

List of invertebrates on Mokoia Island, Lake Rotorua

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

This report was commissioned by Bay of Plenty Conservancy.

ISSN 1171-9834

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Reference to material in this report should be cited thus:

Meads, M.J.; Fitzgerald, B.M., 2001.
List of invertebrates on Mokoia Island, Lake Rotorua. *Conservation Advisory Science Notes No. 343*,
Department of Conservation, Wellington.

Keywords: invertebrates, Lepidoptera, spiders, mouse diet, Mokoia Island, Lake Rotorua.

Abstract

A survey of invertebrates was undertaken on Mokoia Island, Lake Rotorua, for three days in February 2000, with the emphasis on larger ground-dwelling species that might be important in the diet of house mice, or which might recover in numbers when mice are eradicated. A few additional species taken in pitfall traps by R.W. Griffiths in 1999 and 2000 have been included in the list. The species list comprises 124 taxa, including 51 species of spiders in 23 families, 18 species of beetles in 11 families, and 14 species of Lepidoptera in 9 families.

Species typical of the forest floor were poorly represented, and this may reflect the long history of modification and clearing of the forest, and of the presence of mice and Norway rats on the island. Also, rare species on the forest floor may be missed during a brief survey such as this, but may be recorded during the current programme of pitfall trapping.

A list of indicator species that could be important in the diet of mice, or which may increase significantly in numbers if mice are eradicated from the island, is included.

1. Introduction

Mokoia Island (135.5 ha) in Lake Rotorua has been substantially modified; much of the forest had been cleared at various times and mammals had been introduced (Beveridge & Daniel 1965). It is Maori-owned, administered by the Mokoia Island Trust Board, and is managed by the Trust Board in association with the Department of Conservation. Forest is regenerating, and goats (*Capra hircus*) and Norway rats (*Rattus norvegicus*) were eradicated in 1990 (Stephenson et al. 1999). Since then North Island robins (*Petroica australis longipes*), North Island saddlebacks (*Philesturnus carunculatus rufusater*), and stitchbirds (*Notiomystis cincta*) have been released on the island (Stephenson et al. 1999; Owen & Asquith 2000).

House mice (*Mus musculus*) were also present on the island but were not eradicated during the poisoning programme against rodents in 1990. They are now the only introduced mammals remaining on the island. Prior to another attempt to eradicate mice, some research on mice is being undertaken to increase the probability of eradicating them. Invertebrates are an important part of the diet of mice (Murphy & Pickard 1990; Fitzgerald et al. 1996) but no surveys of the invertebrates had been undertaken on Mokoia Island. The present brief survey was undertaken as a prelude to a detailed programme of pitfall trapping being undertaken by Richard Griffiths.

2. Itinerary

Mike Meads and Mike Fitzgerald visited Mokoia Island with Richard Griffiths from 6 to 9 February 2000. Camp was established at the Massey University but towards the northern end of the flat in the afternoon of 6 February. In the evening, invertebrates were collected near the but from grassland, blackberry and trees. On 7 February, specimens were collected along the track around the north-east side of the island and up "Lower Queen Street Gully" to the summit of the island; then in the afternoon, down and around the south-west side of the island and in the patch of kohekohe forest. The evening was spent collecting in the vicinity of Hinemoa's pool and the kohekohe forest. On 8 February much of the morning was spent in discussions about the pitfall trapping programme and on identification of invertebrates, followed by collecting around the camp and in forest on the slope between the camp and jetty. In the afternoon, specimens were collected along the track on the northern side of the island and at the lake edge there. In the evening, specimens were collected at the sandy beach at the north-east corner of the island, back to the vicinity of Hinemoa's pool and at karaka trees along the slope. On 9 February some brief collecting was done around camp, then we packed and departed in mid-morning.

3. Methods

Arthropods were collected by hand picking, sweeping, beating, searching under logs and rocks, and sorting litter. At night collecting was undertaken using spotlights. Most species were identified and released, but voucher specimens of all spiders and a few other arthropods were retained. Voucher specimens of some species of spiders are held by Richard Griffiths, and all other specimens will be deposited in the collections of the Museum of New Zealand.

Since the trip the invertebrates from a few samples of pitfall traps have been examined. Some species additional to those recorded in February were present in the traps and have been included in this species list (and marked '). The full species list is given as Appendix 1.

Common names of insects are from Scott & Emberson (1999) and common names of some additional spiders are from Forster & Forster (1999) and Green & Lessiter (1987).

4. Discussion

The present species list is based on just three days' collecting; it comprises 124 taxa, including 51 species of spiders in 23 families, 18 species of beetles

in 11 families, and 14 species of Lepidoptera in 9 families. Further collecting and pitfall trapping throughout a year will add substantially to the list and may include some rare species of the forest floor that are present on the island, but were missed during this brief survey. The fauna tends to be an impoverished one, especially in terms of larger species of the forest floor, probably reflecting the extensive modification and clearing of the forest, and the presence of mice and Norway rats on the island.

In open habitats, the spider fauna is dominated by orbweb spiders, especially Araneids and the two species of *Tetragnatha*. Both of these groups are probably supported by the vast numbers of "lake flies" (*Polypedilum pavidus*: Diptera, Chironomidae).

Mice eat large numbers of invertebrates, and Lepidoptera larvae and spiders are particularly important in their diet (Dugdale 1996; Fitzgerald 1996). Remains in these two groups in stomachs of mice from the Orongorongo Valley, near Wellington, have been identified to species Q.S. Dugdale, B.M. Fitzgerald, unpublished data). Larvae of many species of Lepidoptera of the forest floor were eaten, including *Rhaphsa scotosialis* (taken in pitfall traps on Mokoia Island). Three species of spiders ("*Miturga* large sp.", *Sidymella angularis*, and *Megadictyna thilenii*) were commonly eaten. "*Miturga* large sp." has been taken in pitfall traps on Mokoia Island, and the other two species might yet be taken in further pitfall sampling. In addition, mice eat smaller numbers of a wide range of invertebrates, including weta, and adult and larval beetles.

Pitfall traps capture species from many groups of invertebrates, and in sorting the samples it is usually necessary in the interests of time to select and identify just those groups that are useful indicator species. In pitfall trapping on Mokoia Island these indicator species should include species that are likely to be important foods of mice, and ones that might increase in abundance when mice are eradicated. Indicator species that mice eat could include all Lepidoptera larvae and the larger, ground-active species of spiders (> about 10 mm). Among these are the two species of *Miturga*, *Hexathele* sp. and *Migas* sp., *Sidymella* spp., the gnaphosids, and "*Cambridgea* (probably *C. longipes*)". Species that might increase after mice are eradicated are the Lepidoptera larvae and large spiders, and also representatives of several other groups of larger invertebrates, including some rare species that have not yet been recorded on the island. Just two species of carabid beetle are recorded from Mokoia (*Zolus* sp. and *Holcaspis* sp.), but the much larger *Mecodema occiputale* has been taken on the mainland and if present on Mokoia might increase quite rapidly if mice are eradicated. Other larger beetles of the forest floor that might be useful indicator species are the elaterids and the tenebrionid, *Mimopeus* sp. Other invertebrates that are potential indicator species are the three genera of cave weta, the ball slater (*Sphaerillo ambitiosus*), and the pill millipede (*Procyliosoma tuberculata*). The last species has not been recorded on Mokoia Island but has been taken in pitfall traps on the mainland. This list of indicator species is inevitably incomplete, given the limited collecting that has been done, but the current programme of pitfall trapping will add to the species list for the island and any larger species among them should be considered for the list of indicator species.

5. Acknowledgements

We thank Richard Griffiths for organising the trip and contributing substantially to collecting specimens and Fran Blundell for all her help.

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SPECIES LIST

ODONATA (dragonflies)		
CORDULIIDAE		
<i>Hemicordulia australiae</i>		dragonfly (at trig)
BLATTODEA (cockroaches)		
BLATTIDAE		
<i>Celatoblatta vulgaris</i>		
<i>Platyzoisteria novaeseelandiae</i>		black cockroach
BLATTELIDAE		
<i>Parallepsidion latipennis</i>		
DERMAPTERA (earwigs)		
LABIDURIDAE		
<i>Labidura riparia</i>		introduced seashore earwig
ORTHOPTERA (wetas, crickets, grasshoppers)		
STENOPELMATIDAE		
<i>Hemideina thoracica</i>		Auckland tree weta
RHAPHIDOPHORIDAE		
<i>Gymnoplectron tuarti</i>		cave weta
<i>Isoplectron</i> sp.		cave weta
<i>Neonetus</i> sp.		cave weta
TETTIGONIIDAE		
<i>Conocephalus semivittatus</i>		longhorned grasshopper
GRYLLIDAE		
<i>Teleogryllus commodus</i>		black field cricket
<i>Nemobius</i> sp.		native cricket
ACRIDIDAE		
<i>Phaulacridium marginale</i>		common grasshopper
PHASMATODEA (stick insects)		
PHASMATIDAE		
<i>A canthoxyla prasina inermis</i>		stick insect
<i>Argosarchus horridus</i>		
HEMIPTERA (plant bugs)		
CICADELLIDAE		
<i>Philaenus trimaculatus</i>		spittle bug
CIXIIDAE		
<i>Aka finitima</i>		
<i>Scolypopa australis</i>		passion vine hopper
FLATIDAE		
<i>Empicoris rubromaculata</i>		assassin bug
PSEUDOCOCCIDAE		
<i>Coelostomidia pilosa</i>		giant mealy bug

COLEOPTERA (beetles, weevils)

CARABIDAE

- Holcaspis* sp. ground beetle
Zolus sp. small ground beetle

LUCANIDAE

- Dendroblax earlii* winged stag beetle

TROGIDAE

- Trox scaber* hide beetle

SCARABAEIDAE

- **Saphobius* sp.

- Stethaspis* sp. cockchafer (probably washed shore)
Pyronota festiva manuka beetle
Aphodius tasmaniae pasture scarab

ELATERIDAE

- Monocrepidius exsul* click beetle
Ochrosternus zealandicus click beetle

COCCINELLIDAE

- Orcus chalybdis* steel blue ladybird

TENEBRIONIDAE

- Mimopeus* sp. darkling beetle
**Phelonais simulans*

CERAMBYCIDAE

- Navomorpha lineata* striped longhorn
Xyloteles humeratus

CURCULIONIDAE

- Phlyctinus callosus* weevil

STAPHYLINIDAE

- **Planophylus comptus*

EROTYLIDAE

- **Thallis polita*

DIPTERA (flies)

SYRPHIDAE

- Melanostoma fasciatum* hover fly

LEPIDOPTERA (butterflies, moths)

HEPIALIDAE

- Aenetus virescens* ghost moth
Wiseana signata porina moth

TORTRICIDAE

- Planotortrix excessana* leaf roller

PIERIDAE

- Pieris rapae* cabbage white

NYMPHALIDAE

- Bassaris gonerilla* red admiral

LYCAENIDAE

- Zizina otis labradus* common blue

OECOPHORIDAE

- Izatha epiphanes*

TINEIDAE

Lysiphragma howesii

GEOMETRIDAE

Cleora scriptaria forest geometrid

Ischalis variabilis variable moth

Chloroclytis sp.

NOCTUIDAE

Agrotis ipsilon aneituma greasy cutworm

Melanchra mutans common cutworm

**Rhapsa scotosialis* (larva)

HYMENOPTERA (wasps, bees, ants)

VESPIDAE

Vespula vulgaris common wasp

APIDAE

Bombus terrestris humble bee

FORMICIDAE

Mesoponera castanea forest ant

Amblyopone australis large ant

SPHECIDAE

Pison spilonae Mason bee or wasp

ARANEAE (spiders)

MYGALOMORPHAE

HEXATHELIDAE

Hexathele sp.

banded tunnelweb spider

MIGIDAE

Migas sp.

tree trapdoor spider

ARANEOMORPHAE

AMAUROBIIDAE

Waitetola huttoni?

AMPHINECTIDAE

Aorangia mauii

ARANEIDAE

Colaranea viriditas

green orbweb spider

Cryptaranea albolineata

Cryptaranea subcompta

Cyclosa trilobata

threelobed spider

Eriophora pustulosa

garden orbweb spider

Zealaranea crassa

whitebanded orbweb spider

CLUBIONIDAE

Clubiona cambridgei

CYCLOCTENIDAE

Plectophanes sp.

DESIDAE

Badumna longinqua

grey house spider

DICTYNIDAE

Paradictyna rufoflava

GNAPHOSIDAE

Hypodrassodes maoricus

* <i>Hypodrassodes</i> sp. (near <i>H. crassus</i>)	
<i>Notiodrassus</i> ? sp.	
LINYPHIIDAE	
<i>Eperigone fradeorum</i>	
<i>Laetesia</i> sp.	
<i>Mynoglenes</i> sp.	
<i>Novafroneta</i> sp.	
LYCOSIDAE	
<i>Lycosa hilaris</i>	garden wolf spider
Lycosid indet.	
MITURGIDAE	
"Miturga (small sp.)"	
*"Miturga (large sp.)"	
NEOLANIDAE	
<i>Neolana</i> sp.	
PHOLCIDAE	
<i>Pholcus phalangioides</i>	daddy longlegs spider
PISAURIDAE	
<i>Dolomedes minor</i>	nurseryweb spider
SALTICIDAE	
<i>Trite auricoma</i>	goldenbrown jumping spider
<i>Trite planiceps</i>	blackheaded jumping spider
Indet. sp. B	
Indet. sp. Cu 77	
Indet. sp. St 25	
SEGESTRIIDAE	
<i>Ariadna</i> sp.	
<i>Segestria</i> sp. (= <i>Gippsicola</i> sp.)	
STIPHIDIIDAE	
<i>Cambridgea foliata</i>	bush spider
<i>Cambridgea</i> sp. (probably <i>C. longipes</i>)	sheetweb spider
SYNOTAXIDAE	
<i>Pahoroides courti</i>	
TETRAGNATHIDAE	
<i>Leucauge dromedaria</i>	horizontal orbweb spider
<i>Tetragnatha flavida</i> ?	'small bigjawed orbweb spider'
<i>Tetragnatha nitens</i> ?	'large bigjawed orbweb spider'
THERIDIIDAE	
<i>Achaeearanea veruculata</i>	New Zealand cobweb spider
<i>Achaeearanea</i> sp.	
<i>Episinus</i> sp.	square-ended cobweb spider
<i>Pholcomma</i> sp?	
<i>Rhomphaea</i> sp.	
<i>Steatoda capensis</i>	false katipo
<i>Steatoda grossa</i>	house cobweb spider
<i>Steatoda lepida</i>	
<i>Theridion zantholabio</i>	
THOMISIDAE	
<i>Sidymella angulata</i>	square-ended crab spider

OPILIONES (harvestmen)

PHALAGIDAE

Phalangium opilio European harvestman

TRIAENONYCHIDAE

Nuncia sp. hard-bodied harvestman

AMPHIPODA (land hoppers)

TALITRIDAE

Parorchestia ? tenuis land hopper

ISOPODA (woodlice)

ONISCIDAE

Sphaerillo ambitiosus ball slater

Porcellio scaber common slater

CHILOGNATHA (centipedes)

GEOPHILIDAE

Geophilus sp. thread centipede

SCOLOPENDRIDAE

Cormocephalus rubriceps giant centipede

SCUTIGERIDAE

Scutigera smithii house centipede

DIPLOPODA (millepedes)

CAMBALIDAE

Dimerogonus sp. smooth millipede

DALODESMIDAE

Icosidesmus sp. beaded millipede

Schedotrigona sp.

PULMONATA (snails and slugs)

ZONITIDAE

Oxychilus cellarius cellar glass snail

PLANORBIDAE

Physastra variabilis fresh water snail

ENDODONTIDAE

Flammulina perdita micro snail

ATHORACOPHORIDAE

Pseudaneitea sp. veined slug

PLANARIA (flatworms)

indeterminate species black flat worm