e.g. *Cleora scriptaria* and *Declana floccosa*, than can be shown on the website.

Funding: TFBIS (Terrestrial and Freshwater Biodiversity Information Systems) administered by Department of Conservation (DoC), Project 225; MSI (Ministry of Science and Innovation) “Defining New Zealand’s Land Biota”

Hoare, R. J. B.; Rhode, B. E.; Emmerson, A. W. 2011 (and updates). Larger moths of New Zealand: Image gallery and online guide. <http://largemoths.landcareresearch.co.nz/>

Invertebrate biosystematists contribute to New Zealand Inventory of Biodiversity volume

Many NZAC staff (Robert Hoare, Marie-Claude Larivière, Rosa Henderson, Thomas Buckley, Zhi-Qiang Zhang, Birgit Rhode, Trevor Crosby) and former staff (Peter Maddison, John Dugdale, Jo Berry, Des Helmore) contributed to *Volume 2* of the *New Zealand Inventory of Biodiversity*, edited by Dennis Gordon (NIWA, Wellington) and published at the end of 2010.

Volume 2 contains species checklists for all groups of terrestrial invertebrates, totalling about 22,500 described and known undescribed or undetermined species. In addition there is extensive text on diversity, natural history, and evolution. Larivière and Henderson contributed to the text sections on Hemiptera, Buckley wrote the section on stick insects, Hoare collaborated on the Lepidoptera text, and Zhang collaborated on the Acari text.

The *New Zealand Inventory of Biodiversity* will remain the most comprehensive text on the terrestrial invertebrates of New Zealand for many years. It is written in a style that is highly accessible to the general public and senior students. The species checklists included in the publication will provide the base data for populating fields in the New Zealand Organisms Register (see www.nzor.org.nz).

Sirvid, P. J.; Zhang, Z.-Q.; Harvey, M. S.; Rhode, B. E.; Cook, D. R.; Bartsch, I.; Staples, D. A. 2010. Chapter 6. Phylum Arthropoda subphylum Chelicerata: horseshoe crabs, sea spiders, arachnids. Pp. 50–89 in: Gordon, D. P. (ed.) *New Zealand Inventory of Biodiversity. Volume 2. Kingdom Animalia. Chaetognatha, Ecdysozoa, Ichnofossils*. Canterbury University Press, Christchurch, New Zealand. 528 pp.

Macfarlane, R. P.; Maddison, P. A.; Andrew, I. G.; Berry, J. A.; Johns, P. M.; Hoare, R. J. B.; Larivière, M.-C.; Greenslade, P.; Henderson, R. C.; Smithers, C. N.; Palma, R. L.; Ward, J. B.; Pilgrim, R. L. C.; Towns, D. R.; McLellan, I. D.; Teulon, D. A. J.; Hitchings, T. R.; Eastop, V. F.; Martin, N. A.; Fletcher, M. J.; Stufkens, M. A. W.; Dale, P. J.; Burckhardt, D.; Buckley, T. R.; Trewick, S. A. 2010. Chapter 9. Phylum Arthropoda subphylum Hexapoda: Protura, springtails, Diplura, and insects. Pp. 233–467 in: Gordon, D. P. (ed.) *New Zealand Inventory of Biodiversity. Volume 2. Kingdom Animalia. Chaetognatha, Ecdysozoa, Ichnofossils*. Canterbury University Press, Christchurch, New Zealand. 528 pp.

Ian McLellan’s collection of Plecoptera now at NZAC

Ian McLellan passed away on 28 November 2008 after a short illness (Patrick & Pawson 2009). Ian was a Research Associate of NZAC and it was agreed, and stated in his will, that his collection was to be deposited with NZAC. From the mid-1960s Plecoptera specimens collected by NZAC researchers were sent routinely to Ian to study at his Westport home. This note is to record that in February 2011 Ian’s collection was received at NZAC, Auckland.

Ian’s Plecoptera collection consists of some 3530 tubes of ethanol-stored New Zealand specimens identified to species plus about 300 tubes of specimens from other countries. The collection is in good condition, and currently housed in 2 metal filing cabinets, each with 11 drawers about 250 mm wide, 360 mm long, and 80 mm deep. The New Zealand Plecoptera material is contained in 14 drawers. Cardboard dividers are in each drawer to separate tubes of different species. Holotypes are in this collection: in Ian’s publications the holotypes are stated to be deposited at NZAC (earlier as DSIR), but it was agreed by NZAC that Ian could look after them in his collection while he was actively researching the group.

Shortly before his death, in a project with Dr Steve Pawson of Scion, Christchurch, Ian provided information on New Zealand’s Plecoptera for the TFBIS-funded project and website www.stoneflies.org.nz. As part of this project, each tube in his collection with a New Zealand species had a NZAC barcode label added, and then the collecting details (including georeferencing data) were recorded in Excel spreadsheets alongside records from other collections. The significance of Ian’s collection is shown by the fact that it contains about half the total number of Plecoptera records for all New Zealand collections. A spreadsheet of the collecting details for any New Zealand stonefly species now can be downloaded by anyone from the stoneflies website.

In addition to the Plecoptera, Ian’s collection contains several hundred tubes of various Diptera families, particularly Thaumaleidae, Empididae, and Blephariceridae.

Patrick, B.; Pawson, S. 2009. Obituary. Ian Dudley McLellan 1924–2008. *New Zealand Entomologist* 32: 91–94. [PDF available <http://www.ento.org.nz/nzentomologist/>]

Pawson, S.; McLellan, I. D. 2007. Stoneflies of New Zealand. www.stoneflies.org.nz.

Trevor Crosby

Surveying bugs and ground-beetles in the Ruahine Ranges and the Dunedin Hills

Marie-Claude Larivière and **André Larochelle** completed their 19th field season since arriving in New Zealand from Canada in October 1992. This year’s fieldwork aimed to sample Heteroptera of the family Rhyparochromidae, especially seed bugs of the tribe Targaremini, and Coleoptera of the family Carabidae, especially small species in the tribes ‘Psydrini’ and Zolini, in order to improve studies on the taxonomy, geographic distribution, and natural history of these groups.

Taxonomic research on these insects is conducted in the context of the “Defining New Zealand’s land biota” programme funded by the Ministry of Science and Innovation, which supports the development and maintenance of NZAC and associated research towards documenting and understanding New Zealand’s biodiversity of land invertebrates.

Species discovery together with species characterisation, biological and geographical documentation, and vouchering of specimens in the NZAC are core data-gathering activities towards the online tools and the multi-year, multi-volume Species Synopses being prepared by Marie-Claude and André in their respective area of speciality.



Targarema stali (seed bug, Targaremini), *Molopsida polita* (ground-beetle, 'Psydrini'). Scale bar = 1 mm.

Two main areas were surveyed this year: the Ruahine Ranges (SE of the central volcanic plateau, North Island), in December 2010, and the hills around the city of Dunedin (South Island), in March 2011.

Sifting and hand-collecting methods were used to sample bugs and ground-beetles inhabiting mesic to wet native forest habitats in the layer between the leaf or twig litter and the soil, in and around 'dry' rotten fallen branches as well as under their bark, in the zone between moss and thin humus on live tree trunks and low branches or on rotten logs, in twigs and other vegetal debris accumulated around the base of tree forks, and at the base of plants such as ferns.

The red beech (*Nothofagus fusca*) forest of the eastern Ruahines yielded interesting species from a particular micro-habitat, the deep, moist leaf-litter at the base of *Blechnum*-ferns. The *Melicytus*-tree *Fuchsia* coastal forests around Dunedin provided unexpectedly diverse samples especially from 'dry' rotten fallen branches and from under the bark of live trees.

The Dunedin trip provided an opportunity to catch-up with John Nunn (private beetle collector closely associated with NZAC) and Anthony Harris (associate with the Otago Museum). Marie-Claude and André were also in contact with staff from the Department of Conservation (Ian Stringer, Stephen Robson, Bryan Welch, Ken Mills, Bruce McKinlay; North and South Island conservancies) and the Dunedin City Council (Dolina Lee, Steve Pearce) who were all extremely supportive during the preparation and execution of the fieldwork.

Results from this year's sampling will be included in upcoming *Fauna of New Zealand* series monographs to be made freely available online (<http://fnz.landcareresearch.co.nz/>).



Ruahine Ranges, North Island: Red beech forest; André sifting leaf-litter from the base of *Blechnum*-ferns.



Dunedin Hills, South Island: Tree-*Fuchsia* forest; Marie-Claude shaking hanging bark from live tree over sifting tray.

Northland fieldwork

Zeng-Qi Zhao, Zhi-Qiang Zhang and his visiting researcher Eric Palevsky (Israel) spent a week (28 Feb–4 Mar 2011) collecting nematodes and mites in native habitats in Northland. Although a large number of samples remains to be sorted, Zhi-Qiang has already identified a very interesting new species of mite belonging an early derivative family previously not recorded from New Zealand.

Photographs below. Zeng-Qi, Zhi-Qiang, and Eric sample diverse Northland habitats for nematodes and mites.



The Brunei Agricultural Research Centre (BARC) insect collection

In mid-February **Trevor Crosby** went to Brunei on an initial visit to advise on the rehabilitation and refurbishment of the BARC insect collection. This is part of a wider 3-year project — “Reduction of Pesticide Residues on Economic Crops through the use of IPM methods and strengthening capabilities in insect identification and collection management” — funded through the Sultanate’s 2007–2012 National Development Plan, and being implemented by CABI Southeast and East Asia Regional Centre, Kuala Lumpur.

The purpose of the collections-based entomological part of this project is to enable the development of up-to-date host–pest lists for economic crops, and ensuring that reported occurrences of species can be confirmed through vouchered specimens.

The BARC collection in Kilanas was started in 1970 by British entomologist D. J. McCrae, with a focus on agriculturally important insects (McCrae 1981 *Insects of Agricultural Importance in Brunei*. [Brunei Press Ltd]. 110 pp). Over 1000 species were identified in the 1970s and early 1980s by specialists in London (CIE based at BMNH). Specimens of nearly all identified species were returned to Brunei and remain in good condition, and representatives were retained at BMNH. These high-quality identifications, backed up by BMNH, make BARC a significant regional reference collection for agriculturally important insects that has been little used outside Brunei.

Currently the pinned specimens are on moveable cork slats housed in drawers. The option is now being explored of using unit trays instead of cork slats so that recently collected specimens can be integrated into the collection more readily.

In June a start will be made on making the collection information available electronically.

Funding: CABI Southeast & East Asia Regional Centre, as contractor for Sultanate of Brunei

Recent and Coming Events

Thomas Buckley has been appointed Associate Professor in the Joint Graduate School for Biodiversity and Biosecurity established between Landcare Research and the University of Auckland. The School is an evolution of the Centre for Biodiversity and Biosecurity, which was launched as a collaborative research centre 6 years ago. The School will focus on postgraduate supervision around projects aligned with Landcare Research’s core purpose. In February Thomas presented a talk on “Comparative phylogeography of N.Z. cicadas: the signature of ephemeral habitats” to the Annual New Zealand Phylogenetics Meeting, held at Leigh 14–18 February.

Bob Anderson (Canadian Museum of Nature, Ottawa) and his son **Eric** worked with **Rich Leschen** on the TIFBIS (Terrestrial and Freshwater Biodiversity Information Systems) project to provide images of N.Z. weevil genera, by databasing specimens and curating part of the weevil collection. Bob may return to New Zealand for a year-long sabbatical to work with **Willy Kuschel** and Rich on a key to N.Z. weevils.

Andrea Schomann (PhD student from University of Copenhagen; together with her husband **Jan Pederson**, Museum of Zoology, and daughter Helena) worked for 4 months in NZAC on staphylinids,

and DNA prepping specimens of *Hyperomma* for a revision and phylogeny of this genus. They also made many trips around N.Z. collecting these rare beetles.

Nathan Lord (PhD student from University of New Mexico, Albuquerque) worked with Rich and Thomas Buckley on N.Z. zopherids to reconstruct their phylogenetic relationships, work on a type catalogue with Rich, and begin a generic revision of the N.Z. taxa.

On 26 February **Grace Hall** participated in *Explorama* at Auckland Museum. *Explorama* was a weekend public activity at Auckland Museum fashioned loosely on BioBlitz. It was an opportunity for Grace to speak to the public about spiders, show them some live specimens, and take them on walks in the Domain grounds to look for spiders. There was a strong level of public interest, with activities also including behind the scenes tours to visit the Museum’s collections.

Zhi-Qiang Zhang was appointed as a Member of the Advisory Board for the *Journal of Insect Science*.

Publications

This section includes recent publications by staff associated with NZAC, or publications by other researchers using NZAC specimens or expertise of NZAC staff.

Eastop, V. F. 2011. *Megoura stufkensi* a new species of aphid (Hemiptera: Aphididae) from New Zealand. *N.Z. Entomologist* 34: 27–29.

Hill, G.; Henderson, R. C.; Mauchline, N. 2011. Diaspidid (Hemiptera: Coccoidea) size plasticity as an adaptive life history trait. *European Journal of Entomology* 108: 153–159.

Hoare, R. J. B. 2011. Lepidoptera of gumland heaths — a threatened and rare ecosystem of northern New Zealand. *N.Z. Entomologist* 34: 67–76.

Leschen, R. A. B.; Butler, E.; Buckley, T. R.; Ritchie, P. 2011. Biogeography of the New Zealand subantarctic islands: phylogenetics of *Pseudhelops* (Coleoptera: Tenebrionidae). *N.Z. Entomologist* 34: 12–26.

Marske, K. A.; Leschen, R. A. B.; Buckley, T. R. 2011. Reconciling phylogeography and ecological niche models for New Zealand beetles: looking beyond glacial refugia. *Molecular Phylogenetics and Evolution* 59: 89–102.

Martin, N. A.; Zhang, Z.-Q. 2010. Identity and distribution of *Sonchus* leaf-curling mite (Acari: Eriophyidae) in New Zealand. *Systematic and Applied Acarology* 15: 263–264.

Martin, N. A.; Zhang, Z.-Q. 2011. Extended distribution and host plants of *Nameriophyes sapidae* Xue & Zhang 2008 (Acari: Eriophyidae) in New Zealand. *Zootaxa* 2796: 67–68.

Plant, A. 2011. The Heterodromiinae (Diptera: Empididae) of New Zealand III. *Antipodromia* new genus. *N.Z. Entomologist* 34: 52–55.

Sinclair, B. J. 2011. Revision of the New Zealand genus *Adipsomyia* (Diptera: Empidoidea: Brachystomatidae: Trichopezinae), with a key to local empidoid family and selected genus groups. *N.Z. Entomologist* 34: 30–36.

Ward, D. F. 2011. *Poecilocryptus zealandicus* sp. n. (Hymenoptera: Ichneumonidae: Labeninae) from New Zealand. *N.Z. Entomologist* 34: 37–39.

Ward, D. F.; Goulet, H. 2011. *Moaxiphia gourlayi* sp. n. (Hymenoptera: Xiphydriidae), a new endemic woodwasp from New Zealand. *N.Z. Entomologist* 34: 1–4.

Yu, L.; Zhang, Z.-Q.; He, L. 2010. Two new species of *Pyemotes* closely related to *P. tritici* (Acari: Pyemotidae). *Zootaxa* 2723: 1–40.

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