The Weta

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THE WETA
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Aims and Scope

The Weta is the news bulletin of the Entomological Society of New Zealand. *The Weta,* like the society's journal, the *New Zealand Entomologist*, promotes the study of the biology, ecology, taxonomy and control of insects and arachnids in an Australasian setting. The purpose of the news bulletin is to provide a medium for both amateur and professional entomologists to record observations, news, views and the results of smaller research projects.

Details for the submission of articles are given on the inside back cover.

The Entomological Society of New Zealand

The Society is a non-profit organisation that exists to foster the science of Entomology in New Zealand, whether in the study of native or adventive fauna. Membership is open to all people interested in the study of insects and related arthropods. Enquiries regarding membership to the Society should be addressed to:

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Editorial

John Leader.

"What's the use of [animals] having names" the Gnat said "if they won't answer to them?". "No use to them" said Alice "but it's useful to the people who name them I suppose. If not why do things have names at all?" "I can't say" the Gnat replied. From "Alice through the Looking Glass". Lewis Carroll.

I first encountered this quotation as a question in Part II of the Natural Sciences Tripos (Zoology) in Cambridge in 1963. On reflection my answer was probably pretty naïve, but this was understandable at a time when the Zoology Department was pioneering experimental physiology. Names didn't matter so much, when most entomological researchers studied the cockroach, the blowfly or the blood-sucking bug *Rhodnius*. At that time, if there were pests, then DDT would fix them. In post-war Britain, no-one cared overmuch about insect pests anyway. Apples were usually host to codling moth caterpillars, cabbages were generally worked over by pierid larvae, and moths and beetles had an uncanny knack of finding stored flour and biscuits. Losses to pests were substantial but tolerated in a diverse economy. The only serious pest in Britain then was the Colorado beetle, a pest of potatoes, a picture of which appeared on every public notice board with an exhortation to find and report.

In New Zealand, a small trading nation with a unique flora and fauna and a fairly narrowly based agricultural economy, and with an enormous flux of people and material into and out of it, the risks of serious economic harm from introduction of unwanted pests and diseases are huge. In the past few years there have been several serious incursions of noxious or damaging pests and the cost of eliminating them has been enormous. For example, extermination of the painted apple moth cost an estimated $62 million, as well as disrupting the lives of a large number of people in Auckland; destroying populations of *Aedes camptorhyncus*, a vector for Ross River virus, cost $70 million. The ongoing programme to eradicate the Queensland fruit fly infestation has cost over $17 million to date. These are the successful projects: A study of the Didymo colonization of New Zealand rivers has cost $10 million so far and with no apparent effect, attempts to control the Varroa mite have been abandoned, with the ongoing cost to the country estimated at up to $900 million over the next 35 years. However even these huge numbers pale into insignificance compared with the effects of an outbreak of 'foot and mouth' disease. In the United Kingdom in 2001 the slaughter of about 10 million cattle and sheep cost that country an estimated ₤7.7 billion, and in this country MPI has calculated that the cost of a similar outbreak would be about $16 billion, which would reduce this country to penury.

The rapidly increasing numbers and variety of visitors to this country mean that inevitably such incursions will increase, in spite of the best efforts of biosecurity staff. It is a matter of regret that a small but vocal minority has prevented the introduction of gamma irradiation of all organic material (other than the passengers) entering the country. This is a rapid, inexpensive and highly effective method of protecting against imported pests. In its absence we have to accept that incursions will happen, and some are likely to strike at one of our larger monocultural industries. If that happens our first effective line of defence is rapid identification of the threat and the initiation of a decisive response. Failure to do this, as with Varroa, results in rapid diffusion of the agent and consequent huge expense or admission of failure.

In this context it is a tragedy that taxonomic studies have such low standing in this country. Skilled specialists, in touch with their colleagues overseas, are uniquely placed to be a reservoir of information about present and future threats. Many of these will arise from invading insects, particularly if there are climatic changes which will bring new challenges. A rapid response will depend on quick identification of the problem, and evaluation of the risk, based on knowledge of the pest.

But in addition, there is in this country an increasing interest and enthusiasm for preservation of our unique natural resources. It is unfortunate that for most people such conservation does not extend beyond the kiwi and kakapo. These iconic birds stand at the top of a pyramid built on an ecology which remains poorly understood, and which is increasingly stressed by the pressure of development.. The key to that understanding must be identification and naming of our endemic fauna, the first step in placing them in an ecological context. This is not just an academic pursuit, the knowledge gained is fundamental to a better management of our indigenous fauna, but it will also enable quicker identification of introduced visitors, prediction of their possible effects, and rapid deployment of measures for their elimination or control.. New Zealanders are entitled to such protection. Good collections and excellent curators are the foundation of biological science, maintaining both at a high level is in the national interest

Second swallowtail butterfly species sighted in New Zealand

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Introduction

The Old World Tropical swallowtail butterfly *Papilio polytes* Linnaeus, 1758 (Papilionidae) was sighted and photographed in a garden in Westshore, Napier, Hawkes Bay on 22 January, 2014 by Richard Karn (Figure 1). *Papilio polytes*, the Common Mormon, is sometimes listed as *Papilio alphenor* or *P. polytes alphenor* – the Philippines subspecies. There are 21 described subspecies of *P. polytes* found across its broad range, but since we do not know where this individual originated it is impossible to place it in any of those subspecies. The blue and red spots, clearly visible, below the row of white spots across the hindwing in Richard's photograph closely resemble male images in Bacscombe *et al.* (1999) and Hoi-Sen (1983) from Hong Kong and Malaysia respectively, but Richard's specimen has a longer hindwing tail. Both the scientific and common names allude to the three forms of the female and the polygamy formerly practised by the Mormon Sect in the United States of America.

The Common Mormon has a wide distribution in the Oriental Region from Pakistan, India and Sri Lanka in the west to Taiwan and Hong Kong in eastern Asia, north to central China and the Ryukyu Islands including Okinawa, south of Japan, and further south to Indo-China including Malaysia, Philippines and Singapore, and eastwards to Sulawesi and the Lesser Sandas of Indonesia. It is generally a common species and over its natural distribution is found in all months of the year. The Common Mormon is not a threatened species anywhere within its broad range, indeed in some areas it is considered a pest species because of the damage its larvae do to citrus foliage.

Fig.1 *Papilio polytes* in a Napier garden (Photo R. Karn)

The common Mormon is not only found in natural forest vegetation up to 1000 metres above sea-level, but is also characteristic of areas of human habitation. In contrast to the females, the males are consistent in their wing pattern with both sexes having a wingspan between 90-100 mm. The flight is relatively slow and usually in a unidirectional zig-zag pattern. It flies quite low compared to many other swallowtails, and is rarely seen over three metres above the ground. The adults take nectar from many flowers but *Lantana* and *Ixora* are particular favourites where they occur. Males may also be found feeding on the ground from damp soil patches (puddling).

The male Common Mormon is non-mimetic, but in contrast the three forms of the female mimic distasteful butterflies such as *Pachylioptera aristolochiae* and are therefore a much-studied case of Batesian mimicry in which a palatable species mimics a distasteful species to avoid being eaten. Much research has been conducted on these female forms, particularly how the butterfly controls the genes that produce these forms (Bascombe *et al*., 1999) and the molecular basis of the different wing colorations.

Other swallowtails recorded in New Zealand

In 2000 the Japanese swallowtail butterfly *Papilio xuthus* was found emerging from its chrysalis underneath an imported Japanese used vehicle in a car-yard in Dunedin (Patrick & Patrick, 2012). This fortuitous discovery was self-explanatory as to the origin of the specimen, and saved a great deal of speculation. Another visual record of this same species of butterfly was made in 2011 by a reputable entomologist in Auckland.

Life-history

The larvae of the Common Mormon feed exclusively on the foliage of various species of citrus (Family Rutaceae), including species in the genera *Citrus, Atalantia, Fortunella, Euodia, Glycosmis, Toddalia, Zanthoxylum* and *Clausena.* The larvae are plump and green and very attractive. Its attraction to citrus explains its abundance in areas inhabited by humans (Kunte, 2000).

This family of plants is not represented in the New Zealand flora by indigenous species, but given the widespread planting of various citrus species for fruit, the butterfly could become established as *Papilio xuthus* has in Hawai'i (Patrick & Patrick, 2012).

Origin

Over the years other exotic butterflies have been discovered in New Zealand, with all being found close to international ports and either proven as having been introduced through them or strongly suspected as follows;

Pieris rapae – Port of Napier (1930) – cabbages from Hawai'i

Papilio xuthus – Port Chalmers, Dunedin (2000) – Japanese used car

Pieris brassicae – Port of Nelson (2010) - container

So it seems an obvious conclusion to draw that *Papilio polytes*, the Common Mormon, entered New Zealand through the Port of Napier amongst the multitude of international imports, including the possibility its chrysalis was attached to a container and the butterfly emerged after it arrived in New Zealand. Given the close relationship this butterfly has to areas of human habitation, and its abundance year-round across its broad range throughout the Oriental Region, this would not be surprising.

Despite New Zealand's temperate climate this butterfly has some potential to become established here, particularly in the warmer parts of New Zealand, including Hawkes Bay, as it has already successfully infiltrated areas populated by humans and shown by its adaption to such areas a certain flexibility and adaptability.

We recommend that any additional records of this butterfly that come to the notice of authorities are followed-up immediately by a search for eggs and larvae on citrus nearby.

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Occurrence of *Bombus hortorum* (L.) (Hymenoptera: Apoidea) on Rakiura (Stewart Island)

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This note reports for the first time the occurrence of *Bombus hortorum* on Rakiura SI.

Fig 1. Queen *Bombus hortorum* captured at Oban, Rakiura, when foraging on foxglove flowers (*Digitalis purpurea* L.), on 5 December 2014. The small mites are *Kuzinia laevis* (Dujardin).

On 2 December 2014, two *Bombus hortorum* were seen in foxglove flowers (*Digitalis purpurea* L.) in the village of Oban, Rakiura SI. On 3 December one queen and one worker were captured on brassica flowers (*Brassica* sp.) on the side of Bay Road on the outskirts of Oban, and on 5 December one worker *B. hortorum* was captured on the same flowers at the same site, and one queen was captured on foxglove flowers about two blocks away. Both workers carry large yellow pellets of brassica pollen, and one worker is dusted liberally on the dorsal area of the mesosoma posterior to the scutellum and over the dorsum of the metasoma with white pollen. Both queens are without pollen in their corbiculae, they show no signs of wear, and there are many mites *Kuzinia laevis* (Dujardin) on one queen (Fig 1), and fewer on the other.

In addition to *B. hortorum,* queen and worker *B. terrestris* (L.) were seen many times, and two workers of this species were captured on 3 December on the roadside brassicas as they collected large pollen pellets.

According to Macfarlane and Gurr (1995), "Dempsey (1967) first recorded bumble bees (species unrecorded) from Stewart I.". From specimens in insect collections Macfarlane and Gurr (1995) found that worker *Bombus terrestris* were first collected in 1955, which indicated that the species was nesting there, and it was present also on the adjacent Codfish Island and Big South Cape Island.

Both *B. terrestris* and *B. hortorum* (and *B. ruderatus* (F.) and *B. subterraneus* (L.)) were recorded as present in Southland SL (and other areas of New Zealand) by Gurr (1964). Rakiura lies about 30 km across Foveaux Strait from the southern shoreline of Southland near Invercargill, but islands of various sizes lie within the Strait. The largest of these is Ruapuke Island which is 16 square km and which lies 14 km off the coast of Southland and 27 km from Rakiura, but from which bumble bees have not been recorded. Centre Island (= Raratoka Island) is 86 ha. and lies about 8 km from the Southland coast and 25 km from Rakiura, and bumble bees have been recorded present but the species is not known.

Macfarlane and Gurr (1995) found *B. terrestris* present on 16 New Zealand islands (and unidentified bumble bees were present on 3 other islands), but there were no reports for *B. hortorum,* or the other two species of bumble bee present in New Zealand (*B. ruderatus* and *B. subterraneus*). Of the 19 islands, 16 were from 2.3 – 8.3 km offshore, so apparently until the colonisation of Rakiura, *B.*

hortorum has been unable to cross stretches of water greater than 2.3 km. – unless the species is on at least one of the three islands with unidentified bumble bees.

How then did *B. hortorum* reach Rakiura? The most obvious method would be the inadvertent transport of a fertilized queen by aircraft or ships which regularly cross Foveaux Strait from coastal Southland. One or more fertilized queens could have entered aircraft at the airport at Invercargill (or elsewhere in the home range of the species in the South and North Islands), and exited on arrival at the only airstrip near Oban, or at coastal beaches where light aircraft sometimes land. From Invercargill flights to Oban take 20 minutes, and the ferry from Bluff to Oban takes one hour. Queen bumble bees would easily survive the trips.

The absence of wear and the lack of pollen on the two queens captured at Oban indicate that they are new queens which have recently emerged from a colony or colonies, and the presence of workers carrying pollen shows that a colony (or colonies) was established and active. Donovan and Wier (1978) suggested that in the South Island there could be up to three generations of *B. hortorum* nests in one calendar year, so new queens appearing in December nearly certainly would go on to found their own nests that same season.
Using population genetic data, Lye et al. (2011) estimated that the New Zealand *B. hortorum* population originated from an effective 19 queens, with intermediate values of 10-39. Gurr (1972) established the species at Palmerston North WI by releasing 87 queens on 11 November 1965 which were collected in South Canterbury SC. By 1985 bees had reached Upper Hutt WN (Macfarlane pers. obs. unpublished), Hawkes Bay HB by 1989 when first looked for (N. Pomeroy pers. comm. 2010), the Waikato WO by late 2013 (D. Pattemore pers. comm. 2013), and Mamaku, 13 km W. of Lake Rotorua BP, by February 2015 (A. Frost pers. comm. 2015). Macfarlane and Griffin (unpublished) believed that *B. hortorum* did not establish near Blenheim MB from their release of a

total of 229 queens from Canterbury MC in October and December 1979 and October 1980, but the release of 570 queens in 1983 was successful. Also, their release of from 4-12 queens at Nelson NN in November 1981 resulted in establishment.

If only one or a few queens reached Rakiura, then unless more queens also reach the island the present population will soon become very inbred. But the establishment of three new populations, at Palmerston North, near Blenheim, and at Nelson, shows that the species can survive and thrive after being subjected to two genetic bottlenecks. However, whether it can survive an extreme bottleneck of perhaps just one queen founding the population on Rakiura remains to be seen.

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Notes on the genus *Rhantus* Lacordaire (Coleoptera: Dytiscidae) in New Zealand

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Introduction

The diving beetle genus *Rhantus* Lacordaire includes over 80 species and has an almost worldwide distribution (Ordish, 1989). Three species are known to occur in the New Zealand region, one of which, *R. suturalis* Macleay, occurs very widely and is found through most of the Old World from New Zealand to Southern and Central Europe. The other two species have much more limited distributions, as they are relatively rare New Zealand endemics.

The purpose of this note is to describe the current status of the three species in New Zealand. There has been some confusion in the New Zealand literature over the correct name and distribution of *R. suturalis*, which I attempt to clarify here. An additional locality is recorded for *R. plantaris* Sharp. The conservation status of both *R. plantaris* and *R. schauinslandi* Ordish is discussed.

Rhantus suturalis (Macleay, 1825)

This species has been known by the junior synonym *Rhantus pulverosus* (Stephens, 1828) in much of the New Zealand literature (Ferro 1977, Winterbourn & Gregson 1981, Winterbourn *et al.* 2000), following the influential papers of Ordish (1966, 1989), who named the species according to the recommendation of the well known British dytiscid specialist Balfour-Browne (1950). However, there is little doubt that the two names are synonyms and no valid case for preserving the junior synonym has been made (Nilsson 2001).

There has also been confusion over the presence or absence of *R. suturalis* on the Chatham Islands. Ordish (1966) did not record the species from the Chatham Islands. This may be because he was uncertain as to which species of *Rhantus* occurred there, as he had not seen any of the original material, rather than an assumption of absence of *R. suturalis* (as *R. pulverosus*) from the islands (Ordish 1989, p. 147). In fact, Alfken (1903) had already recorded *R. suturalis* from the Chatham Islands by the primary homonym *R. punctatus* (Fourc.) Geoffr. var. *chathamicus* Regimb. (Nilsson 2001). The varietal name is unnecessary and was never described by Régimbart, so it remains a *nomen nudum*. Ordish (1989, p. 148) confirmed the presence of *R. suturalis* on Chatham Island and Emberson (1998) recorded the species from both Chatham and Pitt Islands. These records were all overlooked by Balke *et al.* (2000) and Winterbourn *et al.* (2000), as both publications indicated that *R. schauinslandi* was the only species of *Rhantus* occurring on the Chatham Islands.

***Rhantus plantaris* Sharp, 1882**
Sharp (1882) described *R. plantaris* from a single male specimen, now in the Natural History Museum, London, bearing the label 'Dunedin, Castelnau' in Sharp's hand. There has been uncertainty as to whether the specimen was in fact collected in New Zealand, even though F. L. Laporte, Comte de Castelnau, collected Coleoptera from around Dunedin in 1866 (Castelnau, 1868). However, any doubt about the provenance of the species was removed by Balke *et al.* (2000), who recorded its rediscovery in a roadside pond adjacent to Lake Ellesmere in 1986, (MC). They also provided an excellent pictorial key to the Australasian species of *Rhantus.* Unfortunately, the five specimens collected from near Lake Ellesmere all remain in Germany.

When re-examining *Rhantus* material in the Entomology Research Collection at Lincoln University, a specimen of *R. plantaris* was found among the specimens of *R. suturalis*, with the following label data; "under log by Irwell R. MC, 18.x.1978, R.M. Emberson".

This is the third locality recorded for the species, all having been collected on the eastern side of the South Island between Dunedin and Christchurch, and is the only specimen of *R. plantaris* known to be in a New Zealand collection. There could be other unrecognized material of this species in collections as the species is superficially similar to the common *R. suturalis* and can easily be overlooked.

***Rhantus schauinslandi* Ordish, 1989**
Even though it had been known in the literature for 86 years (Alfken 1903), *R. schauinslandi* remained undescribed until Ordish (1989) described the species from a series of six specimens collected over a

period of seventy years from three or four different localities on Chatham Island.

Conservation status of *R. plantaris* and *R. schauinslandi*

R. plantaris was listed by Leschen *et al.* (2012) in the threatened species list as Naturally Uncommon, with the qualifier 'Sparse'. This classification seems conservative for a moderately conspicuous beetle that has only been recorded three times in the last 130 years. There are no obvious reasons why it should be so uncommon. Both of the more recent collections were from unremarkable, relatively modified sites in lowland Mid-Canterbury. Searches in existing collections and in lowland aquatic habitats, both still waters and gently flowing backwaters of the smaller eastern South Island rivers, could result in additional specimens of this species being discovered.

R. schauinslandi is similarly uncommon, but is listed as Nationally Critical with the qualifiers 'Island Endemic' and 'One Location' (Leschen *et al.* 2012). A total of six specimens have been collected over the last 120 years, all from Chatham Island (Ordish 1989). No specimens have been found since 1967, in spite of extensive searching by experienced collectors. Reasons for its apparent rarity and lack of recent records are unclear, but Ordish (1989) suggested *R. schauinslandi* might favour slightly saline waters, which could mean appropriate habitat has been overlooked. Another factor could be that *R. suturalis* has benefited from land clearance on the Chathams Islands and is now very common in both temporary and permanent pools and on lake edges throughout Chatham Island. In these habitats it may out compete the more specialized *R. schauinslandi*. Additional, clearly directed, searching for *R. schauinslandi* in a variety of habitats, with a view to gaining a better understanding of its requirements should be a priority for the conservation of this species.

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Larvae and prey of three native ladybirds (Coleoptera: Coccinellidae)

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Introduction

Gordon (2010) lists 44 named species of ladybird in New Zealand of which 23 are native. Prey of only 4 native species has been recorded. *Coccinella leonina* Fabricius, 1775 has been recorded feeding on at least 10 species of aphids (Hemiptera: Aphidoidea: Aphididae) (Read 1965, Valentine 1967) while *Harmonia antipodum* Mulsant, 1848 is recorded feeding on native Coccidae (Hemiptera: Coccoidea) and an Australian psyllid (Hemiptera: Psylloidea: Psyllidae) (Valentine 1967). *Stethorus bifidus* Kapur, 1948 and *S. griseus* Chazeau, 1979 both mainly feed on spider mites, Tetranychidae (Houston 1990, Peterson et al 1994, Valentine 1967). Read (1965) describes the larvae of *C. leonina* and two other species of ladybird associated with grassland and crops.

During the last few years while collecting information about insects for an internet factsheet series I have found ladybird larvae that I have reared to adults that have been identified. This has provided information about the prey of these ladybirds and images of their distinctive larvae and pupae.

***Adoxellus flavihirtus* (Broun, 1880)** (Figures 1, 2 and 3)
Adults of this species were reared several times from larvae found feeding on the pittosporum psyllid, *Trioza vitreoradiata* (Maskell, 1879) (Hemiptera: Psylloidea: Triozidae) on *Pittosporum crassifolium* Banks & Sol. ex A.Cunn. (Pittosporaceae). Adults were also reared once from larvae feeding on the Long-fringed Astelia mealybug, *Rastrococcus asteliae* (Maskell, 1884) (Hemiptera: Coccoidea: Pseudococcidae). All colonies were found on the west coast of the Waitakere Ranges, Auckland.

Figure 1. Adult yellow haired ladybird, *Adoxellus flavihirtus* (Coleoptera: Coccinellidae) (photograph by Tim Holmes, copyright Plant & Food Research).

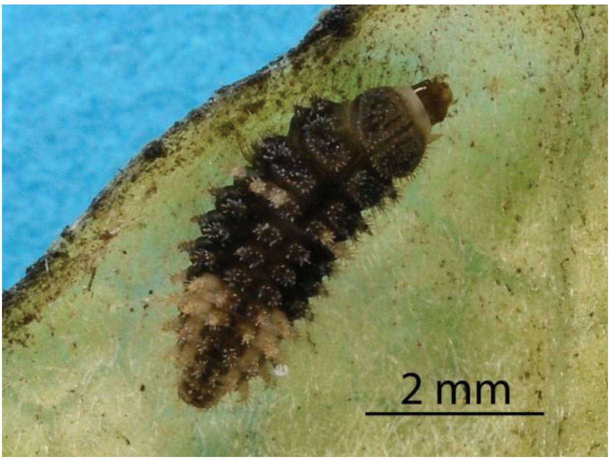

Figure 2. Larva of yellow haired ladybird, *Adoxellus flavihirtus* (Coleoptera: Coccinellidae) (photograph by Nicholas A Martin, copyright Plant & Food Research).

Figure 3. Pupa of yellow haired ladybird, *Adoxellus flavihirtus* (Coleoptera: Coccinellidae), note the short yellow bristles covering the pupa (photograph by Nicholas A Martin, copyright Plant & Food Research).

***Rhyzobius fagus* (Broun, 1880)** (Figures 4,5 and 6)
Adults and larvae of this is ladybird are commonly found around Auckland on New Zealand flax, *Phormium* species (Hemerocallidaceae), where they feed on Flocculent flax scale, *Poliaspis floccosa* Henderson, 2011(Hemiptera: Coccoidea: Diaspididae). I recently saw a ladybird larva on a shrub infested with another species of *Poliaspis.* The larva looked like *R. fagus*, but I failed to catch it. The larvae are distinctly different in appearance to Australian *Rhizobius* species in New Zealand.

Figure 4. Adult flax scale ladybird, *Rhyzobius fagus* (Coleoptera: Coccinellidae) about 2.5 mm long (photograph by Tim Holmes, copyright Plant & Food Research).

Figure 5. Larva of flax scale ladybird, *Rhyzobius fagus* (Coleoptera: Coccinellidae) (photograph by Tim Holmes, copyright Plant & Food Research).

Figure 6. Pupa of flax scale ladybird, *Rhyzobius fagus* (Coleoptera: Coccinellidae) (Photograph by Tim Holmes, copyright Plant & Food Research).

***Rhyzobius* sp. 1 (Kuschel 1990)** (Figures 7,8 and 9)
The distinctive adults of this ladybird were reared from larvae found in colonies of the long-fringed Astelia mealybug, *Rastrococcus asteliae* (Maskell, 1884) (Hemiptera: Coccoidea: Pseudococcidae). The larvae, which look like tiny mealybugs, may also feed on the other mealybug associated with *Astelia*, Laminicoccus asteliae Cox, 1987. I found larvae on the West Coast of the Waitakere Ranges, Auckland. Dr Kuschel found adults in coastal forest in Lynfield, Auckland (Kuschel 1990).

Figure 7. Adult Astelia mealybug ladybird, *Rhyzobius sp. 1* (Coleoptera: Coccinellidae) (photograph by Tim Holmes, copyright Plant & Food Research).

Figure 8. Larva of Astelia mealybug ladybird, *Rhyzobius sp. 1* (Coleoptera: Coccinellidae) (photograph by Tim Holmes, copyright Plant & Food Research).

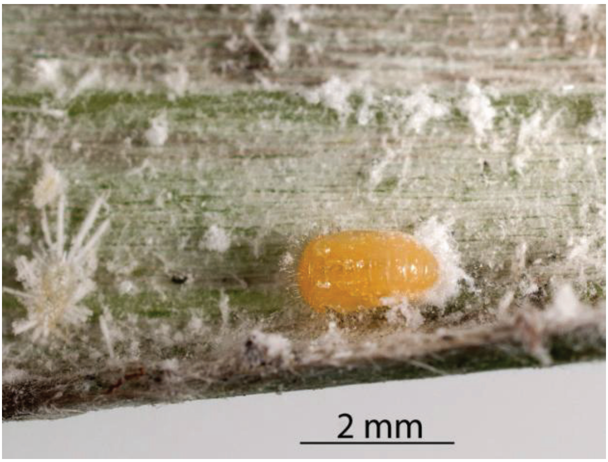

Figure 9. Pupa of Astelia mealybug ladybird, *Rhyzobius sp. 1* (Coleoptera: Coccinellidae), note the white larval skin at the base of the pupa (photograph by Tim Holmes, copyright Plant & Food Research).

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Leather-leaf fern's moth fauna

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Leather-leaf fern (*Pyrrosia eleagnifolia* - Polypodiaceae) is a widespread climbing fern often seen carpeting tree trunks or rock faces where it can cover several square metres. Known as Ngarara wehi to Maori, it is widespread lowland fern species in both moist and dry areas, and shaded forest or open sunny sites.

Crowe (2004) illustrated many of New Zealand's many fern moths in a colourful guide to our fern flora, as does Hoare & Ball (2014) in their coverage of some conspicuous New Zealand moth species.

Here I record the moth fauna of leather-leaf fern, noting their life histories and distribution.

Moth fauna
Remarkably seven, six exclusively, New Zealand moth (Lepidoptera) larvae feed on the succulent leaves and sori of this species as follows:

1. The pretty geometrid, the **hook-tip fern looper** *Sarisa muriferata* (Geometridae: Ennominae) has larvae that feed on the leaves in addition to feeding on several other fern species including hounds tongue fern. It dark brown elongate larvae are often found feeding on the foliage of leather-leaf fern where they scrape the thick leaves. It is a widespread lowland moth of indigenous forests throughout New Zealand.
2. A narrow-winged, delicate moth (Fig.1) associated with this fern is the **leather-leaf spore-eater** *Calicotis crucifera* (Stathmopodidae) which has whitish larvae that feed on the fern's sori. Mature fronds of the fern are more elongate than juveniles and have sori on their ventral side. The larvae feed within the sori and as they feed they make a shelter with silk that resembles the sori they have almost consumed, in that way making themselves extremely well camouflaged. The leather-fern feather moth is pure white in colour and very elegant with its distinctive stance, a pose shared

throughout this moth family. The distinctive species is widespread in New Zealand both in forests and suburban and farmed areas where the hostplant has also spread.

Fig.1. Adult leather-leaf spore eater, *Calicotis crucifera* Merrick.

3. Within the moth Family Tortricidae, known as leaf-rollers, two species have larvae that mine the leaves of leather fern. The species are readily separated by the shape of the mine created by the larvae. Firstly the **leather-leaf star-miner** *Philocryptica polypodii* has mines that radiate out from a centre and are mostly "dead-ends" (Fig.2.). This enigmatic moth was described by the leaf-miner connoisseur Morris Watt in 1921 from Wellington material. The pattern created is very distinctive and often commonly seen over a patch of the hostplant. The moth was thought to be completely confined to the North Island until December 2014, when I found it in one place on Banks Peninsula in Prices Valley. This variable moth species although widespread is not often seen as an adult. Based on leaf mining signs it is widespread in lowland forest in the North Island, and has even

adapted to suburban life with colonies on rock walls in Auckland a feature. I know it from Auckland City, Rotorua, Cape Palliser and more recently Banks Peninsula.

Fig.2. The characteristic pattern of mines made by the larva of *Phyllocrypta polypodii*

4. The other tortricid moth is the **travelling fern moth** *Apoctena taipana*, a colourful species that closely resembles *A. conditana* but is not well known, and may be more widespread than my records indicate at present. The species was described from Wellington in 1882.The green larvae tunnel into leather fern's succulent leaves in much the same way as the following scopariines, and in fact were collected with them and confused with them initially! The pupa is formed between joined leaves of the hostplant. I have records of this species from Thomsons Bush – Invercargill, Tuapeka West in South Otago, and possible larvae from Prices Valley – Banks Peninsula. Adults have been found in December and January in the wild.
5. Three scopariines (Crambidae: Scopariinae) have larvae that mine or tunnel into the thick leaves of leather fern. All three are poorly

known and seldom seen as adults. Firstly *Eudonia zophoclaena* is an elegant species that was described from Takapuna, Auckland in 1923 appears to be a North Island endemic. I know it only from Auckland City, three reserves north and northeast of Napier in Hawkes Bay and the Ruahine Forest Park. Adults have been found in the wild in December and January but are not commonly encountered. The larvae mine the leaves moving from leaf to leaf through silk tunnels it constructs as a highway to aid movement between the leaves. The larvae pupate in amongst this tangle of frass, silk and partially mined leaves.

6. The forests of southern New Zealand support "*Scoparia" illota* was described in 1919 from Blue Cliffs on the southern Southland coastline just east of Fiordland National Park. I recognise it only from Invercargill where it is locally common in Thomsons Bush, and in South Westland on the Cascade Road. All my specimens caught in the wild were caught in January. The larvae found in Thomsons Bush were grey with large "spots" mine and join the leaves of the host and form silk tunnels amongst the fronds and roots.
7. Further north the **leather-leaf scoparia** "*Scoparia" molifera (Fig.3),* first described from Ashurst in the Manawatu in 1926, appears to be more common and widespread. I know it from Dunedin, Purakaunui Bay, Waipori Gorge, Taieri Gorge, Otago Peninsula, Prices Valley – Banks Peninsula and Cape Palliser on the southern Wellington coastline. The larvae feed in the same way as the above two fellow scopariines, similarly making a "mess" of the plant with large areas of frass mixed with silk and half-mined leaves. They appear not to depend on camouflaging their feeding damage in contrast to the sori-feeding *Calicotis* larvae. Adults have been found, mostly attracted to light traps, between December and early February.

Summary

New Zealand has a diverse fern flora (Brownsey, 1989) on which a relatively high number of specialist moth species feed (Crowe, 2004; Hoare & Ball, 2014). All of the fern-feeding moths appear to be restricted to ferns. In terms of our moth fauna, the leather-leaf is the most popular, supporting seven moths, six exclusively.

Fig.3. Characteristic damage indicating the presence of larvae of the leather-leaf moth, *Scoparia molifera* Meyrick.

Although there is much still to learn about these moths and their ecology, it is clear that leather-leaf fern is an ecologically important component of our indigenous ecosystems supporting many indigenous invertebrates including these seven endemic moths and should be protected and enhanced wherever possible.

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The Butterflies of Wallis and Futuna

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Introduction

The tropical Pacific islands known as the Territory of Wallis-and-Futuna, are a French administered territory south of the Equator between Fiji and Samoa. Fiji and Samoa are about as distant from the islands as Wallis is from Futuna.

The Territory of Wallis-and-Futuna has been administered by France since 1888, and consists of three main islands with a total area of 274 square kilometres and population of 12,200 (census 2013) as follows;

- Wallis (population of 8,600; 159 km²) and surrounding and uninhabited islets. The capital Mata 'Utu is situated on the east coast and has a population of 1,000. Discovered by the British navigator Samuel Wallis in 1767, but already inhabited by Polynesian peoples, it is a mainly flat island rising to 145 metres.
- Futuna (population of 3,600; 64 km²) 230 km to the southwest of Wallis discovered by the Dutch in 1616. A mountainous island rising to 524 metres.
- Alofi (51 km²) 2 km east of Futuna is uninhabited due to a lack of freshwater. It is a mountainous island rising to 417 metres.

Patrick & Patrick (2012) recorded four butterfly species for Wallis and Futuna based on the records in Tennant (2006).

One of us (JPP) spent four months on the island of Wallis in 2014 and made a collection of butterflies which was sent to BHP for identification and curation.

The result is a fine collection of 35 specimens of eight species, with positive records of an additional two species that were unable to be captured, making a total butterfly fauna of ten species. Six of the ten species are new territory records for Wallis and Futuna. All the following records are from Wallis and Nukuhifala Islet (east of Wallis), with one photographic record from Futuna. Short trips were made to Alofi and Futuna but no butterfly specimens were caught there.

The 35 specimens are stored dry in the private collection of BHP in Christchurch, New Zealand.

Results

Table 1 gives an annotated list of the ten butterfly species recorded.

Discussion

All four previously recorded butterfly species from Wallis and Futuna were relocated during this survey, but interestingly one of the lycaenids *Euchrysops cnejus samoa* was only found on the small islet of Nukuhifala, east of Wallis. (Fig.1) Its status on Wallis itself is unknown, but it may be much localised there.

Fig.1. *Euchrysops cnejus samoa* Samoa from Nukuhifala Islet.

FAMILY/Species	**ABUNDANCE**	**NOTES**
**Catopsylia pomona*	uncommon	Lemon migrant was regularly seen flying high and fast overhead – a new territory record-not caught
**Eurema brigitta australis*	locally common	Small grass yellow was locally common on tracksides-new territory record
NYMPHALIDAE		
Euploea boisduvalii boisduvalii	uncommon	Endemic subspecies to Fiji and Wallis & Futuna
Euploea lewini eschscholtzii	common	Endemic subspecies to Fiji and Wallis & Futuna
**Hypolimnas bolina pallescens*	uncommon	Blue moon is found in only a few sites –new record
Junonia villida villida	rare	Meadow argus was previously recorded from Wallis & Futuna- photographed and not caught
LYCAENIDAE		
**Catochrysops taitensis taitensis*	rare	Sillver pea-blue found only on Nukuhifala Islet east of Wallis –new territory record
Euchrysops cnejus samoa	rare	Pacific spotted pea-blue found only on Nukuhilafa Islet east of Wallis
**Jamides candrena*	common	Fijian blue was previously thought to be confined to Fiji- new territory record
**Zizina otis labradus*	very abundant	Common blue is found on tracksides everywhere – new territory record

Table 1. A list of the ten species of Lepidoptera recorded from Wallis & Futuna with notes on their abundance. (*= a new record for the Island group)

It is not surprising that the common blue *Zizina otis labradus* is now found on Wallis, as it appears to be expanding its range in recent decades by unknown means, but perhaps with human assistance (Patrick & Patrick, 2012). But the discovery of the Fijian blue *Jamides candrena* on Wallis is a little surprising, as it was thought to be a species endemic to Fiji. With its shining blue wings, it is an unforgettable sight as it flies around forest and shrubland edges. During this survey it was found to be quite common. This species joins the crows *Euploea lewinii eschscholtzii* and *E. boisduvalii boisduvalii* as shared with Fiji, the former exclusively, the latter with Tonga also. (Fig.2

Fig. 2 *Euploea boisduvalii boisduvalii* from Walls and Futuna Islands.

The silver pea-blue *Catochrysops taitensis taitensis* (Fig.3 *)* is a new island record for Wallis where it was found to be rarely seen. It is a butterfly widespread across the South Pacific but never particularly common (Patrick & Patrick, 2012). Elsewhere its larvae have been found feeding on the flowers of *Desmodium* (Fabaceaea).

Fig.3 The silver pea blue, *Catochrysops taitensis taitensis*

The blue moon butterfly *Hypolimnas bolina pallescens* is another new record for Wallis, where it was found to be uncommon. Elsewhere this subspecies is known from Fiji, Tokelau Islands, Tonga, Samoa and American Samoa and is generally one of the more common butterflies. Its rarity here may hint that it is a recent addition to the butterfly fauna or that its larval hostplants are uncommon here also. More research is necessary to pinpoint its larval hostplants here and observe if it is on Futuna too.

The butterflies of Wallis and Futuna show a distinctive distribution pattern with many of the species shared between Tonga and Fiji (small grass yellow - *Eurema brigitta australis* (Fig. 4) and crow *Euploea boisduvalii boisduvalii),* or just with Fiji (blue *Jamides candrena* and crow *Euploea lewinii eschscholtzii*). The other six butterfly species of Wallis and Futuna are more widespread species across the South Pacific islands.

Fig. 4 *Eurema brigitta australis* from Wallis and Futuna Islands.

It would be informative to research the butterflies of the islands of Futuna and uninhabited Alofi, where presumably more natural vegetation exists.

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Halmus chalybeus, a loveliness found in a cabbage tree

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On the 6th of May 2014 my colleague and I conducted a Better Border Biosecurity (B3) survey in Craigavon Park in Blockhouse Bay, Auckland. Our target insects are native Lepidoptera. This park is ideal as it contains plenty of regenerating native forest. The primary plants we survey at this site include Kawakawa, Titoki, Mahoe and Cabbage trees. At certain times of the year, particularly spring, we find an abundance of native caterpillars. With the weather cooling down and new growth on plants dwindling, on this day native caterpillars proved particularly hard to find. We searched many leaves of many shrubs, finding slugs, slaters, an occasional weta, mealy bugs and spiders. At one final stop at a Cabbage tree regularly frequented by us, a thorough search was undertaken, leaves near the centre systematically pulled back; still no caterpillars, instead a magnificent gathering of Steelblue ladybirds, *Halmus chalybeus* (Boisduval, 1835) (Coleoptera: Coccinellidae) with at least fifty individuals present.(Fig.1) Ladybirds are known to overwinter in such locations, but this spot appeared to be a very popular one indeed. Aptly, the colloquial term for a group of ladybirds is a loveliness.

Fig.1 A"loveliness" of ladybirds, Halmus chalybeus

Sub-brachypterous form of *Nysius caledoniae* Distant (Hemiptera: Orsillidae) found in Bay of Plenty.

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Abstract:
Nysius caledoniae is a species of seed bug found across many islands in the South Pacific including Australia. *N. caledoniae* was first sighted in Auckland, New Zealand, in 2006. Here, we report finding six specimens of *N. caledoniae* in Te Puke from 2014 to 2015. In 2014 a male *N. caledoniae* was found during searches for *N. huttoni*. The following summer three *N. caledoniae* were caught in wind vane traps set up in loadout zones of kiwifruit orchards in Te Puke, one of which appears to be sub-brachypterous. Another male *N. caledoniae* was found feeding on cudweed in a Paengaroa orchard in March. A sub-brachypterous female *N. caledoniae* was also found in an artificial hibernation hide on May 29th on the Plant and Food Te Puke Research station.

Introduction:
Nysius caledoniae Distant (Hemiptera: Orsillidae) is a minor horticultural pest of sunflower and safflower, common in Australia with a widespread distribution in the South Pacific (Eyles & Malipatil 2010). In 2006 *N. caledoniae* was found on a lettuce crop in Pukekohe, Auckland. The following year it was found in two additional Auckland locations (Eyles & Malipatil 2010). In 2011 it was collected in Whananki, Northland (A. Eyles). *N. caledoniae* preferentially feeds on weeds, particularly Asteraceae, and only becomes an issue on crops if its preferred food source dries up (Eyles & Malipatil 2010).
There are three native species of *Nysius* in New Zealand: *N. huttoni*, *N. convexus* and *N. liliputanus* (Eyles & Malipatil 2010). *N. huttoni* is a passenger pest in the apple and kiwifruit industries and is known as the wheat bug due to the damage it causes by feeding on wheat crops. Little research has been done on *N. convexus* or *N. liliputanus*. As both *N. caledoniae* and *N. huttoni* feed on the seeds produced by common weeds it

is possible that the ubiquitous habitat of *N. huttoni* in New Zealand will become shared with *N. caledoniae*.

Methods:
In 2014/5 we surveyed kiwifruit orchards near Te Puke in the Bay of Plenty for *N. huttoni* by sampling their preferred habitat containing the host plants *Polygonum aviculare* and *Spergularia rubra*. The following summer and autumn wind vane traps were set up in loadout zones of four orchards in the Te Puke area to monitor the flight behaviour of *N. huttoni*. Traps were checked weekly from mid-December 2014 to the end of March 2015. Artificial hibernation hides were also put out in wheat bug habitat and checked fortnightly. Some specimens of *N. caledoniae* were collected along with specimens of *N. huttoni.*

Results and Discussion:
In the present paper we only present the results for our finds of *Nysius caledoniae*. Results for the surveys on *N. huttoni*, as outlined in 'Methods' will be presented in a commercial report. A single male *N. caledoniae* was found in Te Puke, Bay of Plenty, in 2014 whilst the authors were hand-collecting *N. huttoni.* Three *N. caledoniae* were caught in wind vane traps: two females (January, March) and one male (January). Two additional *N. caledoniae* were found during ground searches; one female in an artificial hibernation hide located at Plant and Food Research's Te Puke research centre (May) and a male on an orchard in Paengaroa (March). To our knowledge, these individuals are the first reports of *N. caledoniae* south of the Auckland area.

The initial male specimen was identified by A. Eyles and was used as a voucher specimen to identify other individuals. *Nysius caledoniae* were recognised by their much larger size than *N. huttoni* (see Fig. 1) (*N. caledoniae*: 4 -5mm vs *N. huttoni*: 2.4 -4.3mm in length). The scutellum of *N. caledoniae* is rounded and upturned at the apex and parameres had a less marked curvature (see Fig. 2) as diagnosed by Eyles and Matipatil (2010).

Fig.1.Adult *N. caledoniae* (left) and *N. huttoni* (right)

Fig.2. Parameres of *N. caledoniae* (lelft) and *N. huttoni* (right).

Nysius huttoni specimens can be classed into three different groups based on wing size: 1) macropterous, where the wings extend beyond the posterior of the abdomen, 2) sub-brachypterous where the wing tip finishes level with, or scarcely exceeds, the posterior of the abdomen and 3) brachytperous, where the wing tip does not reach the end of the abdomen

(Eyles 1960). Specimen examples of these wing forms are shown in Fig. 3.

Nysius caledoniae is currently only known as a macropterous species; however, Eyles & Matapatil (2010) predicted that under the New Zealand climate *N. caledoniae* may develop sub-brachypters and brachypters. According to Eyles (1960) lower temperatures (9 -21°C) during the nymphal development of *N. huttoni* favour the brachypterous form. Wei (2011) conducted further research on *N. huttoni* which indicated that both low and high temperatures, as well as short daylength with low temperatures, tend to accelerate the production of sub-brachypters and brachypters. Macropters are produced in high temperature under long photoperiod.

Fig.3. Wing morphs of *N. huttoni*.

The most common wing-form in *Nysius huttoni* populations in Bay of Plenty is the sub-brachypterous form (60%). Followed by, the macropterous form (28%) and then the rarer brachypterous form (12%) (C. Rowe unpub. data). It appears that the thermal environment in Bay of Plenty has stimulated the species *N. caledoniae* to produce sub-brachypters, as two of our specimens have wings that only slightly exceed the length of the abdomen (see Fig. 4). Both sub-brachypterous specimens are female; their total wing length measures 3.4 and 3.3mm, respectively 6% and 9% of their wings exceed the length of their abdomen (0.2 and 0.3mm). Our macropterous female has a total wing length of 2.9mm with

17% of the wing exceeding the length of the abdomen (0.5mm). Previously, all *N. caledoniae* found have been macropterous, this is the first discovery of a sub-brachypterous form in the species.

Fig.4. Sub-brachypterous form of *N. huttoni*

Acknowledgements:
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More chorus cicadas emerge from kiwifruit orchard blocks than from adjacent native forest

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Introduction

Chorus cicada, *Amphipsalta zelandica* (Boisduval) (Homoptera; Cicadidae), is a widespread endemic forest species that has colonised kiwifruit orchards (Logan *et al.* 2014). They can occur at such high densities that orchard workers may refuse to work in orchard blocks because of the loud song and frequent contact with flying cicadas escaping from disturbance. In addition, sooty mould on fruit is partly attributed to feeding by cicadas and leads to productivity losses, as does the breaking of fruiting canes where egg-nests occur. Kiwifruit orchard blocks adjacent to native forest may be at risk of regular invasion by *A. zelandica* and this has important consequences for the success of any management strategies. The aim of our study was to compare emergence densities in native forest and kiwifruit, in order to estimate that risk.

Materials and Methods

Numbers of *A. zelandica* exuviae were counted in *Actinidia deliciosa* 'Hayward' kiwifruit orchard blocks and native or mixed native/exotic forest at seven sites in the Bay of Plenty kiwifruit-growing region. Population density of *A. zelandica* in kiwifruit and neighbouring forest may be correlated, as adult *A. zelandica*, like other cicadas (Moulds 1990; Simões & Quartau 2007), are apparently poor or slow dispersers; *A. zelandica* tend to have flights of less than 100 m (D.P. Logan, pers. obs.). We assumed that *A. zelandica* colonised kiwifruit orchard blocks from adjacent forest. To account for the influence of spatial correlation on density estimates, we selected paired sites that shared a common boundary or when access was restricted, were in the same locality and shared similar topography. Five of the seven sites were separated by 60-650 m; however, two were separated by 1.8 and 2.5 km (Table 1). All sample sites were roughly equivalent in area (c. 0.1-0.2 ha). At each site counts were made in eight quadrats (4 m x 2.5 m) in each habitat. In forest areas, quadrats were placed in haphazardly chosen areas that included large trees; in kiwifruit orchard blocks, quadrats were centred on haphazardly chosen vines. Counts were made at four paired sites during late February-early March 2013 near Te Puke and three paired sites during early March 2014 near Katikati (n=2) and lower Kaimai (n=1), when most cicada emergence was likely to be complete.

Results

More exuviae were found in quadrats on kiwifruit orchard blocks (overall mean ± standard deviation, 54.4 ± 66.2) than in the adjacent forest sites (1.3 ± 4.5) (Table 1). The difference was consistent and large enough (6- to 276-fold) between the two groups not to warrant inferential statistical comparison. Difference in the density of exuviae between paired habitats was not related by linear regression to distance ($P>0.05$).

Discussion

We found that *A. zelandica* emerged at much higher densities in mature 'Hayward' kiwifruit orchard blocks than from adjacent native and modified forest. These results are consistent with an earlier study at a single site (Logan & Connolly 2005) in which about four times fewer *A. zelandica* were captured by emergence traps in native forest than in kiwifruit orchard blocks. As most *A. zelandica* within a kiwifruit orchard probably emerged from beneath kiwifruit vines, we consider that successful control within orchard blocks will not be compromised by invasion from adjacent forest. Reasons for the relatively large numbers of *A. zelandica* in kiwifruit are speculative. They may include reduced control by natural enemies (e.g. egg parasitism, mortality of nymphs from entomopathogen infection), more preferred oviposition sites (i.e. branches with preferred diameter and texture), and higher food quality of xylem fluid because of fertilisation (Andersen & Brodbeck 1991), leading to better survival of cicada nymphs in kiwifruit orchard blocks than in forest

Acknowledgements

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Site, Year	Habitat		Distance between habitats (m)
	Forest	Kiwifruit	
Te Puke 1, 2013	0.1±0.4	34.5±17.5	70
Te Puke 2, 2013	0	70.4±30.5	650
Te Puke 3, 2013	1.6±1.9	150.1±126.5	170
Te Puke 4, 2013	3.3±4.9	45.0±38.8	80
Katikati 1, 2014	0.4±0.5	47.1±19.1	2480
Katikati 2, 2014	3.8±10.6	24.1±24.2	1800
Kaimai, 2014	0.1±0.4	9.9±5.8	60

Table 1 Density of *Amphipsalta zelandica* exuviae per 10 m^2 in two habitats: native forest and kiwifruit. Values are mean counts of exuviae in eight 4 m x 2.5 m quadrat samples in each habitat. The errors are one standard deviation.

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Scutellista caerulea (Hymenoptera: Pteromalidae) makes another reappearance in New Zealand.

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The purpose of this short note is to record further New Zealand records of *Scutellista caerulea (Fonscolombe, 1832)*. In 1921, *the species* was imported and released in Nelson for the biological control of pest scale insects (Thorpe, 2013). It was not seen again until I captured a single female specimen on 17 April 2013. The specimen was captured alive outdoors on the Tamaki Campus of the University of Auckland. It took me nearly two full years to find a second specimen, but another female (fig. 1) finally turned up on 21 March 2015, just tens of metres away from where I had captured the first specimen. Meanwhile, I collected a parasitised black scale (*Parasaissetia nigra*) from the City Campus of the University of Auckland, on 13 March 2015 (fig. 2). It was on some cycads, growing in the courtyard of the Human Sciences Building. A male *Scutellista caerulea* subsequently emerged, on or before 2 April 2015 (fig. 3). The question remains unanswered as to whether these specimens are descendants of the 1921 release in Nelson, or else represent a new incursion from overseas. At any rate, the species would appear to be established now, and therefore should be registered as such on N.Z. biodiversity checklists (e.g. NZOR), in due course. The species is a chunky 2 mm long blue wasp, with an enormously developed shield like scutellum, under which it tucks away its wings. It cannot be confused with anything else. Apart from strikingly different antennae, males and females are similar. Full collecting data for all specimens are available online at NatureWatch NZ(http://naturewatch.org.nz/observations?taxon_id=244823).

Fig.1 *Scutellista caerulea* female Fig.2 *Parasiassettia nigra*

Fig.3 *Scutellista caerulea* (male) emerged from *Parasiassettia nigra*.

Reference

Thorpe, SE. 2013 *Scutellista caerulea* (Fonscolombe, 1832) (Hymenoptera: Pteromalidae), new to New Zealand for the second time! *Biodiversity data journal*, **1**: e959. doi: 10.3897/BDJ.1.e959

New Zealand spider wasp females (Hymenoptera Pompilidae) feed mostly from the mouth parts of spiders. Are they adversely affected by competition with introduced vespids over honeydew in forests?

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Honeydew is a sugary exudate sometimes found on the trunks of trees and on leaves. It is derived from plant sap that has passed through the guts of aphids and other Hemiptera Sternorrhyncha. Honeydew is an important food source for short-tongued wasps. Professor A. Shimizu informed me (pers. comm. March 2015) that in Japan, honeydew constitutes a very important food for Pompilidae. Wasbauer and Kimsley (1985) noted honeydew is important food for some Pompilinae in USA. In New Zealand, adult pompilids sometimes eat honeydew (personal observations), although the females most often feed from the mouth parts of spider prey after they have first been stung to paralysis, before they have been transported to their nests as food for their larvae (Harris, 1987, 1999).

New Zealand endemic spider wasps (Hymenoptera: Pompilidae), frequently occur in native forest margins and native forest clearings and often live within the interior of native forests (except possibly *Priocnemis* (*Trichocurgus*) *nitidiventris* Smith, which is a psammophile, nesting in sand). I have observed that females of all species of Pompilidae in New Zealand (except *Epipompilus insularis* Kohl) *invariably* feed for over a minute from the mouthparts of prey immediately after they have paralysed a spider. The fluid from a paralysed spider's gut oozes from its mouth when a female pompilid applies her mouthparts to those of the spider and this appears to me to be the main source of food for New Zealand *Priocnemis* (*Trichocurgus*) and *Sphictostethus* species. Nevertheless, New Zealand Pompilidae (both sexes) at times eat honeydew (personal observations).

At Lake Hauroko, southern Fiordland, during March, 2015, I found large numbers of *Vespula vulgaris* (Linnaeus) and lesser numbers of *V.*

germanica (Fabricius) feeding from honeydew in places where *P. (T.) conformis* Smith, *P. (T.) monachus* (Smith), *Epipompilus insularis*, and the three New Zealand *Sphictostethus* species were abundant, whereas I observed no *Vespula* species there sixteen years ago when I was last in the area. The two *Vespula* species now occur throughout New Zealand's native forests where it is likely that their greatly increasing numbers are depriving native short tongued Aculeate Hymenoptera (and many other native terrestrial forest-dwelling insects as well) of this important food source.

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Sampling Odonata in the Pacific islands

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Background

"Islands in the Pacific are a frontier where many scientific hypotheses find their most stringent test." This is the leading thought of a study proposal that I am still trying to find funds for. I believe that somehow it was subconsciously embedded in my mind when back in my early childhood I was reading adventure books about the beauty and diversity of the tropical marine wildlife there. About seven years ago I made a deliberate choice to move from my home country of Bulgaria and establish an Odonata study base for myself here in New Zealand.

Justification

"Why New Zealand?! They have only 16-17 dragonfly species there?" was the spontaneous reaction of a British tourist who regularly visited Bulgaria on dragonfly-watching tours. My home country is a very popular European destination for wildlife explorers, so why leave behind 71 species, localities where you can easily spot up to 20-25 species within a short 15-20 minute walk, or places where you will find yourself amongst a storm of newly emerged individuals, and travelling to a distant country with 17 species only (according to Rowe 1987)? On arriving here and sampling throughout the North, South and Chatham islands, I realised that this number is even smaller. One species has been recently synonymised and a second synonymy is proposed (Amaya-Perilla et al. 2014; Marinov *et al*. in press.). It is true that another species was recently added as new to the country by Rowe et al. (2011), but this can hardly change the frustration of the "dragonfly hunters" who want to tick many boxes with a single visit.

I believe it was a good decision. The uniqueness of the local Odonata fauna places New Zealand and the Pacific islands at the core of the taxonomic, biogeographic and faunistic debates which date back to Darwin (1859). Wallace (1869) worked within the Malay archipelago and established his very famous Line. I am convinced that should he have explored the region further east, he could have had a network of crossroads!

Here my main objective is making a reference collection of damselflies and dragonflies (Insecta: Odonata) from the Pacific islands. I thought finding funds for field trips would be my biggest challenge. Wrong! Obstacles are far more diverse and complicated diverting me from time off my main occupation, namely finding my study subjects in the field.

Field sampling

Here I am – walking beside a river in New Caledonia. My first collecting in the tropics where I expected to revive my childhood memories. I am not in the marine environment, but in freshwater. "Does not matter – tropical sun will bring them close to me". But it did not. Not that easy. While back in Bulgaria I could easily write 10 to 15 species names for each locality, here I can barely see five or six! Michalski (2013) describes a similar story from his recent family trip to New Caledonia with Ailsa and Nick Donnelly. Bright sunny day, perfect flying conditions for insects, but no activity! However, on a rainy miserable day – great success! The problem was that this pattern was never consistent and the success of field observations differed frequently between consecutive visits at the same spot. I am not talking just about species diversity, but number of individuals. Not just New Caledonia, but other Pacific islands.

Michalski's observations have puzzled me for a very long time. They form one of six "oddities" in my study proposal, but in fact they are regularities typical of the Pacific Odonata, which are a result of events about which we know little. Such a lack of knowledge should potentially spark a great interest and open endless possibilities for research. Unfortunately for people judged to provide "pure" instead of "applied" science, funding for such activities is limited. Yet how is it possible to attempt to apply scientific knowledge, for example to conserve an ecosystem, when we do not know its specific composition or how to address the individual species' requirements about which we know almost nothing?! The conservation approach of "protect the biotope and assure species' survival" is not always so easily applicable. In my life time I have seen protected areas left to their natural development in which a shift of Odonata species communities occurred within two field seasons. A single vegetation patch became thicker and that was enough for the flag species in my study area to abandon the site and be replaced by a close relative from the same genus. These were taxonomically well known European species that had been the subject of several specialised ecological studies.

With regard to Pacific Odonata we are far from the stage of ecological studies because have not yet completed the taxonomic phase. Initially therefore, it is logical to first establish the species present!

Initially I had thought that it would be simple to just make a collection. That was my first thought, and which proved to be very naive. I found myself in a completely unfamiliar situation because of several obstacles. In most situations in Bulgaria you can stop by a roadside pool or stream and do your collecting without asking anyone in particular for a special permit. Collecting four or five specimens of most species is not going to have a measurable adverse effect on the population because of the great number of individuals already there. In the Pacific islands, however, stopping by a suitable habitat and entering it without asking is almost always a trespassing. Even when you do not see anyone around you must be aware that you are on someone's property – a tribal or individual family land.

The next question is: collecting, but how many? A collector must retain enough individuals to establish a taxon, yet it is our moral obligation to depart the study area leaving enough individuals to ensure the survival of the species. I have seen sites so depauperate of Odonata that taking even a single insect seemed like a crime. I do not have a proper answer to this ethical question.

Battle with the papers – problems and solutions

Obtaining a collecting permit is the next step to overcome. This is supposed to be the easiest one, but can be the most problematic or at least the most controversial. I have heard advice at both extremes –from "*just go and sample",* to *"don't attempt* to *collect without a permit or you may end up in jail".* This range of opinions comes from collectors who have had difficulties of various kinds, and I have experienced some of them during the little time I have spent in the Pacific. Paper work and the whole application process often revolves around in a vicious circle with many pitfalls. On one occasion I found myself sitting for eight hours on a chair waiting for a sheet of paper that was supposed to be important for me to have, but no one asked about it when I left the country. That was time that I could have spent in the field collecting more data. On another occasion I was asked to sign an agreement which was totally unacceptable for me and because of that I decided to cancel a study planned for nearly a whole year. There was a time when I was instructed to discuss my research plans with local entomologists who never replied to my invitations for discussion, so how could I have done it?!

"Shall I really bother revealing my study intentions to anyone?" I ask myself this question each time that I start my next field trip and this thought comes to my mind even as I write now. If locals just collect my money (for one permit I did not get a receipt) and do not care about my studies, what is the point of going through all those troubles?

I see myself as a visitor to those places. No matter if I like it or not if I step on someone else's land, then I have to comply with his/her rules. Applications for a study permit are generally a prerequisite for any scientific work in the Pacific and I must find a way to deal with it prior to my departure to the study site. I am sure that there are people out there who will benefit from the outcomes of my studies. It is for me to find them and see how we can work together for the benefit of science. Just like I (and anybody else) would not like to see a stranger messing with my property, Pacific nations have the responsibility for conservation of their natural resources. It is our obligations as scientists to help them to fulfill their role – approaching the right people with the right questions at the right time.

Tips to New Zealand Entomological Society members

We can help each other achieve wider understanding on the Pacific islands entomofauna. I am sure that almost every one of us has found him/herself in a similar situation or thought about issues associated with scientific studies on the Pacific islands. New Zealand Entomological Society will publish on its site links to all governmental bodies and the documentation required for carrying out field collecting trips in the Pacific islands. I advise everyone who plans such trips to visit the site and familiarise themselves with the paper work and procedures involved. Bear in mind that requirements often change with time (I have filled two different forms for the same region in consecutive years), so make sure that the most up to date version is available. Always present yourself as a scientist associated with a particular organisation. Steve Pawson, our President, is happy to provide a supporting letter on behalf of the Society if any such is required. Sam Brown, the internet site manager, has promised to update the information as it becomes available. People are encouraged to visit the site at: http://ento.org.nz/tools-and-resources-2/, check the on-line resources and send Sam (Sam.Brown@lincolnuni.ac.nz) updates from their own experience. Do not hang up your entomological net because of difficulties and bureaucracy! What seems to dampen our enthusiasm may unite us in a wider common research for the ultimate good of the Pacific islands biota.

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NOTICES

ISAA 2016 will be held in the Monterey Conference Center, Monterey, California, USA, during June 20-24, 2016. The coming months we will you inform more in detail about ISAA 2016 and about the diverse venue of this event. *Creating, Bridging and Sharing the Values of Adjuvant Technology*. That is the inspiring theme for the 11th International Symposium on Adjuvants for Agrochemicals (ISAA 2016).

Wanted: A copy of New Zealand Entomologist, volume 37 (2), 2014. My copy went astray in the post and no spare issues are available as replacements. If you wish to sell your copy please contact Allen Heath.
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The Weta
News Bulletin of the Entomological Society of New Zealand (Inc.)

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