

Conservation Services Programme
Flesh-footed Shearwater Research Project 4653
Demographic Component, April-May 2016 Report



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Abstract

The trends and population dynamics of flesh-footed shearwaters (*Puffinus carneipes*) in New Zealand are not well understood. The threat classification was changed from “Not Threatened” to “Nationally Vulnerable” between 2008 and 2012 which falls within the criteria of a predicted decline of 50-70%. A clearer understanding of the population dynamics of this species is necessary to pinpoint the key problem areas. This project focused on one study site, Ohinau Island, Mercury Islands group, Coromandel, and expanded on previous work done on flesh-footed shearwaters started in 2012. A two-week trip was carried out during late chick rearing, with the aim of banding as many chicks and adults as possible, both caught in burrows and on the surface at night. A total of 357 birds were banded, of which 90 were adults and 267 were chicks. In addition, 186 study burrows were marked with access to the nest chamber, and 32 burrows were included as control burrows which would only be checked with a burrow-scope. These 218 burrows provide an excellent starting point for the next two seasons where the focus will be on monitoring reproductive success and continuing to increase the marked population and recapturing of banded birds.

Keywords Ohinau Island, burrow, plastic, marked population, survival

1. Introduction

The trends and status of flesh-footed shearwaters (*Puffinus carneipes*) in New Zealand are not well understood. The threat classification has recently been changed from “Not Threatened” to “Nationally Vulnerable” (Robertson et al. 2013). Approximately 11-23% of the global flesh-footed shearwater population breeds in New Zealand (Taylor 2000), and it is therefore important to understand survivorship rates and changes in number of breeding birds. A preliminary study examined survivorship from two New Zealand sites, Lady Alice Island in the Hen and Chickens Group (35.89° S, 174.71° E) and at Kauwahaia Island, Te Henga in West Auckland (36.54° S, 174.26° E; Barbraud et al. 2014). The Conservation Services Programme project is building on this study and its recommendations by increasing the sample size, examining inter-colony effects as well as gaining insight into differences in behaviour between breeders, non-breeders, or sexes. The Lady Alice Island site will continue to be monitored, and Ohinau Island (36.72° S, 175.88° E) will be added as a new site. This also follows suggestions made by Waugh et al. (2014) that mark-recapture studies be continued.

Previous work on flesh-footed shearwaters on Ohinau Island was started in 2012 (Waugh et al. 2014). The island is 32 ha, and has an estimated number of occupied flesh-footed shearwater burrows of 2,071 (95% CI [943, 3200]; Baker et al. 2010). Approximately 50 burrows were marked and monitored, and 62 adult birds banded (Waugh et al. 2014). This work will be expanded upon over the course of the next two years to expand the number of banded birds and to gather as much recapture data as possible. Lady Alice Island is reported to have between 583 and 593 banded and recaptured adults since 1999-2000, with a total of 191 chicks banded and 12 recaptures (Barbraud et al. 2014, Waugh et al. 2014). However, Lady Alice Island could not be visited during this initial part of the project due to access complications.

The main aims of the trip were i) to band as many chicks as possible, both on the surface and in burrows, ii) to target and band any adults seen on the surface at night and in study burrows, and iii) to set up between 150 and 200 study burrows. This report summarizes the results of this trip carried out in April-May 2016 on Ohinau Island.

2. Methods

This trip was conducted on Ohinau Island, which is part of the Mercury Island group in the Coromandel area (Fig. 1a). A field team of two personnel stayed on the island from 20 April to 5 May 2016, using a tent camp (Fig. 2a). Quarantine was carried out at the Whitianga Department of Conservation (DOC) office, and transport was by boat charter from Whitianga.

Study burrows were established during the day. Previously identified colonies by Baker et al. (2010) and Jamieson & Waugh (2015) were located (Fig. 1b), and burrows searched (Fig. 2b). Contents were checked by reaching into the entrance by hand or feeling around with a stick to see if a bird was present. If the bird was reached by hand, it was pulled out of the entrance. If it was felt with a stick, an inspection hatch was dug to enable access to the chamber. These hatches were sealed with a small square of plywood. A selection of burrows were checked with a burrow-scope only. These will provide a useful comparison for determining any impacts that study hatches may have on breeding success. Study hatches were only placed in such a manner that did not compromise the stability and structure of the burrow.

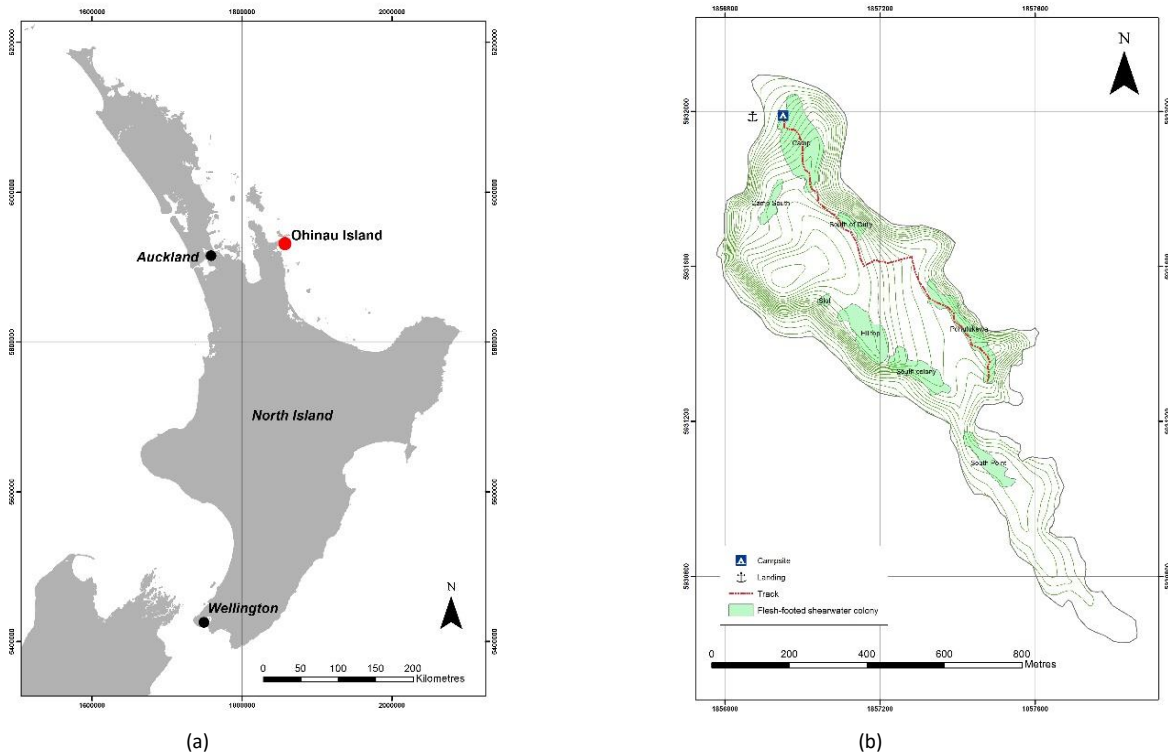


Figure 1. Maps showing (a) location of the flesh-footed shearwater study site, Ohinau Island, and (b) location of previously identified flesh-footed shearwater colonies.

Study burrows were marked with an individually numbered plastic tag and GPS co-ordinates recorded. Only burrows with a chick were marked as this ensured that it was a flesh-footed shearwater burrow and that it was being used by a successful breeding pair. Chicks were removed from the burrow as explained above, and banded with a Z-sized metal band. Each chick had its right hand side wing measured as well as its weight. Wing length was determined with a 400 mm stopped ruler, maximum flattened cord from carpal joint to the tip of the longest primary. Weight was determined by placing the bird in a fabric bag and weighed with a Pesola® scale. The chick was placed back in the burrow to where it was sitting. Study burrows were spread out throughout the island to create a representative sample of breeding success across the whole island, as well as increasing the area searched and hence increasing chances of finding banded birds.



Figure 2. Photos showing (a) campsite, and (b) typical flesh-footed shearwater colony on Ohinau Island

To increase the recapture of banded birds as well as increasing the number of banded birds, adult birds were caught at night on the surface by using a head torch and hand-net. This involved capturing any adults seen walking around on the surface at night. A GPS point was taken at the place of capture, and the birds were released in the same location as they were captured. Night work primarily took

place from midnight until dawn. All adults captured were banded with a Z-sized metal band, and measured to record wing length, weight, head and bill length, and minimum bill depth. These measurements will be used as a possible way to determine sex by using discriminant function analysis (DFA). Wing length was determined with a 400 mm stopped ruler, using the right hand side wing, maximum flattened cord from carpal joint to the tip of the longest primary. Weight was determined by placing the bird in a fabric bag and weighed with a Pesola® scale. Head and bill length were measured with Vernier callipers, from the supraoccipital to the front curve of the bill. Minimum bill depth was also measured with Vernier callipers, at the narrowest point of bill, excluding nostrils. Approximately 3-4 breast feathers were collected from every adult caught and placed in a paper envelope for DNA sexing. A stripe of correction fluid was put on every handled bird's forehead. If a marked bird was seen, it was not handled and/or caught again. This minimised disturbance to the bird.

Chicks found sitting on the surface at night were also captured, banded with a Z-sized metal band, measured, and released in the same place, with a GPS point taken for reference. Measurements of weight and right hand side wing length were taken as outlined above. These could provide a useful indication for fledgling return rates.

A note about the activity of grey-faced petrels (*Pterodroma macroptera*) was made if adults were seen entering and leaving study burrows. Observations of flesh-footed shearwater chicks that had injuries consistent with grey-faced petrel attacks (bald and bleeding head, any piercing in the body, on surface during the day) were noted in order to quantify the impact of inter-species competition for burrows.

Any dead bird found in a burrow or on the surface was necropsied. This included checking the proventriculus and ventriculus for plastic contents. All plastic was placed on a laminated card with 5x5 mm squares (for scale) and a photograph taken to document the type and colour of plastics.

3. Results

A total of 186 study burrows were established within 5 sub-colonies on Ohinau Island (Fig. 2, 3). Of these, 177 contained live chicks, 6 contained recently dead chicks close to fledging age, 2 contained extremely emaciated chicks, and 1 contained an abandoned egg. A further 32 burrows had contents checked by burrow-scope only. All these burrow-scope burrows had live chicks present (Table 1).



Figure 2. Photo showing a flesh-footed shearwater study burrow with hatch, Ohinau Island.

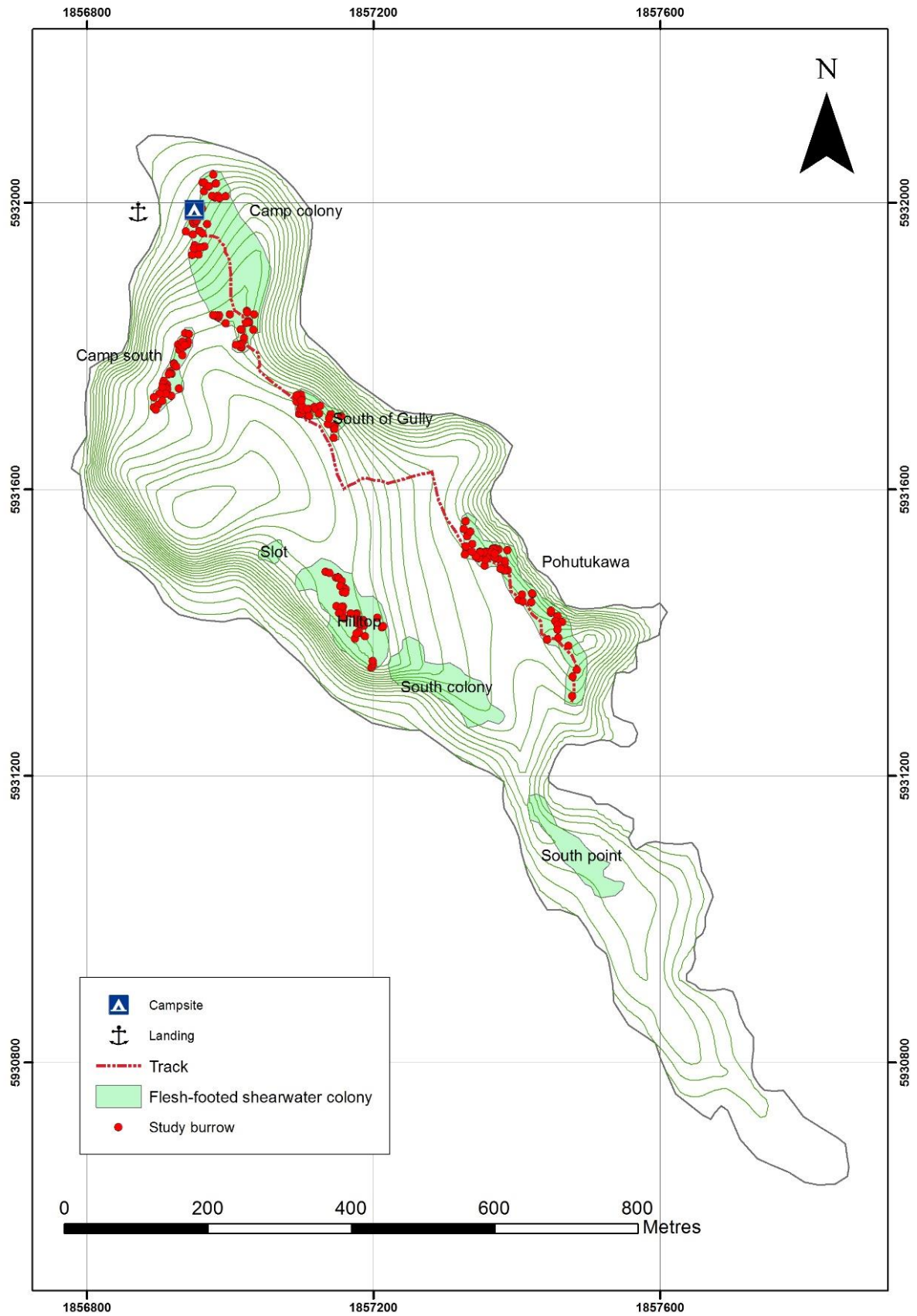


Figure 3. Location of flesh-footed shearwater study burrows within each sub-colony, Ohinau Island.

The study burrows were spread across the whole island, but were excluded from three sub-colonies to allow these to remain undisturbed. All live chicks were banded and measured, and dead ones removed from burrows and necropsied.

Table 1. Number of flesh-footed shearwater study burrows within each sub-colony, Ohinau Island.

Sub-colony	Number of study burrows
Camp	30
Camp South	35
Hill Top	40
Pohutukawa	51
South of Gully	30
Total	186
Burrow-scope	32

A total of 357 flesh-footed shearwaters were banded during the field trip (Table 2). This consisted of 177 chicks from study burrows. No adults were found in study burrows during the day, but 8 were captured at night. A further 90 chicks and 82 adults were caught on the surface at night (Fig. 4). Night work was intensively carried out from April 27th to May 4th. Effort was spread out across the whole island, but no birds were captured in the southwest colonies.

Table 2. Number of chick and adult flesh-footed shearwaters banded in study burrows and on the surface at night, Ohinau Island.

Situation	Number banded
Chick, study burrow	177
Chick, surface	90
Adult, study burrow	8
Adult, surface	82
Total	357

A total of 10 flesh-footed shearwater chicks with evidence of grey-faced petrel attacks were found, 6 of which died, 3 disappeared, and 1 remained alive. Grey-faced petrels were also far more abundant at higher elevations, in colonies such as Pohutukawa, Camp south, and Hilltop, than at lower elevations. Less than 5 individuals were seen in the Camp colony.

A total of 10 dead birds were found, all of which were chicks. Of these, only one did not contain any plastic. Four contained plastic in both the proventriculus and ventriculus, two contained plastic in the proventriculus only, three contained plastic in the ventriculus only. One live chick vomited during handling, and this regurgitate contained plastic. A regurgitated bolus which contained plastic was also found at the entrance of a study burrow, and this was assumed to be from the chick in the burrow.

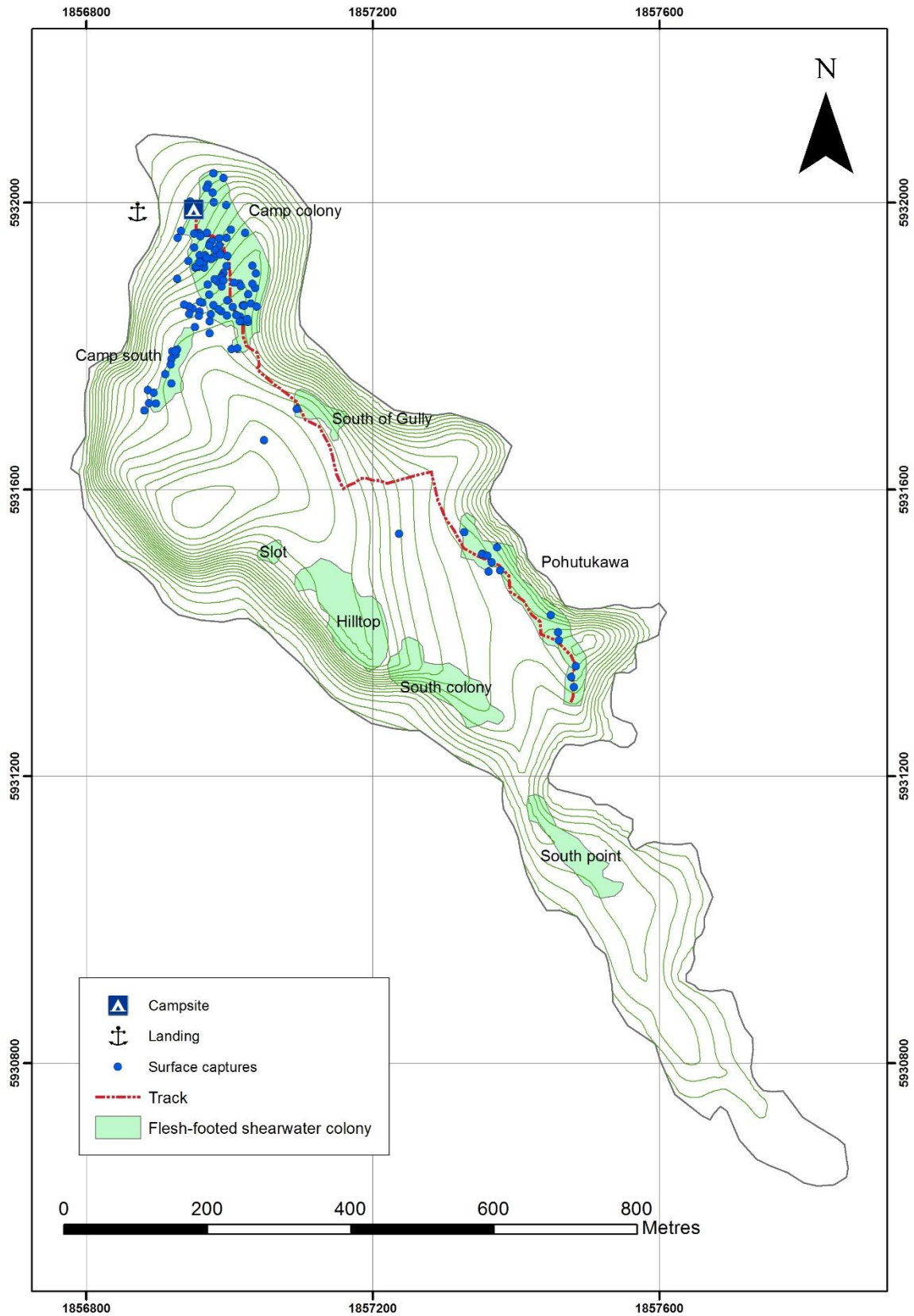


Figure 4. Location of night captures of adult and chick flesh-footed shearwaters, Ohinau Island.

4. Discussion

Ohinau Island showed to be an excellent location to set up a multi-year demographic study on flesh-footed shearwaters. Previous work done by Baker et al. (2010) and Jamieson & Waugh (2015) clearly delineated colony locations, and minimized the time required to find suitable burrows. The lack of thick undergrowth under mahoe trees where colonies were located also allowed for readily spotting burrow entrances. Good visibility while walking also ensured that accidental collapsing of burrows was minimized.

Flesh-footed shearwater burrow chambers were found to be very large. This increases the probability of misclassifying burrow contents, thereby increasing error sources such as occupant detection and observer bias (Parker & Rexer-Huber 2015). Occupied burrows could be incorrectly assigned as empty if a bird is missed, non-breeding if an egg is missed, or the species identity mistaken if a bird is not captured. This occupant detection error will be addressed and minimized next season when marked study burrows are checked for contents by having multiple observers check any burrows that are initially classified as empty, non-breeding, or uncertain of species thereby also reducing observer bias. Since the marking of study burrows was restricted to burrows containing flesh-footed shearwater chicks, these burrows will provide insight into the use of burrows on an annual or inter-annual basis. Consequently, reducing occupant detection and observer bias errors is important to accurately determine the breeding status of marked study burrows. In addition, any study burrows that are not used next summer by breeding flesh-footed shearwaters will remain marked and checked again the following season; however, occupied burrows with a breeding pair in the original 5 sub-colonies (Camp, South of Gully, Pohutukawa, Hilltop, and Camp south) will be added to keep the sample size between 150-200 study burrows.

Previously marked study burrows (approximately 50, all in Camp colony) were intensively searched for by using maps and GPS locations. Unfortunately, yellow tags proved to be difficult to see, and numbers on tags did not correspond with numbers on maps or associated GPS locations. Four burrows with plastic hatches were found and included in the current study, but no others were found. One previously banded bird was captured which was leaving a previously marked burrow.

Night work was trialled at different times to maximize the number of birds, adults and chicks, caught on the surface. There was an initial influx of adult birds shortly after dusk, but this did not last for more than an hour. Also, these adults were not ideal for capturing as they were carrying food for the chick. As a result, searches were best completed during the second half of the night, from midnight until dawn. This allowed for adult birds to be caught post chick feeding, and they were frequently found to be sitting and resting at the burrow entrance before heading off to sea. There was also a large pre-dawn exodus during which adults could be captured.

Chicks did not appear to emerge from burrows until much later in the night. They also did not stay on the surface for very long. This is contrary to what sooty shearwaters (*Puffinus griseus*) have been found to do where chicks spend increasing periods of time on the surface before fledging (M. Bell, pers. comm.). Consequently, the number of chick captures on the surface was sporadic, but still overall successful.

Since this is the first time grey-faced petrel disturbance on flesh-footed shearwater chicks has been recorded on Ohinau Island, no quantitative conclusions about inter-species effects on breeding success can be made. It is, however, evident that the grey-faced petrels do evict and injure flesh-footed shearwater chicks and that this is not consistent across the whole island, but it is not yet clear to what extent. Monitoring will continue over the next two seasons.

Presence of plastics have been documented in flesh-footed shearwater chicks at Australian colonies (Hutton et al. 2008, Lavers et al. 2014), but this has never been done at New Zealand colonies. Small fragments of plastics, mostly white and blue in colour, were consistently seen on the ground spread out across Ohinau Island. The presence of plastic in 9 out of 10 dead necropsied chicks indicates that

there is high plastic loading at New Zealand colonies. Necropsies of any dead birds, adults or chicks, will continue on Ohinau Island over the next two seasons, as well as at any other island where work is being conducted on flesh-footed shearwaters (i.e. Middle Island, Lady Alice Island, Coppermine Island). This will allow for a quantitative measure to be compared to studies done at Australian colonies.

5. Conclusions and recommendations

The field trip to Ohinau Island was highly successful. All logistical matters went as planned, with adequate field equipment and supplies available. Quarantine at the Whitianga DOC office went smoothly and efficiently, and Health and Safety protocols established for the trip worked well and were appropriate. All anticipated work was carried out with no changes to methods necessary. It is recommended that next season's field team is prepared to dig additional hatches as needed and find additional burrows to ensure the sample size remains large.

6. Acknowledgements

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8. Appendix

Notes on birdlife of Ohinau Island

Sooty Shearwater

One adult bird caught exiting a burrow in the southern part of the upper Camp flesh-footed shearwater colony.

Flesh-footed shearwater

Common, few adults still coming ashore to feed chicks, with chicks just starting to emerge from burrows in preparation for fledging.

Fluttering shearwater

Birds heard calling each night, small population on island, birds occupying steeper coast slopes and cliffs.

Little shearwater

Four individuals seen on edge of Pohutukawa flesh-footed shearwater colony. Occasional birds heard calling at night. Probably only a very small population on island.

Diving petrel

Birds heard calling each night, small population on island, birds occupying steeper coast slopes and cliffs.

Grey-faced petrel

Common, birds seen every night, just starting to return to occupy burrows for breeding. Mostly found on upper slopes and ridges. Probably a good population on the island, with an estimate of between 500-1,000 breeding pairs.

Blue penguin

Several birds heard calling each night.

Pied shag

Common, with 4-27 individuals recorded roosting at Camp Bay each day.

White-faced heron

1-2 birds present on island.

Harrier

1-4 birds observed each day on island, seen commuting between island and mainland.

Black-backed gull

1-4 birds present on island.

Caspian tern

2 adults and 1 fledging (still begging) present on island.

NZ pigeon/Kereru

Uncommon, with 1-3 individuals recorded on 3 days in southern part of island.

Kaka

One individual recorded on one morning.

Morepork

At least 3 individuals recorded (one seen, 2 heard) in different parts of the island.

Kingfisher

Common.

Welcome swallow

Common, small flocks of 4-8 birds recorded each day.

Silvereye

Very common, individuals and small flocks (4-25 birds) seen throughout the island.

Grey warbler

Common throughout the island.

Blackbird

Common throughout the island.

Dunnock

Common throughout the island.

Fantail

Common, individuals or pairs scattered across the island.

Bellbird

Very common throughout the island.

Tui

One individual seen on one day.

Chaffinch

Uncommon, 3 birds recorded on one day only.

House sparrow

Small population on island (4-6 birds recorded on about half the days on the island), mainly recorded in southern part of island.

Greenfinch

Uncommon, small population, with low numbers recorded each day.

Starling

Common, small numbers recorded each day.

Notes on lizards recorded on Ohinau Island

Duvaucel's gecko

Very common, especially in Camp flesh-footed shearwater colony. 8 individuals counted in around camp one night.

Pacific gecko

5 individuals recorded.

Moko skink

3 individuals seen.

Shore skink

Very common on beach below camp.

Tusked weta

Very common, abundant in Pohutukawa flesh-footed shearwater colony. Seen eating fish regurgitated by shearwaters, and eating a recently dead flesh footed-shearwater chick.