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The soil and litter fauna showed a lower diversity and abundance than that found on the adjacent Coromandel mainland.

Key words: Korapuki Island; Mercury Islands; Pohutukawa; Metrosideros excelsa; Ecology; reptiles; Rats; Rattus exulans; Rabbits; Insects; Seabirds.

AN ECOLOGICAL RECONNAISSANCE OF KORAPUKI ISLAND, MERCURY ISLANDS

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G. S. HARDY, R. J. ROSER

ABSTRACT

Observations and data are presented from an expedition to Korapuki Island between 25 November and 2 December, 1974. The vegetation composition and communities are mapped and a checklist of plant species identified and compiled from this and former expeditions is presented.

Seven species of seabird are now recorded as breeding on Korapuki Island and their respective burrow distribution and density is outlined. A breeding record of the Sooty Shearwater is the first for the species breeding on this island. The Grey-faced Petrel is the most abundant breeding seabird on the island with an estimated 600 - 700 pairs. Fifteen species of bush bird are noted, of which the Shining Cuckoo, Long-tailed Cuckoo and Morepork are new records.

Four of the five lizard species previously collected from this island were found, the exception being *Sphenomorphus pseudornatus*. It is considered that the habitat of Korapuki Island is marginal for this species.

Stomach examination of rats trapped on the island reveal a high frequency of occurrence (49%) of bird remains. The rabbit population is considered low compared with data collected from previous expeditions.

The soil and litter fauna showed a lower diversity and abundance than that found on the adjacent Coromandel mainland. Large invertebrates were noticeably rare, due possibly to predation by rats.

An incidental insect list is also presented.

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NOTORNIS 22: 195-220 (1975)

INTRODUCTION

The Mercury Islands, lying off the east coast of the Coromandel Peninsula (36°40′S; 175°50′E — Fig. 1), consist of two sub-groups (Skegg 1963). The southernmost island of the northern sub-group, Korapuki (Rabbit Island), was visited between 25 November and 2 December 1974.

Although studies of the flora and fauna of several of the Mercury Islands have been published (Edgar 1962, Skegg 1963, 1972, Atkinson 1964, Thoreson 1967, Crook 1973, Whitaker 1973 — see also *Tane 18:* 1-121; 1972), only passing mention is made of Korapuki Island which Veitch (1974) considers the most modified of the group, due to the presence of rats and rabbits.

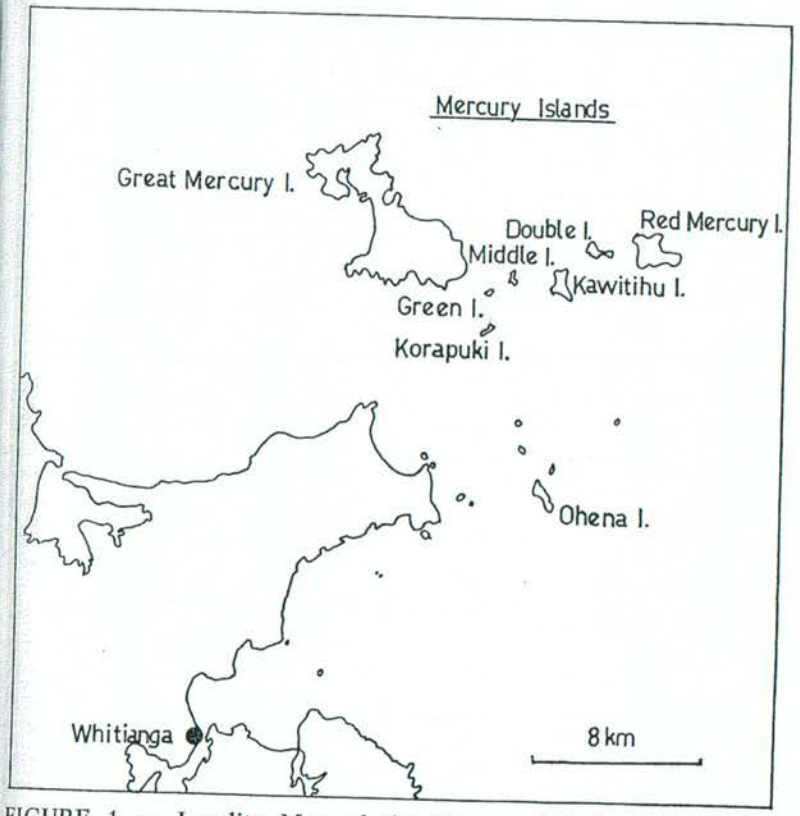


FIGURE 1 — Locality Map of the Mercury Islands, North-eastern New Zealand.

DESCRIPTION OF THE ISLAND

Korapuki Island (18 hectares) is of irregular shape (Fig. 2) and can be divided into eastern and western plateaux linked by a low saddle (Fig. 3). Boulder beaches on the north-western and southern coasts afford easy landings but the rest of the coastline is steep cliffs. There are no permanent streams; a small pond is present near East Point.

Geology

The island is volcanic in origin and the headlands and outcrops of the island are heavily altered grey basaltic lava flows. Bands of red tuffaceous material occur in cliffs to the S.E. and N. and a bench of red basalt rocks occurs at the extreme eastern point and form the Red Bench (Fig. 3).

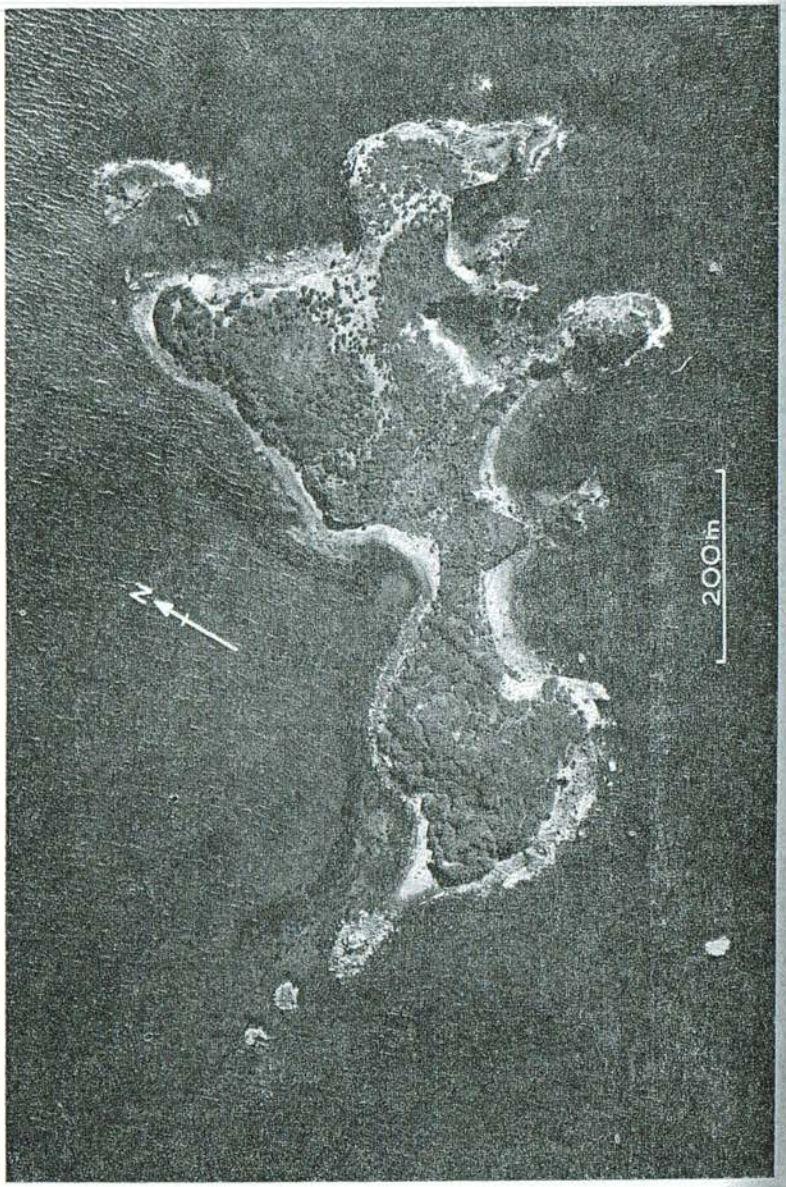


FIGURE 2 — Aerial photograph of Korapuki Island taken 16 December 1960 (N.Z. Department of Lands and Survey No. 1324). Note the extent of open grassland on the Eastern Plateau.

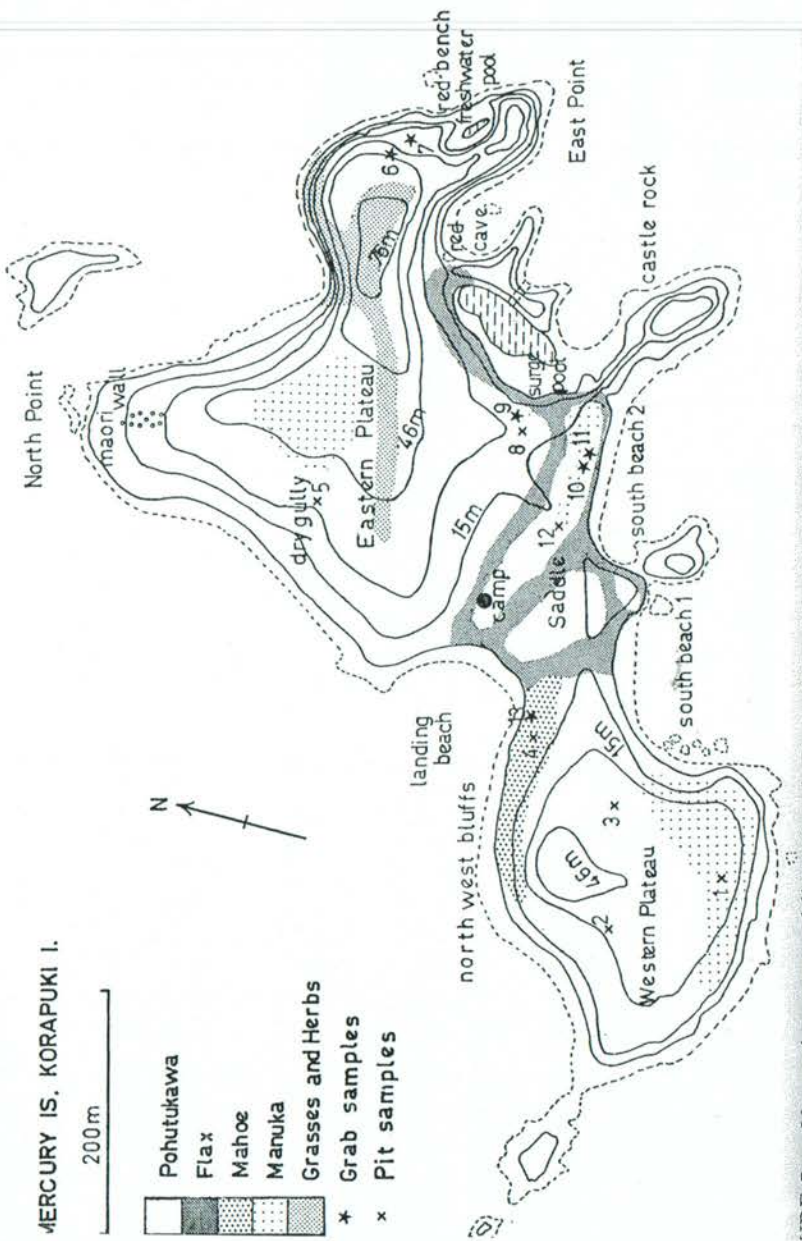
Vegetation

Much of the island in 1925 was apparently under grass and manuka (Edgar 1962). By 1951 regeneration of pohutukawa, flax, karo, mahoe and ngaio had taken place. By 1961 the steep slopes were covered with flax and young pohutukawas. Mahoe occurred in sheltered positions and kawakawa, poroporo and hymenanthera were also noted. Manuka or grass remained on the ridge tops (Edgar 1962). The island was visited in 1962 and 1970 by Dr I. A. E. Atkinson, who compiled a species list (Atkinson, unpubl. report 1962 and pers. comm.). We are indebted to Dr Atkinson for making this list available to us, and for the determination of specimens collected during our visit. In 1962 the seaward slopes were covered by pohutukawa forest and scrub, flax with pohutukawa, or mahoe scrub with pohutukawa. A stand of pure ngaio was noted with the mahoe scrub near the saddle area. The slopes of the plateaux and saddle were covered by pohutukawa scrub, manuka scrub (both erect and prostrate), flax and ratstail grassland. In some places flax, manuka and pohutukawa each formed almost pure stands occurring together in a mosaic pattern. The situation in 1974 was little changed from this. The major areas of vegetation are shown in Fig. 3. Table 1, based in part on that of Atkinson (unpublished report), lists the species and give frequency and locality of plant species. Where species were recorded by Atkinson but not noted by us, the initials I.A.E.A. appear beside the locality.

Western Plateau

The dominant canopy species over most of the plateau is pohutukawa, and the largest trees on the island occur in the north-western corner. Mahoe forms the understorey beneath pohutukawa in this area, and forms the canopy on some slopes above the beach on the north side.

Manuka (about 3.5m high) occurs in dense patches on the south and south-western slopes. Around these patches shrubs of mapou, karo, pohutukawa and mahoe, taupata seedlings, and flax bushes are found. Several tutu plants and some bracken occur at the north-western edge of the manuka. Prostrate manuka bushes are found near the cliff edges. A small stand of ngaio occurs at the north-eastern end of this area, on the slope to the saddle. Mapou shrubs are found in the understorey over much of the plateau, with a dense patch on the eastern end below the summit rocks. Several akepiro shrubs, a lone wharangi tree and a fine black mamaku were found on the gentle slopes in the middle of the plateau. Flax bushes occur throughout the area but there are no dense patches, except in parts on the slope down to the saddle. Toetoe and *Astelia banksii* occur on the western end of the plateau. Two hymenanthera trees were found beneath the summit rocks at the top of the northwest bluffs. Ferns, mainly *Asplenium lucidum*, were abundant amongst the summit rocks.



URE 3 — Vegetation map and litter sample sites of K orapuki Island, November 1974. Topographic names appearing on this map and in the text are for th e convenience of the authors and are not features authorized by the N.Z. Geographical Board.

TABLE 1: VASCULAR FLORA

SPECIES		FREQUENCY	LOCALITY
TREES, SHRUBS AND WOODY CLIMBERS			
Brachyglottis repanda	rangiora	U	clifftop, above red cave
Cassinia retorta	cassinia	U	eastern cliff-tops
Coprosma macrocarpa		F	W.Plateau (local)
C. repens	taupata	U	Southern bays, W.Plateau
C. rhamnoides		U	W.Plateau
Coriaria arborea	tutu	U	Western end, W.Plateau
Corynocarpus laevigatus	karaka	U	I.A.E.A. 1962
Cyathea medullaris	black mamaku	U	middle, W.Plateau
Cyathodes fasciculata	mingimingi	U	cliff-top, above red cave
C. fraseri	patotara	A	ridge top, E.Plateau
Geniostoma ligustrifolium	hangehange		B.D.B.
Hymenanthera novae-zealandiae		U	north west bluffs
Leptospermum ericoides	kanuka		I.A.E.A. 1962
L.scoparium	manuka	A	W.Plateau, Saddle, E.Plateau
L.scoparium prostrate form		A	cliff-tops and exposed areas
Macropiper excelsum	kawakawa	F	W.Plateau
Melicope ternata	wharangi	U	W.Plateau
Melicytus ramiflorus	mahoe	A	almost pure stand north-eastern slopes W.Plateau
Metrosideros excelsa	pohutukawa	A	most areas
Muehlenbeckia complexa	pohue	U	cliffs and stable boulder beaches
Myoporum laetum	ngaio	U	W.Plateau eastern end, E.Plateau northeast slope
Myrsine australis	mapou	F	W.Plateau
Olearia furfuracea	akepiro	U	W.Plateau
Pimelea prostrata var. *urvilleana*			I.A.E.A.
Pittosporum crassifolium	karo	F	W.Plateau
Planchonella novo-zelandica	tawapou	U	eastern cliffs north of red bench
Solanum aviculare	poroporo	F	canopy gaps on E.Plateau
FERNS			
Adiantum hispidulum		U	W.Plateau summit rocks
Asplenium flaccidum		U	W.Plateau summit rocks
A.lucidum		A	beneath pohutukawa
A.obtusatum		U	castle rock
Cheilanthes sieberi		F	open areas
Doodia media		U	I.A.E.A.
Microsorium diversifolium		U	northwestern shoreline
Pellaea rotundifolia		U	A.H.W.
Psilotum nudum		F	under pohutukawa E.Plateau
Pteridium esculentum	bracken	F	W.Plateau, with manuka scrub
Pteristremula		F	W.Plateau summit rocks
Pyrrosia serpens		U	W.Plateau
HERBACEOUS PLANTS: DICOTYLEDONS			
*Anagallis arvensis**	scarlet pimpernell	A	open areas and cliff tops
Apium australe		F	I.A.E.A.

TABLE 1: CONT'D

SPECIES		FREQUENCY	LOCALITY
Chenopodium allanii		U	open areas I.A.E.A.
*Cirsium lanceolatum**	Scots thistle	F	open areas and in canopy gaps
Dichondra repens	Mercury Bay weed	F	open areas around burrows
Disphyma australe	ice plant	A	cliffs, red bench
*Euphorbia peplus**	milkweed	A	open areas
Gnaphalium sp. (cf. *G.audax* and *G.gymnocephalum*		U	cliff edges east and south
G.luteo-album		A	open areas and cliffs
Haloragis depressa		U	I.A.E.A.
H.erecta		U	I.A.E.A.
Hydrocotyle moschata		U	I.A.E.A.
*Hypochoeris radicata**	catsear	F	cliffs
Oxalis corniculata	oxalis	A	spoil from burrows
Oxalis sp.		F	cliff tops
Parietaria debilis		U	I.A.E.A.
Peperomia urvilleana		U	I.A.E.A. splash zone
*Phytolacca octandra**	inkweed	A	open ground fringe beneath pohutukawa
*Ranunculus sessiliflorus**		F	southeastern cliff tops
Salicornia australi		F	red plateau around pool, cliffs
Samolus repens		A	cliffs, red bench
Senecio jacobaea	ragwort	U	cliff top above red cave
S.lautus lautus	shore groundsel	F	I.A.E.A.
Sicyos angulata	mawhai	U	boulders, south end landing beach
Solanum nodiflorum		U	scattered
*Sonchus oleraceus**	sowthistle	U	scattered
Spergularia media	sea spurrey	F	cliffs, red bench
Tetragonia tetragonioides	climbing N.Z. spinach	U	northern cliff, landing beach
Tillaea sieberiana		U	cliffs I.A.E.A.
*Veronica plebeja**	speedwell	F	open areas
Wahlenbergia gracilis		U	I.A.E.A.
HERBACEOUS PLANTS : MONOCOTYLEDONS			
Acianthus sinclairii		U	I.A.E.A.
Arthropodium cirrhatum	rengarenga	U	cliffs between south bays
Astelia banksii		U	W.Plateau
Carex breviculmis		U	W.Plateau eastern end
Cortaderia splendens	toetoe	U	W.Plateau
Cyperus ustulatus		U	southern bays, cliffs
Deyeuxia billardieri		F	I.A.E.A.
Notodanthonia sp.	danthonia	A	summit ridge E.Plateau
Phormium tenax	flax	A	saddle, E.Plateau, some bushes W.Plateau
Poa anceps		U	cliffs
Scirpus cernuus		U	I.A.E.A.
Scirpus nodosus		A	open areas
*Sporobolus africanus**	ratstail	A	summit ridge E.Plateau, open areas

U = Uncommon; few plants seen only at one or two points
F = Frequent; plants seen singly or in small patches in many places
A = Abundant; plants forming almost pure stands or large patches
* = Introduced species
I.A.E.A. = Plant recorded by Dr Atkinson in 1962 or 1970
B.D.B. = " " " Mr Bell but not found in 1962 by Dr Atkinson
A.H.W. = Plant collected by Mr Whitaker in 1970

Saddle Area

Dense flax covers much of the saddle area and access through this is difficult. Flax bushes fringe the low parts of the landing beach, and the low cliffs above south beach 2. Some bracken occurs at the edges of the middle strip of flax. The rest of the saddle area is pohutukawa forest, with a dense patch of manuka scrub at the south-eastern end.

Prostrate manuka is found with this, on the exposed cliff tops. Oxalis, scarlet pimpernell and *Dichondra* are commonly found growing on the heaps of soil outside petrel burrows.

Eastern Plateau

The dominant canopy species over much of this area is pohutukawa. It covers both the rolling slopes of the plateau and is also found on the cliffs and rocky headlands.

The ridge up to the summit and the summit area is open and covered with grasses (ratstail and danthonia), a recumbent prickly shrub *(Cyathodes frazeri)*, scarlet pimpernel, speedwell, milkweed and other herbaceous plants. Pohutukawa shrubs and flax bushes are scattered through this open vegetation. A large patch of wind-sculptured manuka occurs along the northern ridge to the north of the grass and herb field. Areas of dense flax occur on the southern cliffs above the surge pool and occasional flax bushes are found throughout the Eastern Plateau area. On the eastern cliffs one large and several smaller specimens of tawapou are present. A small patch of ngaio occurs at the foot of the dry gully on the north eastern slopes.

At the extreme east of the island is a bench of red basaltic rock, approximately 9m above sea level, 50m long and 28m wide. To landward, the plateau is bordered by a steep cliff of scoriaceous material, which has several stunted pohutukawas and flax bushes growing on it. Running lengthwise along the bench is a freshwater pool (see Fig. 3). Between this and the cliff are patches of ice plant, *Samolus repens, Salicornia australis* and *Spergularia media.* The pool itself has filamentous algae, a variety of insects and snails. The remainder of the bench is devoid of vegetation.

Cliff communities

These were not examined in detail. Plants noted on cliffs and those recorded by Atkinson (unpubl. report) are listed in Table 1.

Evidence of Maori occupation of Korapuki exists in the stone wall on the northern point, localised caches of marine shells and odd, widely scattered flakes of obsidian. Large numbers of water-rounded stones also exist in the upper horizons of the soil on the western and eastern plateaux.

OBSERVATIONS ON THE BREEDING DENSITY AND DISTRIBUTION OF THE SEABIRDS

Seven species of Procellariiformes have now been recorded on Korapuki Island. The island also supports a large breeding population of the Blue Penguin.

BLUE PENGUIN *(Eudyptula minor)*

Blue Penguins breed throughout the Mercury Islands with highest densities on Korapuki and Red Mercury Island (Edgar 1962, Skegg 1963). Penguin burrows are found around most of Korapuki (Fig. 4) where it is one of the most numerous of the breeding seabirds. Much of the fringing flax and shrub areas and beneath shoreline boulders is densely populated, particularly on the western and southern slopes. The flax covered cliffs of the Western Plateau also have many burrows, and some occur beneath Mahoe and Pohutukawa with the highest recorded burrow at about 53m above sea level. In other localities on Korapuki burrows are found up to 30m. Skegg (1963, 1964) recorded penguins breeding at heights of up to 92 and 214m on Red Mercury and Hen Islands respectively. In one area on South Beach 2 a small number of burrows were located high on almost vertical cliffs which were scratched and worn where penguins had struggled up to their nesting sites.

A high number of burrows contained almost fledged chicks, and, on the night of 1 December 1974, two were seen out on the northwest boulder beach from a densely occupied area beneath the rhizomes of *Microsorium diversifolium.*

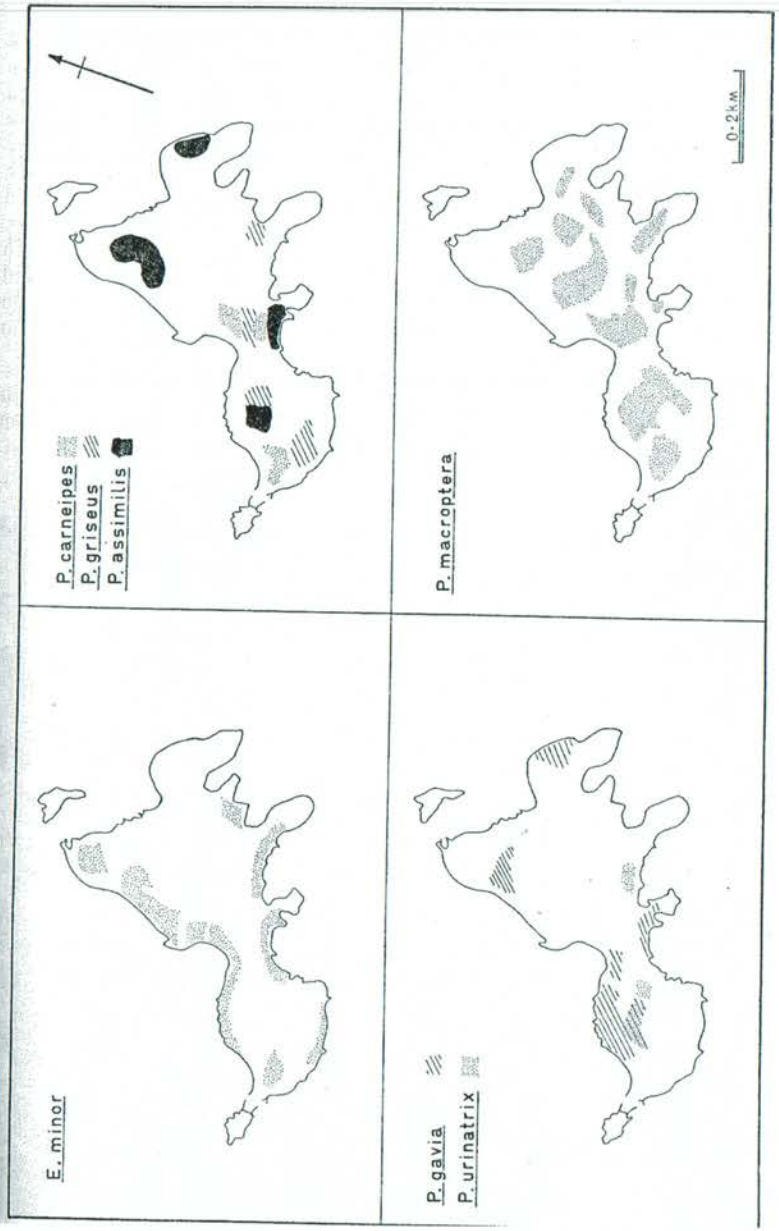
On our return trip from Korapuki to Whitianga on 2 December, eight individuals were observed actively feeding, all within easy reach of nesting areas.

FLESH-FOOTED SHEARWATER *(Puffinus carneipes)*

Few sightings of this species were made, although it is known to be breeding on Ohena Island (Skegg 1963) and on Green Island (Thoreson 1967). Skegg (1963) noted breeding densities of about 43/100m² on Ohena although densities of up to 120/100m² have been recorded on Coppermine Island (Hen and Chickens) by Merton & Atkinson (1968). Only two birds were found ashore during our whole stay on the island, perhaps because our visit may have coincided with the pre-laying exodus from 28 November to 9 December (Thoreson 1967).

SOOTY SHEARWATER *(Puffinus griseus)*

This species nests in small numbers on The Aldermen (Sladden & Falla 1928), Mokohinau Islands, Whale and White Islands (Falla 1934) and the Hen and Chickens (Skegg 1964). Falla (1934: 251)



Four birds were observed on Korapuki. On 28 November a female with an egg in the oviduct was captured on her way to a deep, recently cleaned burrow. Three more individuals were found sitting beneath the roots of the pole manuka stand on the southern cliffs (Fig. 4) on the night of 30 November. These 'burrows' were simply shallow (<12cm) depressions beneath the manuka roots which had been overlain by falling debris (Fig. 5). Use of such unformed burrows is a characteristic of non-breeding birds (J. A. Bartle pers. comm.); however, the soil of this area was hard and stoney which probably precluded deep burrows. Normally burrows are deep and tortuous (Sladden & Falla 1928). Two similar nests were found on the eastern Peninsula and although uninhabited could well belong to *P. griseus.*

This is the first published record of *P. griseus* breeding on Korapuki Island, although it has recently been observed breeding on Kawitihu Island (Skegg 1972).

FIGURE 5 — Sooty Shearwater "burrow" beneath manuka on the southern cliffs of Korapuki Island, see text for discussion.

FLUTTERING SHEARWATER *(Puffinus gavia)*

After the Grey-faced Petrel, the Fluttering Shearwater is the most frequent tube-nose met with on Korapuki. Falla (1934) considers *P. gavia* numerically the commonest breeding petrel in northern coastal waters and Skegg (1963) records them as common on Korapuki in highly variable nesting sites.

Nesting habitats observed during the present study ranged from beneath pohutukawa roots to shallow burrows beneath flax and shoreline boulders (Fig. 4). *P. gavia* favours nesting sites on the lower coastal slopes of islands where suitable habitats are available, but Skegg (1964: 167) recorded the species as the "dominant petrel on the upper slopes" of Hen Island. On Korapuki the burrows were scattered and usually interspersed with burrows of *P. macroptera* and *P. urinatrix.* On the densely burrowed Northwest Bluffs (up to 25m high) a count of up to 19/100m² was made of burrows which could be directly attributed to *P. gavia.* This area appeared to be the preferred habitat on the island, although scattered areas of a similar density were recorded on the cliffs of South Beach 1, amongst *Disphyma australe,* amongst boulders and rocky fissures on Northwest and Northeast faces, or in the high shore boulders and flax together with *E. minor.*

LITTLE SHEARWATER *(Puffinus assimilis)*

Edgar (1962) found the greatest concentrations of this shearwater with *P. macroptera* in the wooded areas in Lunch Bay and Rolypoly Bay, Red Mercury Island. This habitat is almost identical to that where the greatest numbers were found on Korapuki Island. *P. assimilis* breeds only in moderate numbers in well scattered burrows, some being associated with Grey-faced Petrels and Fluttering Shearwaters beneath the dense canopy of the Northwest Bluffs or with Flutterers in short (<1m) burrows with very small entrance holes amongst shattered rock on the cliffs of North Point (Fig. 4).

Although Falla (1934) and Falla *et al.* (1970) described this bird as a winter breeder with most of the young on the wing by the end of October, there is evidence that their breeding cycle is variable and that the Mercury Island population follows a different pattern (Edgar 1962). Edgar reported freshly-laid eggs on Red Mercury Island in early September, and we found fledglings on Korapuki in late November. However, not all Little Shearwaters on the Mercury Islands follow this pattern, for Edgar also found well grown chicks in early September.

On the evening of 28 November one burrow on the Northwest Bluffs of Korapuki Island was inspected and two adult birds were seen inside with an almost fully fledged chick exercising nearby. Another fledgling with only small amounts of down on the nape of the neck and on the breast was seen scuttling amongst the boulders of the Maori stone wall on the Northern Point. *P. assimilis* is not common, and maximum densities are only about 6-8/100m².

GREY-FACED PETREL *(Pterodroma macroptera)*

The Mercury Islands are a stronghold of this species (Skegg 1963) which breeds extensively throughout most islands off north-eastern New Zealand (Sladden & Falla 1928, Falla 1934).

The burrowing habitat described by Heather (*in* Skegg 1964: 169) for Hen Island applies equally to Korapuki: " Particularly favoured was the soil at the foot of the bluffs, in *Astelia* and flax communities, and among boulders and the roots of big trees. They were thus distributed throughout the lower slopes where either beach or cliff is handy. In higher regions they were confined to the neighbourhood of those peaks, bluffs and rocks which pierce the bush canopy."

Falla (1934) suggested that *P. macroptera* is not gregarious or colony-forming, but in one area on Korapuki (the Southern Peninsula), a moderately densely burrowed area (24-36/100m²) consisted almost entirely of Grey-faced Petrel burrows; the majority had chicks present, many still with large amounts of down. Within this area only two burrows were attributed to *P. gavia.* However, the general pattern of Grey-faced Petrel burrowing on Korapuki was of a diffuse and highly variable nature, the distribution of which did not indicate a high degree of habitat selection. In many areas (e.g. Western Plateau, Northern Dry Gully) the soil was very stony and hard or rather thickly littered. Areas such as these sometimes lacked burrows altogether. In such instances burrowing activity was restricted to beneath flax, between the roots of trees and beneath boulders. The preferred habitat of *P. macroptera* was beneath flax or beneath a high canopy where soft friable soil was found e.g. northwest part of the island, central slopes and the Eastern Plateau (Fig. 4). This characteristic coupled with the fact that burrows were generally short and shallow indicates the rather less developed burrowing capabilities of *P. macroptera* compared with such an adept burrower as *P. griseus.*

Edgar (1962) estimated a total population density of *P. macroptera* on Red Mercury, Stanley, Korapuki and Double Islands as about 13,000 pairs and Skegg (1963) made a burrow count of 49/100m² on the slopes of Rolypoly Bay, Red Mercury. The maximum burrowing density on Korapuki, however, was only 36/100m². Based on burrow counts and extrapolation for areas of the island unable to be visited (high Southern peninsulas) a total population estimate for Grey-faced Petrels on Korapuki was between 600 - 700 pairs.

PYCROFT'S PETREL *(Pterodroma pycrofti)*

P. pycrofti was first discovered as breeding on the Mercury Islands by Skegg (1963: 161) who found " some hundreds of pairs on Red Mercury " (see also Skegg 1972 who has since recorded them

forest on 19 November 1972. This record is the earliest recorded date of egg laying in this species (see Bartle 1968). However, Pycroft's Petrels were neither seen nor heard during our stay on the island.

DIVING PETREL *(Pelecanoides urinatrix)*

The highest breeding concentrations of *P. urinatrix* in the Mercury Islands are on nearby Green and Middle Islands where burrow counts range between 60 and 239/100m² (Skegg 1963, Thoreson 1967). Skegg estimated a total population of about 15,000 pairs but Thoreson more accurately estimated about 2,500 individuals on the six acres of Green Island.

Burrow density on Korapuki Island is considerably lower with the highest densities of Diving Petrel burrows at about 24-30/100m² in an isolated area on the slopes of Northwest Bluffs. The species tended to be localised breeders, the largest numbers being recorded between 25 and 35m up on the bluffs where their narrow entranced burrows could be found amongst the roots of Pohutukawa and Mahoe or in fissures in rocky outcrops. The only other area with Diving Petrel burrows was between the two peninsulas on the southern coast (Fig. 4).

The numbers of *P. urinatrix* coming in decreased from 16 birds between 2000-2100 hrs (N.Z. Summer Time) on 26 November to 5 during the same period on 1 December 1974. Thoreson (1969: 255) noted a similar reduction in numbers between late November and mid-December, and indicated that most of the adult birds were apparently moving away to " moult later while at sea." The bulk of the evidence now supports this with the flightless period being spent on the sea surface (Sir Robert Falla pers. comm. 1975). Falla had earlier suggested (see Vooren 1972: 258) that adults remained in their burrows for long periods during the moult.

One burrow was inspected on the Northwest Bluffs on 29 November 1974 and contained an almost fledged chick. Thoreson (1967) records the first juveniles leaving the nest on 22 November 1966 from Green Island.

Seabirds also noted as frequently occurring around the island were: Australian Gannet *(Sula serrator)*, Black Shag *(Phalacrocorax carbo)*, Pied Shag *(P. varius)*, Little Shag *(P. melanoleucos brevirostris)*, Reef Heron *(Egretta sacra)*, Black-backed Gull *(Larus dominicanus)*, Red-billed Gull *(Larus scopulinus)*, Black-billed Gull *(Larus bulleri)* and White-fronted Tern *(Sterna striata)*. The latter nests on

RECORDS OF BUSH BIRDS

Bush birds were recorded by direct sighting or by analysis of the song. The complete list of bush birds is presented in Table 2.

TABLE 2 BUSH BIRDS RECORDED FROM KORAPUKI ISLAND, 25 NOV. - 2 DEC. 1974

SPECIES	SONG HEARD ONLY	NEW RECORD FOR KORAPUKI	RELATIVE ABUNDANCE
* HARRIER			F
RED-CROWNED PARAKEET			A
SHINING CUCKOO		X	A
LONG-TAILED CUCKOO	X	X	U
MOREPORK		X	U
KINGFISHER			U
FANTAIL			A
GREY WARBLER			A
* BLACKBIRD			F
HEDGE SPARROW	X		U
BELLBIRD			U
TUI			U
SILVEREYE			A
* CHAFFINCH			F
STARLING			F

U: Uncommon F: Frequent A: Abundant

* Breeding record (i.e. nests or eggs found)

In order to gain an appreciation and understanding of the whole island ecosystem, of which the avifauna form the most conspicuous part, it is necessary to consider the other animal life, their habitat, distribution and their relative abundance. By providing such a broad general knowledge of this biota a valuable baseline contribution can be made for future expeditions.

REPTILE FAUNA

Five species of lizards have been previously recorded from Korapuki Island (Whitaker 1973). During the present study four of these species were recorded, the exception being *Sphenomorphus pseudornatus*. In the absence of a more recent account, the taxonomy follows McCann (1955) with the following modification. Recent unpublished work by one of us indicates that *S. pseudornatus* (considered by McCann to occur only north of the 38°S. parallel) and *Leiolopisma aeneum* (considered to occur only south of the 38°S. parallel) are conspecific. While this paper is not intended to introduce the taxonomic confusion regarding the New Zealand skinks, it is considered beneficial at this stage to combine McCann's "*pseudornatus*" and "*aeneum*" for the sake of comparison of different island populations*.

Gekkonidae

Hoplodactylus pacificus (Gray)

Only two individuals were seen during the stay, both foraging at dusk on the boulder beach above the landing.

Hoplodactylus duvauceli (Dumeril & Bibron)

These geckos were also rare, with only six being seen — one on the boulder beach and five in the forest at the southern end of the island.

Scincidae

Leiolopisma moco (Dumeril & Bibron)

This skink was commonly observed on Korapuki. Although frequently seen on the grassy areas of the "eastern plateau" and under open forest at the northern end of the island, it was most abundant in the flax line bordering the "landing bay" and amongst boulders high up on the beach (see Whitaker 1973). In the last area, the distribution of *L. moco* overlapped with that of *L. smithi*. The pattern of pit-fall trapping used indicated that *L. moco* tends to establish territories around basking sites, a characteristic reported by Whitaker (1968).

Leiolopisma smithi (Gray)

This skink was seen commonly along the boulder beaches of the landing and the south side of the saddle.

Sphenomorphus "pseudornatus" McCann/*Leiolopisma "aeneum"* (Girard)

Whitaker's (1973) consideration that these lizards are rare on Korapuki is upheld by our failing to sight a single specimen. It is suggested that the low numbers result primarily from a lack of suitable habitat, rather than from predation. There is considerable evidence elsewhere that population densities may be little affected by kiore *(Ratius exulans)*, although effects of the latter may be obscured by latitude, climate, topography and vegetation (Whitaker 1973). *S. pseudornatus* occurs frequently on a number of kiore-inhabited islands, including Red Mercury (Towns 1972), three islands of the Hen and Chickens group (Whitaker 1973), Little Barrier, Great Barrier as well as Brampton Shoal, North of Waitangi (pers. obs.).

* Note also that A. E. Greer has recently included the New Zealand *Sphenomorphus* under the genus *Leiolopisma*. *Aust. J. Zool., Suppl. Series No. 31*, 1974.

The assumption (Towns 1971) that *Rattus norvegicus* is mainly responsible for the low numbers of *S. pseudornatus* on Whale Island (Bay of Plenty), does not concur with the high numbers seen on Kapiti Island (southwest North Island coast) (pers. obs.), where both *R. norvegicus* and *R. exulans* are present (Dr Ben Bell pers. comm.). On Kapiti, the damp forest-covered screes and logs above high tide mark provide a highly suitable habitat. On Whale Island, as on Korapuki, these habitat requirements are much less in evidence.

Tuatara
Sphenodon punctatus

The absence of tuataras on Korapuki has been noted by Crook (1973) and was confirmed by the present party. However, a number of bones comprising part of a tuatara skull were discovered by G.R.F.H. and M.J.M. on the summit ridge of the Eastern Plateau. Whether these bones represent the remains of an animal transported from Middle or Green Islands by a Harrier, or have been excavated by the burrowing activities of rabbits or petrels poses an interesting question.

OBSERVATIONS ON RATS

Kiore (*Rattus exulans* (Peale)) have been recorded from four of the islands in the Mercury Group: Red Mercury, Kawitihu, Double and Korapuki (Crook 1973, Whitaker 1973).

During this study break-back traps were used and were set on seven nights, giving a total of 158 trap nights. Rats were widely distributed on the island but highest numbers were observed in the flax and bush fringes and it appears that these areas are the most favoured habitats. In 22 trap nights on the Eastern Plateau, despite presence of rat droppings, no rats were trapped. In 88 trap nights on the bush slopes of the Western Plateau, 14 rats were trapped, and in 48 trap nights in the flax fringe around the landing beach 16 rats were trapped. Although the total catch of 30 was too small for detailed analysis, the following observations can be made.

Size

Of the 30 rats, nineteen (8 male, 11 female) were adults with eleven juveniles from which the following measurements were obtained. Figures in parentheses indicate the maximum:

	Mean Length (mm)	Mean Weight (gms)	Mean Right Hind Foot (mm) of all specimens	Mean Ear (mm) of all specimens
Adult Males	306.7 (316)	106.9 (115)	25.5	16.3
Adult Females	298.0	96.6		

These rats would therefore appear to be larger than those recorded from a number of Pacific Islands (see Mosby 1971, Twibell 1973 for reviews) but similar in size to others from New Zealand (see Watson 1956, Wodzicki & Robertson 1959 and Bettesworth 1972).

Stomach examination

Preliminary examination of the stomach contents of 29 rats indicates that vegetation is an important part of their diet (frequency of occurrence — 75.9%). Small quantities of insect remains were also commonly present. The frequency of occurrence of bird down in the stomachs (49%) suggests active predation, although distinction between scavenged and predated chicks cannot be made. One Grey-faced Petrel chick was found outside a burrow by G.R.F.H. to have been recently stripped clean of flesh and with fresh rat droppings in the vicinity. Thoreson (1967) has recorded kiore eating the eggs of *P. urinatrix* on Kawitihu Island, while Bettesworth (1972) records moderate quantities (24% occurrence) of vertebrate remains in stomachs of rats from Red Mercury. M. J. Imber (pers. comm.) has noted predation of Cooks Petrel *(Pterodroma cooki)* chicks by kiore on Little Barrier. No lizard remains were noted. Nineteen specimens of a helminth (*Physaloptera murisbrasiliensis* Diesing) were recorded from eight of the stomachs.

Abundance

Comparatively few kiore were observed by the present party with night sightings amounting to only three dozen during the whole period on the island. This contrasts with the observations made by members of an expedition in winter (28 June) 1970, when three observers noted 31 kiore in 1½ hours at night with high populations being recorded at other times (Atkinson pers. comm.). However, one would expect kiore numbers to be higher in winter (following the seasonal peak of March-April- May, see Watson) than in late November, when island populations are usually only just beginning to build up. It is perhaps of interest to note that three of the eleven females were pregnant, containing 5, 6, and 7 embryos respectively.

The rats trapped in the present study and a detailed list of body measurements will be deposited in the National Museum.

OBSERVATIONS ON RABBITS

Rabbits (*Oryctolagus c. cuniculus* L.) were introduced to Korapuki and Kawhitihu Islands during the 19th century (Skegg 1963) but since then little information other than their presence has been gathered. Dr I. A. E. Atkinson visited Korapuki in 1962 and 1970 and recorded the following information:—

September 1962: browsing noted on inkweed *(Phytolacca octandra)*

June 1970: browsing noted on *Notodanthonia* sp., *Psilotum nudum, Scirpus nodosus, Senecio lautus,* flax, ratstail grass *(Sporobolus africanus), Halorhagis depressa, H. erecta, Poa anceps* and *Doodia media.* A number of woody species were also being browsed. Three rabbits were seen by three other members of the party in 1 hour 30 minutes of night searching.

November 1972: (A. H. Whitaker pers. comm.) noted ngaio heavily browsed and saw a group of three rabbits near the landing beach.

During our stay on Korapuki only five rabbits were seen in a total of 130 man hours (both day and night) investigation over the major part of the island. Rabbit sign was found on the lower slopes of the shoreline adjacent to flax; on the " red plateau "; the flax above " south beach 2 "; the most easterly strip of flax on the " saddle " area, and on the open grass and herb field on the " eastern plateau." Most sign was observed in this open area. Sign encountered included rabbit-occupied petrel burrows (2), scratchings (5), dung heaps (2 fresh, 6 old) and abundant scattered pellets. The following plant species were browsed: ngaio *(Myoporum laetum),* iceplant *(Disphyma australe), Samolus repens,* spurrey *(Spergularia media), Psilotum nudum, Salicornia australis* and ratstail grass. No plants were heavily browsed, and abundant food plants and seedlings bore no evidence of browsing by rabbits. This, together with the low incidence of rabbit sightings, suggests that the population on Korapuki was lower than in 1962, 1970 and 1972. The pohutukawa crowns have clearly increased at the expense of the open grass and herb field areas since 1960 (Lands & Survey aerial photograph 1960 Fig. 2). This reduction in grazing area may have accounted for a decline in the rabbit population. The rabbits seen appeared large and healthy, but two freshly dead ones were found on the north-eastern side of the landing beach.

INVERTEBRATE FAUNA

Insects — general

Few large flying insects were observed. Only wasps and cicadas were seen during the day. Moths and Staphylinid beetles were collected at night using a 1500 cp Coleman pressure lamp. Beetles were collected from rotting pohutukawa and mahoe and also from beneath pohutukawa bark. Apart from a Noctuid larva, collected from flax, no other large species of moth or beetle were found. The Orthoptera were represented by grasshoppers only. A list of these identified insects and land and freshwater molluscs is presented in Appendix 1.

Freshwater pool

This pool was apparently unnoticed by previous expeditions, and freshwater insects have not previously been recorded on Korapuki Island. The following species were collected: *Rhantus pulverosus*

Litter and soil fauna

Litter and soil were collected either by pit sampling in which each horizon (litter, fermentation, humification, and upper mineral soil horizons) was removed from an area of 25cm² or by grab sampling of material by hand, usually litter and fermentation horizons. Pit sampling permitted the assessment of animal concentrations down the profile and of population densities. Animals were extracted from the samples using Tullgren funnels at the Soil Bureau, Taita.

Seven sets of pit samples and six grab samples were collected at the sampling sites shown in Fig. 3. The animal groups present in each sample were recorded and densities estimated.

Animal groups recognised were classes of annelids, molluscs, crustaceans and myriapods, sub-classes of arachnids, and orders of insects (separating larval and adult forms). This crude breakdown of the fauna allows a reasonable assessment of faunal diversity. Depth and nature of each horizon were noted in the field. Soil descriptions of the samples from the lower horizons were made by Dr I. A. E. Atkinson. Measurements of litter and soil pH were made in the laboratory, Taita.

Animal distribution, diversity, density and dominance were examined in relation to pH, vegetation type, soil type and depth (Table 3).

(1) *Pohutukawa with no understorey plants* (samples 2, 5, 8, 6 and 9)

The profile structure varied from a dry, loosely packed litter layer overlying the mineral soil horizons, to similar litter layers overlying well developed F, H and A horizons (see Table 3). The litter layer (2-3cm thick) was composed mainly of pohutukawa leaves and twigs. Where present, the F horizon of partially decomposed litter material, was 1.5-2cm thick and less acid than the litter. Samples 5 and 8 had deep H and A horizons composed of fine mixed mineral and organic material. The mineral soil was a brown silt loam. Small round pebbles were present in the F horizon and lower horizons in samples 2 and 8.

The fauna tended to be diverse in soil profiles under the pure pohutukawa canopy, especially where organic layers were deepest, but numbers tended to be low or moderate. Millipedes were commonly the dominant group, and scarabaeid larvae and earthworms were present in the deeper organic horizons of sample 5. Lepidopteran and dipteran larvae were common in some samples. Two ant species were recorded *(Strumigenys perplexa* and *Amblyopone australis).*

(2) *Pohutukawa with understorey plants* (samples 1, 3, 12 and 10)

The main understorey plant species for these samples are listed

TABLE 3. Analysis of invertebrates in pit and grab samples of soil and litter from Korapuki Island, November, 1974.

[C]anopy	Other Vegetation	Horizon depth (cm) L	F	H	A	Horizon pH L	F	H	A	Most populated horizons	Number of faunal groups	Animal nos. (excluding mites & Collembola)	Dominant groups
[po]hutukawa		3	2			5.3	6.5			F + H	16	<100	lepidopteran larvae, millipedes
"		3	1.5	2	7	5.1	6.5	6.4	6.7	H + A	21	100 - 500	millipedes, some earthworms in A horizon
"		2	2		6+	5.3	5.8	6.2		F, H + A	26	100 - 500	none
"							5.3			-	16	100 - 500	none
"							5.3			-	21	100 - 500	millipedes, psocopterans
"	manuka, mahoe, Coprosma macrocarpa	1.5	2.5	4	4	4.8	4.7	4.4	5.0	F, H	21	100 - 500	millipedes
"	mahoe, mapou, akepiro	4	4	8	2	4.7	4.5	5.1	5.4	F	19	100 - 500	millipedes
"	manuka, flax	1.5	5	6	4+	5.0	5.4	5.1	6.4	F	28	100 - 500	millipedes, thrips, campodeid diplurans
"	manuka, flax						4.6			-	8	<100	lepidopteran larvae, thrips
[m]ahoe		3	9			5.7	6.9			F + H	30	>500	millipedes, ants, beetles
"							5.6			-	12	>500	psocopterans, dipteran larvae
[t]awapou							6.0			-	19	100 - 500	psocopterans, millipedes, lepidopteran larvae, beetles
[p]ohutukawa	manuka, flax						5.5			-	8	<100	none

*Grab sample, B bird burrow spoil, L litter, F fermentation horizon, H humification horizon, A top horizon of mineral soil

from pure pohutukawa, and few animals were collected from it. Beneath the litter was a loose, more moist, deep (3 to 4cm) F horizon with fine roots. Myriapods, particularly millipedes, were common in this horizon, and in sample 3 most animals were present. The H horizon below the F horizon was also deep and contained much mineral matter. Many millipedes were present in the H horizon in sample 1. Some A horizon material was collected but few animals were present.

Sample 12 was collected from the Saddle area and although the litter was mainly pohutukawa leaves, manuka and flax remains were also present. The litter was shallow (1.5cm), dry and more acid than pure pohutukawa litter. Few animals were collected from the litter. The F horizon, composed of fine organic matter and a fine-root mat, was deep (5cm), less acid than the litter (pH 5.4) and had a large and varied fauna. Myriapods (in particular millipedes of several families), weevils, campodeid diplurans, dipteran larvae and thrips were common. A nest of the ant *Strumigenys perplexa* was disturbed in this horizon. The H horizon was also deep (6cm), peaty and with fine roots. Millipedes were common in this horizon. Small round pebbles were found in the A horizon but there were few animals present. Apart from lepidoptera larvae and thrips, there were few animals in the litter grab (sample 10) composed of pohutukawa, manuka and flax remains, from the Saddle area.

(3) *Mahoe* (samples 4 and 13)

The forest litter in sample 4 was 3cm deep, loosely packed, composed of mahoe and with some pohutukawa leaves, and with a pH of 5.7. The fauna was varied but not large. Beneath the litter was a deep layer (9cm) of loosely packed, mixed mineral and organic matter. The pH of this was 6.9, and the largest and most diverse fauna of any sample was present. Myriapods, especially millipedes, isopods, bettles, ants, lepidopteran larvae and snails were common. Three species of ants, *Chelaner smithi, Amblyopone saundersi* and *Heteroponera brouni,* were present.

Sample 13 consisted of loose dry material from an area near petrel burrows. The fauna was of limited diversity but large in numbers. Psocopterans dominated the fauna, and beetles, beetle larvae, dipteran and lepidopteran larvae were common. Myriapods were absent. The litter was deep, but the deep mineral/organic layer that was present beneath the litter in sample 4 was absent, perhaps accounting for the absence of myriapods.

(4) *Tawapou* (sample 7)

Litter from beneath the large tawapou tree on the eastern cliffs was deep and dry, and composed mainly of tawapou leaves

(5) *Spoil from outside a petrel burrow* (sample 11)

This sample was composed of dark brown silt loam, with a pH of 5.5. Few animals other than several centipedes and beetle larvae were present. Litter was absent.

Remarks

The variety of animals appeared to be higher where deeper organic layers occurred (e.g. samples 4, 8 and 12), and numbers tended to be greatest in the less acid material (e.g. F and H of sample 4, F and H of sample 8, samples 13 and 7). Numbers and diversity tended to be lowest in pohutukawa litter especially where the organic layers were thin and dry. Disturbance of litter by birds near petrel burrows probably increases moisture loss from the lower horizons and reduces the suitability of these horizons for litter-decomposing invertebrates which generally have a high moisture requirement. The absence of these animals must slow down decomposition and humification of the litter.

Moisture factors are responsible for the low numbers and diversity of the invertebrate fauna of the organic horizons on Korapuki when compared with the mainland. Similar-sized grab samples of litter and organic matter from beneath montane forest on the Coromandel Peninsula (near the summit, Tapu/Coroglen Road) yielded a greater variety and larger numbers of animals than those from Korapuki.

Few large invertebrates (beetles of more than 10mm in length and millipedes of more than 20mm in length) were found in the samples and few were noted beneath logs and stones. This may be related to the presence of rats on the island which are known to eat larger invertebrates (see Bettesworth 1972).

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LITERATURE CITED

ATKINSON, I. A. E. 1962. Unpublished report on the vegetation of the smaller Mercury Islands and Ohena Island.
ATKINSON, I. A. E. 1964. The flora, vegetation and soils of Middle and Green Island, Mercury Islands Group. N.Z. Journal of Botany 2: 385-402.
ATKINSON, I. A. E. 1973: Protection and use of the islands in Hauraki Gulf Maritime Park. Proceedings of New Zealand Ecological Society 20: 103-114.
BARTLE, J. A. 1968. Observations on the breeding habits of Pycroft's Petrel. Notornis 15: 70-99.
BETTESWORTH, D. J. 1972. **Rattus exulans** on Red Mercury Island. Tane 18: 117-118.
CROOK, I. G. 1973. The tuatara, **Sphenodon punctatus** Gray, on islands with and without populations of the Polynesian rat **Rattus exulans** (Peale). Proceedings of New Zealand Ecological Society 20: 115-120.
EDGAR, A. T. 1962. A visit to the Mercury Islands. Notornis 10: 1-15.
FALLA, R. A. 1934. The distribution and breeding habits of petrels in northern New Zealand. Records of the Auckland Institute and Museum 1: 245-259.
FALLA, R. A.; SIBSON, R. B.; TURBOTT, E. G. 1970. A field guide to the birds of New Zealand. Collins, London. 256 pp.
McCANN, C. M. 1955. The lizards of New Zealand, Gekkonidae and Scincidae. Dominion Museum Bulletin No. 17: 127 pp.
MERTON, D. V.; ATKINSON, I. A. E. 1968. Notes on the birds of Coppermine Island, Hen and Chickens group. Notornis 15: 99-107.
MOSBY, J. M. 1971. Ecology, parasitology and feeding habits of **Rattus exulans** (Peale) from the Tokelau Islands. M.Sc. Thesis, Victoria University of Wellington, N.Z.
SKEGG, P. D. G. 1963. Birds of the Mercury Islands Group. Notornis 10: 153-168.
SKEGG, P. D. G. 1964. Birds of the Hen and Chickens Islands. Notornis 11: 159-176.
SKEGG, P. D. G. 1972. Further observations on the Mercury Islands. Notornis 19: 365-368.
SLADDEN, B.; FALLA, R. A. 1928. Alderman Islands. N.Z. Journal of Science and Technology 9: 282-290.
THORESON, A. C. 1967. Ecological observations on Stanley and Green Islands, Mercury Group. Notornis 14: 182-200.
THORESON, A. C. 1969. Observations on the breeding behaviour of the Diving Petrel **Pelecanoides u. urinatrix** (Gmelin). Notornis 16: 241-260.
TOWNS, D. R. 1971. The lizards of Whale Island. Tane 17: 61-65.
TOWNS. D. R. 1972. The reptiles of Red Mercury Island. Tane 18: 95-105.
TWIBELL, T. 1973. The ecology of rodents in the Tonga Islands. Pacific Science 27: 92-98.
VEITCH, C. R. 1974. Island Surveys, Wildlife — A Review No. 5' 38-40.
VOOREN, C. M. 1972. Seasonal abundance and behaviour of seabirds in the Bay of Plenty, New Zealand. Notornis 19: 250-260.
WATSON, J. S. 1956. The present distribution of **Rattus exulans** (Peale) in New Zealand. N.Z. Journal of Science and Technology 37: 559-570.
WHITAKER, A. H. 1968. The lizards of the Poor Knights Islands, New Zealand. N.Z. Journal of Science 11: 623-651.
WHITAKER, A. H. 1973. Lizard populations on islands with and without Polynesian rats **Rattus exulans** (Peale). Proceedings of New Zealand Ecological Society 20: 121-130.
WODZICKI, K. A.; ROBERTSON, F. H. 1959. Birds with a note on the mammal **Rattus exulans** (Peale). **In:** White Island, compiled by HAMILTON, W. M.; BAUMGART, I. L. N.Z. Department of Scientific and Industrial Research Bulletin, 127: 70-82.

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APPENDIX 1: List of Insects, Land and Freshwater Mollusca collected from Korapuki Island, 1974

INSECTA

ORTHOPTERA		
	Phaulicridium marginale	(Acrididae)
PHASMATODEA		
	Clitarchus hookeri	(Phasmidae)
HEMIPTERA		
	Amphipsalta cingulata	(Cicadidae)
	Kikihea cutora cumberi	"
	Notopsalta sericea	"
	Anisops sp.	(Notonectidae)
	Sigara arguta	(Corixidae)
COLEOPTERA		
	Holcaspis mucronata	(Carabidae)
	Rhantus pulverosus	(Dytiscidae)
	Cafius quadriimpressus	(Staphylinidae)
	Cafius caviceps	"
	Odontria xanthosticta	(Scarabaeidae)
	Ataenius picinus	"
	Pedilophorus crysopepsis	(Byrrhidae)
	Eucolaspis sp.	(Chrysomelidae)
	Xyloteles laetus	(Cerambycidae)
LEPIDOPTERA		
	Ctenopseustis obliquana	(Tortricidae)
	Prothelymna antiquana	"
	Strepsicrates zopherana	"
	Bactra noteraula	"
	"*Crocidosemioides*" n.sp.	"
	Grechthia exospila	(Grechthiidae)
	Hectacma stilbella	"
	Scrobipalpa plaesiosema	(Gelechiidae)
	Pareromene auriscriptella	(Pyralidae)
	Proternia philocapne	"
	Scoparia sp. nr *chimeria*	"
	Gellonia dejectaria	(Geometridae)
	Helastia cineraria	"
	Helastia venipuncta	"
	Orthoclydon praefectata	"
	Pseudocoremia suavis	"
	"*Persectania*" *steropastis*	(Noctuidae)
HYMENOPTERA		
	Polistes humilis	(Vespidae)
	Amblyopone saundersi	(Formicidae)
	Amblyopone australis	"
	Chelaner smithi	"
	Chelaner antarcticus	"
	Strumigenys perplexa	"
	Monomorium antipodum	"
	Heteroponera brouni	"

MOLLUSCA

GASTROPODA		
	Cytora sp.	(Cyclophoridae)
	Potamopyrgus antipodarum	(Hydrobiidae)
	Therasia traversi	(Plammulinidae)
	Therasia zelandiae	"
	Charopa pilsbryi	(Charopidae)
	Ptychodon varicosa	"
	Lamellidea (*Tornatellinops*) *novoseelandica*	(Elasmatinidae)