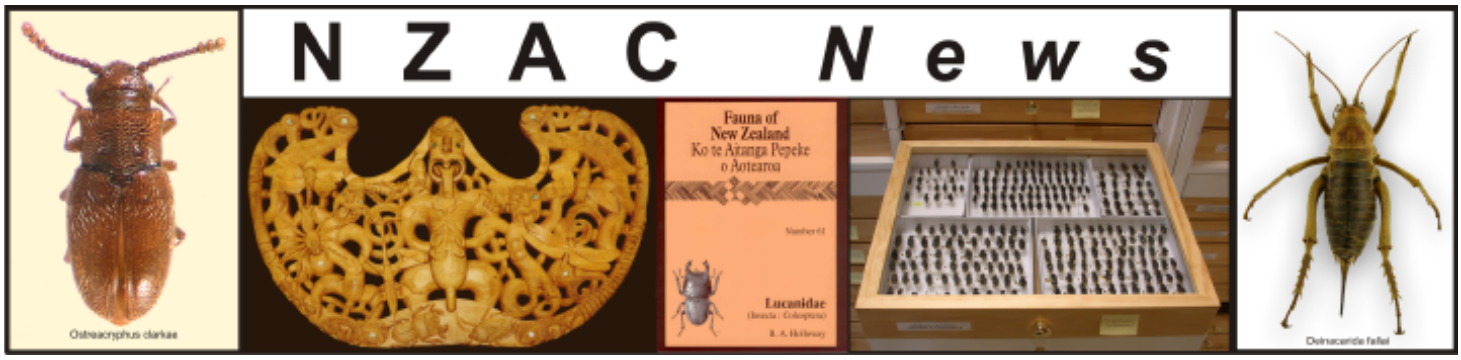

Terrestrial invertebrate biosystematics research and events at the New Zealand Arthropod Collection (NZAC), Auckland

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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.

Moss bugs (Hemiptera: Peloridiidae) of New Zealand

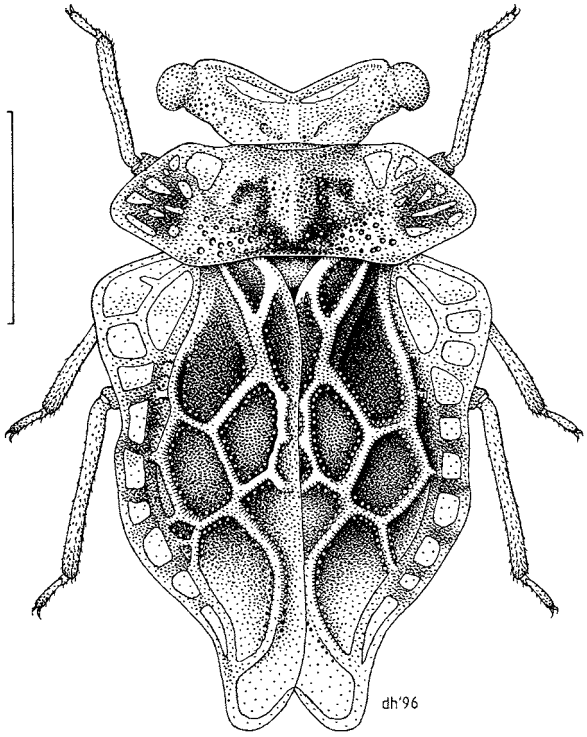
The family Peloridiidae or moss bugs are primitive members of the insect order Hemiptera that have just been reviewed by **Marie-Claude Larivière**, **Daniel Burckhardt**, and **André Larochelle**. These "living fossils", as they are often called, belong to the surborder Coleorrhyncha and live in the wet moss of temperate and subantarctic rainforests. Peloridiids occur in Chile, Argentina, New Zealand, New Caledonia, and eastern Australia, including Tasmania and Lord Howe Island, and are known from 17 genera and 36 species.

New Zealand can be regarded as a biodiversity 'hotspot' for these insects, with all three genera and 13 New Zealand species being endemic. New Zealand has the most diversified fauna at the species level, with 36% of all world species in this group of special significance for the Southern Hemisphere, with evolutionary roots dating back to the break-up of Gondwana.

Moss bugs are strange-looking insects, generally ranging from 2–4 mm in length. Their body is flattened, broadly shaped, and cryptically coloured so that it blends with the surrounding environment. Their head is peculiar in that the eyes are widely separated, prominent at the sides, and petiolate (positioned on short stalks). The surface of their anterior or top wings is hardened and bears a network of veins and variously shaped areolae or closed cells.

All New Zealand species lack posterior wings and are flightless. They probably spend most of their life in the wet moss on which they feed, moving very little. It is thought that if environmental conditions become drier, peloridiids move deeper into the moss layers in search of moisture and remain there until it is again suitably wet nearer to the surface.

Little is known about the biology and behaviour of New Zealand moss bugs. Their life-cycle includes the egg stage, five nymphal stages, and the adult stage. The adult stage occurs mostly from December to March. Newly emerged adults—more soft-bodied and lightly coloured than mature adults—are active in January (North Island) or February (South Island). Nymphs of various stages are often found with adults, from November to December (North Island) or from January to February (South Island). Field surveys conducted during the New Zealand winter (June to September) have yielded only a few mature adults; no newly emerged adults or nymphs have been found in that season. This suggests moss bugs spend the winter in the adult and/or the egg stage.



Oiophysa distincta Woodward, 1952. This species is found in lowland to montane areas in the southern half of the South Island in podocarp, *Nothofagus*, or mixed podocarp–*Nothofagus* forests. All life stages can be collected in moss (e.g., ground moss, moss and lichens under trees or on tree trunks or branches) and wet leaf litter. Scale bar = 1 mm. (Illustration: Des Helmore)

The geographical distribution of most New Zealand peloridiid species was poorly documented before this study. We now have a better understanding of distribution patterns, but more collecting is needed in under-surveyed areas such as Northland, the Coromandel Peninsula, eastern parts of the South Island, the Chatham Islands, and Stewart Island. The genera *Xenophyes* and *Oiophysa* occur on the North and South Islands, while the genus *Xenophysella* is shared between the South Island and Stewart Island, where the genus *Oiophysa* also occurs. Of the two main islands of New Zealand, the South Island has the greater number of genera (3) and species (10 or 77% of the fauna) although not all species are restricted to that island. Two moss bug species are shared between the North and South Islands, eight species are restricted to the South Island, and two species to Stewart Island.

Electronic newsletter of the invertebrate biosystematists of the Ministry of Science and Innovation "Defining New Zealand's Land Biota / Te Tautuhi i nga Hanga Koiora o Aotearoa", incorporating the New Zealand Arthropod Collection (NZAC) and the National Nematode Collection of New Zealand (NNCNZ). Published 3 times per year. Edited by Trevor Crosby, Landcare Research, Private Bag 92170, Auckland 1142, New Zealand. ***Subscribe:*** *email NZACnews@LandcareResearch.co.nz with* **Subscribe** *in the* ***subject line****. Website: www.LandcareResearch.co.nz/research/biosystematics/invertebrates.*

Landcare Research
Manaaki Whenua

Funding: MSI (Ministry of Science and Innovation "Defining New Zealand's Land Biota").

Larivière, M.-C.; Burckhardt, D.; Larochelle, A. 2011: Peloridiidae (Insecta: Hemiptera: Coleorrhyncha). *Fauna of New Zealand 67*, 78 pages. http://www.landcareresearch.co.nz/research/biosystematics/invertebrates/faunaofnz/Extracts/FNZ67/FNZ67ind.asp

Dumbleton's 1958 visit to Campbell Island

It was a Te Papa aphid record for *Uroleucon sonchi* (Linnaeus), said to be collected on Campbell Island in 1958 by Dr Beverley Holloway, that suggested to me the collector details were not correct. Certainly Beverley was likely to have been the identifier of this aphid while Entomologist at the then-named Dominion Museum. However, she was not able to visit Campbell I. during her entomological career. So, who was the collector?

Jack Dumbleton immediately came to mind, as he had described the simuliid *Austrosimulium campbellense* in his 1973 revision of the family, and numerous specimens in NZAC are labelled as being collected by him from the Tucker Cove stream, Campbell I. on 2 November 1958. A quick check of Gressitt *et al*. (1964) to confirm this gave a surprising result: Dumbleton was not recorded as being on any expedition to Campbell I. The Simuliidae specimens listed by Roy Harrison in Gressitt *et al.* (1964: 304) were only Bishop Museum-collected specimens.

A detailed search of the BUGZ literature database (www.bugz.org.nz) revealed the only other specimens published as collected by Dumbleton on Campbell I. in 1958 were 4 mature larvae of an empidid (Diptera). These were described in Dumbleton (1966); they were collected from *Fissidens* moss on submerged stones in the Tucker Cove stream, with a collection date stated to be "21.XI.58". These specimens are mounted on microscope slides and deposited in NZAC: they are dated "3/8/58". The slide-mounted specimens of the other empidid species described by Dumbleton (1966) collected from Peel Forest, SC are dated "24/3/59" and this date corresponds to the date provided in the publication for that species.

Gressitt (1964) recorded that in January 1958 the Denver Museum of Natural History expedition went to Campbell I. for 6 weeks. Bailey & Sorensen (1962) in their account stated that one purpose of this expedition was to collect "… a few of the common species of birds and mammals to be used for display [at the Denver Museum] in two large habitat groups with painted backgrounds showing the interesting terrain of the subantarctic island". Two New Zealand naturalists were with this group: Dr Kaj Westerskov, of the Wildlife Division of the Department of Internal Affairs, and Mr Robert Street, Biologist of the Marine Department. The Te Papa aphid specimen is likely to have been collected by one of them.

A clue as to how Dumbleton might have got to Campbell I. in 1958 came from Kerr (1976), who commented that the Beeman Cove buildings were formally opened in November 1958, and that the Meteorological Station was being serviced by ships of the Holm company. An exploratory email to Jack's son Alastair Dumbleton immediately solved the mystery. The family had 35 mm Kodachrome slides Jack had taken on that trip, and these confirmed that he had indeed made a brief visit on the supply ship *Holmlea*.

It appears that Jack went on this trip to collect simuliids exclusively. The empidids were a by-catch, and their collection date should be "2 Nov 1958" as with the simuliids. The differing dates on the empidid microscope slides and in the publication seem to have resulted from transcription errors from field labels.

Jack's photographs are still in very good condition, and one of Tucker Stream where he collected will be used in a forthcoming *Fauna of New Zealand* contribution on Simuliidae by Craig, Craig & Crosby. Copies of his photographs of that trip, as well as his 1962–63 Auckland Islands trip, have now been made available to NZAC by the Dumbleton family.

Acknowledgment: Alastair Dumbleton (Chief, Employment Relations Authority, Auckland) for providing information and photographs.

Funding: MSI (Ministry of Science and Innovation "Defining New Zealand's Land Biota").

Bailey, A. M.; Sorensen, J. H. 1962: Subantarctic Campbell Island. *Denver Museum of Natural History, Proceedings Number 10*.

Dumbleton, L.J. 1966: Immature stages of two aquatic Empididae (Diptera). *New Zealand Journal of Science 9(3)*: 565–568.

Dumbleton, L. J. 1973: The genus *Austrosimulium* Tonnoir (Diptera: Simuliidae) with particular reference to the New Zealand fauna. *New Zealand Journal of Science 15(4)*: 480–584.

Gressitt, J. L. and collaborators 1964: Insects of Campbell Island. *Pacific Insects Monograph 7*: 1–663.

Kerr, I. S. 1976: Campbell Island: a history. Wellington, A. H. & A. W. Reed. 182 pp.

Trevor K. Crosby

A Sunday stroll on Campbell Island: Jack Dumbleton's 2 November 1958 photograph of the landscape and vegetation as seen looking southeast from near the top of Col Ridge. The supply ship *Holmlea* is anchored in Perserverance Harbour to the left of Beeman Hill, with Mt Honey in the background. In the right foreground is Tucker Cove valley, the type locality of the simuliid *Austrosimulium campbellense*, and site of the old Meteorological Station and World War 2 coastwatchers (CAPE Expedition) quarters. The old fenceline up the valley shows as a cleared line through the *Dracophyllum*. Jack's photographs are of historical significance, providing a record of this area of Campbell I. prior to the removal of sheep, cattle, and Norway rats.

What anthocorid biocontrol agent was introduced to Rarotonga?

Marie-Claude Larivière has been attempting to verify the identity of a minute pirate bug (Heteroptera: Anthocoridae) recently introduced to New Zealand. MAF-IDC (Auckland) funded a preliminary investigation a couple of years ago to resolve its identification, and at that time Marie-Claude identified it as belonging to the genus *Macrotrachelia* Reuter. Further, she tentatively considered it could be the Central American species *M. nigronitens* (Stål, 1860) that had been introduced to Hawaii, and possibly also to California.

The taxonomic literature available on *Macrotrachelia nigronitens* is slim and dates back to the early 1900s. No molecular barcodes are available for any *Macrotrachelia* species. So far, reliably identified reference specimens have not been tracked down in overseas collections. Two more recent non-taxonomic papers (2005, 2007) indicated that *M. nigronitens* had been introduced in Hawaii under the misidentified name *M. thripiformis,* but it may not have established there (the specimens studied by the author of these papers have yet to be returned to the Bishop Museum). Meanwhile, an unidentified *Macrotrachelia* species introduced in California is being investigated by the USDA. Some cross-over occurred between our U.S. and New Zealand investigations, but it did little to progress our case.

In 2010 a laboratory of the Cook Islands Ministry of Agriculture reported that *Macrotrachelia thripiformis* (a misidentification of *M. nigronitens*) was being introduced from Hawaii to control the Cuban laurel thrip (*Gynaikothrips ficorum* (Marchal)) that was a pest on a range of important fruit and vegetable crops. Marie-Claude considered this provided an ideal opportunity to examine true *Macrotrachelia nigronitens* individuals, and thereby confirm her identification of the species introduced to New Zealand.

Unfortunately, things are rarely as easy as they seem in taxonomy. Specimens obtained from the Cuban laurel thrip biocontrol programme, with the assistance of MAF, turned out to be a totally different anthocorid known as *Montandoniola confusa* Streito & Matocq in Pluot-Sigwalt *et al.*, 2009. The Cook Islands research team had been supplied with a species belonging to a completely different genus and tribe than originally requested — and to which their risk assessment profile and import permit allocation process had been based — by the authorities in Hawaii! Although the species-level identification of Anthocoridae, and in many cases generic-level also, requires examination by an expert, the morphological characters distinguishing tribes are clear-cut and available in the literature.

Pluot-Sigwalt *et al*. (2009, *Zootaxa 2208*, p. 40) pointed out that " ... *M. confusa* does not show distinct preferences for particular thrips species or host-plants." Consequently, the Cook Islands researchers may need to keep in mind that the species released may be more of a generalist-predator than they anticipated. Monitoring its effect on non-target organisms may be important to mitigate the effects of its use of potentially palatable indigenous food sources, especially other soft-bodied invertebrates.

Most taxonomists will not be surprised by this account, as this type of event is becoming increasingly frequent with declining taxonomic expertise worldwide. It is a reminder of the wide-ranging benefits of conducting taxonomic research taking into account an entire invertebrate suborder or other higher taxon, and also of maintaining expertise and capability (people, literature resources, collections, and databases) to deal with such issues occurring beyond the geographical confines of New Zealand: you do not know when an taxon from elsewhere becomes relevant to New Zealand.

Funding: MSI (Ministry of Science and Innovation "Defining New Zealand's Land Biota"), aligned with TFBIS.

Marie-Claude Larivière

Macrotrachelia nigronitens (Stål, 1860), from Champion, G. C. 1901: Insecta. Rhynchota. Hemiptera-Heteroptera. *Biologia Centrali-Americana*. 2, plate 19, fig. 18 (http://biodiversitylibrary.org/page/595144)

Neoscope Benchtop SEM

In late 2010 NZAC purchased a JCM-5000 Neoscope Benchtop SEM (Scanning Electron Microscope), a tool which increases resolution and depth-of-field well beyond the range of light microscopes. It is especially useful for very small animals like mites and nematodes.

The Neoscope's capabilities are reduced compared to traditional SEMs, yet it works well as an intermediary tool between high-resolution optical microscopes and full electron microscopes. An image magnification of up to 20,000× is possible. The user interface is fairly user-friendly, with both automatic and manual adjustment modes.

The manufacturer claims that samples can be viewed without special preparations (critical-point-drying, gold coating), but the experience of **Birgit Rhode** and others is that it is advisable to follow traditional procedures to get the best results possible. The maximum resolution of the camera results in just 1 MB images, and this is currently a major drawback. As stubs can only be moved in the x- and y-axes, and not tilted, the specimen needs to be fixed to the stub at the desired angle, or an angled specimen stage used.

So far the Neoscope has been successfully used by **Eric Palewsky** (Israel) studying the functional morphology of phytoseiid mites (noted in *NZAC News 7*) and by **Zeng Zhao** on various nematodes (below).

Neoscope images of the head and tail regions of a new species of nematode from the native ant *Prolasius advenus* (Smith, 1862).

Recent and Coming Events

Kerrie Davies (University of Adelaide, Adelaide) visited for two weeks in January to work with **Zeng Zhao**. They worked on 3 nematodes: one was from the plant *Pittosporum tenuifolium*, and two were from the native ant *Prolasius advenus*. This collaboration resulted in 2 papers, now submitted for publication.

With funding from Guangdong Foreign Expert Bureau, **Zhi-Qiang Zhang** visited Guangdong Academy of Agricultural Sciences in late October and early November 2011. The main purpose of the trip was to provide to the research group his expertise and advice on mites and their use in biocontrol control. He delivered an invited lecture on "Mites for biological control: current status and future directions" at the Plant Protection Research Institute and also presented another lecture, "How to prepare scientific papers for international peer-reviewed journals", to graduate students and researchers at Guangdong Academy of Agricultural Sciences. While in Guangzhou, he also visited South China Agricultural University, which has a group of five professors of systematic entomology (Coleoptera, Lepidoptera, Hymenoptera, Diptera and Thysanoptera) and another working on plant nematode systematics.

Zhi-Qiang Zhang has been appointed Visiting Professor of Northwest A&F University (China) for three years (8 July 2011–7 July 2014). Northwest A&F University is a national key university in China and has a strong team in entomological research. Its entomological museum is the largest in Asia. Zhi-Qiang has a long-term relationship with the group and being the Vice Director of the Editorial Board of their journal *Entomotaxonomia*.

Dr Jianzhen Lin (Fujian Academy of Agricultural Sciences, Fuzhou) worked with **Zhi-Qiang Zhang** in NZAC in October and November 2011 on their revision of *Tarsonemus* mites for the *Fauna of New Zealand* series. They are now in a position to finish this volume (400+ pages) for submission this year.

Doug and **Ruth Craig** (University of Alberta, Edmonton) were in New Zealand from October 2011–February 2012, to work with **Trevor Crosby** on finalising their manuscript on Simuliidae (Diptera). This has just been submitted to the *Fauna of New Zealand* series.

Robert Hoare will be visiting the Australian National Insect Collection (ANIC, Canberra) 14–23 March 2012 in the hope of identifying some of the newly adventive moths that have been collected in New Zealand since 2001, and to investigate whether one of our commonest noctuids (*Proteuxoa* sp.) is truly endemic or a long-established Australian invader.

Adriean Mayor (University of Tennessee, Knoxville) was in New Zealand for 5 months collecting and studying museum material of Melyridae beetles. He was mainly based at NZAC, but visited other museums across the country. Though to most people there are only big ones and little ones of these mostly dark blue species, remarkably he has found several new species from throughout the country and plans a return trip in early Spring 2012.

Matthew Gimmel (University of Kansas, Lawrence) visited NZAC for 1 month working on the mostly south temperate Picrotini (Cryptophagidae), and has sorted over 73 species, most of which are new, and many in New Zealand. Together with Rich, he will revise the generic classification and revise the 30 or so N.Z. species (most are undescribed) for a future *Fauna of New Zealand* contribution.

Konstantin Nadein (Schmalhauzen Institute of Zoology, National Academy of Sciences of Ukraine, Kiev) is working with **Rich** and **Chris Reid** (Australian Museum, Sydney) on a key to the New Zealand Chrysomelidae genera that will also include descriptions of new genera. He is working for two months in NZAC.

Rich Leschen and **Chris Carlton** (Louisiana State University, Baton Rouge) will teach a beetle systematics and field ecology course in Costa Rica through the Organization for Tropical Studies. The course consists of daily lectures on systematics and natural history, alongside small field projects where students learn to collect, sort, and analyse their catches using ecological and ecophylogenetic methods. Rich intends to develop a similar course in New Zealand.

Darren Ward spent the summer based at the Dunedin office, from where he visited the Otago Museum and sampled in the Dunedin area. Malaise and SLAM traps were set up in a number of habitats (urban, forest, tussock) to collect Hymenoptera. Close to 1000 specimens of Ichneumonidae were obtained, including a long series of *Woldstedtius* and a new genus of Anomaloninae (previously only a few specimens of these in NZAC).

Pham Quang Huy's M.Sc. thesis in Biosecurity and Conservation on "Response of fruit fly populations to new management tools in mango orchards in Tien Giang Province, Viet Nam" was awarded with Distinction. Huy was co-supervised by Jacqueline Beggs (The University of Auckland) and Trevor Crosby. Huy is now back at the Ministry of Agriculture and Rural Development, Hanoi.

Publications

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

Brown, S. D. J.; Marris, J. W. M.; Leschen, R. A. B. 2012: Review of the New Zealand *Cryptamorpha* (Coleoptera: Silvanidae), with a description of a new species from the Three Kings Islands. *New Zealand Entomologist 35*: 29–38.

Christenhusz, M. J. M.; Zhang, Z.-Q. 2011: Ave atque vale. *Phytotaxa 38*: 61–64.

Heiss, E. 2011: First record of Aneurinae from New Caledonia (Hemiptera, Heteroptera, Aradidae). *Linzer biologische Beiträge 43(2)*: 1331–1338.

Hoare, R. J. B. 2012: A new species of *Hierodoris* Meyrick (Lepidoptera: Oecophoridae) with a telescopic ovipositor, from granite sand plains in Fiordland. *New Zealand Entomologist 35*: 51–57.

Leschen, R. A. B.; Gimmel, M. L. 2012: Catalogue of the tribe Picrotini (Coleoptera: Cryptophagidae: Cryptophaginae). *New Zealand Entomologist 35*: 14–28.

Marra, M.J.; Leschen, R. A. B. 2011: Persistence of New Zealand Quaternary beetles. *New Zealand Journal of Geology and Geophysics 54*: 403–413.

Marske, K. A.; Leschen, R. A. B.; Buckley, T. R. 2012: Concerted versus independent evolution and the search for multiple refugia: comparative phylogeography of four New Zealand forest beetles. *Evolution* (on line: DOI: 10.1111/j.1558-5646.2011.01538.x).

Seago, A. E.; Leschen, R.A.B. 2011: Revision, phylogeny, and biogeography of *Chelagyrtodes* Szymczakowski (Leiodidae: Camiarinae: Agyrtodini). *Zootaxa 3090*: 1-20.

Seldon, D. S.; Leschen, R. A. B.; Liebherr, J. K. 2012: A new species of *Mecodema* (Carabidae: Broscini) from Northland, New Zealand with notes on a newly observed structure within the female genitalia. *New Zealand Entomologist 35*: 39–50.

Shiyake, S.; Montgomery, M. E.; Leschen, R. A. B. 2012: Three species of *Laricobius* (Coleoptera, Derodontidae) recorded from Japan in 2011. *Sayabane (new series) 5*: 12–16.

Zhang, Z.-Q. (Ed.) 2011: Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. *Zootaxa 3148*: 1–237. (full book for open access http://www.mapress.com/zootaxa/list/2011/3148.html)

Zhang, Z.-Q. 2011: A new chapter in the development of Systematic & Applied Acarology. *Systematic and Applied Acarology 16*: 336.

Zhao, Z.-Q. 2011: A review of the genus *Trischistoma* Cobb, 1913 (Nematoda: Enoplida), with descriptions of four new species from New Zealand. *Zootaxa 3045*: 1–25.

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