

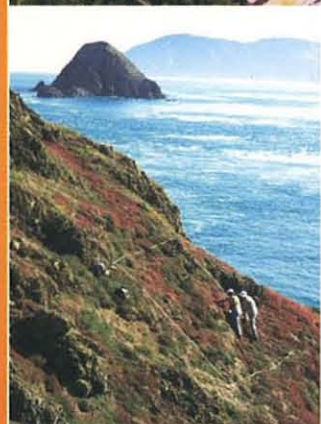
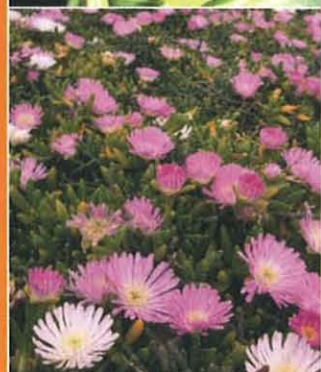
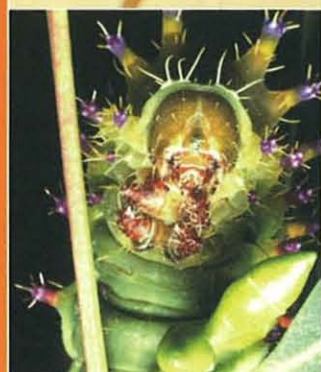
Bio-Protection & Ecology Division

**Survey of the lizard fauna of Quail
Island, Lyttelton Harbour, Canterbury**

by

Kerri Lukis

Lincoln University Wildlife Management Report No. 23



CHRISTCHURCH
NEW ZEALAND
www.lincoln.ac.nz



**Lincoln
University**
Te Whare Wānaka o Aoraki

ISSN: 1177-6242
ISBN: 978-0-86476-193-4

Lincoln University Wildlife Management Report No. 23

**Survey of the lizard fauna of Quail Island,
Lyttelton Harbour, Canterbury**

PREPARED BY:

Kerri Lukis

Ecology and Entomology Group
PO Box 84
Lincoln University

PREPARED FOR:

Quail Island Ecological Restoration Trust

February 1999

1.0 Summary

1.1 Project

Quail Island is presently the focus of an ecological restoration effort. Before restoration can begin the current biota of Quail Island must be surveyed. This study surveyed the lizard fauna of the island. Different habitat types were sampled using both pitfall traps and active searches. This survey provides baseline data against which future surveys can be compared.

1.2 Objectives

- To identify the lizard species present on Quail Island.
- To investigate the distribution of each species with respect to the different habitats on Quail Island.
- To set up lizard survey stations to document future changes in lizard distribution and abundance as revegetation proceeds.

1.3 Methods

49 pitfall traps were used in a stratified sampling of habitats identified on Quail Island. The traps were baited with tinned pair, 41 were set for 20 non-consecutive days and eight set for ten non-consecutive days, during which they were checked daily.

- Active searches for lizards and lizard sign were also used. This was particularly important for geckos which were not caught in pitfall traps.

1.4 Results

- During 900 trap days one common gecko (*H. maculatus*) and 95 skinks (*O. n. polychroma* and/or *O. maccanni*) were trapped, excluding recaptures. As these species are cryptic species further analysis is needed to confirm the presence of both species. The common gecko was found only in rocky areas. The skinks were found at highest densities in grass habitats but were also present in a variety of other habitats over the entire island.

1.5 Conclusion

- The Quail Island lizard fauna is both restricted and depleted at present. It is thought that the restriction in range of the gecko and the exclusion of both skinks and geckos from some habitats on the island will be alleviated by the restoration efforts, in particular the removal of mammalian predators from the island. The ecological restoration of Quail Island will also allow for the re-introduction of those species missing from the island at present.

1.6 Recommendations

- Specific identification of the cryptic skinks by genetic testing of specimens, especially those with different dorsal patterning and from different habitats.
- Removal of all mammalian predators from Quail Island and ongoing control to ensure the island remains free of these species.

Monitoring of trends in lizard populations following vegetation restoration efforts and removal of mammalian predators.

2.0 Introduction

Quail Island (86 ha) is located in Lyttleton Harbour, Canterbury. It is managed by the Department of Conservation as a recreational reserve and is noted for relics of early European activity in the area. Interest has been expressed in the island's potential as a site for ecological restoration. The Quail Island Restoration Trust was formed in 1997 with the intention of returning the island's vegetation to close to what was present prior to human influence. For this project to be complete, each component of the ecosystem must be recognised.

This report will focus on the lizards of Quail Island. The long term goal being to provide base line data on the present lizard fauna using repeatable methods. This will allow for comparisons to be made with future surveys following revegetation and the removal of mammalian predators. This survey will also provide information on habitat use by noting the relative abundance of each species within different habitats. This will allow the impacts of revegetation on the species distribution and abundance to be examined.

The survey will also identify those species that probably occurred once on Quail Island or elsewhere in coastal habitats of the harbour basin (or Banks Peninsula), but are now presumed to be locally extinct. The habitat requirements of these species can then be identified and a protocol for reintroduction examined. It is hoped that with this information the Quail Island ecological restoration efforts can be more complete.

3.0 Background

The New Zealand lizards are a diverse, yet little studied group. The recent recognition of a number of cryptic species has placed the number of extant species endemic to New Zealand at the generic level at 59 (Daugherty *et. al*, 1994). This is comparable to the 53 extant native birds of New Zealand. It is expected that with the further separation of cryptic species complexes in the near future the known New Zealand lizard fauna will continue to grow (Towns and Daugherty, 1994).

Human colonisation of New Zealand has affected the lizard fauna as adversely as it has other vertebrate groups. Daugherty *et al.* (1994) lists 46% of the New Zealand herpetofauna as rare, threatened or endangered. Many species now have ranges significantly smaller than that in pre-human times and over half (54%) of New Zealand's known lizard species of New Zealand are now confined to offshore islands (Towns and Daugherty, 1994). The major factors contributing to the demise of New Zealand's herpetofauna are predation by introduced mammals and habitat loss (Towns and Daugherty, 1994).

Towns and Daugherty (1994) consider that the restoration initiatives on offshore islands could have potential to improve the conservation status of more than 70% of the presently threatened herpetofauna. The removal of introduced mammalian species is now an achievable task with more than 20 successful predator eradication programmes completed (e.g. Cox *et al.*, 1967; Taylor and Thomas, 1989; Wilkinson and Wilkinson 1952).

Revegetation efforts have restored a number of islands around New Zealand including Tiritiri Matangi and Kapiti Islands. Successful re-establishment of lizard populations has occurred on Korapuki Island (Towns, 1996) and Breaksea Island (Taylor and Thomas, 1993), among others. While the threats to the survival of mainland lizard populations continues to exist, offshore islands should be utilised to ensure the conservation of this part of New Zealand's fauna.

Quail Island has been chosen as a site for an ecological restoration project. Top priorities include the removal of the rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), rodents (*Rattus* spp. and *Mus musculus*) and mustelids (*Mustela* spp.) currently found on the island and the reforestation of the exotic pasture grass habitat that presently covers the majority of Quail Island. As the only suitable island in the Canterbury region Quail Island will play an important conservation role as a refuge for species in the region that are struggling on the mainland. This is of special importance to species not found elsewhere in New Zealand, such as New Zealand's only sexually dichromatic lizard - Canterbury's Jewelled gecko (*Naultinus gemmeus*).

3.0 Objectives

3.1 Goal

- To provide baseline data on the distribution and relative abundance of each lizard species on Quail Island.

3.2 Objectives

- To identify the lizard species present on Quail Island.
- To investigate the distribution of each species with respect to the different habitats on Quail Island.
- To set up lizard survey stations to document future changes in lizard distribution and abundance as revegetation proceeds.

4.0 Methods

4.1 Study Area

Quail Island (86 ha) is located at the head of Lyttleton Harbour. It is of volcanic origin, consisting of a plateau surrounded by steep cliffs, sand and shell beaches and mud flats. At low tide Quail Island is connected to the mainland by these mudflats. In this survey I sought to include each of the vegetation types presently on the island thus sampling occurred over most of the island (see figure 1).

4.2 Sampling Methods

Genet (1997) identified four distinct vegetation types on Quail Island. Because of the small home range of the lizards in question (e.g. Freeman, 1994) it was thought necessary to further divide these classes to obtain more specific habitat information. A total of twentyone habitat types were identified (see Appendix A).

Pitfall traps were placed in each of the habitats identified. The traps were 1.5 litre tins, 15cm deep and 15cm in diameter. Lids were placed with wire one centimetre above the top of the trap to provide protection from the weather and predators. Each trap had four holes (0.5mm in diameter) punched in their base to allow water to drain away. The traps were baited with tinned pear (as per Whitaker, 1993) and a piece of damp sponge placed was placed in the bottom of each trap to provide moisture. Traps were set five days at a time, during which they were checked daily so lizards spent no

more than 24 hours in a trap. 41 traps had a total of 20 days and eight a total of ten days, from December 1997 to January 1 1998. This gave a total of 900 trap days. Traps were filled with sticks when not set to allow lizards to escape.

Of the 49 pitfall traps, 17 were placed along a permanent transect running north-east from Walkers Beach up to the summit (see figure one). This 200m line runs through the area that is to be revegetated first. The traps on this transect sample eight of the habitat types identified and it is thought these permanent sites will allow for future comparisons to be made as to how the restoration efforts affect the distribution and abundance of the lizard fauna. Each trap on this transect was set for 20 trap days.

Active searching was also used to locate lizards and lizard sign (droppings and sloughed skin). Each lizard caught was measured, marked with silver paint and released adjacent to the trap it was captured in.

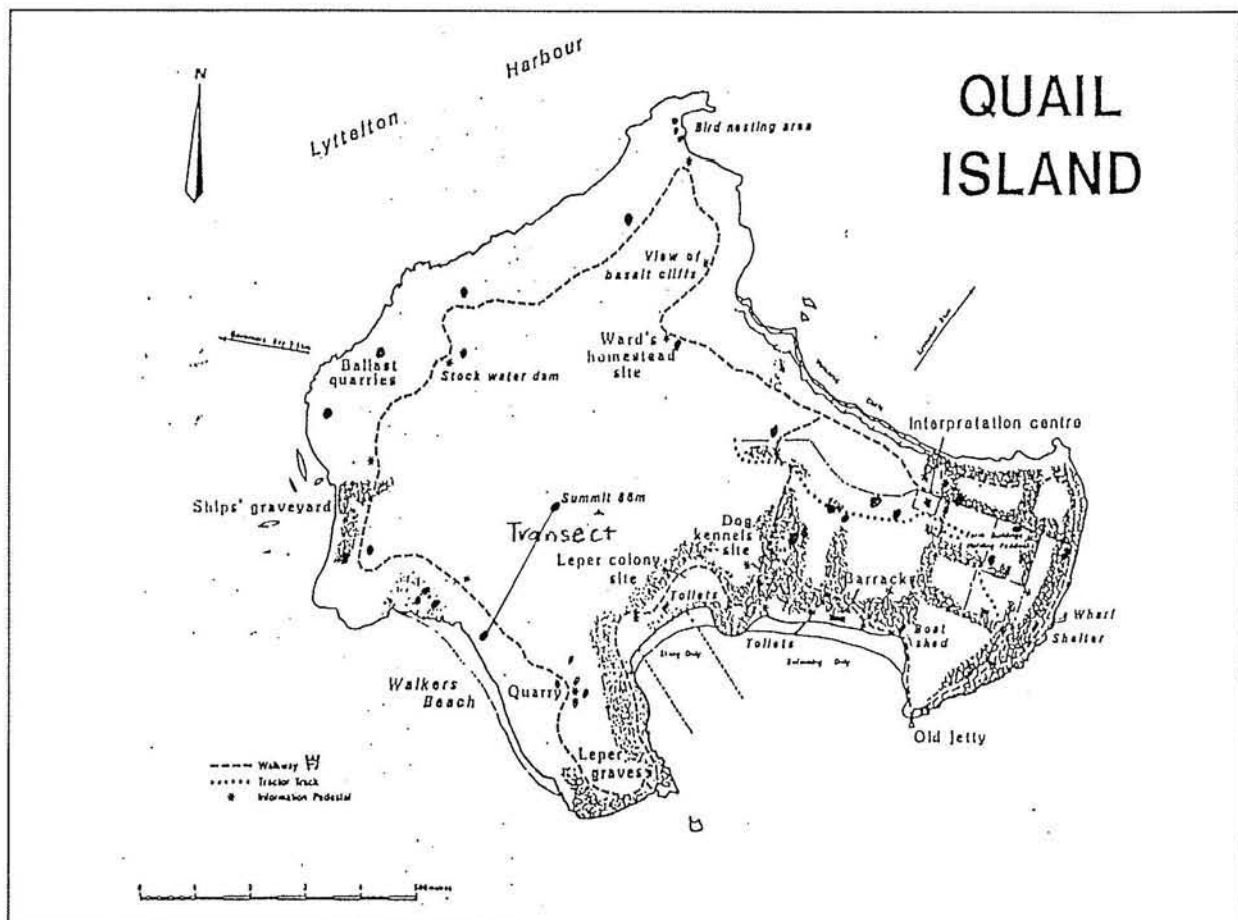


Figure one: Location of pitfall traps on Quail Island, Lyttelton Harbour, Canterbury

5.0 Results

95 skinks and one gecko were captured over the 900 trap nights, excluding recaptures (see table one). There were thirty instances of skinks being recaptured and the gecko was caught twice. A further 25 geckos were caught by hand as pitfall trapping proved an ineffective sampling method.

Table one: Lizard captures on Quail Island, December 1997 - January 1998.

	Total Number Caught		Range Snout-Vent length (mm)	Average Weight (g)
	Pitfall Traps	Hand		
<i>Oligosoma</i> spp.	95	-	23-62	3.1
<i>H. maculatus</i>	1	12	34-75	5.5

5.1 Permanent transect

41 skinks were caught in the pitfall traps on the permanent transect. These are included in Table one. Capture rates for each trap and brief habitat descriptions are given in Table two.

Table two: Pitfall trap results of the permanent transect, Quail Island.

Trap	Habitat	Skinks/ 20 trap-days
1	Beach	4
2	Flax (<i>Phormium tenax</i>)/beach	5
3	Grass (<i>Dactylus glomerata</i> , <i>Lolium multiflorum</i>)	0
4	Tussock (<i>Poa</i> spp.)	0
5	Bracken (<i>Pteridium aquilinum</i>)	1
6	Shrubby pohuehue (<i>Muehlenbeckia complexa</i>)	0
7	Flax	1
8	Matagouri (<i>Discaria toumatou</i>)	0
9	Bracken	0
10	Grass	6
11	Tussock	2
12	Matagouri	5
13	Grass	2
14	Bracken	2
15	Tussock	5
16	Matagouri	4
17	Slash, tree stump	4

5.2 Distribution

Skinks were found in all habitat types except areas with exotic trees (oaks and pines) as the dominant vegetation. Skinks were most commonly trapped in exotic grasses (see figure one). All but one of the 15 pitfall traps placed in grass caught at least one skink. Areas of scrub vegetation also appeared to be habitat favoured by skinks on Quail island. Traps located near *muehlenbeckia complexia* and matagouri (*Discaria toumatou*) plants were noted in particular for higher catches, 25 and 13.3 respectively per 100 trap days (see Appendix A).

The geckos were trapped and located by hand only in rocky habitats. No geckos or gecko sign was found in any of the other habitats despite extensive searches both during the day and at night.

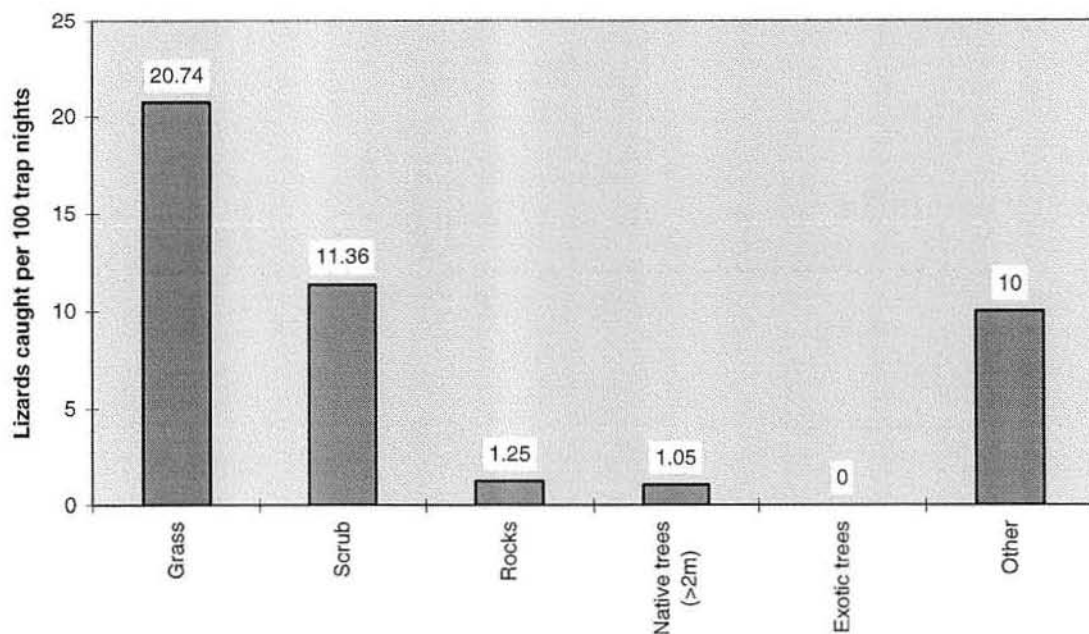


Figure one: Habitat distribution of skinks on Quail Island, December 1997 - January, 1998.

Note: see Appendix A for full description of each of the habitat categories

6.0 Discussion

6.1 Skinks

All skinks identified in this survey were of the genus *Oligosoma*, which is endemic to New Zealand. Specific identification has not been possible because of the cryptic nature of these species. Cryptic species are those which appear morphologically similar yet are genetically distinct enough to warrant recognition as a separate species.

All skinks captured were previously known as the Common New Zealand Skink (*Leiopisma nigriplantare maccanni*). Patterson and Daugherty (1990) separated this one species into five new taxonomic categories. The four new species and one subspecies were recognised on the basis of alloyme and subtle morphological variation. Since the recognition of these species further research has also established ecological differences between the five taxa. However identification in the field remains difficult not only because of the morphological similarities between these species but also because of the great amount of morphological variation within each species. The skinks trapped on Quail Island are thought to be the common skink (*Oligosoma nigriplantare polychroma*) and/or McCanns skink (*Oligosoma maccanni*).

O. n. polychroma is a diurnal skink growing up to 77mm in snout-vent length (Gill and Whitaker, 1996). It is found in Hawkes Bay and the central and southern North Island, throughout the South Island and on Stewart Island (Pickard and Towns, 1988). It's preferred habitat is dry open areas with low vegetation or debris and is common from coastal areas to altitudes of 1700m (Gill and Whitaker, 1996).

McCann's skink is also diurnal but is slightly smaller in size with a snout-vent length of up to 73mm length (Gill and Whitaker, 1996). McCann's skink is found only in the eastern South Island from mid-Canterbury to Southland (Pickard and Towns, 1988). The preferred habitat is dry, rocky areas in tussock grasslands and scrub (Gill and Whitaker, 1996).

The skinks captured on Quail Island showed a variety of dorsal patterns. Most had clear and distinctive mid-dorsal stripes while a few individuals had no or very faded mid-dorsal stripes but intense speckling patterns in the stripes either side of the centre line. It is unclear without genetic testing whether these patterns are within species variations (such as those observed in

O. n. polychroma by Freeman and Freeman (1994) at Travis Swamp, Christchurch) or whether they actually signal the presence of two species. It was noted however that individuals with faded or no dorsal stripe but increased dorsal speckling were captured in areas of scrub and native trees. This is particularly so of a skink caught within a patch of native trees at the stock water dam. Its dorsal pattern was markedly different from that of the other skinks caught.

Should both the common skink and McCann's skink be present on Quail Island it is unclear which dorsal pattern belongs to which species. Patterson (1992) studied Otago populations of both species. He found that the common skink occupied grassland and tussock habitat and McCann's skink preferred herb/shrub habitats. Both species had adapted to their chosen microhabitat as the common skink had distinctive dorsal striping where as McCann's skink had a speckled dorsal pattern with no clear dorsal stripe. However in a study of Kaitorete Spit, Canterbury, Freeman (1997) found the two species preferred opposite habitats to Patterson's findings while also showing opposite dorsal patterns. It is therefore recommended that further work be done to establish the specific identity and habitat preferences of the cryptic Quail Island skinks.

6.2 Geckos

The common gecko (*Hoplodactylus maculatus*) was the only species of gecko found on Quail Island during this survey. This species is the most widespread of the New Zealand lizards and is found on all three main islands. However the common gecko is now thought to be a complex of several cryptic species which should be described in the near future (Daugherty *et al.*, 1994). This may have significant implications for the Quail Island population as it may in fact belong to a taxon much smaller in numbers and more restricted than the currently recognised taxon. In which case the protection and expansion of Quail Island's population may become an important aspect of the restoration project.

The common gecko is nocturnal and inhabits a variety of habitats including forest, scrub and grassland from sea level to an altitude of 1700m (Gill and Whitaker, 1996). At present on Quail Island the common gecko appears to be confined to areas of rocky habitat. There were

at least five rocky areas on the island with geckos present whereas other habitats such as *Muehlenbeckia* shrub, a habitat used by common geckos elsewhere, had no sign of geckos.

Mammalian predators are thought to be the major restricting factor on Quail Island. Their presence is limiting the amount of habitat that provides suitable refuges for lizards. In the absence of mammalian predators it is expected that the present gecko range will expand as the need for predator-safe habitat ceases making more habitats suitable. Motonau Island, off the north Canterbury Coast, has a history and present vegetation similar to that of Quail Island. However all mammals have been eradicated and as a result the common gecko is not limited to 'predator-proof' sites but is found in a variety of habitats, which are also on Quail Island (C. Bannock, pers. comm.).

Skinks occur in a wider range of habitats on Quail Island than the geckos. Thus the factor(s) restricting the distribution of the geckos has not had the same effect on the skinks. Possible reasons for this include the different habits of the two species. Skinks are diurnal while geckos are nocturnal. This would influence each species vulnerability to predation. Skinks may exhibit an increased ability for predator avoidance and may also react in a different manner to the presence of predators.

6.3 Restoration

The most important aspect of the restoration project for the lizards of Quail Island is the removal of predators. A recent survey indicates the presence of at least six adult cats who are likely to be breeding (Hickling, unpublished data). Daugherty and Towns (1991) found the contents of one cat's stomach to contain the remains of 14 undigested lizards, the result of just one morning's foraging. A cat was observed eating a skink on one of the island's walkways. Rats and mustelids are presumed to be on the island and are also well documented for predation on lizards (Towns and Daugherty, 1994). For the skinks, the removal of mammals will allow greater population densities to be reached. The geckos should be able to extend their range to new habitats.

Revegetation of Quail Island will provide additional refuge sites for both the common gecko and the skinks. Unlike the macrohabitat focus required for bird species, the habitat utilised by

lizards is much smaller in scale. As grassland appears to be the preferred habitat of the skinks it is recommended that some areas remain as tussock grasslands. This is in compliance with the revegetation scheme as areas around the island are not to be forested because of the views they offer or their cultural significance.

6.3.1 Possible reintroductions

Revegetation of Quail Island will reestablish habitat suitable for the reintroduction of lizards thought to be missing from Quail Island. At least two species are thought to be absent from Quail Island that still persist on Banks Peninsula, the jewelled gecko (*Naultinus gemmeus*) and the spotted skink (*Oligosoma lineoocellatum*). Following the removal of all mammalian predators it is thought that suitable habitat exists on Quail Island for the reintroductions of these species.

The jewelled gecko is currently found in the Eastern South Island and on Stewart Island (Pickard and Towns, 1988). Populations on Banks Peninsula and within the Christchurch region are becoming restricted due to habitat loss (Freeman, 1997). These populations are of special concern as they are New Zealand's only sexually dichromatic lizards. The jewelled gecko inhabits forest, scrub and tussock grasslands. It prefers small leaved vegetation such as manuka (*Leptospermum scoparium*) and *Coprosma propinqua*, where it forages on the outer foliage feeding on invertebrates and nectar (Gill and Whitaker, 1996).

The present distribution of the spotted skink is in the Eastern South Island ranging from Nelson and Marlborough, through to South Canterbury (Pickard and Towns, 1988). Mainland populations are also thought to be declining (Freeman, 1997). The spotted skink inhabits rough open habitats with ground cover. Suitable areas include open grassy or tussock areas, scrub, coastal shrublands, rock screes, sea dune vegetation and beach wreck debris (Gill and Whitaker, 1996).

Other lizard species may be missing from the entire Banks Peninsula region and postulation of their existence on Quail Island is subjective, such as Duvaucel's gecko (*Hoplodactylus duvaucelii*) and the forest gecko (*Hoplodactylus granulosus*). Before any reintroduction

attempts be made with these species they will require both the removal of all mammalian predators and the establishment of suitable habitat through the revegetation efforts.

Duvaucel's gecko is currently found on offshore islands in the Cook Strait area and off the north-east coast of the North Island (Pickard and Towns, 1988). Fossil records indicate this species was once found on the mainland and it is thought that predation is responsible for its present restricted distribution (Towns and Daugherty, 1994). Duvaucel's gecko inhabits forest, scrub and coastal vegetation (Gill and Whitaker, 1996).

The forest gecko is found throughout mainland New Zealand except Marlborough and Canterbury (Pickard and Towns, 1988). Records show individuals of this species to have been collected from the Canterbury region in the early 1900's (Burt and Burt, 1932). This species inhabits forest and scrub, foraging at night in trees and bushes (Gill and Whitaker, 1996).

7.0 Recommendations

- Specific identification of the cryptic skinks by genetic testing of specimens, especially those with different dorsal patterning and from different habitats
- Removal of all mammalian predators from Quail Island and ongoing control to ensure the island remains free of these species.
- Monitoring of trends in lizard populations following vegetation restoration efforts and removal of mammalian predators.

8.0 Acknowledgments

I would like to thank Kerry-Jayne Wilson for advice and assistance with this report.

Thanks also to Lyttleton Harbour Cruises for transport to Quail Island and the Department of Conservation for use of facilities on the island. I am grateful for having been awarded a summer research scholarship by the Department of Entomology and Animal Ecology at Lincoln University which allowed me to undertake this survey.

9.0 References

- Burt, C.E. and Burt, M.D. (1932) Herpetological results of the Whitney South Sea Expedition. VI Pacific Island amphibians and reptiles in the collection of the American Museum of Natural history. *Bulletin of the American Museum of Natural History* 63: 461-597.
- Cox, J.E., Taylor, R.H. and Mason, R. (1967) *Motunau Island, Canterbury, New Zealand: an ecological survey*. Bulletin 178. New Zealand Department of Scientific and Industrial Research.
- Daugherty, C.H., Patterson, G.B. and Hitchmough, R.H. (1994) Taxonomic and conservation review of the New Zealand herpetofauna. *New Zealand Journal of Zoology* 21: 317-323.
- Freeman, A.B. (1994) *An ecological study of the lizard fauna of Kaitorete Spit, Canterbury*. M. Applied Science Thesis, Lincoln University, Canterbury.
- Freeman, A.B. (1997) Comparative ecology of two Oligosoma skinks in coastal Canterbury: A contrast with central Otago. *New Zealand Journal of Ecology* 21(2): 153-160.
- Freeman, A.B. (1997) The distribution of lizards in Christchurch and its environments. *Lincoln University Wildlife Management Report No. 11*.
- Freeman, A.B. and Freeman, A. (1996) Survey of the lizard fauna of Travis Wetland, Christchurch. *Lincoln University Wildlife Management Report No. 9*.
- Genet R. (1997) (Draft) *Vision for the ecological restoration of Quail Island*. Department of Conservation, Canterbury Conservancy.
- Gill, B.J. and Whitaker, A.H. (1996) *New Zealand frogs and reptiles*. David Bateman Ltd, Auckland, New Zealand.
- Patterson, G.B. (1992) The ecology of a New Zealand lizard guild. *Journal of the Royal Society of New Zealand* 21:91-106
- Patterson, G.B. and Daugherty, C.H. (1990) Four new species and one new subspecies of skink, genus *Leiopisma* (Reptilia:Lacertila:Scincidae) from New Zealand. *Journal of the Royal Society of New Zealand* 20: 65-84.
- Pickard, C.R. and Towns, D.R. (1988) *Atlas of the amphibians and reptiles of New Zealand*. Conservation series publication. Department of Conservation, Wellington
- Taylor, R.H. and Thomas, B.W. (1989) Erradication of Norway rats (*Rattus norvegicus*) from Hawea Island, Fiordland, using Bradificoum. *New Zealand Journal of Ecology* 12: 23-32.
- Taylor, R.H. and Thomas, B.W. (1993) Rats erradicated from rugged Breaksea Island (170 ha), Fiordland, New Zealand. *Biological Conservation* 65: 191-198
- Towns, D.R. (1996) Changes in habitat use b lizards on a New Zealand Island following removal of the introduced Pacific rat *Rattus exulans*. *Pacific Conservation Biology* 2: 286-92.
- Towns, D.R. and Daugherty, C.H. (1994) Patterns of range contractions and extinctions in the New Zealand herpetofauna following human colonisation. *New Zealand Journal of Zoology* 21:325-339.
- Whitaker, A.H. (1993) Survey methods for lizards. *Ecological management* 2.
- Wilkinson, A.S. and Wilkinson, A. (1952) *Kapiti bird sanctuary, a natural history of the island*. The Marsterton Printing Company.

10.0 Appendices

10.1 Appendix A

Pitfall trap habitat description and skink captures.

Category	Habitat description	Trap-nights	skinks caught	skinks/100trap days
Grass	Exotic grass only	90	34	37.8
	Tussock	100	17	17.0
	Grass within 3m of rocks	60	4	6.7
	Grass within 2m of flax	20	1	0.5
Scrub	Muehlenbeckia	20	5	25.0
	Matagouri	60	8	13.3
	Flax	80	9	11.3
	Bracken	60	3	5.0
Rocks	Rock tumble with fern and muehlenbeckia within 1m	70	1	1.4
	Rocks within 5m of shore	10	0	0
Native trees >2m	Native trees >5m	60	2	3.3
	Ngaio (<i>Muoporum laetum</i>)	10	0	0
	Kanuka (<i>Kunzea ericoides</i>)	60	0	0
	Muehlenbeckia (tree)	40	0	0
	Poroporo (<i>Solanum</i> sp.)	20	0	0
Exotic trees	Oak (<i>Quercus</i> sp.)seedlings and litter	20	0	0
	Under mature pines (<i>Pinus</i> sp.)	20	0	0
	Rotting chopped wood pile	20	0	0
Other	Walkers Beach, muehlenbeckia within 2m	20	6	30.0
	Exotic tree slash	20	4	20.0
	Volcanic cliffs above gull colony	40	0	0