

**A REPORT ON A VISIT TO NORTH BROTHER ISLAND,
COOK STRAIT, 6-11 FEBRUARY 1993.**

**A preliminary investigation of the impact of burrow-breeding seabirds on vegetation,
insects and reptiles.**

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Introduction

New Zealand has a large number of burrow breeding seabirds, namely the little blue penguin and most small petrels. These birds often breed in large numbers and bring ashore nutrients which influence the plant associations in their colonies and allows the occurrence of unusually high densities of invertebrates and reptiles (Crook 1975, Towns et al 1990). Seabird colonies have characteristic vegetation communities of hardy plants that can withstand salt spray, plus trampling and burrowing by the birds which can inhibit the establishment of seedlings. These island ecosystems are a largely neglected ecological feature of New Zealand. The plant communities have been little studied, the reptile/bird associations have received some study, but the insect fauna associated with seabird colonies has been virtually overlooked. The dynamics of these associations have received very little attention. Some seabird islands are home to rare or endangered reptiles and insects.

This report is an account of a visit to North Brother Island in Cook Strait by four ecologists from Lincoln University. The party comprised a plant ecologist, Gavin Daly, an ornithologist, Kerry-Jayne Wilson, a herpetologist, Alastair Freeman and an entomologist, John Marris. North Brother Island is one of several seabird islands we plan to visit over the next few years. The purpose of these initial visits is to find a suitable study island and to have a group of ecologists from different disciplines make preliminary observations that will form the conceptual basis of later more detailed research into the dynamics of the bird-plant-reptile-insect associations on seabird islands. This research would be done primarily by graduate students.

At North Brother Island we described the vegetation types present, and for each recorded the range of seabird burrow densities, the bird and reptile species present and collected insects for later identification. The objective of this work was primarily to develop methods appropriate to the later more detailed studies.

North Brother is a largely unmodified island which supports colonies of little blue penguins (*Eudyptula minor*), fairy prions (*Pachyptila turtur*) and diving petrels (*Pelecanoides urinatrix*). There are five species of reptile present, tuatara, (*Sphenodon guntheri*) plus two geckos and two skinks. The vegetation has been described previously (Gilham, 1960) as has the ecology of Duvaucel's gecko (Barwick, 1982). These earlier studies provide a baseline against which changes can be determined.

Narrative and methods

We arrived on the island about 1800hrs 6 February 1993 and left at 0800hrs on 11 February. The first day was spent exploring the island, determining the main vegetation associations, areas of high and low densities of seabird burrows and the general patterns of distribution of birds and reptiles.

The bulk of our work was carried out in 5x5m quadrats. Within each quadrat the percentage cover for each plant species, bare ground and rock was assessed visually. The seabird burrows were counted and each temporally marked by placing a wooden spatula beside the entrance, the species of reptiles and birds seen using a particular burrow were

recorded on the spatula. The birds and reptiles present in each quadrat were recorded by day and by night. As the plots were laid out over the duration of our visit and the main insect collecting was by pit-trapping, it was not possible to assess insect abundance within the plots (full details of insect collection methods is given by J. Marris).

These methods proved suitable for our preliminary observations, but would need to be improved for later work. The vegetation should be assessed with more precision and bird and reptile observations made several times at different seasons, for each plot. The plots would have to be marked for the duration of the study and insects collected within the plots.

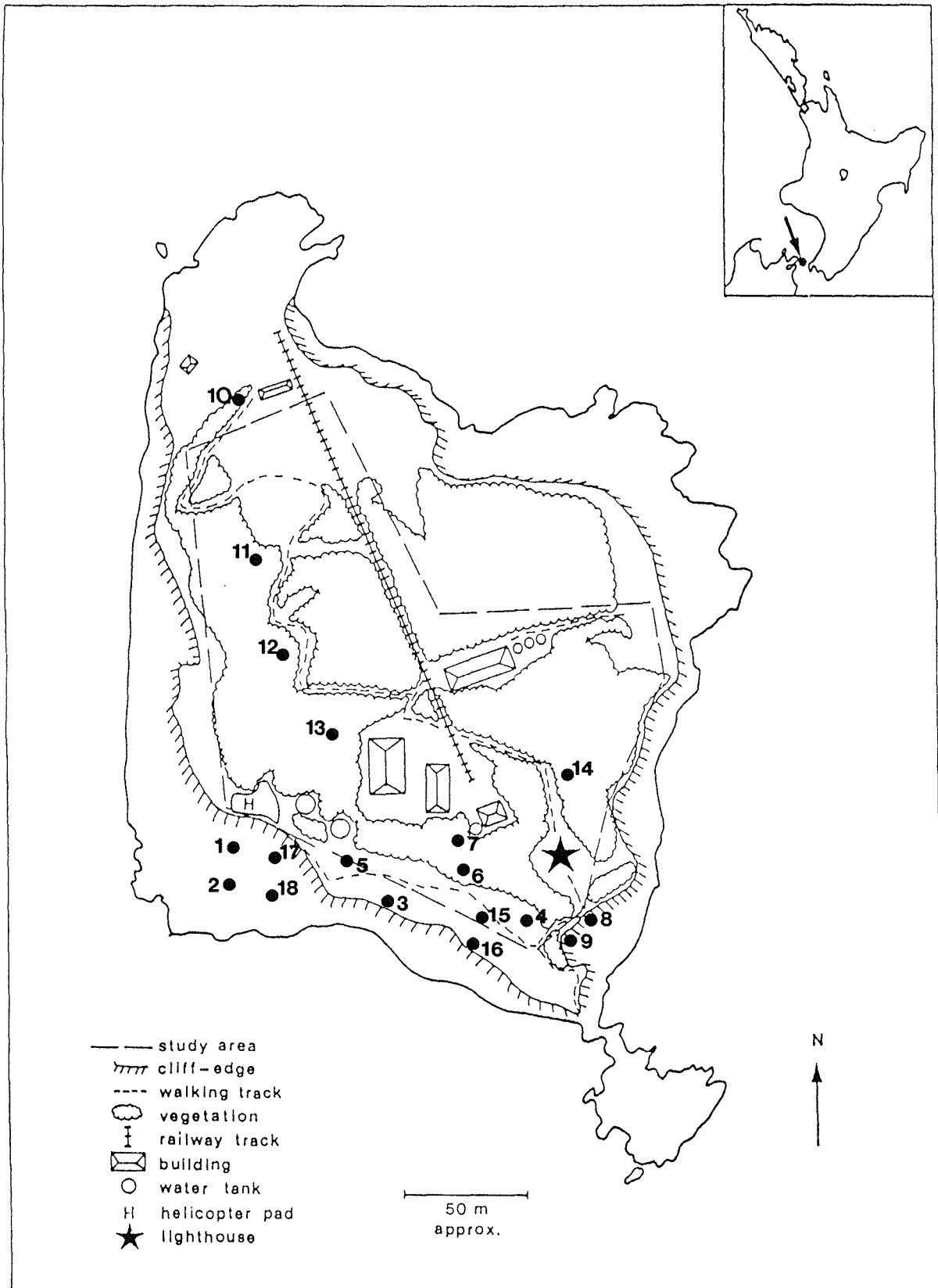
Distribution of quadrats is given in Appendix 1, data collected in the vegetation/burrow plots is presented in Appendix 2.

An analysis of the data gathered and of general observations made by each person follows.

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Appendix 1



Locality of survey quadrats.

Appendix 2

Study Plots

Plot 1. SW corner of island.

Slope: 1 in 5, aspect south.

Mean Soil Depth: 68mm

Cover and Vegetation: *Salicornia australis* dominant, also present *Senecio sterquilinus*.

Total vegetation cover 55%.

No. of Burrows: 4.

Fauna Present: common gecko, spotted skink, fairy prion (adjacent), diving petrel.

Plot 2. SW corner of island.

Slope: 1 in 8, aspect south.

Mean Soil Depth: 105mm

Cover and Vegetation: *Salicornia australis* dominant, *Senecio sterquilinus* and *Disphyma australe* also present. Total vegetation cover 55%.

No. of Burrows: 34.

Fauna Present: fairy prion.

Plot 3. South coast, below track.

Slope: 1 in 5, aspect south.

Mean Soil Depth: 160mm

Cover and Vegetation: *Salicornia australis* dominant, *Senecio sterquilinus* frequent, *Triglochin striatum* frequent, also present *Disphyma australe* and *Polycarpon tetraphyllum*.

Total vegetation cover 95%.

No. of burrows: 48.

Fauna present: fairy prion, diving petrel.

Plot 4. South coast, below track.

Slope: 1 in 3, aspect south east.

Mean Soil Depth: 86mm

Cover and Vegetation: *Disphyma australe* dominant, *Carpobrotus edule* dominant, also present *Salicornia australis*. Total vegetation cover 90%.

No. of burrows: 14.

Fauna present: spotted skink, fairy prion, diving petrel.

Plot 5 South coast above track.

Slope: 1 in 4, aspect south.

Mean Soil Depth: 96mm

Cover and Vegetation: *Coprosma repens* dominant (height 0.5m), *Poa cita* frequent, also present *Salicornia australis*, *Carpobrotus edule*, *Elymus* sp and *Apium australe*. Total vegetation cover 95%.

No. of burrows: 6.

Fauna present: tuatara, fairy prion.

Plot 6. South coast above track

Slope: aspect south.

Mean Soil Depth: 80mm

Cover and Vegetation: *Carpobrotus edule* dominant, some *Poa cita* and *Atriplex hastata*, also present *Elymus* sp. Total vegetation cover 100%.

No. of burrows: 2.

Fauna present: tuatara (adjacent), fairy prion.

Plot 7. South coast below generator shed.

Slope: 1 in 3, aspect south.

Mean Soil Depth: 131mm

Cover and Vegetation: *Coprosma repens* dominant (height 0.5m), some *Poa cita*, *Elymus* sp and *Atriplex hastata*. Total vegetation cover 100%.

No. of burrows: 10.

Fauna present: tuatara, Duvaucel's gecko, fairy prion.

Plot 8 SE corner of island below lighthouse.

Slope: 1 in 3 aspect, south east.

Mean Soil Depth: 49mm

Cover and Vegetation: *Coprosma repens* dominant, *Poa cita* and *Muehlenbeckia complexa* frequent. *Asplenium obtusatum* and *Asplenium flaccidum* also present. Total vegetation cover 100%.

No. of burrows: 7.

Fauna present: common gecko, fairy prion, diving petrel (egg).

Plot 9 SE corner of island below lighthouse.

Slope: 1 in 4 aspect, south east.

Mean Soil Depth: 81mm

Cover and Vegetation: *Muehlenbeckia complexa* dominant, *Poa cita*, *Asplenium flaccidum*, *Microseris scapigera* and *Elymus* sp also present. Total vegetation cover 90%.

No. of burrows: 7.

Fauna present: fairy prion, diving petrel.

Plot 10 NW coast above crane.

Slope: 1 in 3, aspect west.

Mean Soil Depth: 90mm

Vegetation and Cover: Low *Coprosma repens* dominant, *Poa seta*, *Elymus* sp and *Senecio sterquilinus* also present. Total vegetation cover 100%.

No. of burrows: 15.

Fauna present: Tuatara, Duvaucel's gecko, fairy prion.

Plot 11 West coast, below track.

Slope: 1 in 4, aspect west.

Mean Soil Depth: 72mm

Vegetation and Cover: *Coprosma repens* dominant. *Atriplex hastata*, *Elymus* sp, *Senecio sterquilinus* and *Disphyma australe* also present. Total vegetation cover 95%.

No. of burrows: 10.

Fauna present: tuatara, fairy prion.

Plot 12 West coast, below track.

Slope: 1 in 5, aspect west.

Mean Soil Depth: 127mm

Vegetation and Cover: Low *Coprosma repens* dominant. *Altriplex hastata*, *Elymus* sp and *Senecio sterquilinus* also present. Total vegetation cover 130%.

No. of burrows: 9.

Fauna present: tuatara, Duvaucel's gecko (adjacent), fairy prion, diving petrel.

Plot 13 Hebe thicket below house.

Slope: 1 in 8, aspect south west.

Mean Soil Depth: 125mm

Vegetation and Cover: *Hebe elliptica* (hieght 2m). *Coprosma repens* and *Lavatera arborea*. Total vegetation cover 150%.

No. of burrows: 2.

Fauna present: tuatara, little blue penguin, fairy prion.

Plot 14 Grassy area by lighthouse.

Slope: 1 in 10, aspect north east.

Mean Soil Depth: 57mm

Vegetation and Cover: *Poa cita* dominant. *Coprosma repens* and *Elymus* sp. Total vegetation cover 100%.

No. of burrows: 2.

Fauna present: spotted skink (adjacent).

Plot 15 South coast beside track.

Slope: 1 in 3, aspect south.

Mean Soil Depth: 134mm

Vegetation and Cover: *Salicornia australis* and *Disphyma australe* dominant. *Senecio sterquilinus* frequent. *Elymus* sp also present. Total vegetation cover 55%.

No. of burrows: 45.

Fauna present: fairy prion, diving petrel.

Plot 16 South coast above coastal cliffs.

Slope: 1 in 3, aspect south.

Mean Soil Depth: 106mm

Vegetation and Cover: *Salicornia australis* and *Senecio sterquilinus* dominant. Total vegetation cover 40%.

No. of burrows: 34.

Fauna present: fairy prion, diving petrel.

Plot 17 South coast below helicopter pad.

Slope: 1 in 4, aspect south west.

Mean Soil Depth: 71mm

Vegetation and Cover: *Salicornia australis* and *Senecio sterquilinus* dominant. Some *Carpobrotus edule* and *Lepidium oleraceum* also present. Total vegetation cover 80%.

No. of burrows: 15.

Fauna present: little blue penguin, fairy prion.

Plot 18 South coast below helicopter pad.

Slope: 1 in 4, aspect south west.

Mean Soil Depth: 137mm

Vegetation and Cover: *Salicornia australis* and *Disphyma australe* dominant. *Senecio sterquilinus* also present. Total vegetation cover 40%.

No. of burrows: 35.

Fauna present: spotted skink, fairy prion.

Vegetation

by Gavin Daly

At lower levels on the steep rocky slopes plants are responding strongly to the copious amounts of sea salt driven on to the land as a result of high winds. Consequently, glasswort (*Sarcocornia quinqueflora*) and *Disphyma australe* are the dominant perennial with the opportunistic *Senecio sterquilinus* and Cooks Scurvy grass (*Lepidium oleraceum*) prominent in disturbed areas.

At higher elevations silver tussock grassland (*Poa cita*) and taupata (*Coprosma repens*) shrubland over blue wheat grass (*Elymus* sp) and ferns (*Asplenium*) become the dominant vegetation types. Dry rocky localities may include areas of *Kirkianella*. More sheltered areas, in the vicinity of the main accommodation, support dense stands of *Hebe elliptica* and *Coprosma repens*.

All together some 30 species of vascular plants and four lichens and mosses are found above the high tide line on North Brother Island.

Insects

by John Marris

Introduction

Little is known of the insect fauna of North Brother Island. No survey of the insects present on the island has been carried out, although specimens have been collected from the island on various occasions since late last century.

Over the period of our visit insects were collected from all major habitats using a range of collecting techniques. Emphasis was placed on the Coleoptera (beetles), which are my particular field of interest, but insects from other orders were also collected.

Collection Methods

Pitfall traps: Pitfall traps were used for the collection of cursorial insects. Twenty traps were set up from 7 to 10 February 1993 and were placed in the ground in each of the main vegetation types .

Because of the high density of reptiles on the island small escape 'ladders' were fitted to the traps. No reptiles were caught in pitfall traps.

Yellow Pan Traps: Yellow pan traps were used for the collection of flying insects, particularly plant and nectar feeding species. Six pan traps were set up between 9 and 10 February 1993, these were placed out in each of the main vegetation types.

Malaise Trap: A malaise trap was set up in the area of *Hebe* and *Coprosma* scrub below the lighthouse accommodation block for the collection of flying insects. Due to strong winds the trap was only used between 6 and 7.2.93 and on 10.2.93.

Litter Samples: Litter samples were collected from under *Hebe/Coprosma* scrub vegetation, from seabird burrows and from a little blue penguin moult burrow. Insects and other invertebrates were later extracted using a Berlese funnel apparatus.

Hand Collecting: Insects were collected by beating and sweeping vegetation and general hand collection. Night collecting was done on all nights of our visit.

Results

At the time of writing this report much of the collected material was yet to be curated and/or identified. Identifications and information on some of the more notable species are given below.

Orthoptera (Identified by P M Johns, Canterbury University)

Stenopelmatidae (Ground and tree weta)

Hemiandrus bilobatus Ander 1938

Specimens of this ground weta were collected from burrows in bare, clay banks on the northern face of the island. The Brothers are the type locality for the species which is distributed around the greater Wellington area.

Rhaphidophoridae (Cave weta)

Isoplectron cf aciculatus Karny 1937

A small species of cave weta found under timber under *Hebe* scrub. This species is also distributed around the Wellington area.

Coleoptera (Identified by R M Emberson and J W M Marris, Lincoln University)

Carabidae (Ground beetles)

Demetrida nasuta White

Collected under rocks in *Hebe/Coprosma* scrub. A widespread species ranging from coastal to sub-alpine habitats.

Mecodema sulcatum Sharp

Only a few specimens of this large species were seen. Collected from under timber lying under *Hebe* scrub. This species is found in coastal habitats from Kaikoura to Cook Strait.

Histeridae (Pill beetles)

Saprinus antipodus Dahlgren

Collected from the litter of a collapsed petrel burrow. A widespread species often associated with animal nests and carrion.

Tenebrionidae (Darkling beetles)

Mimopeus opaculus Bates*Mimopeus elongatus* Brême

Both of these widely distributed species have previously been recorded from the Brothers (Watt, 1989). These are easily the most common of the larger beetle species found on the island and are probably an important part of the diet of the tuatara. The larger *M. opaculus* appeared to be more common among the areas of taller scrub on the island whereas *M. elongatus* could be seen in large numbers on the mat vegetation (*Disphyma* and *Salicornia*) at night.

Curculionidae (Weevils)

Anagotus (?) sp.

A medium sized species found feeding on *Coprosma repens* at night.

Lepidoptera (Identification and notes by J S Dugdale, Landcare Research)

Oecophoridae

Schiffmuelleria orthophanes Meyrick

Uncommon. Previously collected from Stephens Island; also known from the Nelson/Marlborough, Wellington and Southland areas. Nothing is known of the biology of the species; the larvae may specialise on litter or twigs.

Hymenoptera (Identification and notes by J W Early, Auckland Museum)

Undescribed family 'Maamingidae'

'*Maaminga*' sp E64

A good series of this species which is also relatively abundant on Chetwode and Somes Islands; scarce on the mainland (1 specimen from each of Banks Peninsula and East Cape). The family is a Cretaceous relic, endemic to New Zealand.

Diapriidae

Spilomicrus sp E35

Also on Stephens Island. A flightless species found in leaf litter, probably endemic to the Sounds area and neighbouring islands.

Trichopria? sp.

Possibly a new genus. So far, this species is only known from North Brother Island.

Trichopria sp.

A flightless litter dwelling species.

Scelionidae

New genus 1

A distinct species of an undescribed genus. A closely related species (also undescribed) is common throughout the northern half of the North Island. Probably parasitic on Orthoptera eggs, perhaps ground weta.

New genus 2

A small rotund species with reduced wings. I have never seen this species before.

Proctotrupidae

Fustiserphus inntrudens

Widespread throughout New Zealand. Parasitic on caterpillars of Oecophoridae (*Tingena* spp) in leaf litter.

Braconidae

Orgilinae sp.

Apterous species - unusual for this subfamily. This species also from Mt Stokes and Stewart Island.

Encyrtidae

Austrochoreia? sp.

Possibly a new genus. I have never seen this species before.

? genus

A species which does not run satisfactorily to John Noyes' key - perhaps a new genus.

Pteromalidae

Spalangia sp.

Undescribed species from penguin moult burrows. Will be parasitic on flies (probably Muscidae) living in bird droppings and nest debris.

Formicidae (Ants)

Amblyopone saundersi

Common.

Chelaner antarctica

Common throughout New Zealand.

Discussion

North Brother Island supports an interesting and unusual insect fauna which in the past has been largely neglected and warrants further study. One of the most noteworthy findings from this study was the apparent absence of the Cook Strait click beetle (*Amychus granulatus*) - this result and its implications are discussed below.

***Amychus granulatus* Broun - The Cook Strait Click Beetle**

Amychus granulatus is a large (c. 18-24 mm), flightless, click beetle (family Elateridae) restricted to some of the outer islands of the Marlborough Sounds (North Brother, Stephens, Maud and the Trios Islands). The species was described by Broun (1886) from a specimen collected from the Brothers by the lighthouse-keeper of the day, Mr P. Stewart-Sandager. The only other species in the genus, *A. candezei*, is now restricted to offshore islands of the Chatham Islands.

Hudson (1934) described *A. granulatus* as "abundant in the crevices in the rocks, and under logs and stones". In 1957, Gibbs (pers. comm.) collected nine specimens of the beetle on a single day on North Brother Island where they were readily found by rock turning. More recently, however, Meads (1990) considered *A. granulatus* to be rare on both Stephens Island and the Brothers and suggested that this may be related to increased numbers of tuatara.

A. granulatus is one of 26 species of invertebrates given legal protection under the seventh schedule of the Wildlife Amendment Act, 1980. Ramsay *et al.* (1988) placed the beetle in the rare category (based on the definitions of the International Union for Conservation of Nature and Natural Resources (IUCN), while Molloy and Davis (1992) placed it in category B, the second priority group of threatened New Zealand species.

During our visit to North Brother Island I was unable to find any *A. granulatus* despite using collecting techniques suited to location of the beetle (i.e., searching under rocks, logs and timber, pitfall trapping and extensive night collecting. Moreover, personal experience in collecting the similar *A. candezei* on the Chatham Islands ensured that I was familiar with the likely habitats and activities of the beetle. It is unlikely that the beetle was not seen due to inappropriate timing of the trip with the insects' seasonality; records from the New Zealand Arthropod Collection and specimens held by Dr G W Gibbs and Mr P M Johns showed that the adult beetles are active virtually throughout the year and certainly over the summer months. Thus it appears that the population of *A. granulatus* from North Brother Island has been severely reduced or is possibly extinct.

Extinction of *A. granulatus* from North Brother Island would mean the loss of a significant population of this endangered species. It is, therefore, suggested that a thorough search of the island is made to more positively ascertain the presence or absence of the beetle. Further valuable research on *A. granulatus* would include:

- establish the former distribution of the species by reference to museum collections.
- check for the presence of the beetle on South Brother Island. There are no collection records of the beetle from South Brother that I am aware of, however, specimens simply labelled "The Brothers" are ambiguous.
- assess the status of the Stephens Island population, which is reported to be in decline (Meads, 1990; Gibbs pers comm.).
- assess the status of populations on other islands where the beetle is known to have been present.

Insect material collected on this trip will be passed on to entomologists interested in the relevant groups. All Hymenoptera will be held in the Auckland Museum collection while all the Coleoptera and all remaining material will be held in Lincoln University's, Entomology Department Museum collection.

Acknowledgements

Thanks are due to John Dugdale (Landcare Research NZ Ltd.), John Early (Auckland Museum), Rowan Emberson (Lincoln University), George Gibbs (Victoria University) and Peter Johns (Canterbury University) for their identification and/or comments on insect specimens and records.

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Lizards

By Alastair Freeman

Introduction

Herpetologically, North Brother Island is one of the most important island sanctuaries in New Zealand. Not only is it considered a stronghold for Duvaucels gecko (*Hoplodactylus duvauceli*) but it is the only locality where the tuatara species *Sphenodon guntheri* is present (Barwick, 1982; Daugherty et al, 1990; Thompson et al, 1992).

Over a period of five days observations were made of lizards present in each quadrat. In addition general data were collected on the lizards present, with emphasis being placed on Duvaucels gecko. Notes on each of the species follows.

Spotted Skink *Leiopisma lineocellatum*

Spotted skinks were common and widespread, most often observed basking on concrete paths and rocks during the day. Spotted skinks were found in a variety of habitats over most of the island from the *Coprosma repens* dominated scrub areas next to the accommodation to the bare rock/iceplant habitats at the northern end to the burrowed slopes habitats at the southern end of the island.

One large spotted skink was observed taking a small common gecko.

For details of distribution see appendix 1.

Common Skinks *Leiopisma nigriplantare polychroma?*

Three animals were captured by hand and a further 19 were observed in a variety of habitats. These are the first records for a common skink from the Brothers Island group. Scale counts, lamellae counts as well as colour and patterning (see appendix 2) indicate that this skink is probably *L. n. polychroma* (G. Patterson pers com).

Table 1: Morphological details of the three common skinks captured.

SVL (mm)	Sex	Weight (gm)	Toe Lammellae	Midbody Scales
59	female	4.2	22	28-30
58	male	3.8	23-24	27-29
65	female	4.6	20	29

While this lizard did not appear to be as common as spotted skinks it was not uncommon and was sighted in nearly all vegetated habitats on the island. Details on the distribution of this species appears in appendix 3.

Common Gecko *Hoplodactylus maculatus*

As with the two species of skink this species appeared to be common and widespread. It was often captured in its daytime refugia but was seldom observed foraging at night. This is in contrast to Davaucel's gecko which was regularly observed foraging at night in open habitats.

Distribution of this species is illustrated in appendix 4.

Duvaucel's Gecko *Hoplodactylus duvaucelii*

A total of 25 Duvaucel's geckos were captured by hand. These animals were then measured, weighed, sexed (where possible) and the condition of the tail was noted (ie regrown or original). The habitat type within the vicinity (approximately 1m) of the animal was also noted. Each animal was marked with an individual number on the dorsal surface using a "Stephens Radiant Marker". A further 14 geckos were observed but not captured.

The majority of geckos (n=18) were caught in open areas of bare rock and iceplant at night while foraging. A further five were captured in their daytime retreats under building debris and amongst rocks; two animals were captured foraging amongst *C. repens* scrub. One of the animals captured had a possible toe clip combination of LF5, RF5, LR2, RR5. From the data collected there appears to be a correlation between habitat type and number of animals captured, however, this is almost certainly due to the ease with which individuals were observed and captured in the bare rock/coastal succulent habitat compared with *C. repens* dominated shrub habitat.

Table 2: Major habitat types in which individual animals were captured.

Habitat Type	Foraging	Refugia	Number
PC.I.BR	28		18(72%)
HR.CR.HE		2	2(8%)
HR.PC.I.BR		3	3(12%)
CR	2		2(8%)

Habitat types; Bare Rock (BR), *C. repens* (CR), *Hebe elliptica* (HE), Human refuse (HR), Iceplant (I), *Poa cita* (PC)

None of the marked animals were observed more than once, although three marked animals were observed by DOC staff on a subsequent trip to the island in March 1993 (B. Cash pers com). This

species did not appear to show strong site fidelity, with individual animals being captured at one locality one night then different individuals being captured at the same site the next night. Actively foraging individuals were also often observed some distance from any obvious refugia. Both these factors would seem to indicate that Duvaucel's gecko will range widely when foraging. Whitaker (1968) noted similar behaviour in this species on the Poor Knights Islands in Northland.

The largest animals captured were two males with SVL's (Snout Vent Lengths) of 115mm the smallest animal captured was a immature with a 50mm SVL. The heaviest animals were a male and a female which both weighed 40.6gms; the former had a SVL of 115mm and the latter 113mm. Only one of the females, captured on the night of 10/2/93, appeared to be gravid (full morphological details appear in appendix 5). Details of the distribution of this species appears in Appendix 6.

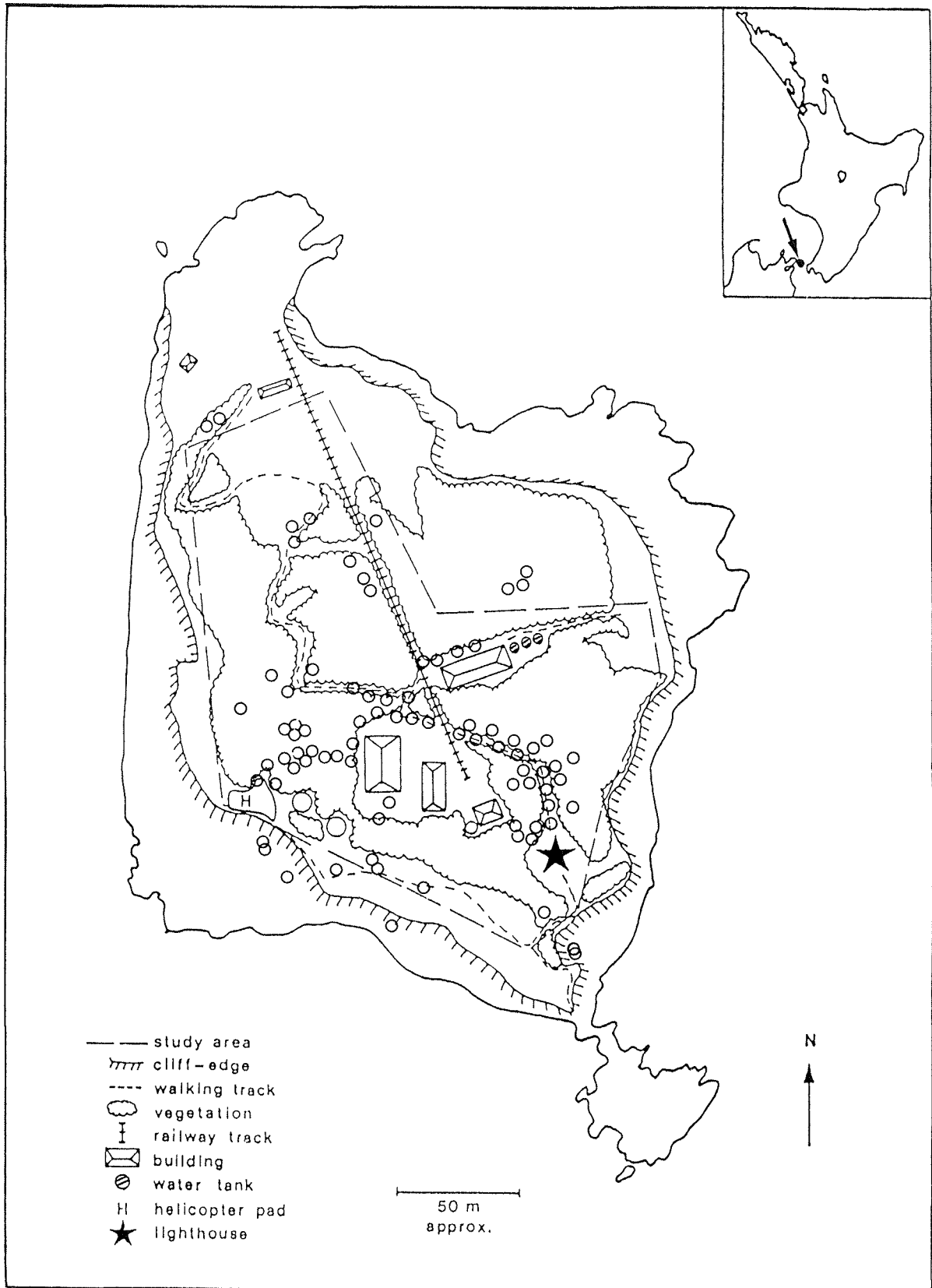
Discussion

None of the lizard species present on North Brother Island could be considered rare. Common geckos and spotted skinks were observed in most habitats on the island in good numbers. Duvaucel's gecko, while not as abundant as the above species, was regularly observed at night. The common skink appeared to be at least as common as Duvaucel's gecko.

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Appendix 1



○ Sightings of *Leiolopisma lineocellatum*

Appendix 2

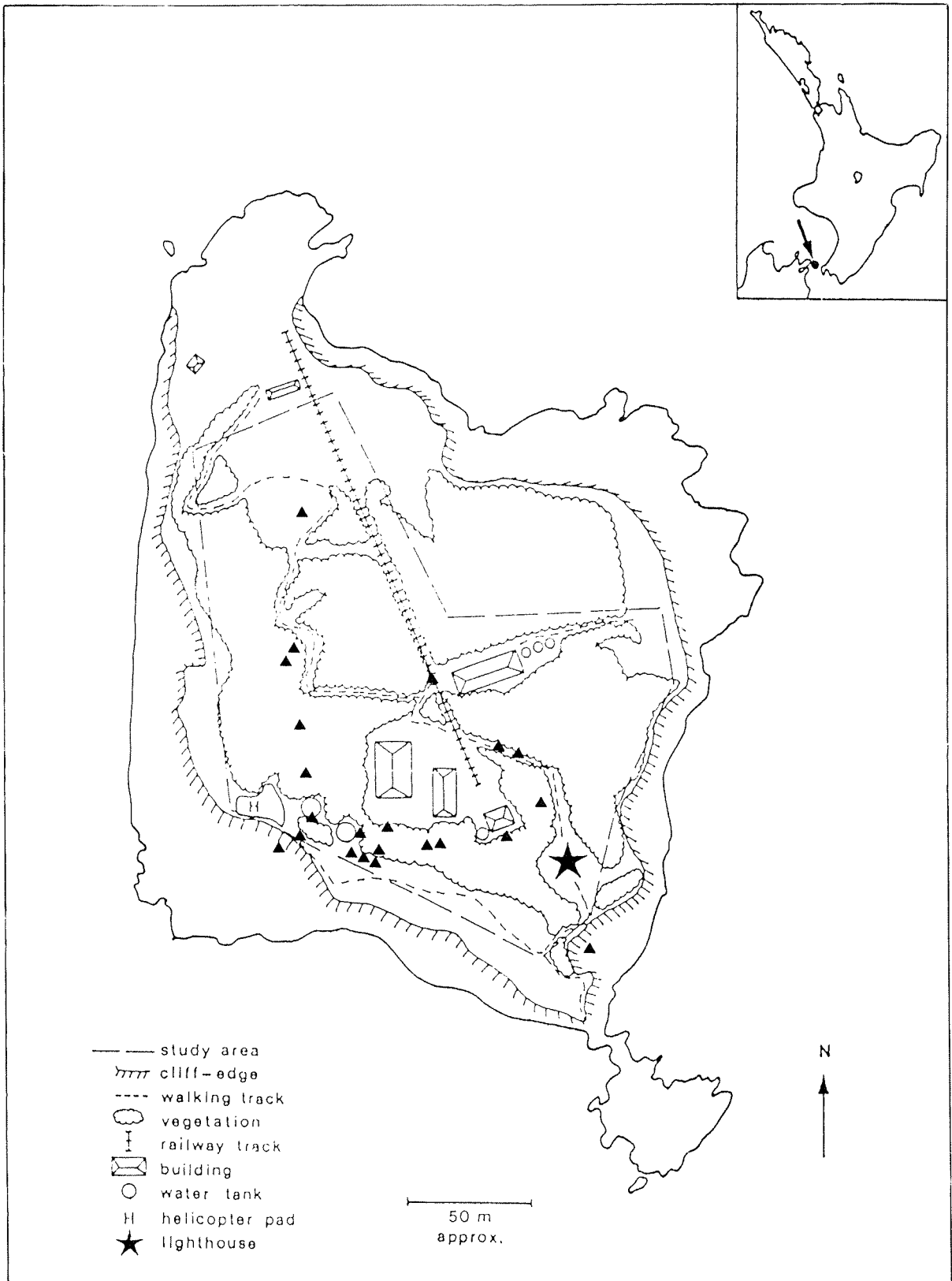
Dorsal surface of common skink captured on North Brother Island (*L. n. polychroma?*)



Ventral surface of common skink captured on North Brother Island (*L. n. polychroma?*)

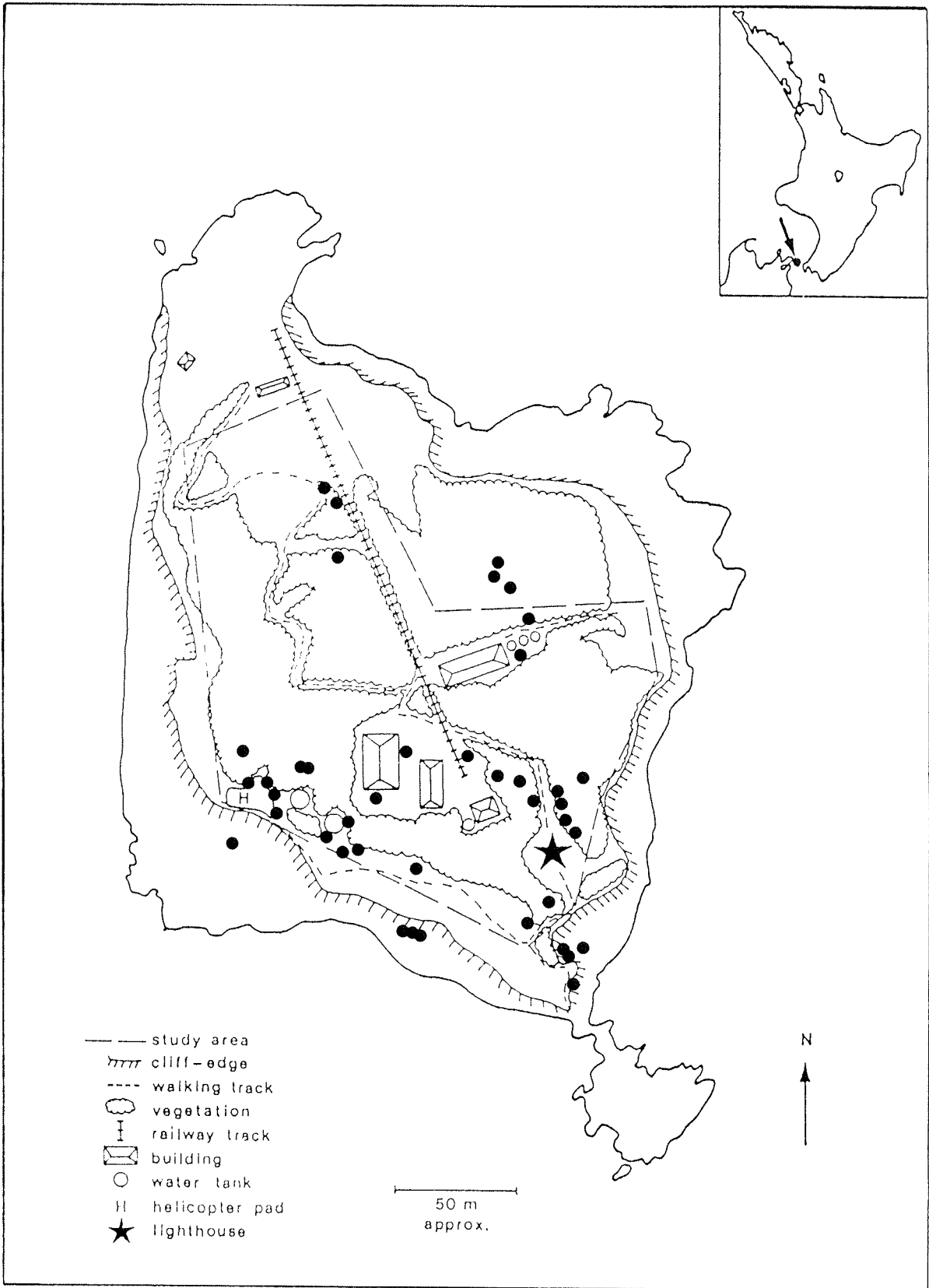


Appendix 3



▲ Sightings of *Leiolopisma nigriplantare polychroma*

Appendix 4



● Sightings of *Hoplodactylus maculatus*

Appendix 5

Morphological Details for *H. duvaucelii* Captured On North Brother Island.

SVL-111mm Weight-38.1gm Sex-female Tail regrown	SVL-77 Weight-10.6gm Sex-? Tail original	SVL-109mm Weight-33.6gm Sex-female Tail regrown
SVL-64mm Weight-5.6gm Sex-? Tail regrown	SVL-103mm Weight-29.6gm Sex-male Tail regrown	SVL-113mm Weight-37.1gm Sex-male Tail regrown
SVL-115mm Weight-40.6 Sex-male Tail regrown	SVL-111mm Weight-37.1gm Sex-female Tail original	SVL-92mm Weight-19.6gm Sex-? Tail original
SVL-82mm Weight-? Sex-? Tail original	SVL-82mm Weight-11.1gm Sex-? Tail original	SVL-101mm Weight-31.6gm Sex-female Tail regrown
SVL-109mm Weight-33.1gm Sex-female Tail original	SVL-108 Weight-34.1gm Sex-female Tail regrown	SVL-107mm Weight-29.2gm Sex-female Tail original
SVL-113mm Weight-38.1gm Sex-male Tail regrown	SVL-113mm Weight-40.6gm Sex-female Tail original	SVL-109mm Weight-39.1gm Sex-female Tail original
SVL-109mm Weight-26.6gm Sex-female Tail regrown	SVL-104 Weight-27.6gm Sex-male Tail original	SVL-100mm Weight-25.6gm Sex-female Tail regrown

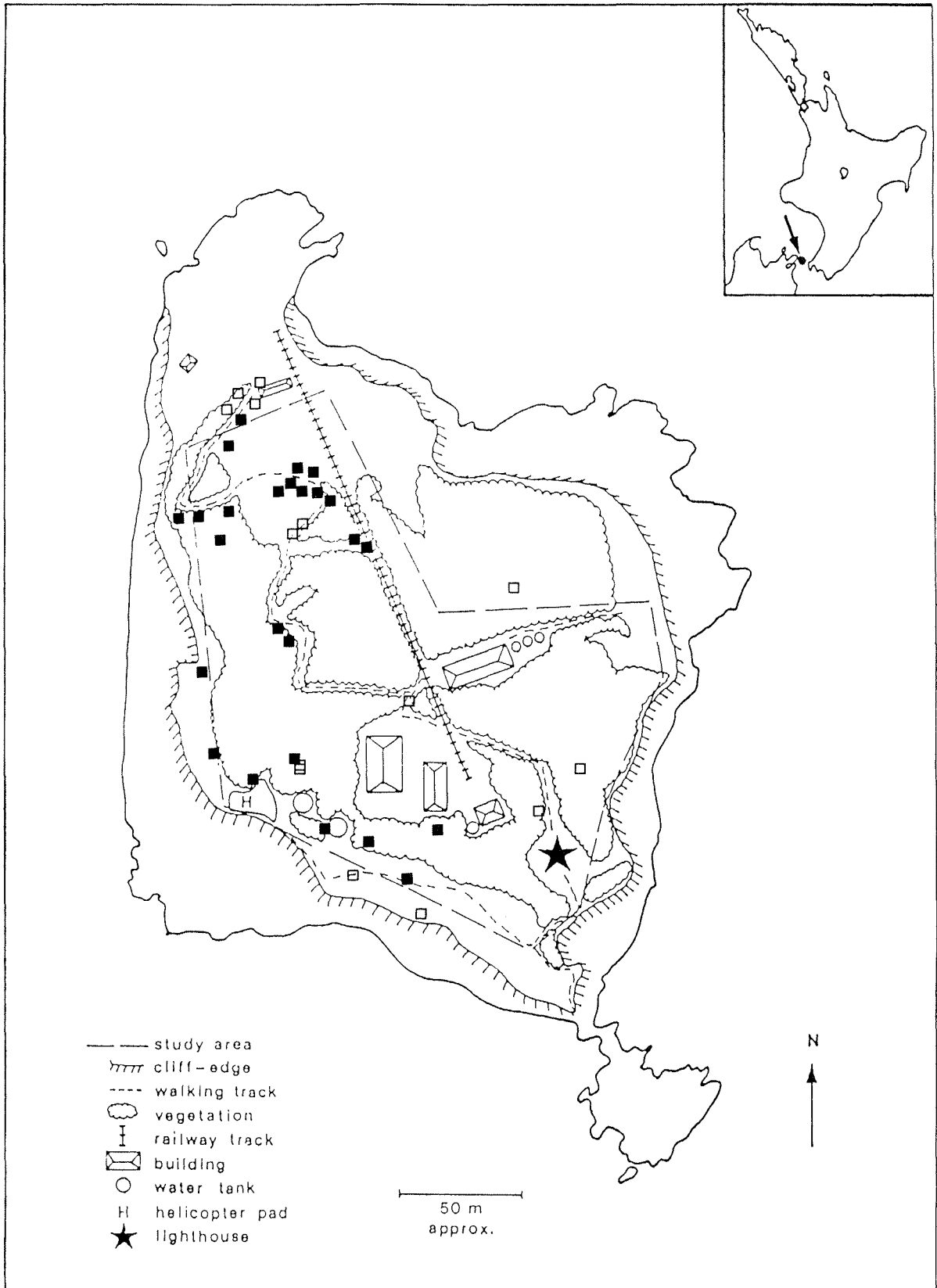
SVL-50mm
Weight-3.6gm
Sex-?
Tail original

SVL-115mm
Weight-37.6gm
Sex-male
Tail regrown

SVL-110mm
Weight-33.6gm
Sex-female
Tail regrown

SVL-85mm
Weight-15.1gm
Sex-?
Tail original

Appendix 6



□ Sightings of *Hoplodactylus duvaucelii*

■ Capture sites of *Hoplodactylus duvaucelii*

Birds

by Kerry-Jayne Wilson.

Records were kept of birds seen on the island and at sea although systematic bird counts were only made within the study plots. Notes on the birds seen follow.

Diving petrel (*Pelecanoides urinatrix*) This was the most commonly observed bird offshore being seen virtually anytime the seas were scanned by telescope. Birds were recorded ashore at eight locations on the south slope of the island and in one quadrat on the west coast. These included quadrats 1, 3, 4, 8, 9, 12, 15 and 16. Distribution of possible breeding sights is given in Appendix 1.

Flesh-footed shearwater (*Puffinus carneipes*) One positively identified in a group of sooty shearwaters on 10 February 1993.

Sooty shearwater (*P. griseus*) Small numbers were seen offshore on 6 and 10 February 1993. After dark on 10 February 1993 one called in flight over the north slope of the island.

Bullers shearwater (*P. bulleri*) One seen north of the island on 9 February 1993.

Fluttering shearwater (*P. gavia*) On 8 February 1993 over 100 fluttering shearwaters were feeding between North and South Brother Islands and by the stacks south of the island. Smaller numbers of fluttering shearwaters were seen on 6 7 and 10 of February 1993.

Huttons shearwaters (*P. huttoni*) One Huttons shearwater was seen in a flock of fluttering shearwaters on 8 February 1993 and several were positively identified on 9 February.

Westland petrel (*Procellaria westlandica*) One seen north of the island on 9 February 1993.

Northern giant petrel (*Macronectes halli*) One seen offshore on 9 February 1993.

Fairy prion (*Pachyptila turtur*) Fairy prions were breeding in all quadrats and at most other places on the island. A few were seen offshore by day.

Blue penguin (*Eudyptula minor*) Several blue penguins were seen in the waters around the island each day, including one that was feeding only a few metres off south landing. They were recorded in quadrats 13 and 17, on coastal rocks by north landing, near the accommodation building and at two places on the south slope (see Appendix 1).

Australasian gannet (*Morus serrator*) One seen on 6 and 8 February 1993.

Pied shag (*Phalacrocorax varius*) One seen feeding close to shore on 6 February 1993.

Little shag (*P. melanoleucos*) One seen on coastal rocks on 9 February 1993 and four

Little shag (*P. melanoleucos*) One seen on coastal rocks on 9 February 1993 and four seen flying past the island on 10 February 1993.

King shag (*Leucocarbo carunculatus*) A king shag was seen on 7 and 8 February 1993.

Spotted shag (*Stictocarbo punctatus*) One was seen feeding about 20m offshore on 7 February 1993.

Black-backed gull (*Larus dominicanus*) Up to three birds seen each day.

Red-billed gull (*Larus novaehollandiae*) There is a colony of at least 100 nests in the vicinity of the lighthouse and its associated buildings.

White fronted tern (*Sterna striata*) A few white fronted terns were seen on 6 and 7 February 1993, and on the night of 9 February 1993 several hundred were seen flying around the island.

Australasian Harrier (*Circus approximans*) One or two harriers were seen overhead most days. They did not appear to roost on the island.

Dunnock (*Prunella modularis*) A few dunnocks were seen, mostly in the *Hebe* scrub near the buildings.

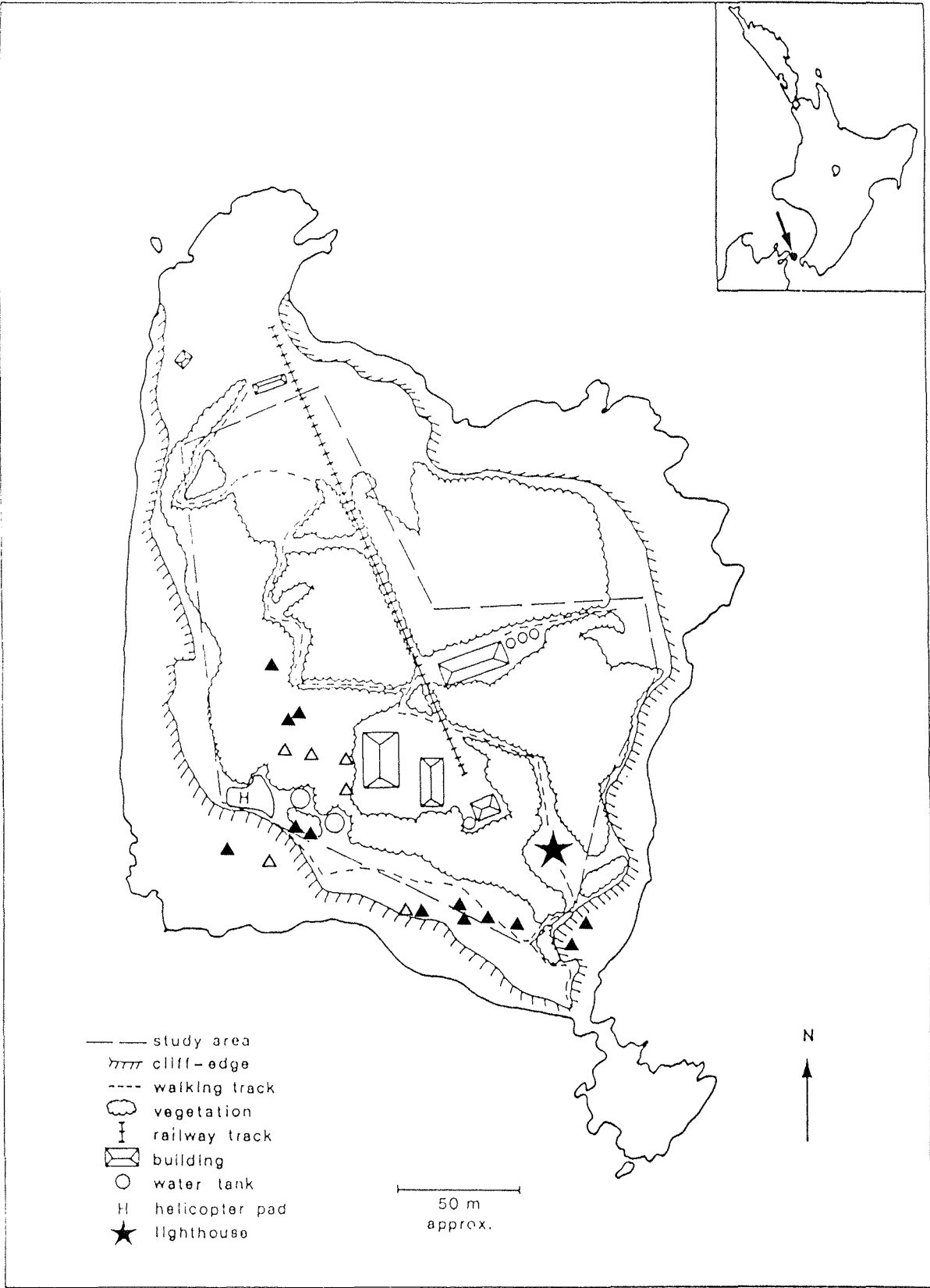
Grey warbler (*Gerygone igata*) Two seen in *Hebe* scrub by the house on 11 February 1993.

Mammals

Kerry-Jayne Wilson

Fur seal (*Arctocephalus forsteri*) Lone male fur seals were seen hauled out on the rocks south east of the helicopter pad on 7, 8 and 10 February 1993. On 7 February 1993 a second seal was seen at sea south of the island.

Appendix 1



▲ Probable breeding localities for diving petrels.
△ Sightings of little blue penguins.

Discussion

By Kerry-Jayne Wilson

The prime objectives of this trip to North Brother Island were to; assess the suitability of the island for our planned studies on seabird-vegetation-reptile-insect interactions.

have a team of ecologists from a range of specialist disciplines work together in the field to develop the conceptual base and methods for this study.

Results from our study of seabird-vegetation-reptile-insect interactions are of a preliminary nature and no reportable analysis of them has been carried out. We append to this report a summary of data collected as part of this study.

In addition the trip provided the opportunity for observations to be made on Duvaucel's gecko which will form part of a planned study of the ecology of this species. The insects collected provided additional distribution records for many species, and included material which will be incorporated into taxonomic studies particularly of Coleoptera and Hymenoptera quite separate from our own research programme. The apparent absence of *Amychus granulatus*, a large, flightless click beetle, which is restricted to a few outer islands of the Marlborough Sounds, is of concern and a further trip to search for this endangered beetle is planned.

North Brother Island has many features we require for our long term study. The island is compact, with simple yet discrete vegetation communities, and we recorded a range of burrow densities from two to 48 burrows per 5x5m quadrat. With three species of burrowing seabird, tuatara and both small and large skinks and geckos the required range of animals are present. Another important feature of this island is accommodation. For prolonged field studies, accommodation with space for writing and sorting of samples is highly desirable. In a study such as this where some people work mostly at night and others by day separate rooms such as are available on North Brother Island are valuable.

The island is smaller than ideal and has a more restricted range of vegetation types than we would wish. We plan to visit Middle Trio Island to assess the suitability of this for study before committing our resources to the Brothers.