MOKOHINAU (POKOHINU) ISLANDS – BIRD SURVEY

Search for a possible breeding site for New Zealand Storm Petrel (*Oceanites maorianus*) and general survey of nesting sites for seabirds: 26-28 May 2004

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1 Introduction

The discovery of 'NZ Storm Petrels' in Hauraki Gulf waters and the ensuing discussion is the most exciting NZ bird story for many years. It began on the 25th January 2003 when a possible sighting of the supposedly extinct New Zealand Storm Petrel (*Oceanites maorianus*) was made by Brent Stephenson, Ian Saville and several other birders, during a pelagic bird watching trip out of Whitianga. Photos were taken and a report of the sighting made, creating a lot of interest and speculation amongst the NZ ornithological and scientific community, as well as overseas. Stephenson and Saville made further trips to the same area (7th September and 6th November 2003) but were unsuccessful in seeing the bird again.

On 1st Nov 2003 a small black and white storm petrel was sighted by Chris Gaskin north of Little Barrier in the Hauraki Gulf on a pelagic trip. With the promotion of the Gulf as a pelagic birdwatching destination it has been possible to run regular birdwatching trips attracting overseas birdwatchers. On the 17th November 2003 approx. 10 birds were observed, photographed and video-taped by two British seabird enthusiasts (Bob Flood and Bryan Thomas) in the same area as the 1 November sighting to the north of Little Barrier Island. The publication of these photographs in the December 2003 issue of 'Birding World' (along with the accompanying article) generated a further excitement internationally. Since that time consistent sightings of these birds have been made in the Outer Hauraki Gulf on weekly pelagic birdwatching tours.

Mike Imber, in his April 2004 report on NZ Storm Petrels to the NZ Rare Birds Committee, noted: *I do not favour the idea of these NZ Storm Petrels representing a random irruption in New Zealand seas of a species breeding elsewhere. I do accept the suggestion already advanced in RBC discussion documents on this species, that this represents a near-extinct species of ca.1850 to 2000 which has been released from predation pressure (probably mainly rats* Rattus exulans*) and is now increasing to the point where it is readily detectable. How this has happened will have to await the discovery of its breeding place or places, and then we will have a much better idea of the ecological history of its survival.*

For the purposes of this report we regard these birds as a distinct species which in all probability is the NZ Storm Petrel *Oceanites maorianus.* At the time of writing formal taxonomic identification has yet to be completed, likewise ratification by the NZ Rare Birds Committee.

All sightings of NZ Storm Petrels in the Hauraki Gulf have been plotted against trip routes, wind direction and strength, chumming locations and non-sightings while chumming (Chris Gaskin and Karen Baird, in prep). Preliminary analysis of this data leads us to believe that the Mokohinau (Pokohinu) Island Group is the most likely breeding location for these birds in the Outer Hauraki Gulf although other sites remain a possibility. Seasonal behaviour and known breeding sites of White-faced Storm Petrel (*Pelagodroma marina*) are additional factors in this study. Further analysis of sightings will be carried out jointly with Department of Conservation and other interested parties to facilitate the search for NZ Storm Petrel breeding areas.

1.1 Purpose of this visit

The purpose of this visit was to undertake a ground search of Burgess, Hokoromea (Flax), Atihau (Trig), Stack H, Lizard and Groper Islands for sign of breeding of the NZ Storm Petrel. Although late in the season it was possible that evidence of breeding (carcasses, feathers etc) could still be around. This survey was in preparation for a more exhaustive survey later in the year once the return of NZ Storm Petrels to the Outer Hauraki Gulf is confirmed. Our initial plan had been to make this visit in March 2004 while NZ Storm Petrels were still being seen in the Hauraki Gulf area; to link with a DOC team working on the islands maintaining bait stations, checking tracking tunnels and locating/clearing weeds. Unfortunately this was not possible and the late-April dates were set. Following the eradication of kiore from most of the Mokohinau Islands in 1990, this visit also presented the opportunity to undertake a general bird survey of the islands. Previous studies and reports are listed in Section 6 References below.

On Monday 26 April 2004 the party comprised Halema Jamieson (Biodiversity Officer, Great Barrier Island Area Office), Derek Bettesworth (Whangarei), Nigel Milius (Whitianga), Brett Rathe (Warkworth), Karen Baird and Chris Gaskin (both Warkworth). We gathered at Sandspit to load up Brett's boat *Assassin* then crossed to Great Barrier Island to pick up Halema from Nagle's Bay. Fairly quiet in terms of birds seen en route. We reached the Mokohinaus late morning after a brief stop at Maori Rocks to show Halema the Grey Ternlets.

1.2 Mokohinau (Pokohinu) Island Group

The Mokohinau Islands are known to the Ngati Rehua as Pokohinu Islands and are located in the Outer Hauraki Gulf; approximately 100km northeast of Auckland, and 25km northwest of Great Barrier Island (Fig. 5). The Group is comprised of several islands and a number of smaller stacks and rocks. All islands are rat and mice-free, with monitoring and bait stations maintained and serviced four times a year to protect against re-infestation. Kiore (*Rattus exulans*) were eradicated on most islands following the first year of the eradication programme in 1990 (where they were present), and more recently (1997) on Fanal (Motukino) Island. Table 1 lists those islands that were: rat-free; unlikely to have had rats: and where present, when eradication was implemented.

Fig. 3 Atihau (back left) & Arches Rock

Fig. 4 Western headland on Burgess with Bird Rock. Groper Island in distance

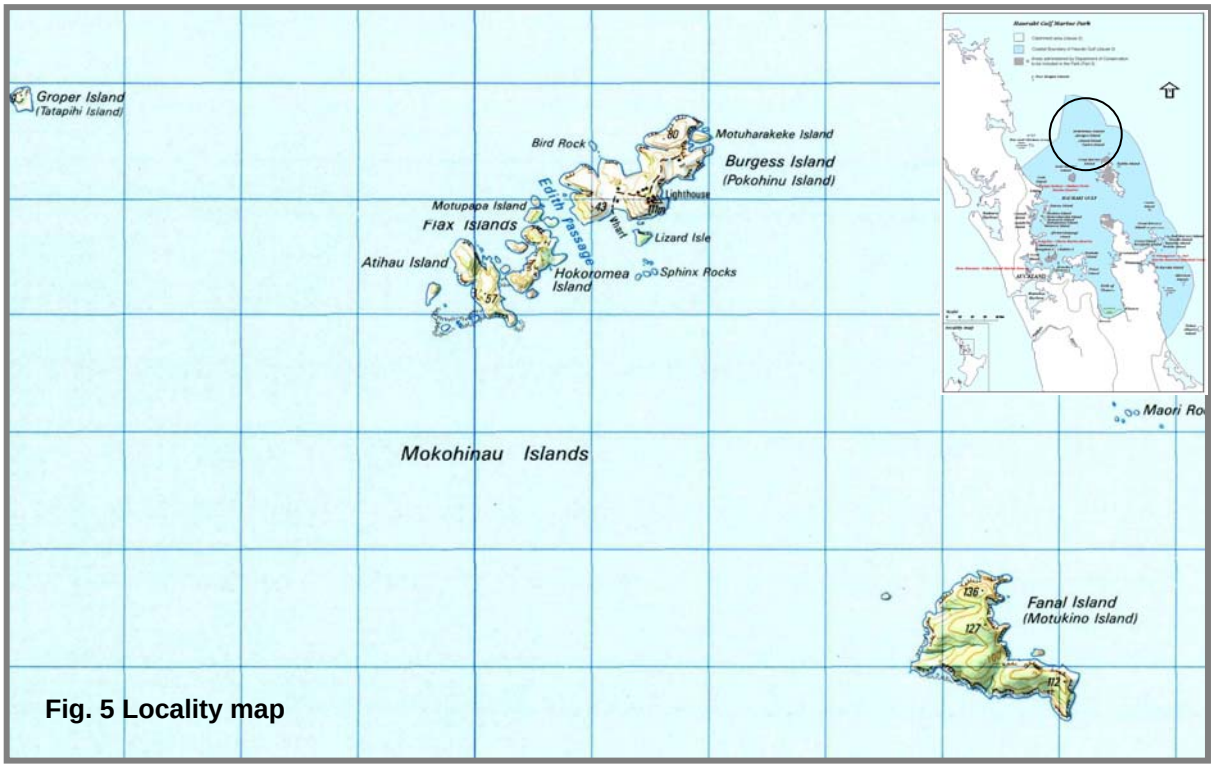


Fig. 5 Locality map

Table 1 – List of islands of the Mokohinau Group
(after Auckland Conservancy Island Plan Appendix 8)

Island	Grid ref.	Size (ha)	Max el. (m)	Rat Status (eradication date)
Fanal (Motukino) Island	S07 043820	76.5	136	Kiore removed 1997
Burgess (Pokohinu Island)	S07 015860	55.6	111	Kiore removed 1990
Flax Isle	S07 019865	1.2	≈ 15	Kiore removed 1990
Flax (Hokoromea) Island	S07 006855	10.6	≈ 55	Kiore removed 1990
Atihau (Trig) Island	S07 001852	15.6	57	Kiore removed 1990
Lizard Island	S07 014856	1.0	≈ 10	Kiore got onto the island briefly mid-1970s – were eradicated in 1979
Groper (Tatapihi) Island	S07 961869	3.0	30	Kiore absent
Arch Rock	S07 004856	0.74	≈ 35	Kiore removed 1990
Mokohinau Stack A	S07 014858	0.08	≈ 15	Kiore unlikely to have been present
Mokohinau Stack B	S07 005860	0.18	≈ 15	Kiore removed 1990
Mokohinau Stack C (Motupapa)	S07 005859	1.48	≈ 25	Kiore removed 1990
Mokohinau Stack D	S07 007858	1.06	≈ 20	Kiore removed 1990
Mokohinau Stack E	S07 002855	0.1	≈ 15	Kiore removed 1990
Mokohinau Stack F	S07 003854	0.33	≈ 25	Kiore removed 1990
Mokohinau Stack G	S07 005852	0.74*	≈ 25	Kiore removed 1990
Mokohinau Stack H	S07 996852	0.74	≈ 30	Kiore absent
Mokohinau Stack I	S07 998849	0.09	≈ 15	Kiore absent
Mokohinau Stack J	S07 000850	0.15	≈ 15	Kiore removed 1990
Navire Rock	S07 043804	0.16	≈ 15	-
Sphinx Isle (+ stacks)	S07 014853	0.46	≈ 10	-
Bird Rock	S07 010865	0.25	≈ 20	Kiore absent
Maori(Cathedral) Rocks	NZMS 262 Sheet 2	0.42	≈ 10	Kiore absent

Most of Burgess Island is a scenic reserve, the balance (1.5ha) is Crown land administered by the Ministry of Transport (MSA). The other islands and offshore stacks form the Mokohinau Islands Nature Reserve and are a wildlife sanctuary under the Wildlife Act 1953. The islands comprising the nature reserve are subject to the Hauraki Gulf Maritime Park Management Plan (1982).

Ngati Rehua exercise rights to cultural harvesting of Grey-faced petrels on the Mokohinau Islands, although permits issued in recent years have not been used. Cultural harvest of seabirds is governed by Section 6 of the Wildlife Act 1953 and Section 50 of the Reserves Act 1977.

1.3 Methods

We conducted a series of ground searches over areas of Burgess, Hokoromea, Atihau (Trig), Motupapa, Lizard, Groper Islands and Stacks D & H. Burrow positions, general size and occurrence of occupancy were noted and dead birds, feathers and other material collected (Appendix 1). Storm petrels as a group don't always use burrows so we surveyed likely crevices, where accessible, in and under vegetation, especially areas of club rush, tussock, mats of buffalo grass and stunted shrubby vegetation. For the most part the party of six split into three teams of two and searched a designated area. We used *Assassin* as our accommodation base for the visit thus minimising the amount of gear and food taken ashore. An inflatable was used for landings.

Fig. 6 Mixed vegetation on steep slopes. Atihau I.

Fig. 7 South-eastern slopes of Groper Island from sea

Fig. 8 Mixed vegetation and bare rock on upper slope of western headland. Burgess Island.

2 Results

Section 2.1 covers individual areas/sites visited and are presented north to south through the main group with Groper and Fanal Island following. Sites where burrows were found are described and indicated on accompanying maps. Section 2.2 summarises habitat and breeding activity found. Section 2.3 summarises bird species seen during the survey.

2.1 Individual areas and sites surveyed

Northern headland beyond narrow isthmus, Burgess Island

Fig. 9

HJ/KB/DB

Access to this north western part of Burgess Island is across a very narrow steep-sided neck. Care needs to be taken in crossing here.

1 Once across the main isthmus the route goes though some low Ngaio which contains small burrows especially on the edge of the neck. These could be Diving Petrels, Fluttering Shearwater or Little Shearwater

2 The slope facing Motuharakeke is steep with rocky ledges. Beneath the rocky ledges are steeply sloping areas of vegetation and bare earth with burrows in them. These could not be examined due to the steepness of the slope.

3 The vertical slope facing south towards the main part of Burgess Island is also inaccessible but rocky ledges appeared to support sufficient vegetation and earth to enable burrowing. Also rocky crevices could provide habitat for seabirds such as storm petrels. In particular the long tussock bushes growing out of the crevices provide ample habitat for small burrowing seabirds.

4 The outer edge (NW facing) is a steep 45^{o} slope down to vertical rock cliffs. About 40% giant umbrella sedge; 20% taupata, small pockets of flax; 20% rocks and bare earth and 10% iceplant. Didn't examine for burrows but based on previous experience looked very good habitat for burrows.

5 The top and NE slopes of the headland are covered in dense buffalo grass, dense mixtures of maidenhair fern and *Muehlenbeckia* with some bracken and rasp fern (*Doodia media*), occasional flax and *Cassinia leptophylla.*The dense buffalo grass contained small burrows in the grass (rat-like) and in places burrows in the earth underneath. Where the buffalo grass was cleared by burrowing large burrows appeared to be Grey-faced petrel burrows.

Headlands overlooking House Bay and Flax Island, Burgess Island

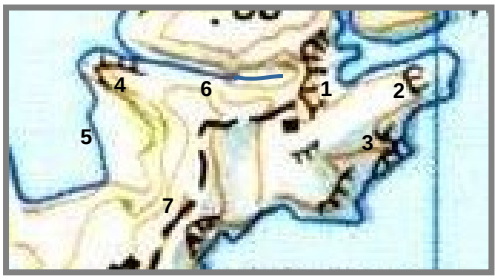


Fig. 10

NM; CG/BR (23 March 2004)

1. This small peak overlooking the narrow neck that leads to the northern part of Burgess Island has a mix of grass, *Cassinia* and other stunted shrubs. A few burrows around the margins. No occupation.
2. Burrows in soft soil amongst flax, ice plant and under the occasional woody shrub. A couple of largish burrows with strong bird smell indicating current occupancy or recent use.
3. Areas of flax with burrows – Grey-faced Petrels
4. Steep sided high rocky headland with mixed vegetation including some good-sized pohutukawa. Burrows in soft soil amongst flax, bracken and grass, also under rocks. A few under pohutukawa trees. A couple of larger burrows with strong bird smell indicating current or recent use – Grey-faced Petrels
5. Low headland protruding into House Bay. Large and very small burrows in soft soil between rocky outcrops and amongst woody plants, ice plant and grass.
6. Good vantage point for spotlighting along both sides of the deep gut that almost cuts the island into two.
7. A White-faced Storm Petrel carcass was found here 16 March 2004. Sent through to Trevor Worthy for ID by Halema.

South-western headlands of Burgess

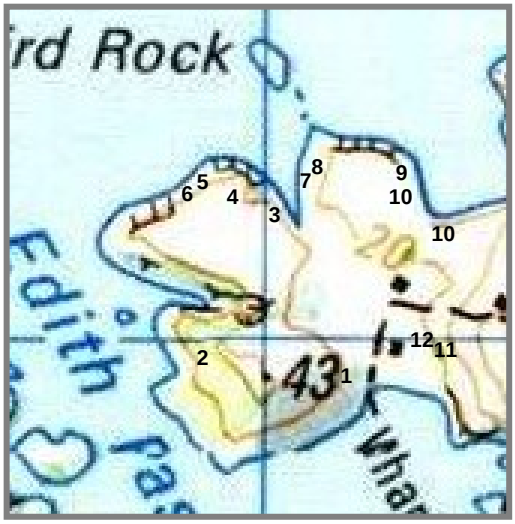


Fig. 11

NM/DB; HJ/BR; KB/CG

1 Two Blue Penguin burrows with evidence of moulting NM/DB
2 Scattered Grey-faced Petrel burrows under pohutukawa NM/DB
3 Small tunnels/burrows through grass (like rat trails) HJ/BR
4 Rushes with lots of burrows HJ/BR
5 Bird footprints and bones under overhang (behind rushes); some identified by Trevor Worthy as Little Shearwater. HJ/BR
6 Found small egg fragments and feathers at burrows in club rush (collected) HJ/BR

7 A lot of burrows around the top end of the cliff; between rocks, under trees and in *Leptocarpus* (club rush); mixed sizes (Fluttering Shearwater, Grey-faced Petrel. Some small tunnels in vegetation possible Diving Petrel or storm petrel. KB/CG
8 Burrows into buffalo grass, rush and in low ngaio. Fluttering Shearwater, Diving Petrel. KB/CG
9 Burrows into ice plant, giant umbrella sedge and under tree roots on ledges on cliff face KB/CG
10 Burrows into buffalo grass, flax and under Pohutukawa – more Grey-faced Petrel KB/CG
11 A lot of penguin activity with a distinct track up from the end of the beach DB
12 A few Grey-faced Petrel and Diving Petrel burrows under trees DB

Lizard Island

Fig. 12

Whole party

1 Small burrows (in some areas densely packed) in soft ground under ice-plant mats along top edge of cliff and on gently sloping areas (20+ smallish burrows in ice plant in one area with sign of fresh excavation; Diving Petrels were found to be occupying some of these – see below for visit at night
2 Many burrows further back in stunted pohutukawa, taupata, ngaio and giant umbrella sedge (Fluttering Shearwater and Little Shearwater; possibly occasional Grey-faced Petrel)
3 Smallish burrows along margins between club rush and *Sarcocornia* (Diving Petrel)
4 Larger burrows further back in dense club rush (Diving Petrel and Little Shearwater)
5 Smaller burrows in soft ground under ice-plant on ledges and under overhangs (Fluttering Shearwater and Little Shearwater)
6 Fluttering shearwater carcass found on ground outside burrow under taupata/ngaio

Note: White-faced Storm Petrels are known to be common on this island. If they are breeding here they will need to share areas of burrows with other species – particularly Diving Petrels.

After Dark at Anchor in Landing Bay and on Burgess and Lizard Islands, 26 April

Fig. 13

1 Fluttering shearwaters heard on ridge (above valley leading to old house site – north-western side of island) HJ/KB/NM
2 Diving Petrels in dense buffalo grass/Muehlenbeckia on flat behind boulder beach HJ/KB/NM
3 Blue Penguins on track up from end of beach, also behind wharf HJ/KB/NM
4 Grey-faced Petrel over-flying anchorage area of Burgess

5 A lot of bird calls from slope below Lighthouse – Diving Petrels and Grey-faced Petrels although the latter could have been flying through
6 Diving Petrels seen on ground near track at top of ridge HJ/KB/NM
7 Diving Petrels in dense buffalo grass/Muehlenbeckia in valley near tramline leading down from Lighthouse HJ/KB/NM
8 Diving Petrels heard in burrows described above on Lizard Island in previous section; seen on ground and in entrances to burrows in club rush margins CG/DB/BR
9 Little Shearwaters heard; one seen on top of dense club rush on Lizard Is. CG/DB/BR
10 A good number of lizards (skinks and geckoes) seen on rocks, iceplant or amongst vegetation on Lizard Is. CG/DB/BR
11 Many large crabs seen – some feeding on detritus from ice-plant on Lizard Is. CG/DB/BR

After Dark (Lizard Island) – 27 April

Very heavy rain squalls, strong NE wind (25-30kns), thunder and lightning. We landed on Lizard about 9.00PM. Again, good numbers of lizards (skinks and geckos) sitting on top of vegetation or on rocks. Diving petrels responded well to imitations of calls indicating g0od numbers already in burrows. Two birds seen outside burrows (just landed). Also heard a few calls from Little Shearwaters and saw one bird outside a club rush burrow.

Very early in morning (circa 3AM) Fluttering Shearwaters were heard (very loud) close to the boat, on Lizard Island or more probably leaving Lizard Island

Hokoromea (Flax) Island

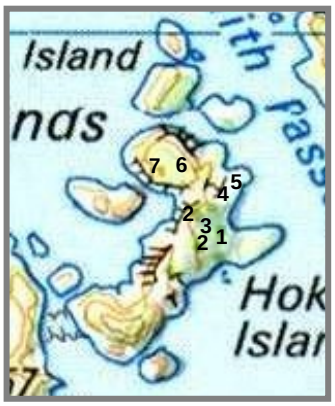


Fig.14

HJ/DB; KB/CG

1 Smaller burrows into ice-plant and low scrub on cliff top above narrow gut between Hokoromea and stack (not separated on map); dark-tipped white feathers collected KB/CG
2 Many Grey-faced Petrel burrows along edges of flax and pohutukawa; also under pohutukawa; the occasional old eggs or eggshell ejected from burrows; feathers KB/CG
3 Burrows in some areas of dense flax KB/CG
4 Smaller burrows into bases of tussocks; stumps of tussocks still burrowed HJ/DB
5 Small burrows under rock ledges; scattered Grey-faced Petrel burrows; Pied Shags roost on end of point HJ/DB
6 High density of Grey-faced Petrel burrows; no small burrows HJ/DB
7 Fluttering Shearwater carcass under trees HJ/DB

Motupapa Island (Stack C) & Stack D

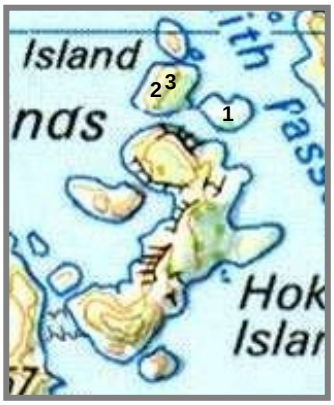


Fig. 15

BR/NM; KB/CG

1 (Stack D) Some Grey-faced Petrel burrows under trees; small burrows and some Grey-faced Petrel burrows on cliff tops – crevices and in soft soil. Blue Penguin feathers in burrow in rocks BR/NM

2 (Motupapa) Grey-faced Petrel in burrows, one carcass; burrows under ice-plant as well as flax; bare earth on top with a lot of burrows (possibly penguins) BR/NM

3 (Motupapa) Cook's Petrel head fragments and wing feathers found lower down on the edge of vegetation (see Table 3); Grey-faced Petrel burrows under flax and pohutukawa; larger burrows for penguins BR/NM; KB/CG

Atihau (Trig) Island

Fig. 16

CG/DB

1. This is a small slender flax-covered peninsula overlooking the Arches anchorage. We landed in a chasm-like cove near one of the bait stations. The ridge-top is dense flax with some open areas and stunted vegetation. Saw these as excellent places for spotlighting – not only for incoming birds on the ridge itself but also the two prominent stacks (E & F) adjacent. Blue penguin track leads to the top of the ridge. Their burrows are in amongst pohutukawa and just below the flax line.
2. Dense flax dominates the ridge top although there are some areas of grass. The steep sides of this little peninsula have beds of iceplant or the occasional tussocks. Grey-faced Petrel burrows in flax. Found one carcass. More burrows in grassed areas.
3. Dense flax up this ridge. Noted that burrows are in areas up to 5m from the flax margins, although where a rock outcrop or a low tree (ngaio) or a small grove of pohutukawa provide birds with access; burrows appeared to be in the middle of dense flax.
4. Steep narrow gut leading down to a bouldery beach. Grey-faced Petrel burrows in flax areas at the top. Smaller burrows in mixed vegetation on the side of the gut further down.

5. Two stacks E & F look very interesting. Both are difficult to climb from a boat however spotlighting from a boat or from the ridge overlooking them (between #1 and #2 above) would help determine which birds are breeding there.
6. Several small narow headlands or ridges separating beach areas. Mixed vegetation on steep faces – burrows obvious under tussocks and in areas of ice-plant.

Atihau (Trig) Island (south-west side)

Fig. 17

CG

1 Narrow gut leading up from blocky beach between cliffs with flax; Blue Penguins lower down; sign of Fluttering Shearwater in burrows up the RHS of the gut under flax, ngaio and other vegetation.

2 Steep cliff with ice-plant covered ledges riddled with burrows; white; white/grey and larger grey-faced petrel-type feathers outside burrows; evidence of use; egg collected outside one of the lower burrows – size consistent with Diving Petrel

3 Rubble-filled gut leads up to ridge; smaller burrows in all vegetation on RHS of gut (Fluttering Shearwater); at flax edge at top of gut a lot of tracks leading into the flax from take-off points; flax margin riddled with burrows (Grey-faced Petrel); ridge line to end of SE point is quite open with bare ground showing in some places, whereas the top of the main part of the island is covered in dense flax.

Stack H

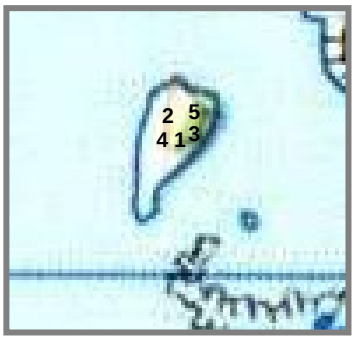


Fig. 18

HJ/KB/DB

1 Lots of small burrows in rock crevices around the sides

2 A few burrows in soft earth and under rocks under low Pohutukawa, *Cyperus*, *Calystegia*, & low Ngaio

3 Burrows in amongst rengarenga lilies, flax and taupata – Diving Petrel & Fluttering Shearwater

4 A lot of burrows on top had water in the entrances.

5 Small burrows under ice plant on top of stack – mostly Diving Petrel.

Groper (Rock) Island

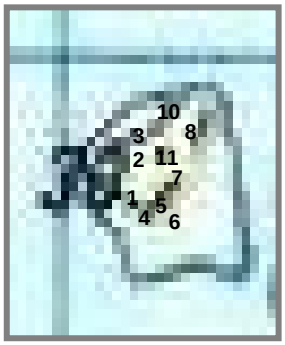


Fig. 19

HJ/CG/NM

1 Rock ledges covered with dense iceplant – many burrows into soft soil underneath iceplant; about 20-30% with sign of recent excavation; many with white/grey feathers in entrance to burrows
2 Sloping area to west and south of summit of island covered with iceplant, a number of rock outcrops – many burrows into soft soil underneath iceplant; about 20-30% with sign of recent excavation; many with white/grey feathers in entrance to burrows
3 Stunted or low-growing windswept taupata – few burrows. Flock of 13+ Red-crowned Parakeets feeding on taupata; took off and split into two groups to be seen from other parts of the island.
4 Slope between cliffs and bare rock platform – either bare ground or covered with ice plant – many burrows, 10-20% showing sign of recent excavation
5 Under overhang next to the large brackish pool – sign of moulting Blue Penguin; close by white/pale blue tipped feathers
6 12+ Welcome swallows dipping and 'hawking'over the large brackish pool. Note: there were some large drifts of tube-worm cases in the pool and on the rockty surrounds highlighting the wave-swept nature of this island.
7 Steep small valley leading up to summit area – all soft ground covered with iceplant and riddled with small to medium sized burrows; 10-20% showing sign of recent excavation
8 Basin-like slope above a rock ledge – all soft ground covered with iceplant/ *Sarcocornia* and two ngaio, riddled with small to medium sized burrows; 10-20% showing sign of recent excavation; there are some very small burrows in an area of *Sarcocornia* on steep ground
9 Slope on northern side of summit
10 Summit area

Location west of Arches for chumming – 27 April

Prior to sunset and the onset of a 30kn squall and heavy rain we noticed a lot of birds in the channel between main islands and Groper Rock. We went to a location about 1km west of Atihau/Arches to get amongst them and for a brief chumming session. The build-up of Grey-faced Petrels was extraordinary – a sight not unlike that of Sooty Shearwaters around Stewart Island or Snares. While a good number of birds came to the chum (and fed), many flew through or circled. The only other birds seen were a handful of Diving Petrels flying past.

Conditions deteriorated and we returned to Landing Bay, and anchored very close to Lizard Island to avoid most of the swell wash coming through the gap under the lighthouse.

Fanal Island (no landing) & Departure

Fig. 20

We cruised slowly along the south-western flank of Fanal following departure from Burgess. Halema had been on the island mid-March as was able to talk about some of the features. Of great interest were the high cliffs with very prominent jointing offering many possible crevices. Note: a small population of Fairy Prions (*Pachyptila turtur*) has been found on steep cliffs inaccessible to rodents on the mainland near Dunedin, G. Loh pers comm. It is possible that a small population of storm petrels which favoured nesting in crevices could have persisted on cliffs even while the main part of the island was populated with rats. The top of Fanal is covered with dense vegetation – dense flax and areas of forest.

1. SW Landing
2. Muttonbirder's campsite
3. Cliffs with mixed vegetation on ledges and crests of headlands

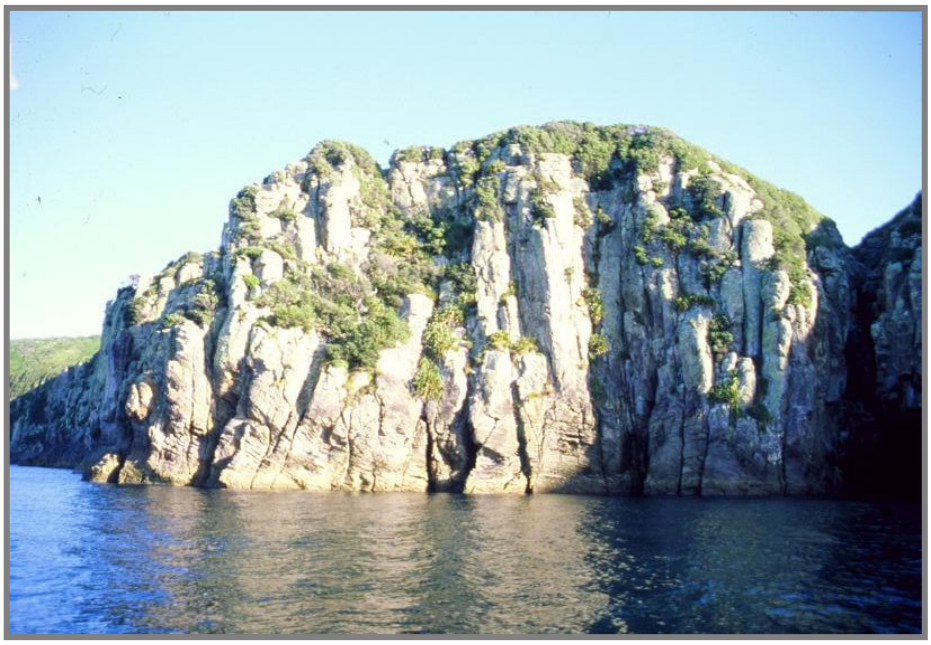


Fig. 21 Fanal Island

2.2 Habitats

Fig. 22 Lizard Island

Fig. 23 Hokoromea (Flax) Island in foreground, Burgess, Stack A, Lizard and Sphinx Rocks at back

Table 2

Summarises habitats in relation to breeding sign

Habitat	**Islands**	**Burrows/Birds**
Dense flax (*Phormium tenax*) margins (Fig 23)	Hokoromea, Atihau (Trig), Motuharakeke (Flax Isle)	1. Dense burrows and tracks along margins, very few burrows more than 5-10m away from margins/Grey-faced Petrel 2. Dense network of large burrows and tracks along cliff top margins/Grey-faced Petrel 3. Smaller burrows where flax margins are on narrow ridges or up steep guts/Fluttering Shearwater and/or Little Shearwater
Areas of dense flax (Fig 23)	Burgess, Hokoromea, Atihau (Trig), Arch Rock	1. There appear to be no Grey-faced Petrel burrows in areas of dense flax if birds cannot move in and out easily – ie. beyond 10m from margins 2. We found burrows where pohutukawa or ngaio 'islands' or rocky outcrops exist to provide access for the birds
Mature pohutukawa (*Metrosideros excelsa*) groves (sometimes just 2 or 3 trees) (Fig 23)	Burgess, Hokoromea, Atihau (Trig)	1. Large burrows in soft ground under trees, and amongst roots/Grey-faced Petrel 2. Occasional smaller burrow under trees/ Fluttering or Little Shearwater

Small or stunted pohutukawa/ngaio (*Myoporum laetum*) /taupata (*Coprosma repens*) groves – on headlands or small islands (Fig 4)	Burgess, Hokoromea, Atihau (Trig), Motupapa Stack H	1. Mix of large and smaller burrows in soft ground under trees (2m) and in rock crevices or under rock overhangs/Grey-faced petrel, Fluttering Shearwater and Little Shearwater 2. We also found burrows under low-growing stunted trees (especially taupata and ngaio) – small isolated groves between grass, tussocks or club rush.
Stunted taupata	Groper	Burrows of mixed sizes. Note: this area wasn't investigated fully because of difficulty moving through vegetation and risk of damage
Mixed taupata/giant umbrella sedge (*Cyperus ustulatus*) /club rush (*Scirpus nodosus*)	Lizard	Difficult to penetrate this area without damaging the many burrows. Night-time observation confirmed Fluttering and Little Shearwaters
Tussocky club rush (Fig 8)	Burgess, Lizard, Motupapa (Stack C)	1. Many tunnels and obvious sign of birds in almost every clump or mass of club rush, especially where the vegetation was near bare ground providing birds with easy access/Diving Petrel and Little Shearwater. 2. We didn't investigate some areas of very large 'tussocks' of club rush on Burgess.
Ice-plant (*Disphyma australe* subsp. *australe*) on gently sloping ground (Fig 22)	Lizard and Groper Islands, Stack H	1. Often had smaller burrows in soft soil underneath ice-plant, easily dug by the smaller birds, sometimes had water in them/ Diving Petrel, Fluttering or Little Shearwater. (Lizard and Stack H) 2. Many Diving Petrel burrows – burrow densities vary from site to site. (Groper) 3. Smaller burrows – possible Storm Petrels
Ice plant on ledges steep cliffs/small headlands	All islands and stacks	Same as above, although some of these ledges can be very narrow 30-50cm and two to three metres in length, and stacked like a steep staircase. In these cases there are burrows of varying sizes wherever there is sufficient soil under the ice-plant

Glasswort (*Sarcocornia quinqueflora* subsp. *quinqueflora)* on steep or sloping ground; sometimes mixed in with ice plant (Fig 22)	Groper, Lizard (to a lesser extent)	Smaller burrows/ Diving Petrel, White-faced Storm Petrel. Occasional larger burrow/ Fluttering or Little Shearwater
Mixed tussock (*Chionochloa bromoides*) /occasional flax or shrub/club rush/ice plant on cliffs and steep headlands (Fig 6)	Most islands and high stacks	1. Where tussock occurs on cliffs and steep slopes or along tops of cliffs the base of the tussocks and ground underneath contain burrows 2. We found burrows amongst the roots of small trees or shrubs 3. We found or could see burrows in areas of ice plant
Mixed tussock/occasional flax or shrub/club rush/ice plant – on summits or upper slopes of small sheer sided stacks (Fig 3)	Bird Rock, Stacks B, E, F & G	Where we could gain a clear view from a high vantage point we could make out burrows in the top of some of these stacks.
Dense mats of buffalo grass (*Stenotaphrum secundatum*) (Fig 4)	Burgess north headland	1. Tiny tunnels in grass, like rat holes/possibly White-faced Storm Petrel 2. Some larger burrows in earth beneath/Diving Petrel
Dense deep mats of buffalo grass/ *Muehlenbeckia complexa* (Fig 27)	Burgess and North headland	1. Tiny tunnels in grass like rat holes. Possible White-faced Storm Petrel 2. Some larger burrows in earth beneath/Diving Petrel 3. In some areas where Diving Petrels were heard under vegetation there was no obvious sign of burrows
Rock cliffs with deep dry crevices (Fig 22)	Fanal	1. The jointed columnar structure of south-west facing cliffs of Fanal Island 2. A number of stacks and headlands of larger islands have rock formations that contain crevices that may be suitable for nesting storm petrels

2.3 Birds

Table 3
Summarises birds seen during the survey and notes occurance

Species		**Notes**
Grey-faced Petrel	*Pterodroma macroptera*	Abundant on the Mokohinau Islands. Seen at sea close to the Mokohinau Islands in increasing numbers through afternoon, culminating in huge numbers early evening on one of the two nights. Note; prior to the deterioration in the weather.
Cook's Petrel	*Pterodroma cookii*	Partial carcass found on Motupapa. Head and a few wing feathers only. Could be harrier kill. Mike Imber on positively identifying this bird has suggested the following: "Ppossibly taken at sea nearby by a Harrier and brought ashore there. One of the weak fledglings that occur every year but perhaps more than usual this season." Note: Cook's Petrels were seen in spotlights mid-February in Landing Bay and off the SE headland of Atihau. Over summer months they are commonly seen in the Outer Hauraki Gulf
Common Diving Petrel	*Pelecanoides urinatrix*	Seen in large numbers at sea between Mokes and GBI – sometimes the water would erupt with 10s of birds.
Little (Allied) Shearwater	*Puffinus assimilis haurakiensis*	Found on Lizard Island and heard elsewhere. Note: This species is very seldom seen at sea – we have only 3 positive records in the 14 months of observations
Fluttering Shearwater	*Puffinus gavia*	One carcass found on Lizard Island. Another found in forest on Hokoromea. Heard on Lizard Island and on (or over) Burgess. Heard from boat (anchored next to Lizard) very early (4am) one morning. Handful of birds seen at sea during this trip.
Buller's Shearwater	*Puffinus bulleri*	10s seen at sea close to Mokohinaus during day (from headlands and boat)

Flesh-footed Shearwater	*Puffinus carneipus*	10s seen at sea between Mokohinaus and GBI during day on this trip.
Fairy Prion	*Pachydyptila turtur*	Seen at sea close to Mokohinaus during day. Large numbers of these birds can be seen in the waters around the Mokohinaus at this time of the year.
Blue Penguin	*Eudyptula minor*	Evidenced by well-defined tracks leading from beaches and most small coves, and associated burrows and guano. Some burrows 20m above high tide. Heard at night in Landing Bay. Seen next to wharf and at end of beach. Common
Australasian Gannet	*Sula serrator*	Common – seen at sea. Breed on Maori Rocks. Just a handful of juveniles left with a few adults roosting.
Pied Shag	*Phalacrocorax varius*	Burgess, Hokoromea and Atihau.
Red-billed Gull	*Larus scopulinus*	Large tight groups seen around the Mokohinaus feeding with schools of pelagic fish on plankton – near Groper and to the south/east of the main group; also Maori Rocks. We saw no sign of the Red-billed Gull colony that has been reported for Burgess over many years (Fleming 1946, Buddle 1947, MacFadden & Greene 1994). Fleming's study shows groups of gulls nesting at ten locations on Burgess, between 5,000 and 10,000 birds.
Black-backed Gull	*Larus dominicanus*	A few juveniles seen around the Mokohinaus
White-fronted Tern	*Sterna striata*	A few seen flying around the islands
Grey Ternlet	*Procelsterna cerulea*	12+ at Maori Rocks
Reef Heron	*Egretta sacra*	Two seen on Hokoromea; one seen on Atihau. Another was seen on Burgess. Could be one pair.
Red-crowned Parakeet	*Cyanoramphus novaezelandiae*	One of the most common birds on Burgess especially, but present on all islands including Stack H. A flock of 13+ were seen on Groper Is. Some feeding on taupata.
Kingfisher	*Halcyon sancta*	Present on all islands. Common

NZ Bellbird	*Anthorinis melanura*	Common on all islands (not Stack H)
Tui	*Prosthemadera novaeseelandiae*	Two seen flying over Burgess. Note: over summer tui are very conspicuous at the Mokohinaus, especially when flax is flowering.
NZ Pigeon	*Hemiphaga novaeseelandiae*	Two seen on Burgess, also one fltying over Fanal
NZ Fantail	*Phipidura fuliginosa*	Common on all islands
Silvereye	*Zosterops lateralis*	Small group seen
Australasian Harrier	*Circus approximans*	At least two birds seen in main group; another seen over Fanal; none seen on Groper on this visit
Welcome Swallow	*Hirundo tahitica*	Common around islands, including over sea. 12+ on Groper
House Sparrow	*Passer domesticus*	A few on Burgess and Groper
European Starling	*Sturnus vulgaris*	Common around all islands

3 Discussion

The primary goal of this visit was to search for sign of NZ Storm Petrel and to survey for possible breeding localities on the Mokohinaus. Although no evidence of NZ Storm Petrel was found, this visit gave us an excellent opportunity to survey the extent of seabird nesting on these islands (with the exception of Fanal).

1. Grey-faced Petrels return to islands of the Hauraki Gulf throughout April to begin clearing burrows prior to breeding. We found some burrows occupied, and a good number in the process of fresh excavation. Grey-faced Petrel carcasses (4), feathers, down and eggs were found outside burrows, ejected by the birds during burrow excavations.
2. Diving Petrels were also in the process of excavating burrows in preparation for laying in August.
3. Little Shearwaters are known to return to their colonies irregularly all year, and begin laying in mid-June. This activity can be confirmed on Lizard with two birds seen outside burrows and more heard on two visits to the island at night.
4. Fluttering Shearwaters were also heard on two islands, we believe coming ashore (Burgess and Lizard), although they are not known to begin their courting until August.

We identified fifteen ‘habitat’ types that are being used by seabirds during April on the Mokohinau Islands. Size of burrow and presence of feathers/eggs/carcasses gave an indication of the types of seabirds using these areas. A more extensive and ongoing study would be required to positively identify which seabirds were using these burrows (see below – 3.2 Future visits).

Distribution of seabirds on the islands is not uniform, for example:
1. We found burrows where ever soil was soft enough to burrow: depth of soil, vegetation cover and steepness of slope determine species.
2. Flax dominates the tops of three of the larger islands. There are burrows in dense flax where access is possible by cliff-edges, open ground, trees or rocky outcrops however tracks and burrows extend little further than 5m from access points.

3. In matted vegetation or tussock-like club rush we found burrows in the soil as well as tunnels in the vegetation itself.
4. Areas of club rush and buffalo grass bordering bare ground. Tiny tunnels may be attributed to storm petrels
5. Areas of iceplant (Burgess, Atihau, Stack H, Lizard and Groper) and *Sarcocornia* (Groper). Very small burrows close to or amongst Diving Petrel burrows may be made by storm petrels.

It appears that seabirds are colonising new areas in the wake of rat eradication (all islands where rats were present), also stock removal in the case of Burgess. Smaller seabirds (Diving Petrel, White-faced Storm Petrel, Fluttering and Little Shearwaters) may find some very attractive sites on Burgess, rather than the ledges and tussocks on cliffs of densely vegetated (flax, pohutukawa) islands such as Hokoromea and Atihau; or competing for space on smaller islands such as Lizard and Groper. It should be noted that Grey-faced Petrels are also on Burgess using areas wherever flax and larger trees occur.

3.1 Storm Petrels

Although we found no evidence of NZ Storm Petrel on any of the islands of the Mokohinau Group visited on this trip, we can't rule out the possibility that NZ Storm Petrel breeds on these islands. If this is the case it is possible they would have finished breeding by April and migrated away from the Outer Hauraki Gulf area. NZ Storm Petrels were discovered 20nm off shore on 10 April 2004, four weeks after the last confirmed sighting in the Outer Hauraki Gulf (Gaskin & Baird, *Pterodroma Pelagics* website). On 23 May they were also sighted 20nms east of North Cape (Gaskin & Baird, *Pterodroma Pelagics* website).

We also found no evidence of the presence of White-faced Storm Petrels during the visit, other than possible burrows. Reasons for this could include disturbance by Diving Petrels in areas they share; small, scattered burrows amongst more active burrows of Diving Petrels or on the edges could also be easily missed; and adverse weather conditions through February and March that would effectively clear up any post breeding 'litter' in exposed places. Graeme Taylor notes: *"Diving Petrels and White-faced Storm Petrels do share mixed colonies elsewhere (e.g. Hongiora, Plate, Rangatira) but generally when diving petrels are common, the White-Faced Storm Petrel are not. White-Faced Storm Petrel would lose out competitively to Diving Petrels so to avoid competition for nests (and having their burrows taken over by Diving Petrel) they need to nest in sites that are less suitable for diving petrels (e.g. in very soft friable or sandy soils), or sites that are too tight for divers (amongst dense vines, rocky ground, or very rooty ground or they nest in flat areas well away from cliff edges)."* (G. A. Taylor pers. comm.)

White-faced Storm Petrel is known to breed on at least one of the islands – Lizard (Greene 1994 and pers. comm., Taylor, 2000). We did find some very small burrows and tunnels in vegetation on Groper, Burgess, Atihau and Stack H that could be made by storm petrels. And if they are indeed breeding in club-rush tunnels then breeding litter would be concealed well inside. In 1990 a White-faced Storm Petrel was caught in a rat-trap on northern part of Burgess – this bird is held in the Auckland Museum collection (Terry Greene, pers comm.). In March (2004) a White-faced Storm Petrel carcass was found by the DOC team on Burgess on the high ridge to the north of the lighthouse. The fact that no obvious sign of White-faced Storm Petrels was found during this visit emphasises the difficulty of finding sign of a NZ Storm Petrel presence several months following the end of a breeding season.

With respect to NZ Storm Petrel significant questions remain unanswered. Where and when do they breed? And what nest sites do they adopt? As Mike Imber suggests: *"I think that NZ Storm Petrels would return to the area about September, though the numbers of more easily detected non-breeders may not build up till November. As the NZ Storm Petrel is likely to breed about the same time as White-faced Storm Petrels (i.e. laying October-November), there is likely to be competition for nest sites that will result in NZ Storm Petrels breeding not in burrows but crevices or nests in vegetation, such as Grey-backed Storm Petrels* Oceanites nereis *do further south."* (M.J. Imber, Notes to NZRBC April 2004)

These potential breeding sites are present on the Mokohinau Islands. Importantly the islands have been rat-free for almost fifteen years, and some of the islands (e.g. Groper and Lizard) and stacks are likely not to have had rats at any time (See Table 1). The latter must rank as the most likely places for NZ Storm Petrel to have survived. We suggest it is possible that with significant areas of suitable habitat now available on Burgess, there is also a possibility of NZ Storm Petrels breeding there. They might have survived on rat-free stacks or inaccessible cliffs, but with the eradication of rats on Burgess, release from predation pressure would enable them to colonise new areas.

We do note that Sandager did *not* record the presence of NZ Storm Petrel-type birds in his notes of the birds of the Mokohinaus. He does however report a *Thalassidroma melangaster* (ie. Black-bellied Storm Petrel *Fregata tropica*). His comments: *"So far as I have been able to discover, this species does not breed here. In 1886 Mr. W.R. Wilson caught a specimen which flew against the lantern. It is the only one I have seen."* (F.S. Sandager 1889). Unfortunately, it is unclear whether he collected the bird. The specimen does not appear to have been handed on to Cheeseman at the Auckland Museum, along with other birds he collected. It is not in the museum collection.

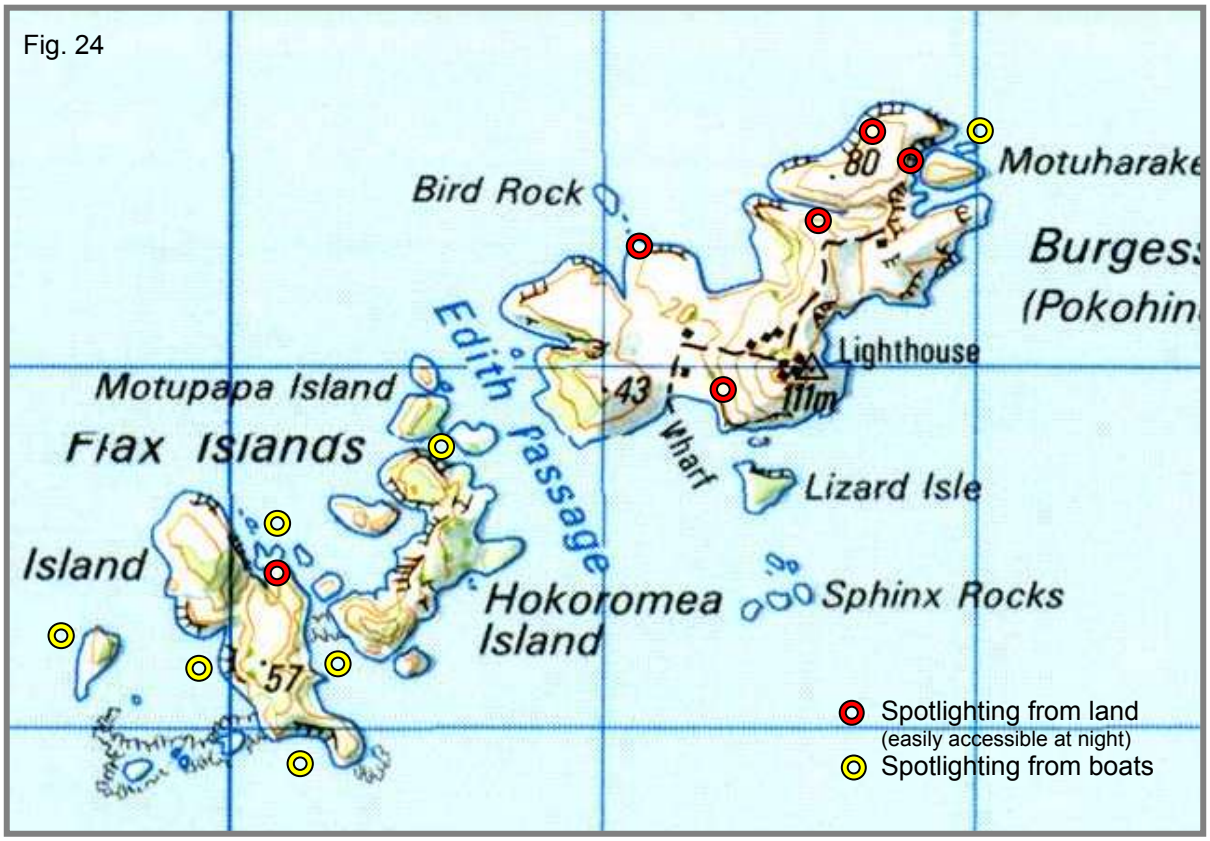
3.2 Future visits

Based on the current study, it would be useful to return to the Mokohinau Islands to undertake further seabird surveys, with two major objectives:

1. To find breeding areas of the NZ Storm Petrel.
2. To continue the monitoring work of other seabirds.

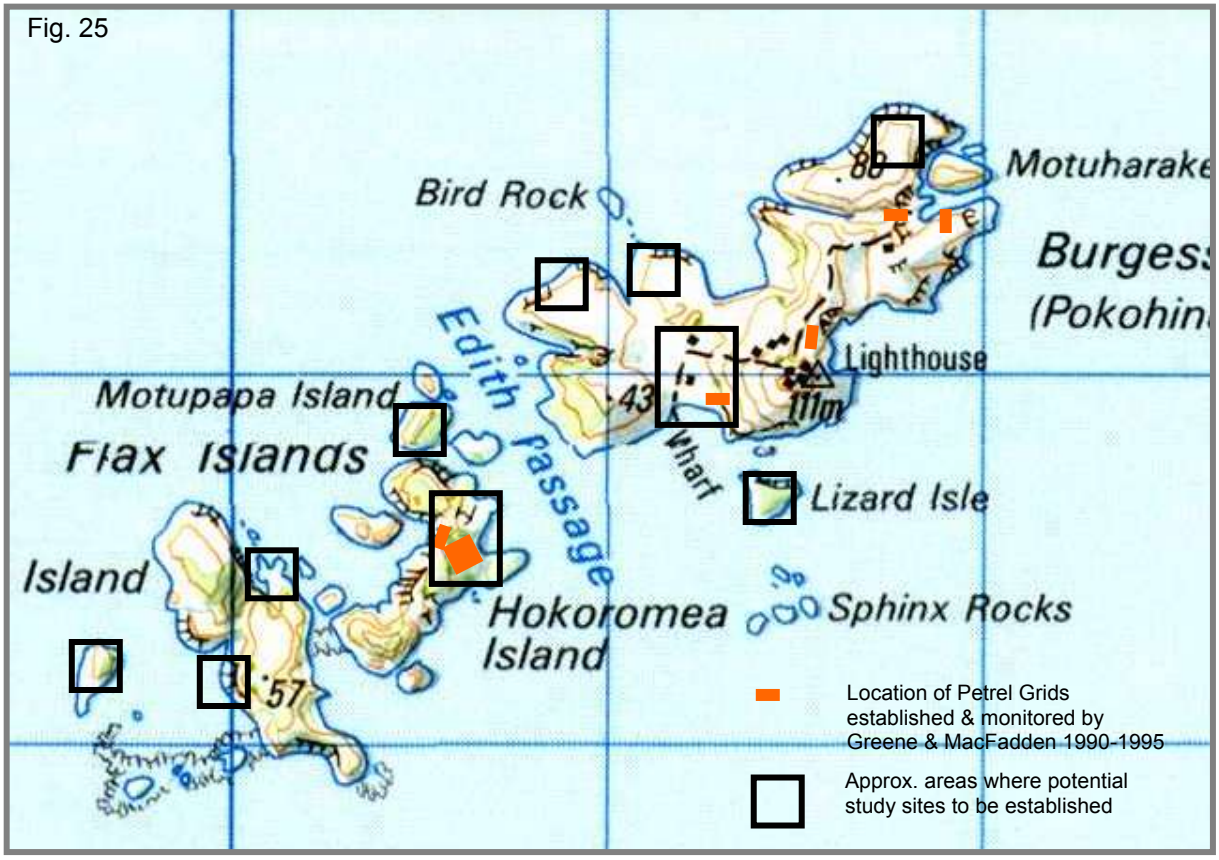
Our suggestions for future trips cover:

- Further ground searches (day and night) to confirm which species are using burrows surveyed here with spotlighting from land mid-winter (July) and October (see Fig. 24).



- Spotlighting from boats – again, to identify species utilising habitats and specific locations surveyed here. In particular some difficult to access but potentially interesting sites (eg Stack E, F, H and steep places on Atihau (Trig) Island). Given the difficulty of landing on Groper at night we'd also like to spotlight using a boat, although the rock platforms below the breeding grounds on the island would ensure anyone ashore at night could stay well away from fragile areas.
- If NZSP are sighted coming in to the spotlights then arrangements could be made to use nets and sound recordings to try to capture a bird for measurement, photography and possibly to attach a transmittter.
- Terry Greene and Ian MacFadden set up six 10 X 2m petrel grids following rat eradication in 1990. One of these was enlarged to 30 X 30m in 1993 (see Fig. 25). These should be located and permanently fixed for future monitoring. Note: we were unaware of these when we visited the island.
- Set up further study areas or transects in a variety of habitats (see Fig. 25). Sites suggested cover a good sampling of situations and species. We would also like to continue to monitor Groper Island with a further ground search in October.

Fig. 25



- Mapping using recent colour aerial photographs would determine extent of various habitats.
- We can then use a combination of mapping and density of birds in study areas as a method to estimate the numbers of species breeding on the islands.
- One area in particular needs study – that is, the areas of buffalo grass/muehlenbeckia on level ground behind the beach in Landing Bay, either side of the track leading up to the house sites, and the tramway leading to the A-frame/lighthouse. It appears that Diving Petrels are using this vegetation-cover for breeding and if confirmed could have implications on visitor access away from existing tracks. Were the existing concrete track and tramways kept clear of vegetation

then visitors would be encouraged to stay on what is essentially a loop track, thus minimising the risk of birds/nests/burrows being trampled.

- A set of photo-points could be established using photographs taken by Greene and MacFadden in the early 1990s to monitor vegetation changes.

3.3 'Sandager' Bird Observatory, Mokohinau (Pokohinu) Islands

An idea mooted and discussed by the group (as well as elsewhere) would be to set up a bird observatory on Burgess Island, using the MSA A-frame Hut as a base (Fig 26). This would be along the lines of observatories around the world such as that on the Isle of May at the entrance to the Firth of Forth in Scotland, although limitations of site access and facilities would keep this proposition 'low-key'.

MSA may look favourably at a proposal for ongoing use for research in exchange for an undertaking to maintain the hut (including keeping water supply and generator in good working order). However, we acknowledge that such a proposal would need Department of Conservation and Ngati Rehua approvals and meet strict guidelines. We envisage a bird observatory to be for research only; to be run through a Trust in conjunction with the Department of Conservation and OSNZ, and consultation with Ngati Rehua. Research projects would require specific High Impact/Research Permits and supervision through Great Barrier Area Office, Department of Conservation.

Were the proposition ever to get off the ground the naming should be in honour of A.F.S. Sandager; the assistant lighthouse keeper in the 1880s and who's remarkable observations of birds (also fish and beetles) we are indebted to this day.

Fig. 26 MSA A-frame hut on Burgess Island

Fig. 27
Burgess Island from headland overlooking House Bay; old house sites below trees; with lighthouse at summit. Chest high, dense buffalo grass and Muehlenbeckia on slope beyond cliff edge.

5 Acknowledgements

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observations made during visits; and. Peter de Lange for a similar useful discussion. Also, Richard Griffiths and Rolien Elliot (Department of Conservation, Warkworth) who provided encouragement and support. Ray Pierce for comments on the research proposal. Graeme Loh for information on Fairy Prions breeding.

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Appendix 1 – Catalogue of items collected

Table 4
Lists items collected during survey 26-28 April 2004

No.	Item	Site	Collector	Notes
	Cook's Petrel skull/wing feathers	Motupapa (Stack C)	Brett Rathe	These were sent to Mike Imber for identification
1	Fluttering Shearwater carcass (no head)	Hokoromea	Derek Bettesworth	Found in forest on ridge
2	Fluttering Shearwater carcass	Lizard	Karen Baird	Found on ice plant-covered ledge close to burrows
3	Jock Stewart (fish)	Burgess		Found on ridge top – likely to have been deposited during Feb 2003 storm. Waves have breached the isthmus between Blowhole Bay and the Landing.
4	Egg fragments/feathers	Lizard	Karen Baird	
5	Egg fragments	Lizard	Halema Jamieson	
6	Diving Petrel egg	Atihau	Chris Gaskin	Found on cliff ledge – rock and ice plant. About 20m above high tide.
7	Feathers (unidentified)	Hokoromea	Karen Baird	Steep bay on Eastern side on cliff edge – low veg flax/pohutukawa
8	Feathers (unidentified)	Burgess	Helena Jamieson	Possible Fluttering Shearwater/Diving Petrels. Western lobe of Burgess
9	Feather (unidentified down)	Mokohinau Islands	?	Down associated with GFP egg
10	Feathers (unidentified)	Mokohinaus Islands	?	Grey-faced Petrel
11	Gecko skins	Mokohinau Islands	?	
12	Feather (unidentified)	Mokohinau Islands	?	Primary feather
13	Feathers (Grey-faced P)	Mokohinau Islands	?	12 body feathers
14	Feather (unidentified)	Stack H	Karen Baird	1 small body feather
15	Feathers (unidentified)	Hokoromea	Chris Gaskin	6 small dark feathers possible Diving Petrel; near south end of gut
16	Feathers (Grey-faced P)	Hokoromea	Karen Baird	6 GFP feathers
17	Feathers (Grey-faced P)	Mokohinau Islands	Karen Baird	15+ feathers
18	Regurgitation (Harrier)	Burgess	Brett Rathe Chris Gaskin	Collected 23/3/04, on ridge above House Bay
19	Bones (assorted)	Burgess	Halema Jamieson	Found under a rock overhang. A number of Little Shearwater have been identified- scans of several wing bones were emailed to Trevor Worthy for identification. Further material to be collected at a later date. Possible harrier kills.
	Grey-faced Petrel carcass (5X)	Hokoromea, Stack D, Motupapa, Atihau		Not brought back