

Kermadec seabirds – OP HAVRE 01/2018



Incl. birds seen in vicinity of Raoul Island: implications
for restoration

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26 February- 8 March 2018

Report by: Chris Gaskin & Edin Whitehead



Figure 1. Juvenile male great frigatebird

The expedition was made possible by the Sir Peter Blake Trust and Royal NZ Navy



Young  Blake
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Introduction

Raoul Island is by far the largest of the Kermadec Group (2943ha), the next largest is Macauley Island (306ha). The most recent estimates place the seabird population of the group at 10-15 million birds, with the vast proportion of them breeding on Macauley, Curtis, Cheeseman and the Herald Islands (Gaskin 2011). The number of seabirds breeding on Raoul prior to first human arrivals is difficult to estimate with respect to both taxonomic diversity and total population size. It is most likely seabird populations would have been considerably larger than the estimates (c. 1.5 million birds) made in the early 20th Century (Iredale, 1910, 1913, 1914; Oliver 1912). It is certain, however, that by the end of the 20th Century the island was almost totally devoid of seabirds owing to predation, harvesting and habitat loss following human arrival (Merton 1970). Only sooty terns, a few white terns and red-tailed tropicbirds remained. The vast numbers of petrels and shearwaters were gone (Gaskin 2011).

A long-term government commitment to pest-animal control has seen a reversal of these massive losses. First, goats were eliminated during 1972-1984, then Norway rats and feral cats were eradicated by DOC beginning in 2003. In the fifteen years since, three species that formerly bred on the island have become established – black-winged petrel (breeding first confirmed 2006), Kermadec petrel (winter-breeding) (2007), wedge-tailed shearwater (2008) – along with two for which there are no historical records – Kermadec little shearwater (2015) and Kermadec storm-petrel (2017). Currently seabird species diversity stands at eight species, at the rate of one species per three years; although populations are still a fraction of those formerly breeding on the island. The key determinant in the recovery is the proximity of source populations on the Herald Islands, the closest only 2kms from Raoul Island, with Raoul providing fertile ground for recolonisation. However, most notably, there is no confirmation of breeding for white-naped petrels or Kermadec petrel (summer-breeding) that formerly bred on Raoul Island, the latter a taxon now recognised by the NZ Threat Classification System (NZTCS) as a subspecies. White-naped petrels are known only to breed on Macauley Island (c.50,000 pairs) and Philip Island (Norfolk Island) (c.250 pairs). Summer-breeding Kermadec petrels are only known to breed on North and South Meyer Islands (50-100 pairs) and Macauley Island (<50 pairs).

Seabird islands

To witness the spectacle of seabirds massing over Macauley Island and the diminutive Meyer and Herald Islands close to Raoul is to appreciate why some islands, especially those that are truly oceanic and where seabirds dominate their ecology, can best be regarded as ‘seabird islands’. Seabirds provide conduits that link marine and terrestrial ecosystems (fig 3), and seabird islands have many distinct emergent community and ecosystem properties.

Although studies of seabirds at their breeding sites can provide a picture of trends in the marine environment, fluctuations of these populations can have important implications for the ecology of the terrestrial ecosystems in which they are situated. The lifestyles of seabirds operate on strikingly divergent spatial scales with individuals foraging over vast areas, yet concentrating their breeding efforts to spatially restricted (often island) breeding sites that are often reused year after year. Accordingly, seabirds play a major role in shaping the ecology of terrestrial communities by acting as links between the land and sea; importing sources of marine derived nutrients into terrestrial communities (Mulder et al 2011). At sites where seabirds are present, soil fertility and plant growth can be enhanced through the concentration of minerals (provided by guano and dead adults, chicks and eggs) and in the case of burrowing species through the tilling of the soil and incorporation of leaf litter into the soil by burrow nesting. Colonies provide habitat and food sources for a range of invertebrate and small vertebrate fauna and this enhancement of the biodiversity can travel up the food chain enriching the diversity and abundance of species at higher trophic levels (Gaskin & Rayner 2013).

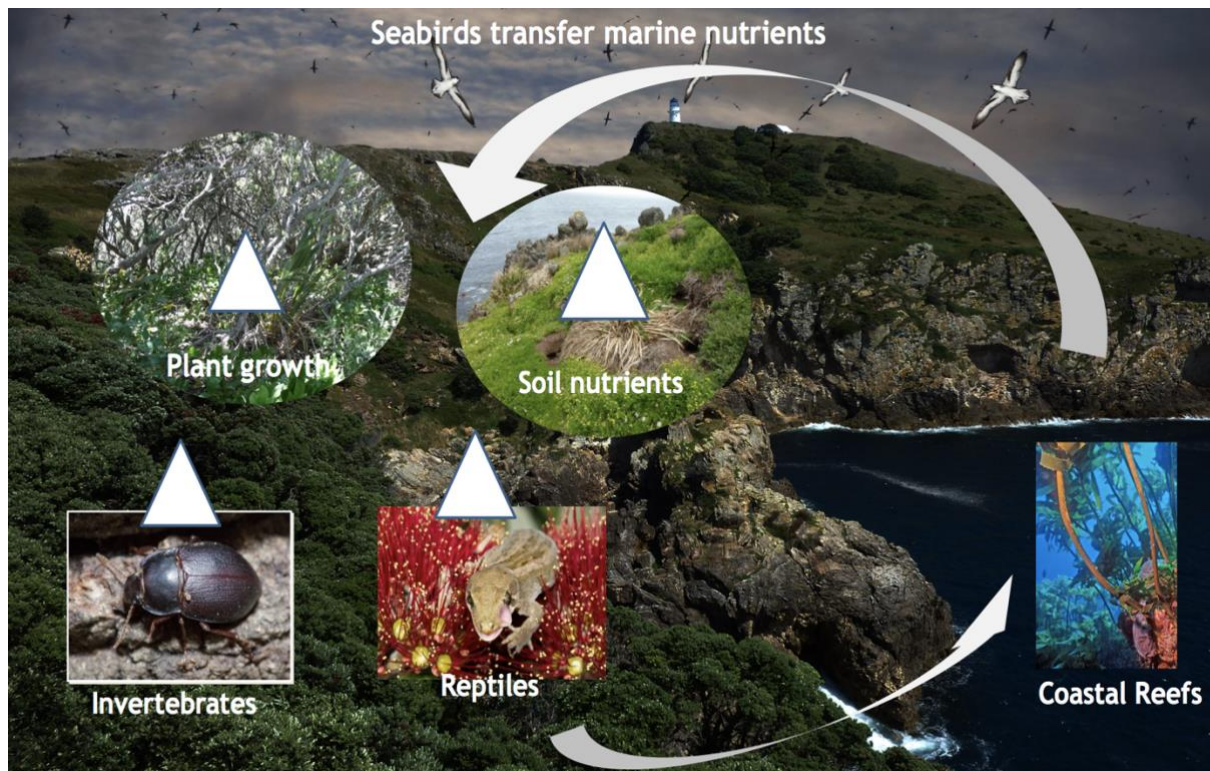


Figure 3. Seabird transfer of marine-derived nutrients to land and resulting impacts on terrestrial ecosystem productivity. Graphic from Rayner, M.J., Gaskin, C.P. (2013). Hunting the New Zealand Storm Petrel in a world centre for seabird diversity. Presentation at the Australasian Ornithological Conference, 4-7 December 2013, Auckland, New Zealand. Photos: Shelley Heiss-Dunlop, Dylan van Winkel, Neil Fitzgerald, Kim Westerskov, Karen Baird, Chris Gaskin.

Tracking the changes

Every island restoration project has its own dynamic, and monitoring post-eradication changes over the long term should be a high priority to better inform conservation management, as well as future restoration projects elsewhere, both in New Zealand and overseas. The international spotlight is on the Raoul programme and the island's recovery, especially its seabirds. Likewise, understanding the ecology of many Kermadec seabirds is a high priority for research, both with respect to the islands on which they breed and the marine environment where they feed.

This report

This report has been prepared to support seabird restoration of Raoul Island. It presents observations made during OP HAVRE 01/2018, i.e. birds seen in vicinity of Raoul Island and the significance of those observations for seabird restoration; also, boat-based, shoreline surveys of the Herald and Raoul Islands. A number of recommendations are made related to species seen and/or breeding at the Kermadecs. These are included in the species entries and summarised in a separate section.

Trip itinerary

26-28 February – transit to Raoul from Auckland, via Macauley Island for GNS to install equipment on shore platform. Sea watch during daylight hours.

1 March – first day of operations off Raoul. Maintained a sea watch from the *Canterbury* during most of daylight hours. Teams used the RHIBs to get the science programme underway – plankton tows, baited remote underwater video rigs (BRUV), algal collections, and light traps.

2 March – return to Macauley overnight to survey wreckage of a boat that the helicopter crew had seen on 28 Feb. Surveyed island from sea for any survivors. Photographed (stitched landscapes) island's south and east coasts in high resolution, north coast from a distance (ie. lower resolution).

3 March – 0930-1030hrs, boat-based survey of Meyer and Herald Islands using one of the RHIBs. Circuit starting at South Meyer, then North Meyer, east sides of both islands, across to Chanter Islets, then Dayrell, Nugent and Napier Islands. High resolution photos taken of both seabirds and vegetation. 1330-1600hrs, survey of Napier, North and South Meyer Islands for more photographs of seabirds and vegetation cover. Then moved across to Raoul Island's north coast – specifically Wilson Point, Rayner Point, a brief stop at Fishing Rock, then headed towards Hutchison Bluff to photo survey the tropicbird cliffs. Raoul supply operation continued most of the afternoon. *Canterbury* anchored south side of Hutchison Bluff for the night.

4 March – weighed anchor, then headed to north side of island for the day. Ship-bound day for the seabird team, with the exception of an evening run to Boat Cove for EW accompanying a team setting light traps. Photographs taken by EW at Boat Cove.

5 March – GNS and DOC operations with helicopter and RHIBs, science and snorkelling programme using one of the RHIBs around at Boat Cove. Seabird team on board *Canterbury*.

6 March – CG with BRUV deployment crew around at Boat Cove, from Nash Point through to Darcy Point (0945-1245hrs). EW with snorkel team in Boat Cove from 0800-0930. Early departure (1700hrs) from Raoul due to a serious injury to one of the naval crewman.

7-8 March – return to Auckland.



Figure 4. The 'seabird team' in action during OP HAVRE 01/2018 – Chris Gaskin and Edin Whitehead. Photo: Chris Weissenborn, RNZ Navy

Recommendations summarised

1. Complete the investigation into Kermadec petrel taxonomic status, as required by DOC (NNZST with University of Canterbury). This can only be determined through analyses of blood samples collected on the Meyer Islands, for example from chicks during February/March to be certain of collecting from summer-breeders.
2. Assess the status of both summer-breeding and winter-breeding populations and to provide recommendations for future management actions including attracting 'summer' breeders to Raoul Island.
3. The *Nationally Endangered* status (NZTCS 2017) of summer-breeding Kermadec petrels warrants control of pukeko on the Meyer islands to mitigate against predation, in particular of chicks. Control measures would also be beneficial for other species.
4. Obtain audio recordings of summer-breeding Kermadec petrels on the Meyer Islands for use in acoustic attraction systems.
5. Survey for a site at Hutchison Bluff for installing a fourth acoustic attraction system. This would target white-naped petrels.
6. Monitor the three acoustic attraction systems on Raoul Island for signs of seabirds nesting - in particular target species (i.e. white-naped petrel, summer-breeding Kermadec petrel).
7. Survey for signs of breeding on Raoul Island for white-naped petrel, masked booby, grey noddy (grey ternlet), black noddy.
8. Record species breeding in the northern Kermadec Islands for the first time - e.g. white-bellied storm-petrel, brown noddy, frigatebird species, brown booby.
9. Survey distribution of pukeko and assess for predation on nesting seabirds and terrestrial birds.
10. Survey extent of seabird breeding on Raoul Island and provide population estimates on for Kermadec petrel, black-winged petrel, Kermadec little shearwater, wedge-tailed shearwater, red-tailed tropicbird, sooty tern and white tern. Set up study areas for regular monitoring, and breeding and tracking studies.
11. Survey North and South Meyer Islands for all species and assess any changes due to inter-specific competition for nesting areas; effects on seabird nesting from soil erosion and vegetation loss due to cyclone/storm events; effects from disturbance by human intrusion (e.g. weed teams working in densely burrowed areas).
12. Establish a comprehensive research programme for northern Kermadec seabirds (i.e. Raoul and Herald Islands), building on the ad hoc study since 2006 by scientists and DOC staff. The programme will provide a detailed long-term examination of total seabird taxonomy, breeding biology, physiology, population dynamics, behavioural ecology and marine foraging ecology, niche partitioning and migration (refer Wildlife Act Authority application documents submitted by the Northern NZ Seabird Trust October 2016).

Seabirds not confirmed breeding on Raoul and Herald Islands

The following entries are for seabird species that are not known to be currently breeding in the northern Kermadec Islands (Raoul and the Herald Islands) – in one case, the white-naped petrel formerly bred on Raoul Island, the other two are species that are regarded as visitors from Pacific Islands.



Figure 5. White-naped petrel

White-naped petrel *Pterodroma cervicalis*

Establishing a breeding population of the white-naped petrel on Raoul Island has to a major goal for the restoration programme. The white-naped petrel, also known as the Sunday Island petrel after an early name for Raoul Island, used to breed on Raoul Island until the 1920s-1930s when they were extirpated, the result of cat and possibly rat (Norway rat) predation. Most of the global population breeds on Macauley (c.50,000 pairs estimated in 1988) with a small population on Phillip Island (Norfolk Island) (c. 250 pairs).

In February 2006 and March 2007 single white-naped petrels were found on the beach below the western end of the Northern Terraces, just west of western springs. Both were covered with the burrs of a native grass (*Centrus calyculatus*) dubbed ‘velcro grass’ that grows on the terraces in that area. These birds were either prospecting or fledglings. In January 2018 one bird landed at the DOC hostel, possibly attracted by the lights. Unsuccessful searches for sign of white-naped petrel breeding were made of the terraces and lower slopes in April 2008.

Acoustic attraction (playback) is a technique that has been used successfully to establish breeding populations of target species on offshore islands and a few mainland sites around Aotearoa New Zealand (Friesen, Gaskin et al, *in prep*). It has also been used to anchor translocated seabirds to their new sites (Miskelly et al 2011). The method is successful provided target species are within range of the calls being played – either immediately offshore or flying overhead. Three systems were installed on Raoul Island in 2007 through DOC’s Technical Support unit.

One of the systems is now located at Sweaty Man's Rock above Western Springs/Ravine Eight, beside the track to Hutchison Bluff. This system is playing recordings of white-naped petrel calls made on Macauley Island (S. Cockburn, pers. comm.). However, only black-winged petrels have been reported breeding in the vicinity of the speaker system.

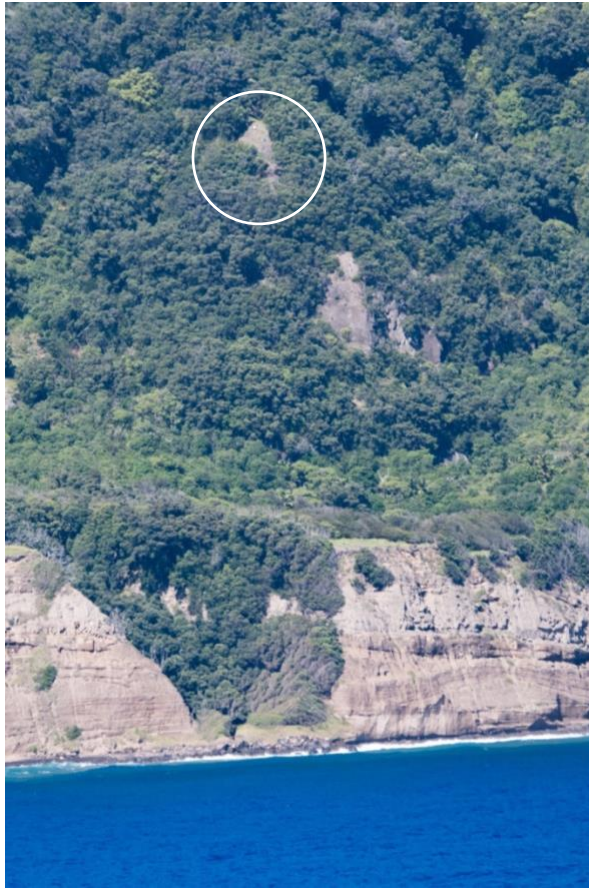


Figure 6 & 7. Speaker site in relation to Northern Terraces & Ravine Eight

During OP HAVRE 01/2018 we observed white-naped petrels (WNPE) opportunistically in close proximity to Raoul Island on a number of occasions. Land points were recorded for possible new sites for a new (second) acoustic attraction system targeting this species. Observations are as follows:

- 28 Feb – several WNPE seen late afternoon close to the north coast of Raoul (between Hutchison Bluff and Fleetwood Point) – within 3nm.
- 1 March – (1335hrs) one WNPE seen 1.9nm off Hutchison Bluff, another off Denham Bay (further out) later in the day.
- 3 March – one WNPE seen from RHIB 2.5nm from Hutchison Bluff north coast en route back to *Canterbury*.
- 4 March – several WNPE seen flying north along the long current line off Hutchison Bluff early morning; another seen off the north coast of Raoul late morning.

RECOMMENDATIONS

- **Change the direction of existing speaker at the Sweaty Man's Rock to northwest. The speakers are very directional and the change will mean the broadcast calls will be directed to areas where white-naped petrels have been observed, not only on this trip but also during previous trips – ie. predominantly off north-western end of the island.**

- Regular checks to be made at Sweaty Man's Rock for sign of white-naped petrel burrows during breeding, especially from January to March.
- Playback of war-whoop calls (recorded) from a site (cliff edge) at the end of road at Ravine Eight. The eastern side is preferable to one on the western side of Ravine Eight because of extensive 'velcro grass' in that area. It is important that any birds attracted will not land in 'velcro grass'.
- Install another system above the north Hutchison Bluff coast. Actual site dependent on access but preferably at mid-height (ie midway between beach and ridge top), on a forest-covered ridge with an open area for solar panel, and heads of forested gullies behind. If sited too high then calls will unlikely reach sea level and passing birds. If too low then there may not be a suitable area for birds to colonise – most are steep grassy slopes above the beach with low cliffs (see fig. 8).
- Obtain new recordings of white-naped petrels on Macauley Island, preferably with minimal accompanying black-winged petrel calls. The latter on the current recording are likely attracting that species which are rapidly re-establishing on Raoul.

Figure 8. Towards Hutchison Bluff (north face).



Brown booby *Sula leucogaster*

A brown booby had been photographed by one of the Raoul team in 2016 at Denham Bay. Three birds were seen together at L'Esperance Rock, Kermadec Islands in March 2016 (NZ Birds Online).

Observations made during OP HAVRE 01/2018 are as follows:

28 Feb – juvenile seen at sea 29.71608°S, 178.21704°W (fig 34). Photos show moult indicating the bird is not a first-year bird; also, adult birds were seen off north coast of Raoul on two separate occasions, possibly two different birds?

3 March – adult seen over South Meyer Island, adult and juvenile seen over Napier Island.

RECOMMENDATION

- **Check for both presence at Herald Islands and coast of Raoul throughout the year and signs of breeding. Brown boobies nest in trees with the closest colonies in Tonga and Fiji.**

Figure 9. Brown booby



Great frigatebird *Fregata minor*

Frigatebirds have been regularly for the northern Kermadecs (Veitch et al 2004, Gaskin 2011) with a maximum single observation of 18 over Hutchison Bluff in 2008 (K. Baird pers. comm.).

Observations during OP HAVRE 01/2018 are as follows:

1 March – one female seen off Hutchison Bluff (1240hrs); one male seen off Darcy Point.

3 March – numbers seen (c 15) in the air over North Meyer, South Meyer, Chanter and Napier Islands, both in the morning and afternoon. Three were seen roosting in trees – one on Chanter North Islet, and two on Napier Island (one adult male and a juvenile). One photographed pursuing a wedge-tailed shearwater (fig 8); one being harassed by a Kermadec petrel (fig. 9). Also, one male seen over Hutchison Bluff in the evening from the *Canterbury* at anchor.

6 March – individuals seen over Wilson Point and Darcy Point.

RECOMMENDATION

- **Record presence throughout the year and signs of breeding. Frigatebirds nest in low scrubby vegetation. Searches should include all the Herald Islands.**

Figure 10. Juvenile great frigatebird, roosting, South Chanter Islet.



Figure 11. Kermadec petrel pursuing a male great frigatebird.



Figure 12. Juvenile great frigatebird pursuing a wedge-tailed shearwater.



Other species

Species confirmed breeding on southern Kermadec Islands, but not known for northern Kermadec Islands nor seen in the vicinity of Raoul and Herald Islands during OP HAVRE 01/2018 are: Christmas Island shearwater (*Puffinus nativitatus*), white-bellied storm-petrel (*Fregetta grallaria grallaria*) and common (brown) noddy (*Anous stolidus pileatus*). Two white-bellied storm-petrels were seen in the vicinity to Macauley Island, one on 28 March and a second on 2 March.

Figure 13. White-bellied storm-petrel, off Macauley island.



Seabirds confirmed breeding on Raoul and Herald Islands

The following entries are for seabird species that are currently known to be breeding in the northern Kermadec Islands (Raoul and the Herald Islands). Those confirmed breeding on Raoul have separate species entries; those breeding on the Herald Islands but not on Raoul are grouped under 'Other species'.

Kermadec petrel *Pterodroma neglecta neglecta*

Seen around Raoul Island on all days although not in large numbers except over the Herald Islands. Single birds seen flying along cliffs at Boat Cove on the evening of the 4th March, and morning of 6th March. None were seen in the vicinity of Macauley Island. Summer and winter-breeding adults are impossible to identify separately. The genetic analysis following collection of blood samples in October 2015 led to the recognition of two separate subspecies. Further clarification is required to confirm the status of these two taxa and can only be completed through the collection of blood samples from summer-breeding chicks to be certain that that particular taxon has been selected. Kermadec petrels are surface nesters and chicks are extremely vulnerable to predation. Summer-breeding Kermadec petrels are now classified as Nationally Endangered (NZTCS 2017).

RECOMMENDATIONS

- **Collect blood samples from summer-breeding Kermadec petrel chicks in February/March on North and South Meyer (the most accessible Herald Island sites)**
- **Assess threats to summer-breeding chicks, in particular for sign of pukeko predation (see section – Additional Notes below).**
- **Obtain recordings of summer-breeding Kermadec petrels during November to January period on Meyer Islands.**

Figure 14. Mark Miller (University of Queensland/NNZST) and Emma McCool (DOC) measuring and taking blood samples from a winter-breeding Kermadec petrel chick on summit of North Meyer Island, October 2015. Photo: Chris Gaskin



Black-winged petrel *Pterodroma nigripennis*

Ever present over all islands – in particular Macauley, Meyer and Herald Islands. This species was seen over Raoul Island at several locations from the Canterbury offshore, also when close to shore in RHIBs. Wilson Point, Boat Cove, Rayner Point, Terraces, Western Springs Terrace, Hutchison Bluff, Smiths Bluff, and Darcy Point. Previously unrecorded sites include the south side of Hutchison Bluff, with birds circling over a fan and the forest above a small beach to their east of the fan. Teams on Raoul have recorded black-winged numbers increasing and continuing to expand into new areas. Black-winged petrels are in a number of easily accessible sites that should allow for the establishment of study plots.

RECOMMENDATIONS

- **Mapping the extent of black-winged petrel burrows will be a necessary outcome of a comprehensive seabird survey programme for Raoul Island.**
- **Set up study plots for ongoing monitoring – breeding success, physiological and tracking studies.**

Figure 15. Black-winged petrel, Raoul island.



Wedge-tailed shearwater *Puffinus (Ardenna) pacificus*

Known colonies are along the cliffs in front of the DOC hostel and ‘bomb shed’, Rayner Point, and Nash Point. There is a significant population on the Herald Islands, with the largest for the Kermadec Islands on Macauley Island.

28 Feb - 6 March – Seen during daylight hours close amongst the Herald Islands, some over the islands themselves. Towards dusk numbers of birds could be seen approaching the islands. Also seen in numbers at Macauley Island around the middle of the day.

6 March – seen late morning flying over rocks close to the known colony at Nash Point, Raoul Island.

RECOMMENDATION

- **Detailed survey of known colonies**
- **Set up a study plot at Nash Point for ongoing monitoring – breeding success, physiological and tracking studies.**

Figure 16. Wedge-tailed shearwater, off Raoul Island.



Red-tailed tropicbird *Phaethon rubicauda*

Conspicuous species seen on all days, especially on the north coast of Raoul Island and at the Herald Islands.

28 Feb – 2 March – Numbers seen flying along the face of the cliffs on the northern side of Hutchison Bluff. Nest sites were located when flying birds ‘disappeared’ – ie. were landing on ledges, in vegetation on ledges, or flying into shallow caves backing ledges. Some birds could be seen sitting on ledges. A small number of birds were seen flying towards the southern side of Hutchison Bluff but a binocular search after rounding the headland did not locate any further birds, either flying or on ledges.

3 March – during boat survey seen over all the islands in the Meyer and Herald Group and in considerable numbers over the Meyers during the afternoon survey. Also, one seen at Wilson Point during the afternoon survey.

5 March – Photographs were taken in the afternoon of the cliffs east of Hutchison Bluff along the northern coast. Birds were seen further to the east of observations on 3 March.

6 March – individuals seen at Darcy Point, Boat Cove, Wilson Point

RECOMMENDATIONS

- **Locate former ‘Tropicbird Cliffs’ that Roy Bell (1910) writes about in his diary. This is where he and his brother King Bell collected eggs.**
- **Check for presence throughout the year and signs of breeding.**
- **Collect blood samples to support phylogenetic research on red-tailed tropicbirds**

Figure 17. Red-tailed tropicbird, Herald Islands.



Sooty tern *Onychoprion fuscatus serratus*

Sooty terns are a dominant presence on the Herald Islands (c. 10,000 pairs) and commonly seen at sea around the islands. On Raoul Island, sooty terns occupy the beaches and vegetated dunes and slopes along the northern coast, the two debris fans below Hutchison Bluff itself. There have been reports of breeding further towards Denham Bay. Sooty terns also breed on Macauley Island, current population unknown but likely >10,000 pairs.

28 Feb – both adults and juvenile birds were seen from the *Canterbury* on the approach to the island. We saw considerable numbers over the debris fan below Hutchison Bluff – seen in silhouette from on board *Canterbury* to the north.

1 March – On rounding the bluff in the *Canterbury* (c. 1.75nm offshore), we could see the two fans where sooty terns have been reported nesting in addition to the north coast beaches. Both have scrubby low vegetation and grass with relatively bare areas where the terns nest. While few birds could be seen over the fans, crew in one of the RHIBs

passing close to shore en route to Denham Bay reported that the noise of the boat set off many birds, which followed overhead. Between the eastern-most fan and Denham Bay there are some short beaches and a vegetated fan, then cliffs which drop almost sheer to the sea from high cliffs – a hard rocky shore. The fan does not appear to have any bare patches and no terns were seen roosting. At present, there is no sign that the sooty terns will return to their former stronghold of Denham Bay on their own.

RECOMMENDATIONS

- **Reinstate the sooty tern surveys run by DOC Raoul staff 2005-2011.**
- **Check for nesting at other sites during breeding (November to April). Outside this period sooty terns migrate from Kermadec waters – distribution unknown.**

Figure 18. Sooty tern, off Raoul Island.



White tern (*Gygis alba candida*)

Confirmed breeding only on Raoul Island. Nest in trees (large pohutukawa) in the Wilson Point/Boat Cove/Sunshine Valley area. Formerly bred at Denham Bay.

28 Feb – several seen off north coast later in the day. Seen in twos or threes, occasionally singly. All flying towards the Meyers/eastern end of Raoul.

1 March – seen at sea on all coasts in the first two days. Seen flying in twos and threes, also a feeding flock (c. 10) with black noddies and grey ternlets (grey noddies) off Smiths Bluff.

4 March – late evening, several seen flying along cliffs at Boat Cove, two pairs seen roosting in pohutukawa trees along the cliff edges.

6 March – early morning (0745hrs) pairs flying together along the cliffs at Boat Cove

RECOMMENDATIONS

- **Check for presence at other sites during breeding (October to March).**
- **Locate nesting and roosting trees (all seasons).**

Figure 19. White tern, off Raoul Island.



Other species

Masked (Tasman) booby *Sula dactylatra tasmani*, black noddy *Anous minutus minutus* and grey noddy (grey ternlet) *Procelsterna cerulea albivittata* breed on the Herald Islands (the latter in large numbers). While they were seen foraging, and feeding close to Raoul, they do not nest on the island. Grey noddies were seen roosting at Wilson Point during this trip and have also been seen roosting at Te Konui Point, Boat Cove and Hutchison Bluff in the past.

RECOMMENDATIONS

- **Check for and record signs of nesting and roosting on Raoul Island – masked booby (throughout year), black noddy (August to April), grey noddy (August to February)**

Figures 20, 21, & 22. Masked booby, black noddy and grey noddy.



Figure 24. Grey ternlets roosting on rocks at Wilson Point, Raoul Island; two Kermadec petrels in flight.



ADDITIONAL NOTES

The pukeko situation – Meyer and Raoul Islands

In October 2015 two pukeko were observed working nests of seabirds on North Meyer. Observations were made by a diving team just out from the Boat Harbour (D. Aguirre, T. Trnski pers. comm.). The pukeko were seen towards the northern end of the island moving along ledges, in and out of sight, continually being dive-bombed by seabirds, most likely noddies and petrels. Of the surface-nesting seabirds, winter-breeding Kermadec petrels would have had nearly-fledged chicks, and masked boobies on eggs, or small chicks. There are large numbers of Kermadec little shearwaters on the Meyer Islands nesting in shallow burrows in the soft loamy soils and these would also have had chicks in October. The team in the boat observed the pukeko for half an hour until they disappeared over the top of the islands and out of sight.

This presence and behaviour is not confined apparently to the month of October as pukeko have been observed flying to the Meyers from Raoul Island (T. Gibson, pers. comm.). The concern is the continued predation of nesting seabirds (and kakariki and spotless crakes) on Meyer Island; and in particular the impact on surface-nesting summer-breeding Kermadec petrels known only to be breeding on the Meyer and Macauley Islands (estimated population 50-100 pairs, Nationally Endangered under NZ Threat Classification System). The concern about pukeko predation extends to Raoul Island, as discussed at the Raoul Island Prescription Review Hui 2017. Pukeko have been observed regularly preying on black-winged petrels (fig 24), kakariki and spotless crakes, when control measures (and possible eradication) of pukeko were recommended. Kermadec storm-petrels (Nationally Critical) and Kermadec little shearwaters (Nationally Uncommon) have both been confirmed breeding at Wilson Point on Raoul (C. Gaskin pers. obs., T. Bliss, pers. comm.) and are regarded as a major conservation success for the Raoul Island restoration programme (and ‘gold’ for eradication programmes generally). The predation of these highly vulnerable small burrow-nesting seabirds by pukeko, which are present in the Boat Cove area, would be a major setback.

Figure 24. Pukeko predation of black-winged petrels (inset photo) on hostel lawn, Raoul Island. Photo: DOC



Vegetation cover of Herald Islands

During OP HAVRE 01/2018 EW took series of photos of each of the Herald Islands (e.g. North and South Meyer, fig 25) during coastline surveys in the RHIBs, which stitched together provide high-resolution, highly-detailed landscapes of each of the islands showing vegetation cover, and roosting and nesting seabirds. During cyclones and heavy rain events the loamy soil is eroded from the slopes exposing burrows and removing surface-nesting seabirds' nests. Fans of soil were deposited on the rocky shore platform at the Boat Landing, North Meyer Island in 2015.

Figure 25. North Meyer (top) and South Meyer (bottom), stitched panoramas.



Figure 26. Ngaio trees recovering from 2007 cyclone, North Meyer – taken April 2008. Photo Chris Gaskin.



Figure 27. Cyclone damage to trees on South Meyer April 2008. Photo: Chris Gaskin



Figure 28. South Meyer March 2018.



Figure 29. Slope behind Boat Landing, North Meyer October 2015. Photos: Chris Gaskin



Figure 30. Slope behind Boat Landing, North Meyer March 2018. Rock in fig 29, is just visible behind the vegetation above the rock platform.



Macauley Island

After landing the GNS crew on Macauley Island on 28 Feb the *Canterbury*'s helicopter crew photographed a wrecked boat on the southeast shore. On 2 Mar the *Canterbury* returned to Macauley to survey the wreck and see if there were any survivors. A storm throughout the morning kept the ship offshore idling down and up wind until winds and seas had subsided for a survey of the shoreline. Neither the helicopter or RHIB were launched, rather a pass was made within 1nm from shore and scanning with binoculars and cameras. The wreck was located – an upturned fibreglass power-catamaran, an unlikely boat to be travelling between the New Zealand mainland and the Pacific Islands. Most likely a tender lost from a larger vessel. A long blast of the ship's horn got no response from shore.

In Sandy Bay, there was no sign of the sand dune that used to back the beach reforming. The cliffs drop sheer to the beach. Seabirds were seen in huge numbers in the vicinity of the island and flying over the summit plateau.

Species seen:

- Black-winged petrel
- White-naped petrel
- Wedge-tailed shearwater
- White-bellied storm-petrel
- Red-tailed tropicbird
- Masked booby
- Sooty Tern
- Black noddy
- Grey noddy (grey ternlet)

No Kermadec petrels or brown noddies were seen. Other species known to be breeding on Macauley and Hazzard Islands (Kermadec little shearwater and Kermadec storm-petrel) were outside their breeding season.

Figure 31. Seabirds over the plateau of Macauley island.



High resolution photographs (stitched landscapes) were taken of the island showing its vegetation from the south-west, south-east and eastern sides. We have also been provided with aerial photos were taken by the Navy's photographer, Chris Weissenborn, on a later flight to check the wreck.

Figure 32. Macauley Island (with Haszard Island in foreground).

Figure 33. Aerial view of Macauley showing Sandy Bay and rock platform. Photo: Chris Weissenborn, RNZ Navy



Figure 34. Juvenile brown booby

