REPORT ON THIRD TRANSFER OF GREY-FACED PETREL (*Pterodroma macroptera gouldi*) CHICKS FROM TARANGA (HEN) ISLAND TO MATAKOHE-LIMESTONE ISLAND (DECEMBER 2006)

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ABSTRACT

Forty grey-faced petrels (oi) were transferred from Taranga (Hen) Island to Matakohe-Limestone Island by boat on 8 December 2006. This was the third of up to five transfers planned by the Friends of Matakohe-Limestone Island (FOMLI), in order to establish a new population of this species on the island.

In the two previous years there had been some difficulty finding enough chicks of suitable maturity for transfer. This year (2006), the collection trip was carried out a week later. A good number of chicks were available for selection and forty chicks were transferred.

Once on Matakohe-Limestone Island, the chicks were fed using the same method as in the previous years, with tinned sardines in soya oil, blended with water, via crop tube. The chicks were fed small watery meals at first while they adjusted to the artificial diet. Meals of undiluted puree were then gradually increased in size to the level required for each individual to reach the normal fledge weight range. Where required the diet was supplemented with cod liver oil at a rate of 5ml oil: 50ml sardine puree. All chicks appeared to do well on the diet and fledged within the normal range, including the lower weight birds.

One bird became lost on first emerging and was not able to be found.

39 chicks (97%) were presumed to have successfully fledged from Matakohe-Limestone Island. After a mean of 21 days on the island, the chicks fledged at a mean weight of 516 gm and mean wing length of 314 mm.

INTRODUCTION / BACKGROUND (Gummer, H. & Bishop, C.; 2005)

The grey-faced petrel *Pterodroma macroptera gouldi* (oi) is a member of the Procellariidae family of seabirds; all have distinctive external nostrils encased in a tube on the top or sides of the bill. This species colonises mainland headlands, cliff tops and offshore islands from the Three Kings to Taranaki on the west coast and near Gisborne on the east coast. The main colonies occur on Taranga (Hen Island), Mokohinau Is., the Mercury and Alderman Is., Whale Is. and White Is. This species is the most common breeding in the New Zealand region with over 1,000,000 pairs (Heather & Robertson 1996: Field guide to the birds of NZ). Their diet is mainly squid, with some fish and crustaceans.

Matakohe-Limestone Island is a 40 ha (approx.) island located in the upper Whangarei Harbour. The island is a designated scenic reserve managed by a voluntary community incorporated society, Friends of Matakohe-Limestone Island (FOMLI), formed in 1991. A full-time ranger is resident on the island. A large scale revegetation programme is underway with species introductions carried out (both assisted and unassisted) as habitat and food source increase. It is highly likely that petrels, shearwaters and other seabirds once bred on Matakohe-Limestone Island.

The five year project began in 2004 with the transfer of the first 40 chicks, and FOMLI plan to translocate up to fifty oi chicks annually to Matakohe-Limestone Island. Breeding seabirds excrete considerable quantities of guano which will help lift the nutrient levels on the island. Nest burrows will provide additional habitat for lizards, kiwi and invertebrates.

Man made burrows were constructed and set into the ground in a suitable location on Matakohe Island. Seabird ecologist Helen Gummer was contracted by FOMLI in 2004 for the first transfer, and supervised the feeding and welfare of the birds until the first chicks fledged. Nine chicks died during the first week after transfer and a further three were found dead at a later stage, probably due to the inability of these under-nourished birds to cope with the artificial diet. They were in poor condition when transferred and probably would not have survived naturally on Taranga Island. 28 chicks were presumed to have fledged from the Matakohe-Limestone Island colony site from the 2004 transfer.

For the second transfer in 2005, Rose Collen (aviculturalist with experience in seabird hand-rearing and transfers) was contracted by FOMLI, and supervised the feeding and care of the chicks until 28 December 2005. At this point care of the chicks was handed over to the new resident rangers Cathy & Peter Mitchell, and Ngatiwai contractor Tanya Munro, with the last of the chicks fledging on 11 January 2006. 31 chicks were transferred, 5 died and 26 are presumed to have fledged successfully.

This report details the third transfer of grey-faced petrel chicks from Taranga (Hen) Island to Matakohe-Limestone Island in 2006. The project was managed by Cathy and Peter Mitchell, resident rangers on Matakohe-Limestone Island. Cathy is an NZVA registered Veterinarian.

All transferred chicks have been banded. Approximately three years after fledging the first birds should begin returning to Matakohe-Limestone Island and start prospecting for suitable nesting burrows and partners. Breeding may not occur until the birds are seven years old.

<u>Background information on grey-faced petrel fledging weight and wing length statistics</u>

Grey-faced petrel weights peak dramatically before falling to a weight at which birds are able to fly/fledge. Parental meals may reduce in size and frequency after chick weight peaks as chicks need to lose weight while plumage development is completed. Key information below on weights, wing lengths and emergence behaviour prior to and at fledging is based on data collected by Graeme Taylor at the Bethell's beach (west Auckland) colony:

- Peak weight for grey-faced petrel chicks occurs at around 75-80 days (approx. 175-190 mm wing length)
- Peak weights reach 800-1100 g after feeds (900 g for normal healthy chicks)
- Fledging weight range is 480-580 g (most commonly 520-550 g). *Chicks are not fed for last 3-5 days or longer before fledging; fledging weights are not post-feed weights.*
- Fledging wing length range is 305-340 mm (average around 315-320 mm)
- Wing growth accelerates with age: at >250 mm the primaries grow at 5 mm/day; at 200-250 mm the primaries grow at 4 mm/day; at <200 mm the primaries grow at <4 mm/day, etc. It would take a chick approximately 12-13 days to grow from 200 mm to 250 mm and a further 14 days to grow from 250 mm to the average fledging wing length of 320 mm. Therefore, chicks with wings measuring 200 mm could be expected to fledge approximately 27 days later.
- Chicks have not been recorded naturally as emerging from burrows with wings less than 250 mm.
- Chicks emerge from burrows each night for an average of 2 weeks before fledging.

NB From experience with other seabird chick transfers, chicks fed on the artificial sardine diet tend to fledge at heavier weights and with longer wings than naturally-reared chicks. If this is the case with grey-faced petrels then it could be expected that chicks in the best condition fledge at weights up to 600 g and with wing lengths closer to 340 mm.

METHODS / RESULTS

Preliminary survey on Taranga (Hen) Island, October 2006

From 5 – 7th October 2006 a six person team searched burrows in the sites identified on the previous trips. As with the previous year many nest chambers were unoccupied or the chicks were beyond reach and not accessible via a study hole (too deep or running under major root systems or rocks). We estimate that one in every ten burrows searched contained an accessible chick. Chicks which were accessible were weighed, their wing length measured and their general condition assessed. A total of 87 chicks were located, and their burrow locations recorded (see Appendix 1). Detailed accurate information was essential for re-locating the chicks during the collection trip. Due to a poor weather forecast, the survey trip was cut short by one day. This meant that the areas around the campsite and the far eastern end of the island were not thoroughly searched. These areas had not been as productive on the previous trip and it was felt that we already had a good number of birds to select from. (6 new birds were located on the collection trip – 2 of these were selected for transfer)

From analysis of the data from the two previous transfers, in consultation with DoC, it was decided to schedule the collection trip a week later. It appears that the Taranga colony matures later than the Bethels Beach colony from which predicted fledging dates were originally derived. This has meant that birds in less than optimum condition were collected in the first two transfers. As the average weight/ wing data on the survey trip were similar with those from the two previous years, it was assumed that the 2006 chicks would fledge at the same time as those from 2004-5.

Because burrow markers have to be taken down between years it is not possible to accurately determine which burrows have had chicks taken from them before. (Use of GPS has proven to be difficult due to the high canopy). The presence of an existing study lid indicates the burrow was occupied in one of the two previous years, though the chick from that burrow may not have been selected. 19 of the 87 burrows containing chicks were recorded as having been previously occupied. This will be an underestimate.

Selection and transfer of chicks from Taranga Island 6 – 8th December 2006.

A team of 6 people arrived on Taranga Island on 6th December, and spent that day re-locating the 52 burrows at the western end; weighing, measuring and assessing the health of each chick. Each chick was examined thoroughly for any signs of injury or abnormality as part of the health check (results shown in Appendix 2). A 3-stick fence was put up at the entrance to each burrow to give an indication of subsequent activity at the burrow (parental visit/feed or chick emergence). The data from this first day indicated that not only were the chicks of good weights, but they were also at a good stage of maturity. Of the 46 chicks measured, 42 (87%) had wing lengths greater than 180 mm. The previous year only 27% of birds measured had wing lengths greater than 180 mm.

The weather was predicted to deteriorate over the following day, which would have made it impossible to get off the island with the chicks for at least 3, and possibly 5, days. It was decided to collect the chicks for transfer the following day (7th) and take them off the island first thing on the 8th. In support of this decision, the first days measurements had indicated that we would probably have sufficient chicks of good weight and maturity to select from.

The selection criteria were adjusted as the original protocol allowed for two weights over 2-3 days. For the birds which had not been weighed on the first day, birds for selection had to be over 600 gm and of wing length above 180 mm. For the birds which were weighed on the first day, the original criteria were followed – ie, birds above 500 gm weight and 180 mm wing length.

The 40 selected chicks were placed into corflute carry boxes lined with shredded paper (two chicks per box with a diagonal divider). They were then carried down to Wahine Bay to a cool, dry gully beside the camp and placed singly into corflute boxes lined with shredded paper. The burrows furthest from camp were approximately two hours walk.

The chicks spent the night in the boxes and were transferred to Matakohe-Limestone Island by boat at 8 a.m. on 8 December (four hour journey). The boat trip went well; the chicks were placed in the shade within the cabin area and did not seem distressed.

Arrival and installation of chicks on Matakohe-Limestone Island

The boat arrived at Matakohe-Limestone Island at 12 midday and the chicks were loaded onto a trailer. The chicks were welcomed onto the island by representatives from Ngatiwai and Te Parawhau. Approximately 30 people were present, with representatives from Te Parawhau, Ngatiwai, FOMLI, and the local community.

The chicks were then driven up the hill to the artificial petrel colony site. The chicks were placed in the shade of the petrel feeding station shelter as quickly as possible, (the weather was hot out of the wind). Each chick was fed 20 ml of boiled (cooled) water via a syringe and crop tube (to rehydrate after the transfer), and placed in one of the numbered burrows.

The straw and the gravel base of the burrows were removed at the completion of the 2005 transfer. The wooden burrow walls were sprayed with Trigene and the burrows were left open for several months to assist disinfection. Burrows in which birds had died were removed and replaced with new boxes. Just prior to the chicks arrival, fresh gravel and dead dry grass were placed in the nest chambers. The entrance tunnels were blocked off with fence post rounds.

The chicks were banded as soon as a permitted Banding Officer was available. Andrea Booth (DoC, Whangarei Conservancy) banded all chicks on December 15th. Prior to banding, twink was applied to the chick's feet in patterns which would allow for individual identification, to prevent any mix ups before banding had taken place.

Supplementary feeding

Chicks were fed the same diet as the previous years; tinned "Brunswick" sardines in soya oil (66%) blended with water (33%). Each 106-gram tin was blended with 50 ml cold (boiled > 3 mins) water to a smooth puree. All food preparation methods and equipment remained the same as for the 2004-2005 transfers (appendices 5, 6 and 8).

One modification made this year was to supplement the diet with cod liver oil, rather than feeding large volumes of the sardine puree, to avoid overfilling the crop. Thus lighter chicks, which needed to gain weight, were fed a maximum of 130 gm puree plus 10 ml cod liver oil. This regime appeared to work very well with all lighter chicks fledging within normal fledging parameters.

In addition, chicks approaching fledging often have trouble taking larger food volumes, and thus maintaining their weights can be difficult. These chicks were also supplemented with cod liver oil where needed, at a rate of 5 ml oil to 50 ml puree.

A feeding regime, which would allow the chicks to make a gradual transition from natural to artificial diet, was adopted (as was recommended by Helen Gummer and Rose Collen after the 2004-5 transfers).

The feeding process was as follows:

Transfer day:	All given 20 ml water on arrival 50 ml runny puree (50:50 sardines: water) given to all chicks in the evening
Day 1:	50 ml runny puree fed to all chicks
Day 2:	100 ml runny puree fed to all chicks
Day 3:	None fed
Day 4:	All fed 100 ml normal puree mix (66:33 sardines: water)

All chicks were fed every second day thereafter.

On arrival at Matakohe-Limestone Island most of the chicks appeared bright and alert, though some were quiet. All chicks were weighed and fed the evening of transfer day. Weight losses recorded at this time ranged from 0 to 100 gm. This is as would be expected with greatest weight losses occurring during the stressful 36 hour transfer period. Subsequent weight changes were relatively minor, ranging from -30 to +30 gm between feeds, with most chicks maintaining or gaining weight.

The amount fed was adjusted for each chick on feeding days. Weight, wing length (maturity), and response to previous feed were used to decide on feeding for that day.

A total of 368 tins (106 g) of sardines were used to feed the grey-faced petrel chicks in 2006.

Daily chick and burrow monitoring

The process for checking, handling and feeding the chicks was the same as the year before (Appendix 7). On 11th December, after three nights blocked into their burrows, the blockades were removed so chicks could emerge. Stick fences at the burrow entrances were used to monitor each chick's emergence behaviour. All burrows were checked daily (including non-feed days) and fence status recorded, and the chicks sighted and checked for any signs of ill-health.

All chicks were weighed daily for the first three days (lighter birds for the first five days), until the pattern of daily weight changes could be predicted. Thereafter they were weighed and wings were measured before each feed (every second day).

Disease screening

All birds were given a general health check on Taranga before selection.

Ten chicks were screened on 18th December 2006 on Matakohe-Limestone Island. The chicks in burrows 4, 32, 33, 34, 35, 36, 37, 38, 39 and 40 were blood sampled (wing vein) for a complete blood count (CBC) and testing for blood parasites. Cloacal swabs were also taken from these chicks for salmonella and yersinia. Faecal samples were taken from 2, 4, 5, 7, 9, 10, 19, 23, 31 and 38 as the birds obliged, and were tested for internal parasites. Samples were tested at New Zealand Veterinary Pathology in Hamilton.

All results returned negative or normal, with the exception of a low to moderate level of coccidia in the bird from Burrow 10. This bird appeared quite healthy and it was decided not to treat it. A moderate/high level or a sick bird would have indicated that treatment was required. It is possible that there was a transient rise in coccidial shedding with the stress of transfer.

Health problems and mortality

No particular health problems were encountered.

The bird in burrow 4 had regurgitation problems after four of the first five feeds and also regurgitated, including squid beaks, on the day it was banded. Its weight was monitored twice between feeds and it maintained good weights throughout. It was one of the birds selected for disease screening and results were normal. It did not regurgitate later in the rearing period and fledged at a good weight.

A number of birds regurgitated after feeds as they got close to fledging. Feeds were kept smaller for these birds and where weight was a concern extra oil was fed.

Burrow 15. This bird was of good weight (610 gm at last weighing) and wing length (272 mm), and had given no cause for concern. It remained in its burrow for 6 nights after it was unblocked and did not return after the first night it emerged. It seems likely that this bird became lost. It was not found despite extensive searching.

Burrow hygiene and temperature

Burrow hygiene was closely monitored throughout the rearing period. Straw was replaced or topped up every feeding day. The burrows remained dry and ammonia/smells were minimal. Tunnels had a small amount of gravel in them so plumage would not become soiled if they were damp, however most remained dry.

The nest chambers were kept covered with two sand-filled sacks at all times to help keep the burrows cool. Water was available on site this year and was used to keep the sacks damp. Water was also sprayed onto the ground at tunnel entrances in an attempt to keep the burrows cooler. The trees on the site have grown significantly over the last two years and are beginning to provide shade, however manuka branches were also laid over some of the more exposed burrows.

Temperatures were monitored on a number of days. Ambient temperature ranged from 16 – 25 degrees Celsius. Burrow temperatures tended to follow ambient temperatures fairly closely, being at or only 1-2 degrees lower than ambient. The highest ambient temperatures were recorded on the last few days when only three birds were left. It seemed that the use of manuka branches over the tunnel entrances was the most effective at keeping temperatures down, however more work needs to be done on this. The lower ambient and burrow temperatures compared with previous years, for most of the rearing period, meant that heat stress did not become an issue for chick health.

Details of chicks sitting in tunnels:

Burrow 10 - found in tunnel once with head in nest chamber
Burrow 11 - often found in tunnel, also entered other tunnels (see below)
Burrow 25 - found in tunnel on transfer day

This represents a significant reduction compared to previous years, possibly due to improved burrow hygiene and cooler temperatures.

Burrow 11. This bird was the heaviest at 840 gm and 216 mm wing on transfer day. Not only did it emerge prematurely, but it also was found in its own tunnel (x 6) and that of burrow 10 (x 2) at various times. In addition, on the 19th it could not be located in any of the burrows, but was found under vegetation a few metres from its own burrow. It was then blocked in its burrow for two nights so that it could not enter the tunnel. When the tunnel was unblocked a low fence was erected around the burrow so it could not wander, but had enough room to exercise. The chick then seemed to settle into its own burrow and the fence was removed four days later. It was found once in its own tunnel after that, but did not move to other burrows. This chick did not appear sick at any time.

Emergence and fledging

Emergence and fledging dates are recorded for each chick in Appendix 3.

Chicks usually start emerging after their wing length has reached 250 mm; however of the 40 chicks transferred, nine started emerging with wings less than 250 mm. Most had wing lengths of 230 mm or more on first emerging, and five only emerged intermittently until they were of normal emerging wing length. This unusual behaviour is often associated with sick or starving chicks, which have also been known to come out of their burrows during the day. None of these birds appeared to be sick and all fledged successfully.

Apart from Burrow 15, which was too short in the wing, any absent chicks were presumed to have fledged. Burrow 22 was absent one day, but appeared in burrow 18 the next. A number of chicks were found in burrows other than their own. Apart from Burrow 11, these birds were all close to fledging.

Details of chicks wandering and being found in burrows other than their own:

Burrow 11 - found in tunnel 10 twice, see above
Burrow 17 - found in burrow 18 once just before fledge
Burrow 22 - found in burrow 18 once just before fledge
Burrow 24 - moving between burrows 23 & 24 just before fledge
Burrow 33 - moved to burrow 35, 5 days before fledge

The first chicks were assumed to have fledged on 20 December 2005 (burrows 19, 23, 29, 35 & 40), and the last chicks left on 6 January 2007 (burrows 8 & 11). The 39 surviving chicks spent an average (mean) of 21 days on Matakohe-Limestone Island. The average (mean) emergence period was 15 days.

DISCUSSION / RECOMMENDATIONS

Timing of the transfer

Carrying out the collection and transfer trip one week later was a significant factor in the success of this year's transfer. The chicks were a reasonable weight, but more importantly many were of ideal maturity (wing length 180 – 250 mm), giving a good number to select from. It was helpful that so many chicks (87) had been located on the survey trip. This may reflect a better breeding season, but probably also the greater experience of the survey team. A further 6 birds were located on the transfer trip, 2 of which were subsequently selected.

Adjusted data (see appendix 4) from the three years of the translocation to date, show that the birds have matured (fledged) at similar times. It is recommended that the selection trip be carried out at a similar time next year – ie. in the second week of December.

With three years of data available, it is now possible to reliably predict fledging dates (+/- 1 week) for the Taranga colony. It may be possible to locate and collect the chicks in one trip in subsequent years. The trip would need to be at least 5 days duration, to allow for two weights 2-3 days apart and collection on the final day. The option of a second trip a week later should also be kept open in case there are insufficient suitable chicks available on the first trip.

Selection of chicks for transfer

The guidelines established for selection following the 2005 transfer were followed this year, with some modifications due to the shortened trip (see above). It is recommended that the criteria outlined in Appendix 1 of the *2006 Translocation Proposal* continue to be followed. That is, ideally, only chicks above 500 gm should be selected for transfer. Weighing twice 2-3 days apart will ensure that the "true", unfed weight is obtained – this will be the lower of the two weights. Where there is a shortage of appropriate chicks, then those above 500 gm on the second weighing (and above 180 mm wing length), could be selected. If there is still a shortage of appropriate chicks then a second collection trip one week later should give sufficient numbers.

Although significant weight losses, (up to 100 gm), can occur during transfer, the chicks selected in 2006 had adequate weight and maturity to cope with these losses.

There were some weighing errors on the collection trip, which resulted in up to six lighter than ideal birds being transferred. Birds are weighed in pillowcases and it is likely that this weight, up to 100 gm, was not taken off in some cases. However, these birds were all of good maturity, did not suffer any health problems, were able to gain weight and fledged within the normal fledging weight range. To prevent this problem next year the recording books will be pre-ruled with columns for total, bag and bird weights.

Feeding

It is recommended that the 2006 feeding protocol be followed in future years. That is – a transitional diet of watery puree be used initially, followed by full-strength puree up to 130 gm, supplemented with cod liver oil as needed.

For some chicks close to fledging it was difficult to maintain weights. Some chicks, such as Burrow 33, were at an appropriate fledging wing length for up to six days before actually fledging. However the chick had trouble taking its feeds (regurgitating), and lost 50 gm over that period. For this reason it is recommended that chicks are fed 130 gm as standard for as long as they can cope with this volume of food, to give a greater "buffer" against pre-fledging weight loss.

Site Management

Clean and air all burrows several months before the next transfer. While the chicks are occupying the burrows, the condition of the straw should be closely monitored and topped up/changed as needed.

The cooler than normal ambient temperatures while the chicks were on M-L Island this year may have helped prevent health problems. Wetting the sand in the sacks over burrow lids and the ground around tunnel entrances did not keep burrows a lot cooler than the ambient temperatures. Use of manuka branches to provide shade appeared to assist in reducing burrow temperatures. This should be investigated further next year.

It was found very helpful to have key staff assigned specific roles during feeding. The three key roles were; chick measuring and deciding on feed for that day, feeding the chicks, and burrow monitoring. This meant that each task was handled in a consistent manner and any potential problems were detected early. This was particularly important in the first settling-in period.

Missing birds

Two birds, Burrows 11 & 15, went missing from their burrows. Fortunately Burrow 11 was subsequently found on the site, but Burrow 15 was not found. After this, three spare boxes with tunnels attached were placed around the site in the hope of providing a refuge should any other birds become lost. Placing a low fence around Burrow 11, seemed effective in preventing any further wandering and "training" the chick to stay in its own burrow. It is recommended that this be repeated in future years for any chicks showing a tendency to wander soon after arrival. Some wandering close to fledging seems to be normal.

Between-year Comparison

Adjusted data for the transfer years has been compared (see Appendix 4). Fledge dates, fledge wing lengths and number of days on Matakohe-Limestone Island (allowing for the later collection date in 2006), are all very similar. This indicates that fledging dates between years are similar and timing the collection trip around the 8th of December is likely to give the best results.

Of interest is the pattern of weight change whilst on Matakohe-Limestone Island. Transfer weight in the 2004 year was the lowest at 508 gm, despite the birds being of good maturity (wing length 220 mm). This may reflect the smaller number of birds available for selection and/or a poor year for the colony. (Note that these weights are those measured the evening of arrival on Matakohe - Limestone Island. The equivalent figure for the 2006 transfer was 535 gm).

Of interest is that these lower weight birds had a weight gain, despite being fed less than those in the two following years. The 2004 chicks were mostly fed 100 gm, and occasionally up to 130 gm. In the two following years larger feeds were needed to maintain/gain weight. In 2005 feeds up to 180 gm were given, while in 2006 feeds of 130 gm were standard with cod liver oil added where needed.

Birds in 2005 and 2006 lost weight between transfer and fledging, with those in 2006 losing the most weight. The 2006 weight change probably reflects the more usual pattern, with most of the birds needing to lose weight as they approached fledging.

ACKNOWLEDGEMENTS

This project can be considered a success, and we would like to thank the following people who made it so:

- Ngatiwai have mana whenua over Taranga Island, and Te Parawhau over Matakohe Island. Both groups were involved in all stages of this project.
- Department of Conservation staff who gave advice (Graeme Taylor and Tony Beauchamp) and practical assistance, including Emma Craig and Paul Cornille (Taranga team) and Andrea Booth (SOP, banding).
- The many dedicated volunteers who gave their time to help with the transfer and feeding programme.
- The experienced Taranga team of Tanya Munro, Grant Stevens, Michelle Martin and Lawrie Mead, who willingly tramped the steep slopes of the island and achieved wonders in the short time available.
- The well-documented experience of the two previous transfers was also crucial to this year's success.
- Thanks once again to Martin Hunt for volunteering his time and his launch "Manaaki" to transport the chicks and people from Taranga to Matakohe-Limestone Island

REFERENCES

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APPENDICES

Appendix 1: Locations of grey-faced petrel burrows on Taranga (Hen) Island. 2006

Appendix 2: Weights, wing measurements and health status of chicks found on Taranga (Hen) Island. 2006

Appendix 3: Transfer, emergence and fledging data for 40 grey-faced petrel chicks transferred to Matakohe-Limestone Island in December 2006.

Appendix 4: Comparison of (adjusted) data from Grey-faced Petrel translocations over three years (2004 – 2006)

Appendix 5: Grey-faced petrel chick food preparation guide

Appendix 6: Checklist of equipment to transport to colony site on chick feeding day

Appendix 7: Grey-faced petrel chick feeding, measuring and monitoring guide

Appendix 8: Grey-faced petrel chick post-feeding clean-up guide

Appendix 1: Locations of grey-faced petrel burrows on Taranga (Hen) Island, 2006

Location	Burrow ID	Comments – 4th October 2006	
A block towards TM 14, west of B block			
Right on track at base of giant boulder, far end of A block	AT1	rock lid.	R Pb
B block @ TM 15 (2 blue tags)			
Directly below lunch rock, middle of track	BT1		Pb
approx 1.5 mtrs East of BT1	BT2	rock lid, tape directly above lid & burrow entrance.	
Right next to BT2	BT3	rock lid. tape directly above lid & burrow entrance	
approx 1.5 mtrs SE of BT2	BT4	rock lid	R
east of lunch rock and fallen log	BC1	rock lid, parent in burrow	R
Labyrinth. "Spongy" area east of B block, below large rock, (blue tapes 1-7 to TM 16)			
approx 10-15 mtrs SW of Labyrinth, #1 blue tape to track	LabT1	rock lid	R
approx 1 mtr below LabT1, off #2 blue tape	LabT2	rock lid	
Below track, old blue marker	LabC1	rock lid	R Pb
C block – east of TM 16 extending to TM 17 (1 blue tag)			
approx 4-5 mtrs E of TM 16	CT1	rock lid	R
approx 0.5 mtr below track, under puriri/rata	CT2	rock lid	R Pb
approx 2.5 mtrs above main track and CT1	CT3	rock lid	R
Right of track as look uphill. E2664473 N6580583	CC1	rock lid	R Pb
right of CC1, as look uphill	CC2		R
Below CC1	CC3	rock lid	Pb
20-30 mtrs from TM (17?), at 220 past CT2	CC4	Below very large rock. Rock lid	
Below TM 17	CC5	rock lid	
D block – vicinity of TM 18 (4 blue tags)			
8-10 mtrs above main track	DT1	rock lid	Pb
4-5 mtrs directly above TM 18	DT2	rock lid	R Pb
directly above DT2	DT3	rock lid	Pb
20-25 mtrs before TM 18	DT4	rock lid	Pb
directly above DT5	DT5	rock lid, very quiet	R Pb
right on main track, before TM 18	DT6	rock lid, deep chamber, 2 tags	R Pb
above track, east of large rock	DC1		R Pb
as for DC1	DC2	parent in burrow	
E block 20m east of TM 18, blue TM			
approx 10 mtrs directly below blue TM	ET1	rock lid	
above track, east of blue TM and big rock	EC1	rock lid	R
below EC1	EC2	rock lid, long reach	R
F block east of E block, TM 20 approx			
approx 8 mtrs above main track	FT1	rock lid	
approx 6 mtrs above main track	FT2		
2 mtrs north of FT2	FT3		R
approx 3 mtrs above track, south of 2004 lunch boulder	FT4		R
approx 1.5 mtrs above FT4	FT5		R
15 mtrs above track, above FT4 & 5	FC1	rock lid	
west of FC1, right of as look uphill	FC2	rock lid	R
Hanging Petrel (HP) site is located on steep, eastern track down to Dragon Mouth Cove camp site (from TM 22 at ridge) (1 blue tag) Tanya			
right of main track, @ end of rope 3	HP1	rock lid	R Pb
approx 8 mtrs east, 90 to block marker	HP2	rock lid	R Pb
1 mtr above HP2	HP3	rock lid	
1.5 mtrs below HP2	HP4	rock lid	R
approx 5 mtrs above HP4	HP5		
approx 8 mtrs NW of HP4, beneath supplejack/mahoe	HP6	rock lid	R
under large puriri, below rock face	HP7	rock lid	R
just west of HP7	HP8		
below large rewarewa, below rock face as for HP7, 10 mtrs Nth HP8	HP9	rock lid	R
Astelia Knoll (AK) from TM 22 round to south side, blue marker on main track Cathy			
below track west of main AK site, blue marker on track, on level patch	AK1	rock lid, ? tuatara also in burrow	R
10 mtrs from track at 130	AK2	rock lid	R Pb
seaward slope, at tree/nikau base	AK3	rock lid	
above & to west AK3, in astelia	AK4		R
west and just below AK3	AK5		
far lower end of slope	AK6	rock lid	Pb
very bottom of slope, below AK6, among nikau fronds	AK7		R

Location	Burrow ID	Comments – 4th October 2006	
Main western ridge track			
on main track, between TM 22 & 33, below small taraires	track		R
G block 50m west of TM 26 (Nic's knoll), right around knoll, back to track (most birds on Nthern side)			
50-60 mtrs from main track, south side (bald rock)	GT1	rock lid	Pb
at top of 1st gut, past GT1	GT2	rock lid	
blue marker large puriri approx 3 mtrs above large puriri	GT3	rock lid	
20 mtrs nth of 1st gut to 3rd gut	GT4		R Pb
2nd gut , 7 mtrs south of puriri	GC1		R
10-15 mtrs NE of puriri, below GT3	GC2		R
just above GC2	GC3	rock lid	R
approx 5 mtrs along contour from GC3	GC4	rock lid	R
approx 20 mtrs east of puriri	GT5	rock lid	R
next to GT5	GT6	rock lid	
approx 7-8 mtrs above GT6 , base of rock face	GT7		
20 mtrs from puriri, above & to left as face uphill	GC5	rock lid	
just below GC5, (?50m past puriri, same contour)	GC6	2 rock lids, branching burrow	Pb
blue marker fallen puriri 10 mtrs NE of fallen puriri	GT8	rock lid	R
3-4 mtrs from fallen puriri	GT9	rock lid	
2 mtrs from fallen puriri	GT10	rock lid	
2 mtrs above GT10	GE11	rock lid	
down from GE11, along from GT10	GE12	rock lid, in collospermum	
5 mtrs from GE12	GE13	rock lid	R
20 mtrs N of GE11	GE14	rock lid, under red matipo	
20 mtrs SE of fallen puriri	GC7	rock lid	R
just above GC7	GC8	rock lid	R
5 mtrs across from GE14, both at eastern end of block	GC9	fragile burrow entrance	
H block – before/below lunch knob			
Blue tag tree, between lge rock above & large puriri below just below tagged tree	HC1		R
15 mtrs along from HC1	HE1		R
I block - TM 47 junction & moving to north side of Knob			
2 mtrs from TM 47	IC1	2 entrances, long arm reach	
on track	IE1		R
’20 mtrs due N of rock, on old blue trail, beside fallen tree	IC2		R
20 mtrs from IC2, on similar contour	IC3	rock lid	R
20 mtrs below IC2	IE2	2 entrances	R
To Rock Wall Grant & Lawrie			
right on track, between TM 48 & 50	GL		
Rock wall, can see from track	RW1		
west and well down bank	RW2		
Wahine Bay track Grant & Lawrie			
2 birds located and burrows marked, not enough time to search thoroughly			

Notes

- TM 1 – 35 run from Dragon Mouth Cove to Wahine Bay Junction. Block A – F, plus Labyrinth, Hanging Petrel & Astelia Knob on this track.
- TM 1 – 70 run from Wahine Bay to Eastern Point. Block G – I, plus Rock Wall on this track
- R = regurgitated
- Pb = previously occupied burrow

Appendix 2: Weights, wing measurements and health status of chicks found on Taranga (Hen) Island, 2006

Selected √	Burrow	Wgt Oct 6 (g)	Wgt Dec 6 (g)	Wgt Dec 7 (g)	Fence status D/PD/I	Wing Oct 6 (mm)	Wing Dec 6 (mm)	Wing Dec 7 (mm)	Health comments	M-L burrow no.
	AT1	310	480			57	196		too light	
	BT1	330				63			GONE	
√	BT2	290	690	740		55	227	232	poo	15
	BT3	270	635	730		40	166	163	too immature	
√	BT4	340	490	550		55	241	242		14
	BC1	380				60			GONE	
	BC2	-	520			-	284		new bird, too mature	
√	LabT1	300	600	680		56	254	262	vomit x 3	2
√	LabT2	280	470	450		68	225		(weighing error)	22
	LabC1	320	470			75	223		too light	
	CT1	470				45			GONE	
√	CT2	550	670	680		70	212		vomit	5
√	CT3	240	470	530		72	205	206	vomit	8
	CC1	360	510	470		76	270		too mature	
√	CC2	540	600	660		77	231			7
	CC3	340	610			85	281		too mature	
	CC4	270	405			66	204		too light	
√	CC5	350	580	670		81	252	255	sm vomit	40
	DT1	220	470			40		120	too immature	
√	DT2	400	750	760		45	219	220	vomit	20
√	DT3	220	570	540		43	213			17
	DT4	320	390			65	206			
√	DT5	390	550	650	I	53	238			10
	DT6	270	430			42	178		too immature	
√	DC1	330	630	580		65	230		vomit	21
	DC2	210				30			GONE	
	DC3	-	800		D	-	253		new bird, emerging	
√	ET1	260	610	560		63	256		vomit lots	19
	EC1	210	450			45	190		too light	
	EC2	350	590	gone		89	293		Gone 7/12/06	
	FT1	210	480			47	168		vomit, too immature	
√	FT2	210	550	680		55	247			23
√	FT3	410	610	860		57	219	223		4
	FT4	310	570	600		42	158		too immature	
√	FT5	250	590	550		47	187		vomit	25
√	FC1	370	600	540		60	220			34
√	FC2	460	540	620		60	191			3
√	FC3	-	510	560		-	245		new bird	18
√	HP1	265	620	600		58	230	236	vomit x 3	9
√	HP2	340	690	670		45	201	248	vomit x 2	28
√	HP3	290	570	710		57	249	255		29
√	HP4	340	560	460		72	232	235	(weighing error)	16

Selected √	Burrow	Wgt Oct 6 (g)	Wgt Dec 6 (g)	Wgt Dec 7 (g)	Fence status D/PD/I	Wing Oct 6 (mm)	Wing Dec 6 (mm)	Wing Dec 7 (mm)	Health comments	M-L burrow no.
	HP5	340				55			GONE	
	HP6	250				48			GONE	
	HP7	450	600			85	287		too mature	
	HP8	330	440			60	242		too light	
	HP9	270	480			56	209			
	AK1	290	530	480		51	183		vomit	
	AK2	290	470			55	180		vomit	
	AK3	290				52			GONE	
√	AK4	370	560	570		43	179			24
√	AK5	400	540	560		53	188		vomit	38
√	AK6	480	500	540		58	198		vomit lots	1
√	AK7	220	550	540		54	192			6
	Track	270	400			55	192		too light	
√	GT1	280		900		46		206		11
√	GT2	350		600		56		182		26
	GT3	400		640		80		291	too mature	
	GT4	360				70			DEAD	
√	GC1	400		702		84		232		30
	GC2	380				86		294	too mature	
√	GC3	410		620		78		252		31
√	GC4	430		600		55		254		12
	GT5	380		440		54		175		
	GT6	220		530		32		209		
√	GT7	630		680		76		252		35
	GC5	330		530		52		237		
√	GC6	320		901?		53		231		33
	GT8	290		550		44		147	too immature	
√	GT9	370		720		68		248		27
	GT10	370		530		88		307	too mature	
	GE11	350		530		70		251		
	GE12	350		710		83		283	too mature	
√	GE13	290		570		57		245		39
√	GE14	255		712?		56		243		36
	GC7	510				118			too mature	
	GC8	270		410		53		184	too light	
	GC9	280		570		47		204		
	HC1	440		440		81		297	too mature	
√	HE1	515		700		66		223		32
	IC1	310				45			too hard to reach	
	IE1	335		430		50		177	too immature	
	IC2	310		300		65			no primaries, very immature	
	IC3	470		560		75		262	too mature	
√	IE2	290		670		60		206		13
	GL	160				38			not revisited	
	RW1	350				69			not revisited	
	RW2	230				37			not revisited	
√	WB1	-	610	660		-	191	192	new bird	37
	WB2	-	400			-	142		too immature	
	WB3	-	550				168		new bird, vomit x3, too immature	
	WB4	-	530			-	172		new bird, too immature	

Appendix 3: Transfer, emergence and fledging data for 40 grey-faced petrel chicks transferred to Matakohe-Limestone Island in December 2006.

Mat. Is. burrow no.	Band	T. Is. burrow	Trans. wgt (g)	Trans. wing (mm)	Fledge weight (g)	Fledge wing (mm)	First emerge date (pm)	Fledge date (pm)	Emergence period (nights)	Total no. days on Matakohe	Comments
1	E212680	AK6	540	198	500	309	22/12/2006	3/01/2007	12	26	
2	E212679	LabT1	600	262	500	328	12/12/2006	23/12/2006	11	15	
3	E212678	FC2	540	191	480	305	21/12/2006	3/01/2007	13	26	
4	E212677	FT3	610	223	530	318	15/12/2006	27/12/2006	12	19	
5	E212676	CT2	670	212	490	312	18/12/2006	31/12/2006	23	23	
6	E212675	AK7	540	192	530	313	17/12/2006	5/01/2007	19	28	
7	E212674	CC2	600	231	510	313	16/12/2006	25/12/2006	9	17	
8	E212673	CT3	470	206	500	318	23/12/2006	6/01/2007	14	29	
9	E212672	HP1	600	236	530	315	14/12/2006	27/12/2006	13	19	
10	E212671	DT5	550	238	520	318	13/12/2006	25/12/2006	12	17	
11	E212670	GT1	900	206	570	320	14/12/2006	6/01/2007	23	29	
12	E212669	GC4	600	254	530	318	18/12/2006	1/01/2007	14	24	
13	E212668	IE2	670	206	530	320	16/12/2006	2/01/2007	17	25	
14	E212667	BT4	490	242	510	317	13/12/2006	31/12/2006	18	23	
15	E212666	BT2	690	232			16/12/2006				Death due to misadventure, became lost
16	E212650	HP4	460	235	490	317	17/12/2006	2/01/2007	16	25	
17	E212648	DT3	540	213	540	309	12/12/2006	2/01/2007	21	25	
18	E212647	FC3	510	245	500	300	14/12/2006	21/12/2006	7	13	
19	E212646	ET1	560	256	490	308	11/12/2006	19/12/2006	7	11	
20	E212645	DT2	750	220	540	316	14/12/2006	29/12/2006	15	21	
21	E212644	DC1	580	230	530	304	13/12/2006	29/12/2006	16	21	
22	E212643	LabT2	450	225	500	316	14/12/2006	1/01/2006	18	24	
23	E212642	FT2	550	247	520	314	11/12/2006	20/12/2006	8	12	
24	E212641	AK4	560	179	520	308	17/12/2006	4/01/2007	18	27	
25	E212640	FT5	550	187	510	316	12/12/2006	4/01/2007	23	27	
26	E212639	GT2	600	182	500	308	16/12/2006	4/01/2007	19	27	
27	E212638	GT9	720	248	510	315	11/12/2006	21/12/2006	10	13	
28	E212637	HP2	670	201	510	310	12/12/2006	1/01/2007	20	24	
29	E212636	HP3	570	255	500	319	11/12/2006	20/12/2006	9	12	
30	E212635	GC1	702	232	520	320	14/12/2006	29/12/2006	15	21	
31	E212634	GC3	620	252	520	307	11/12/2006	21/12/2006	10	13	
32	E212633	HE1	700	223	550	309	12/12/2006	29/12/2006	17	21	
33	E212632	GC6	901	231	520	323	14/12/2006	28/12/2006	14	20	
34	E212631	FC1	540	220	500	315	12/12/2006	2/01/2007	21	25	
35	E212630	GT7	680	252	540	318	11/12/2006	20/12/2006	9	12	
36	E212629	GE14	712	243	510	325	11/12/2006	29/12/2006	18	21	
37	E212628	WB1	610	192	550	315	11/12/2006	3/01/2007	23	26	
38	E212627	AK5	540	188	470	310	15/12/2006	2/01/2007	18	25	
39	E212626	GE13	570	245	530	308	12/12/2006	21/12/2006	9	13	
40	E212625	CC5	580	255	510	315	11/12/2006	20/12/2006	9	12	
			Transfer weight (g)	Transfer wing (mm)	Fledge weight (g)	Fledge wing (mm)			Emergence period (nights)	Total no. days on Matakohe	
		Mean	607	225	516	314			15	21	
		Standard deviation	100	24	21	6			5	6	
		Range	450– 901	182 – 262	470 – 570	300 – 328			01/07/23	01/11/29	
		Sample size	N = 40	N = 40	N = 39	N = 39			N = 39	N = 39	

Notes:

- Where birds were weighed twice on the collection trip, the lighter weight was taken as the transfer weight.
- Total number of days on Matakohe-Limestone Island included transfer day.
- Where birds fledged the night after a feed, their fledge weight was taken to be the pre-fed weight on the feeding day.
- Where birds fledged the second night after a feed, their fledge weight was estimated on the basis of the previous pattern of weight loss/gain between feeds.

Appendix 4: Comparison of (adjusted) data from Grey-faced Petrel translocations over three years (2004 – 2006)

Year	Transfer date	Transfer Weight	Transfer Wing	Fledge Weight	Fledge Wing	Median Fledge Date	Days on M-L Is
2004	Dec-01	(508)	220	535	312	Dec-26	26
2005	Dec-03	515	195	498	311	Dec-31	28
2006	Dec-08	605 (535)	224	516	314	Dec-29	21

Adjustments:

- Deceased/missing birds not included
- Where birds were weighed twice on the collection trip, the lighter weight was taken as the transfer weight.
- Note that in 2004 chicks were not weighed on Taranga. Transfer weight is that on the evening of arrival on M-L Is. – the equivalent weight for 2006 is given in brackets.
- Where birds fledged the night after a feed, their fledge weight was taken to be the pre-fed weight on the feeding day.
- Where birds fledged the second night after a feed, their fledge weight was estimated on the basis of the previous pattern of weight loss/gain between feeds.

Appendix 5: Grey-faced petrel chick food preparation guide

Grey-faced petrel chick food preparation (Gummer & Bishop, 2004)

1. Wash hands with antibacterial soap.

2. Boil water for up to four 1 litre thermos flasks for food-warming baths.

3. Make up 8 litres of Johnson's antibacterial solution in small bucket
   (1 tablet / 2 litres cold water, so 4 tablets/ 8 litres water).

4. Clean sink/bench area and wipe over with cloth soaked in antibacterial solution.

5. Heat water for cleaning after food preparation (at least two kettles).

   Equipment for food preparation:
   Blenders / knife / spatula / cold (boiled for >3 mins) water / sardines / food containers

   Recipe:
   1 (106 g) tin sardines in soya oil (include oil contents)
   50 ml cold (boiled > 3 mins) water
   Contents of sardine cans: sardines (89%), soya oil (10%), salt (<1%)

   NB: Process a mix of only 3 tins of fish (with 150 ml water) in each batch to prevent strain on blender.

6. Place 150 ml cold (boiled > 3 mins) water in blender with 1 tin of fish and liquidize. Add half of second tin (chop fish up in tin) and blend.
   Add remainder of second tin and blend. Repeat with third tin until smooth. Pour mixture into container – 2 or 3 batches (6 or 9 tins) per container.

7. Place food containers in large red chilly bin with three chilly blocks. Food must be kept cool at the colony site (to prevent contamination) and then warmed just before use.
   NB Keep one container out for first round of feeding – transport in small blue chilly bin.

8. Wash out sardine tins in hot, soapy water for disposal.

9. Wipe down blender bases with cloth soaked in antibacterial solution.

10. Remove blender blades and rinse out blender etc. before doing two thorough washes (with the petrel washing-up brush) in very hot, very soapy water to remove all oil. Rinse off detergent before placing equipment in bucket of antibacterial solution for the day (minimum soak period 2 hrs).

Appendix 6: Checklist of equipment to transport to colony site on chick feeding day

Checklist of equipment to transport to colony site on grey-faced petrel chick feeding day
(Gummer & Bishop, 2004)

- 1 container of food (not chilled) for first feeding round, in 1 small blue chilly bin (food-warming bath)
- 1 large red chilly bin containing rest of food containers + 3 chilly blocks
- 2 syringes (50 ml Bovivet plexiglass)
- 2 crop-feeding tubes (6.3 x 140 mm Teflon speed feeding tubes)
- 1 tall jar (for crop tube sterilising chlorhexidine solution)
- 2 rectangular rinse baths
- 1 large lid (for resting loaded syringes on)
- 1 spatula
- 1 container (3 litres) boiled (>3 mins) water for rinsing
- Up to 4 thermos flasks of hot water (food-warming baths)
- Waterproof notebooks (x3) and pencil
- Clean pillow cases (weigh bags)
- Any other supplies to restock e.g. tissues, rubbish bags, paper towels, hand-washing water.

Microshields chlorhexidine (5%) is a pink runny sterilising liquid made into a solution with water:
1 part chlorhexidine to 9 parts water (e.g. 10 ml chlorhexidine to 90 ml water).

At the colony site stored in a bucket should be:

- Castor oil (to lubricate syringes)
- Chlorhexidine solution
- Scales (1000 g and >1000 g Pesola scales)
- Wing rule (400 mm)
- Spare pillow cases
- Spare tissues and paper towels
- Band aids
- Hand-washing water
- Antibacterial soap
- Spare pencils
- Rubbish bags and bin
- Spare transfer boxes

Appendix 7: Grey-faced petrel chick feeding, measuring and monitoring guide

Grey-faced petrel chick feeding, measuring and monitoring (Gummer & Bishop, 2004)

A 3-person team is ideal for a full feeding day: one feeder (concentrating on feeding, food temperature, hygiene) and two handlers.

1. Wash hands (with antibacterial soap).

2. Place first food container in small chilly bin in 1 flask of hot water to warm up. Use clean spatula to stir regularly (even temperature).
   Test temperature on wrist: mixture should be *just* warm (cold mix may be rejected by chick; hot mix may damage chick's internal tissues).

3. Fill two rinse baths with boiled (>3 mins) water.
   Fill tall jar with chlorhexidine solution/water mix and stabilise with chux cloths in flask lid

4. Assemble syringes and crop tubes (hand-tight) and lubricate plunger with smear of castor oil.

5. Complete rounds of all occupied burrows to record fence status (emergence behaviour). NB Don't bother erecting fences at this stage (see 7 below).

6. Process chicks in the following order:
   - Extract chick from burrow.
   - Check nest thoroughly for signs of regurgitation and that faeces are present and normal (dark brown gritty faeces with white fluidy urates, usually seen on chamber walls).
   - Replace lid to keep chamber cool and dry.
   - Weigh (to obtain pre-feed or base weight)
   - Wing length (right wing) if wing measuring day
   - Any other handling (e.g. screening, physical examination)
   - Feed (record amount delivered)
   - Return to burrow (face chick to back of chamber opposite pipe).

7. Search all pipes for any missing chicks (two chicks can be found in one burrow) by feeling inside entire length of every pipe with fence recorded as down. Two people can feel inside pipe from each end, or use long soft stick to feel from entrance end. Fences can be restored at this stage, or at the end of all chick processing.

8. Weigh birds over a surface (to prevent injury if fall from scales). Replace weigh bags as soon as soiled. Keep birds in bags (to keep calm) for wing measuring, removing right wing to measure – gently straightened and flattened to record maximum wing cord.

9. For feeding, load syringe full to an excess of 50 ml, ensuring all air bubbles are removed. The excess allows for 7 ml to be left in the bottom of the syringe after delivery of 50 ml to the chick, important for the sterilising process. Wipe the crop tube with a clean tissue to remove residue food.

10. During feeding, the handler holds the chick firmly on a surface with crop (breast area) unrestricted while the feeder inserts the crop tube to the back and side of the throat (to keep airway clear), stretching the head and neck up at all times. Food is delivered in 50 ml batches (up to 30 seconds delivery time) which allows chick to rest in between loads. Food delivery stops at the pre-determined amount, or earlier if signs of food coming back up throat. Chick is rested briefly, then carried immediately back to the burrow (not in bag) held in an upright position to prevent any regurgitation incidences.

11. After feeding, wipe the crop tube with a tissue and place tube upright in jar of chlorhexidine for a minimum of 2 mins sterilising time. After sterilisation, remove syringe/tube and eject remaining food (<7 ml) in syringe – this is important to remove any disinfecting solution that may have soaked into the food in the tube. Rinse the outside (entire length) of tube through two rinse baths. The syringe/tube is now ready to draw up more fresh food (there should be no air bubbles present).

12. Keep monitoring food temperature regularly (before each chick) and stir with spatula before drawing up food (the thick part of the mix can settle). Remove from water bath if too warm. Towards the end of each batch, get the next batch out to warm up using a new flask of hot water. Thoroughly clean spatula before using in the next mix – rinse off with the pre-boiled water in the 1 litre red-top bottle.

13. On a full feeding day, the syringe barrels need to be rinsed out and disinfected (fill them with chlorhexidine for minimum 2 mins) and rinse baths replaced at least once during the day (twice if very hot weather). Thoroughly rinse syringes with clean (boiled) water before use again.

14. After all feeding is complete, check all fences at burrow entrances are restored. Three thin straight sticks are sufficient, lightly placed in the soil at the entrance so as not to barricade the chicks in!

Appendix 8: Grey-faced petrel chick post-feeding clean-up guide

Grey-faced petrel chick post-feeding clean-up (Gummer & Bishop, 2004)

1. Heat water for cleaning (at least two kettles).

2. Wash hands, then remove food preparation equipment (blender jugs etc.) from antibacterial solution that have been soaking over the day in the small bucket. Rinse equipment under cold tap and air dry.

3. Pour the antibacterial solution from the bucket into the large red chilly bin, ready for soaking the days equipment after washing. Add a further 2 litres of water and 1 Milton or Johnson's tablet.

4. Wipe thermos flasks with cloth soaked in Milton, take off lids and stack on shelf.

5. Discard surplus sardine mixture in the sea (to prevent oiling up drains).

6. Rinse all equipment under hot tap to remove bulk of mixture before doing two thorough washes (with petrel washing-up brush) in very hot, very soapy water to remove all oil. Pass hot, soapy water through tube and syringe, then remove tube and plunger for more thorough washing (put dish-wash liquid in syringe barrel and use petrel bottle brush to remove oil residue).

7. Rinse off detergent before placing in chilly bin of antibacterial solution (minimum soak period 2 hrs). After sterilising, rinse equipment under cold tap and air dry. Discard the antibacterial solution (recommended to change this every 24 hours); fresh solution is made on the next feeding day.

8. Shake out weigh bags and soak in Napisan overnight. Weigh bags from the previous weighing day will need to be rinsed well and hung to dry.

9. Boil water (>3 mins), enough to fill the boiled water container full ready for the next feeding day and to set aside (in a clean/sterilised food container) for use in food preparation on the next feeding day.