



REPORT ON SECOND TRANSFER OF GREY-FACED PETREL (*Pterodroma macroptera gouldi*) CHICKS FROM TARANGA (HEN) ISLAND TO MATAKOHE-LIMESTONE ISLAND (DECEMBER 2005)

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for the Friends of Matakohē-Limestone Island, January 2006.

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ABSTRACT

Thirty-one grey-faced petrels (oi) were transferred from Taranga (Hen) Island to Matakohē-Limestone Island by boat on 3 December 2005. This was the second of up to five transfers planned by the Friends of Matakohē-Limestone Island (FOMLI), in order to establish a new population of this species on the island.

The project aimed to transfer forty chicks from Taranga Island. However most of the chicks found on Taranga were of less than optimal condition and size (as was also the case the previous year), so the target of forty chicks was not achieved. Thirty-one chicks meeting the required minimum weight and wing length criteria were found and transferred. The transferred chicks varied greatly in size and weight, and fledging from Matakohē-Limestone Island was spread over a month, from 15 December 2005 to 11 January 2006.

Once on Matakohē-Limestone Island, the chicks were fed using the same method as the previous year, 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, then meal sizes were gradually increased to the level required for each individual to reach the normal fledge weight range.

All chicks appeared to be doing well on the diet for the first 20 days; however by 23 December problems developed for several of the younger (smaller) birds, which became ill and started vomiting. Five chicks died; all were amongst the smallest chicks transferred by wing length or weight. It is possible that the diet was insufficient to carry these under-developed chicks through to fledge. Judging by their weights and wing lengths at transfer it is likely that they were under-nourished at the source colony and may not have survived naturally either.

26 chicks (84%) were presumed to have successfully fledged from Matakohē-Limestone Island.

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 Is.), 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 around fifty or 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.

This report details the second transfer of grey-faced petrel chicks from Taranga (Hen) Island to Matakohe-Limestone Island, 2005. Rose Collen (aviculturist 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, until the last of the chicks had fledged on 11 January 2006.

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.

Background information on grey-faced petrel fledging weight and wing length statistics

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 surveys for burrows and chicks on Taranga (Hen) Island, August & October 2005

Prior to the 2004 transfer, the western third of Taranga Island was surveyed and grey-faced petrel chicks taken from this area. Due to the low number (50) of accessible chicks located in this area it was decided that the remaining area of Taranga should be surveyed to identify additional areas in which burrows were concentrated.

August survey:

The 8 – 12 August 2005 survey was timed to coincide with commencement of the prospecting and nesting period for grey-faced petrels. Adult birds could be heard and observed flying in at dusk and were found wandering around on the ground along the main ridge during this time.

A team of three people surveyed the two-thirds of the main ridge not surveyed in 2004 (east from the Eastern Dragon Mouth Cove junction). Areas on either side of the main ridge were surveyed to near sea level at likely looking places, however very few burrows were found in these areas. Most burrows were scattered along the main ridge, with higher densities around prominent rock outcrops. The highest density of burrows along the main ridge was in the area in which chicks were taken for the 2004 transfer (the western third). One lower colony site was discovered directly above the Wahine Bay campsite (southern side of the island). As a result of this trip it was decided that this more central location (Wahine Bay) should be chosen for the campsite. Chicks could then be transported from either end of the island along the main ridge and down to the campsite for transfer by boat. The western area of the island was also given a quick survey to check on activity around the previous year's burrow sites. Study holes had been inserted into some burrow tunnels the previous year to improve access to chicks. The condition of some of these burrows was checked and all were found to be well sealed and dry, with adults sitting on eggs within. The activity in these areas seemed to be unchanged from 2004.

October survey:

From 15 - 19 October 2005 a six person team searched the 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 only one in every twenty burrows searched contained an accessible chick. Chicks that were accessible were weighed, their wing length measured and their general condition assessed. A total of 72 chicks were located (well short of the 100 hoped for), and their burrow locations recorded (in Appendix 1). Detailed accurate information was essential for re-locating the chicks during the transfer trip. There was a fairly even spread of chicks along the main ridge on either side of the Wahine Bay junction, plus nine chicks located in a small colony directly above the campsite. The remains of some eggs and dead chicks were found near the entrances to a number of burrows during this trip.

The weight and wing information from these chicks was analysed and the first emergence and fledge dates were predicted for each chick. So that most of the hand rearing could be completed by the end of December (as was done the previous year), the 40 oldest chicks were targeted for transfer. The transfer date was then planned for 1 December, just before the expected first emergence of these chicks.

Selection and transfer of chicks from Taranga Island 30 November to 3 December 2005

A team of six people arrived on Taranga Island on 30 November, and spent two days re-locating the 72 burrows; 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). After the first check of all the burrows, only 13 chicks met the minimum required size criteria of 180 mm wing length and 450 grams in weight. After gaining agreement with the Department of Conservation the minimum wing length was reduced to 165 mm and the decision made to re-check any borderline birds that had had a parental feed. On 2 December, 44 birds were re-visited and weighed and measured again. Four chicks selected for transfer were taken off the list because they had not had parental feeds and had dropped below 450 grams. 12 chicks were added to the list because the wing length minimum had been reduced; a further two were added because they had had parental feeds which brought their weights up over 450 grams, and another four were added due to a combination of both wing length change and weight increase.

The 31 selected chicks were banded with metal bands for identification, placed into cardboard 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 core flute 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 3 December (three hour journey). The boat trip went well; the chicks were stored 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 11 a.m. and the chicks were immediately loaded onto a truck and trailer and driven up the hill to the artificial petrel colony site. The weather was very hot and sunny, and to avoid overheating the transfer boxes and chicks were placed in the shade of the petrel feeding station shelter as quickly as possible. Each chick was then weighed, 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.

Burrows 1 – 33 on Matakohe Island were used, with the exception of 9 and 32 (not used due to one facing into the scrub and one off to the side of the colony). In preparation, all burrows were lined with dead dry grass, and the entrance tunnels blocked off with clods of dirt or fence post rounds.

By midday, all chicks were installed in their burrows, and they were then welcomed onto the island by Te Parawhau and Ngatiwai. Approximately 30 people were present, with representatives from Te Parawhau, Ngatiwai, FOMLI, Golden Bay Cement (principal sponsor of the island) and the local community.

Supplementary feeding

Chicks were fed the same diet as the previous year; 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 transfer (Appendices 6, 7 and 9).

As with the 2004 transfer, most of the chicks were smaller or younger than optimum for transfer, so a feeding regime that would allow the chicks to make a gradual transition from natural to artificial diet was adopted (as was recommended by Helen Gummer after the 2004 transfer).

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 chicks (15 total) that were low in weight or had not had a parental feed on Taranga the night before transfer.

Day 1: 50 ml runny puree fed to the 16 chicks not fed transfer day plus one very underweight chick.

Day 2: 100 ml runny puree given to chicks that were fed on transfer day, and 50 ml

runny puree to those fed on Day 1.

Day 3: None fed (intention to get all birds feeding on same day)

Day 4: All fed 100 ml normal puree mix (66:33 sardines:water)

All chicks were fed every second day thereafter.

On arrival at Matakohē-Limestone Island, three of the chicks were weak and appeared dehydrated, and a number were subdued, however by the next day most seemed lively and recovered. Interestingly, the chicks' weights on arrival were the same as they were when they were removed from their burrows on Taranga Island the day before.

The chicks that were not fed on the evening of the transfer day had dropped significantly in weight by the following morning; some lost as much as 100 grams. The chicks fed on the evening of the transfer day however, maintained their weight or only dropped a small amount.

The amount fed slowly increased as the chicks adjusted to the diet. During the first week, small feeds of up to 100 ml saw weight gains in the chicks. After approximately 10-12 days on the diet, large feeds (130ml +) were necessary just to maintain their weights. Most chicks still had a lot of growing to do before fledging, so they were fed as much as required to ensure weight gains if they were below the usual fledge weight, or weight maintenance if they were within or above the usual fledge weight range. The amount fed was usually 130 – 150 ml but occasionally up to 180 ml.

A total of 451 tins (106 g) of sardines were used to feed grey-faced petrel chicks 2005.

Daily chick and burrow monitoring

The process for checking, handling and feeding the chicks was the same as the year before (Appendix 8). On 6 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 8 days until the pattern of daily weight changes could be predicted. Thereafter they were weighed before each feed (every second day). Wings were measured after weighing (before feeding), every 2 – 4 days.

Disease screening

Twelve chicks were screened on 9 December 2005 – the chicks in burrows 1, 2, 3, 6, 7, 8, 10, 11, 12 and 13.

Blood samples were obtained from either the wing or the leg, for a complete blood count (CBC) and to test for blood parasites and avian malaria. Cloacal swabs were taken and tested for salmonella, campylobacter and yersinia.

Faecal samples (for parasitology) proved more difficult to obtain, so were not from all of the chicks sampled above, but just those that would oblige. Faecals were obtained from chicks in burrows 1, 3, 5, 6, 10, 14, 20, 23, 25, and 31.

All samples were sent to Gribbles Animal Health Lab in Auckland, with the exception of some blood samples for avian malaria, which went to Kate McInnes (DoC veterinarian).

All results returned negative or normal.

None of the chicks transferred had any deformities or obvious health problems (until a number fell ill late in December, see below).

Health problems and mortality

Health problems were encountered with eight chicks. Of these, five are known to have died and were sent to Massey University for pathology examination, two apparently recovered and are presumed to have fledged, and one disappeared or possibly fledged at a very low weight. Burrows of chicks that had died were blocked up so other chicks could not go into them. Some chicks were dosed with antibiotic "Clavulox" – the dose given was 125 mg for a 500 gram bird; twice per day.

Deaths:

Three chicks died very near fledging, they all appeared normal and healthy prior to a sudden onset of weight loss, vomiting and death:

Burrow 8: Nick-named "Sid" because of vicious behaviour, this chick showed no signs of illness until the day it died. Growth and development appeared normal throughout the rearing process and its weight (570 g) and wing length (301 mm) were at a point very close to fledge and within the normal fledging range. On 2 January the chick had dropped in weight suddenly, by 110g since the previous feed. Attempts to feed it resulted in immediate regurgitation, and the chick was returned to its burrow. It was found dead outside the burrow at 8.30 that evening, weight 460 grams.

Burrow 13: Very similar case to that of Burrow 8, with no symptoms until the day before death. On 6 January the chick's weight had dropped suddenly by 50g to 470 grams, it was dirty and smelly and was refusing food (immediate regurgitation). It was given two doses of antibiotic that day, but was found dead the next morning (7 January). Again, this chick was very close to fledge and was within the normal weight (520g) and wing length (300 mm) range for fledging.

Burrow 20: Similar to 8 and 13, with no signs of illness until the day before death, apart from a resistance to the feeding noted. On 6 January, vomit was seen in the burrow and the chick's weight had dropped 70 grams to 460 grams, so it was not fed but electrolytes given. It became weaker during the day. The next morning it was very weak and an attempt to give fluids and antibiotics failed. Found dead that afternoon (7 January), weight 430 grams. Had been close to fledge and within normal weight range.

Two chicks showed symptoms a couple of days before death, with at least a week to go before they were due to fledge:

Burrow 27: On 23 December, this chick had a sudden weight loss of 60 grams since last fed, had vomited in its burrow and was vomiting any food it was fed. The following day it was weak, but took some oil and sardine pieces which it later vomited. Antibiotics were administered that afternoon, but the chick was found dead in its burrow the next day (25 December), weight 425 grams. While this bird's weight was over 500 grams before its decline, it was the lightest chick transferred (450 grams) and it was a struggle to get the weight back up after the transfer.

Burrow 29: On 25 December this chick had vomited in the burrow, so was given 25 ml water to rehydrate. The next morning the chick was weak and its weight had dropped 100 grams to 445 grams. It was given a small feed of puree and some water and started on antibiotics. That evening (26 December) it was found dead outside the burrow, weight 430 grams.

Illnesses:

Two chicks became ill and apparently recovered:

Burrow 30: Nick-named "Ivan the Terrible" due to his very feisty nature and savage biting, this was one of the smallest chicks transferred (by wing length) and the last bird to fledge – much to the joy of his handlers! On 8 January the chick was showing neurological signs – incoordination, trembling, head twitching & arching back, and appeared disorientated. He was very close to fledging (within the normal weight and wing length range) and the symptoms coincided with the chick moving to a different burrow further up the slope of the colony site. He was fed puree, electrolytes and antibiotics, some of which was regurgitated, and the chick was still lively and biting the whole time. He appeared much improved later that day and by 10 January was feeding well and seemed normal again. Dosing with antibiotics was continued until 11 January when the bird was presumed to have fledged.

Burrow 33: On 25 December, the day after this chick's first emergence, vomit was found in its burrow and the chick's weight had dropped by 100 grams, to 535g. It was given 25 ml water and not fed. The next day it was started on antibiotics and given a small amount of food which it later vomited, and its health declined to a point where it was shaking and weak. On the evening of 27 December, the chick started to improve and was able to keep down sardine pieces and electrolytes. It chose to move to the adjacent burrow, number 34. The chick received antibiotics for five days and appeared to be in good health by 31 December. On 4 January it was absent and presumed fledged, and the weight (490 g) and wing length (308 mm) would have been within normal range for fledging.

The following chick was ill for a lengthy period:

Burrow 11: This chick was ill for 16 days before its disappearance. The problems with this chick began on 25 December, with it refusing the morning feed by gagging and regurgitating. At this stage it was still a good weight; however over the subsequent weeks its weight decreased overall as the chick struggled to keep any food down, often vomiting the morning feed. The chick was dosed with Clavulox antibiotic twice daily for six days from 29 December 2005, then again on 8 and 9 January 2006. During the two weeks of illness it seemed to improve a couple of times, becoming stronger and feeding well, although it also exhibited abnormal behaviours such as wandering outside the burrow during the day and arching its head right back onto its back. On the last day it was handled its weight had dropped to 400 grams and it was vomiting anything it was fed, but was also strong and behaving normally.

On 10 January the chick was absent, and not found despite a search of the colony site. If it did survive to fledge it would have been well below the normal size range for chicks to fledge, with a weight of approx. 400 grams and wing length of 295 mm.

Burrow hygiene and temperature

Two to three weeks after the transfer, many of the burrows were becoming very smelly with a strong ammonia smell – not particularly noticeable unless very close up (face close to nest chamber). Nest chamber straw was replaced if it got wet (from a chick being outside on a rainy night) or a chick vomited in there, however this was not enough to get rid of the ammonia smell which seemed to have permeated into the wooden burrow walls. This smell was quite harsh and may have been the cause of some chicks sitting in the tunnel rather than the nest, perhaps to gain fresher air. Chicks that were retrieved from a burrow tunnel rather than the nest chamber often had dirty breast feathers which had to be wiped clean.

A couple of the worst burrows were washed down with water and nest straw replaced, and this improved the smell.

Details of chicks sitting in tunnels:

- Burrow 11 - found in tunnel once
- Burrow 13 - often found in tunnel, once with dirty plumage
- Burrow 16 - found in tunnel once
- Burrow 18 - found in tunnel once
- Burrow 23 - found in tunnel several times
- Burrow 24 - often found in tunnel, once with dirty plumage.

The nest chambers were kept covered with two sand-filled sacks at all times to keep the burrows cool; however the temperatures inside the burrow and tunnel were not measured.

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 31

chicks transferred, 17 started emerging with wings less than 250 mm. 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. Of the eight chicks that ended up with health problems, six of them were emerging prematurely. Worth noting also is that there were eleven chicks emerging earlier than expected that appeared to have no health problems.

Any of the chicks that were absent from their burrows were either found in another burrow that day or never seen again (presumed fledged) – unlike last year when some chicks disappeared and returned a day or two later.

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

- Burrow 2 - found in burrow 40 just before fledge
- Burrow 19 - found in burrow 18 sharing with chick once
- Burrow 21 - found in burrow 15 just before fledge
- Burrow 24 - found in burrow 23 tunnel (sharing) just before fledge
- Burrow 30 - found in burrows 14 then 3 just before fledge
- Burrow 31 - found in burrows 19 then 23 just before fledge
- Burrow 33 - moving between burrows 33 and 34 while ill and just before fledge

The first chick was thought to have fledged on 14 December 2005 (burrow 22), and the last chick left on 10 January 2006 (burrow 30). The 26 surviving chicks spent an average (mean) of 28 days on Matakoho-Limestone Island. The average (mean) emergence period was 19 days.

DISCUSSION / RECOMMENDATIONS

Condition of the chicks and timing of the transfer

During the selection and transfer trip it became evident that most of the birds had not grown at the predicted rate (this was also the case the previous year). At 1 December it would be expected that the chicks selected for transfer would be at their peak weights (660 – 1000g) or in the process of losing weight to reach fledge weight. They were expected to be near first emergence, with wing lengths of 200-250 mm. In reality, only a couple of chicks were found in this condition, and the best 31 chicks were selected from 72 possible burrows. The average (mean) transfer weight was 562 grams, and the average wing length was 192 mm – well below the optimum for transfer (see also Appendix 3). The reasons for this are beyond the scope of FOMLI's work and this report, however it is essential to the success of the project that we have as many chicks as possible, in optimum condition, to choose from. Therefore it is suggested that rather than select the oldest 40 chicks and plan the transfer around their predicted fledge/emergence dates, the chicks in the middle of the range should be targeted. This would allow some leeway either way in case of a poor season, providing a greater pool of birds to choose from. This would have been achieved if we had carried out the 2005 transfer a week to ten days later. The hand rearing component of the project would continue through until mid January.

Weighing of chicks on Taranga selection trip

Chick weights can vary considerably over a few days depending on whether or not they have received a parental feed. Many of the chicks weighed on 30 November and 1 December, that were over the minimum weight required for transfer, were too light on transfer day and vice versa (others had had a parental feed bringing them well over the weight minimum – see also Appendix 2). When selecting the optimum chicks for transfer it is important to weigh the chicks again just before transfer from their burrows to ensure they have not dropped below the weight minimum. Others that nearly meet the minimum weight/wing length criteria should also re-visited if there is a shortage of optimum chicks, if they have had a parental feed. Fences erected at burrow entrances will assist in assessing whether a chick has had a parental visit (and may therefore be heavier!).

Selection criteria / health problems

The chicks that became sick all had wing lengths of less than 180 mm when transferred, with the exception of the burrow 27 chick, which had a wing length of 194 mm but was the lightest in weight at 450 grams. This would suggest that transferred chicks with a wing length of less than 180 mm or a weight of less than 500 grams have a reduced chance of survival through to fledge. Of the 5 chicks transferred at less than 500g, 2 died (see also Appendix 5).

However, of the 16 chicks with wing lengths of less than 180 mm, 10 survived and their weights ranged from 500 – 720 g. Chicks transferred with shorter wing length may have reduced chances of survival but may still be worth taking, if there is a shortage of chicks in optimum condition available at the source colony, and if mortality of some chicks on Matakohe-Limestone is acceptable.

Likewise, chicks weighing 450 – 500 grams may survive if they have a wing length of over 200 mm – i.e. they are nearer emergence/fledging.

We recommend staying with the original selection criteria:

- wing length 200 – 250 mm (or greater than 250 mm if chick not yet emerged)
- minimum weight 500 g

If there is a shortage of such (optimum) chicks:

- minimum of 180 mm wing length or down to 165 mm if prepared to lose some of these smaller chicks
- Minimum weight 460 grams

Transfer methods

This year's transfer methods worked well and we recommend the same methods be used next year: i.e. Select the chicks over a two day period, transfer them down to the Wahine Bay campsite the following day, house in boxes overnight, transfer by boat early the next morning to arrive at Matakohe-Limestone Island by midday.

Feeding

If the transfer is conducted the same way next year (over two days), feed all chicks 50 ml watery puree 6 hours after transfer, i.e. that evening. This will help avoid the dramatic post transfer weight losses seen this year, while also allowing the chicks a gradual transition to the artificial diet.

Transfer day: 20 ml water on arrival after transfer (about midday), then 50 ml watery puree in evening.

Day 1: Any chick that has lost more than 10 grams in weight since transfer weight, give top-up feed of 50 ml watery puree.

Day 2: Feed all chicks 100 ml watery puree.

Day 3: Non feed day.

Day 4: Feed all chicks 100 ml normal puree.

Feed all chicks every second day thereafter.

A weight gain of 10-15g per day is reasonable, but if a chick has increased by more than this beware – they may be being overfilled and unable to digest the volume of food given. This is usually evident by the feel of the belly area, which feels swollen and firm when full, but soft and flat when empty (practise feeling the belly gently before and after feeding to recognise this).

While the current artificial diet has been proven to sustain chicks during the last few weeks before fledge, it might not provide sufficient nutrition for chicks that are further behind in development and still have much growing to do – such as some of the smaller chicks transferred this year (less than 180 mm wing length).

The following diet was used in 2000 at the National Wildlife Centre, to successfully hand-rear two grey-faced petrel chicks from 9 and 16 days of age, and a further five chicks from approximately 70 days of age:

2 tins sardines	(63%)
100 ml salt water	(30%)
16 ml cod liver oil	(5%)
9 g Bonegro (calcium)	(2.5%)
1½ tabs Mazuri multivitamin	

Burrows

Clean and air all burrows several months before the next transfer.

Monitor the temperatures in tunnels and nest chambers on hot days, in case some of the health problems and burrow swaps were caused by heat stress – especially in those burrows that were occupied by birds with health problems. It would help to monitor the average temperature in occupied burrows on Taranga Island, to obtain baseline information on the chicks' natural environmental requirements.

Continue to monitor temperatures (on Matakohe-Limestone Island) while birds are occupying the burrows, as their body heat may also increase the temperature inside, and compare temperatures with those on Taranga Island. The depth of soil coverage over the entrance tunnels (especially) and around the nest chambers should be checked and built-up if necessary.

Modify the nest chamber walls if possible to make them easier to clean with water. The wooden walls as they are seem to soak up the urates, causing the strong ammonia smell.

ACKNOWLEDGEMENTS

This project can be considered a success, and thanks go to the following people who made it so:

- Ngatiwai have mana whenua over Taranga Island, and Te Parawhau over Matakohe Island. Both groups along with members of the wider community were involved in all stages of this project. The assistance of these groups was invaluable, along with that of Department of Conservation, Forest & Bird, World Wildlife Fund (major sponsor) and the dedicated volunteers who gave their time to help with the transfer and feeding programme.
- The following people tramped up, down and around the slopes of Taranga (up to their arms in it): Derek Bettsworth, Olly Ball, Michelle Martin, Grant and Pam Stevens, Tanya Munro, Lawrie Mead, and Nicola Butchart.
- Thanks to Martin Hunt for volunteering his time and his launch “Manaaki” to transport the chicks from Taranga to Matakohe-Limestone Island
- Thanks also to Peter and Cathy Mitchell, and Tanya Munroe, for so ably taking over the petrel care and feeding, with the chicks at such a difficult stage.
- Massey University pathologists examined the unfortunate petrel chicks and provided helpful advice on possible causes.

REFERENCES

Gummer, H.; Bishop, C. 2004. First transfer of grey-faced petrel (*Pterodroma macroptera gouldi*) chicks from Taranga (Hen) Island to Matakohe-Limestone Island.

APPENDICES

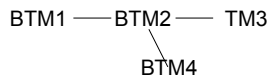
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Appendix 1: Locations of grey-faced petrel burrows on Taranga (Hen) Island 2005

Location	Burrow ID	Comments – 17 October 2005
300° 15m above TM2	A1	'A' block - main track out of Wahine Bay
35° from TM(first tm after tm2) close to track	A2	east of track
150° 10m from TM3	A3	rock lid, east of track, bird seems a bit weak.
270° 30m west of TM3, blue tape above track	A4	Across small gully. Rock lid.
All burrows in 'B' block on same ridge, directly above camp. Start BTM at foot of ridge with pink weed marker. Follow BM's up ridge.		
50m above B3P	B1T	
20m above B1T	B2T	big bird
20-30m west of 2nd BM from first BM at tree	B1P	rock lid
60° 50m above B1P	B2P	
30° 20m from BM by big Puriri	B3P	RH eye closed, lathargic, bird in poor condition.
'C' block - west of Wahine Bay junction. 15m west of TM24. Below astelia/colospermum field east of hanging petrel site.		
Go around base of colospermum to Taraire tree with blue, white flagging tape, 220° from tree	C1P	rock lid
'D' block - after hanging petrel (TM22) junction. 20m east of TM 20		
210° 15m from BTM (uphill from track)	D1P	rock lid 20m east of TM 20
200° 10m from 2nd BTM (uphill from track)	D2P	rock lid, but accessible from burrow entrance
'E' block - 10m east of TM 18		
0° 10m from BTM	E1P	rock lid
20m east of TM 18. 90°	E2P	
2m away from E1P	E3P	2 story study hole (through other burrow) full arm length. Rock lid
3m below E2P 0°	E4P	below large rock
210° 10m from TM 18	E5P	rock lid
5m west of TM 17	E1T	on track
40m west of E1T on track	E2T	3m northeast of track
10m east of TM 16, 2m above track	E3T	rock lid
'F' block 20m east of TM15		
30° 7m above track from BTM	F2P	Below very large rock. Rock lid
Approx. 20m above track between TM 16 & 17	F3P	next to F2T above large fallen Taraire on track
as above	F4P	next to F2T & F3P, rock lid (also above fallen Taraire)
as above	F1T	above fallen Taraire
as above	F2T	1/2m above F1T
Follow seven blue markers east of 'F' block to top of knoll, under twisted big kanuka	F3T	lots of astelia. 80-90m away from 'F' block. Beware cliff
West of 'F' block below rock face	F4T	above track
'G' block @ TM 15		
175° 15m from TM 15	G1P	on track
1m above TM 15	G1T	
Middle of track below lunch rock	G2T	
330° 8m from TM15	G3P	rock lid
T' block on way down to HP site. BM at TM next to Puriri.	T block	1m above track (1 bird)
On way to HP site, below 'T' block, approx. 40m above HP	Lawrie	on track (1 bird)
Hanging Petrel (HP) site is located on steep, eastern track down to Dragon Mouth Cove camp site (from TM22 at ridge)		
75° 8-10m below BTM	HP1	rock lid
south of HP approx. 20m follow BM (6)	HP2	entrance at base of Matipo tree
125° 15m amongst supplejack	HP3	rock lid
150° 15m from BTM	HP4	rock lid. Next to HP5
as above	HP5	rock lid. Next to HP4
200° 25m from BTM	HP6	against rock face at top of block. Rock lid
'H' block (1 bird) 30° 20m from TM 14	H1T	
'I' block (1 bird) 20m before (east of) TM 13 on track	I1T	rock lid

Location	Burrow ID	Comments – 17 October 2005
'J' block 50m west of TM 26 (southern side of Nic's knoll)		
40° 15m from BTM	J1P	
110° 25m from BTM	J2P	xtra blue marker added to give direction, hard to find in rangiora
'K' block eastern/northern side of Nic's knoll (Note: total of 3 numbered BTM's from big puriri (9 total 0 -- 1 -- 2 -- 3))		
350° from BM on weed line. (BM's lead to site). Weed line runs from TM26 (to the NE)	K1T	RH eye partially closed, rock lid
Northern side of knoll, 2nd gut in rock face, BTM @ top of gut. From BM go left 3-5m	K2T	
330° 30m from BTM (west of big puriri	K3T	Rock lid. Huge rewarewa
2m above K4P 45° 15m below BTM3	K4T	Lethargic (refer note)
east of Nic's knoll 15m from rock face	K1P	rock lid
N.E of Nic's knoll, 10m from rock face	K2P	rock lid
50m north of nic's knoll. 300° 20m from large marked puriri	K3P	rock lid. Puriri marked with blue tape refer notes above.
On blue marked line from large puriri	K4P	
BTM 1 (numbered) west of large marked puriri	K5P	rock lid
BTM 1 2m away from K5P	K4PA	rock lid (may just be marked as K4P)
'L' block - 30m east of TM 32 (follow rock face around to blue marker 60-70m approx.)		
2m from 'L' block blue marker	L1P	
270° from BTM1	L2P	
as above	L3P	2m from L2P rock lid
1m below L block marker 0°	L4P	rock lid
260° 30m below BTM	L1T	
6m below L1T	L2T	
0° 6m east of L1T	L3T	
follow BM from main 'L' block marker	L4T	
'M' block - TM 47 junction		
50° 8m from TM 47	M1P	rock lid. careful - shallow burrow
290° 5m from TM 47	M1T	
10-15m from TM 47, 80m from Junction	M2T	rock lid (on BTM 1)
follow blue markers to west from M2T to M3T	M3T	at BTM3
80° 15m from BTM 4	M4T	rock lid
'N' block (1 bird) 3m away from TM 49	N1P	
'O' block - 7m east of TM 58		
330° 20m from BTM	O1T	
3m north of O1T	O2T	
1 1/2m from O1T	O3T	
P' block (1 bird) west side of TM 60 (20m). 2m from BTM (north side)	P1P	long arm
Q' block (1 bird) 30m east of TM61. 200° 5m from BTM	Q1P	



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Appendix 2: Weight, wing measurement and health status of chicks found on Taranga (Hen) Is. 2005

Selected √ or X	Burrow	Wgt Oct 17 (g)	Wgt Nov 30 (g)	Wgt Dec 2 (g)	Fence status D/PD/I	Wing Oct 17 (mm)	Wing Nov 30 (mm)	Wing Dec 2 (mm)	Health comments	M-L burrow no.
X	A1	105	565	435	I	62	172		No parental feed so too light to transfer.	
√	A2	430	600	670	D	80	190	200	Vomited on first handling.	26
√	A3	370	520	620	D	70	160	173		29
X	A4	220	305			54	84		No primaries.	
X	B1T	260	450			53	132		Small primaries.	
√	B2T	545	515	460	I	112	224		Vomited first handling. Dead parent hanging by burrow.	16
X	B1P	430	370	440	D	72	165	165	Too light.	
X	B2P	310	350			67	126		Small primaries.	
X	B3P	310	X			63	X		Chick not there.	
√	J1P	350	505	460	D	80	198	205	Vomited on first handling.	5
√	J2P	370	405	570	D	80	155	169		13
X	K1T	300	410			70	125		Too small.	
√	K2T	280	540	550	D	70	186	196		24
X	K3T	260	355			66	128		Too small.	
X	K4T	290	470		D	75	146		Couldn't reach second time.	
√	K1P	520	560	600	D	95	205	210		25
√	K2P	390	650	590	PD	87	163	170	Vomited on first handling.	23
X	K3P	360	440	430	D	70	167		Vomited on second handling. Too light to transfer.	
√	K4P	390	430	610	D	90	170	176	Vomited on first handling.	21
X	K5P	380	390		D	70	166		Couldn't reach second time.	
X	K4PA	310	520	420	I	72	177		Vomited both times handled. Too light to transfer.	
X	L1P	350	530		I	50	118		Too small.	
√	L2P	560	415	450	D	105	184	194		27
√	L3P	320	390	580	D	80	155	166		18
√	L4P	330	450	540	PD	90	170	178		6
X	L1T	260	410		D	60	146	160	Vomited on first handling. Too small.	
√	L2T	485	570	540	I	75	172	175	Vomited oil on first handling.	2
√	L3T	320	575	670	D	70	176	190	Vomited on first handling.	28
√	L4T	240	570	500	I	65	164	170	Vomited on first handling.	30
√	M1P	270	520	460	I	75	166	167		20
X	M1T	375	385	430	D	90	166		Too light.	
X	M2T	340	365		I	65	146		Too small.	
√	M3T	260	495	540	D	62	157	165		11
√	M4T	540	700	650	I	93	222		Vomited on first handling.	4
X	N1P	265	465			60	148		Vomited on first handling. Too small.	
√	O1T	350	640	550	I	72	189		Vomited oil on first handling.	3
X	O2T	260	345		D	62	140		Too small.	

Selected √ or X	Burrow	Wgt Oct 17 (g)	Wgt Nov 30 (g)	Wgt Dec 2 (g)	Fence status D/PD/I	Wing Oct 17 (mm)	Wing Nov 30 (mm)	Wing Dec 2 (mm)	Health comments	M-L burrow no.
√	O3T	290	505	660	D	76	166	166	Vomited on first handling.	31
√	P1P	240	610	510	I	61	168			19
√	Q1P	520	510	485	I	95	219			12
X	C1P	340	X			50	X		Chick not there.	
X	D1P	310	380			66	152		Small primaries.	
X	D2P	370	440	410	I	70	180		Too light.	
X	E1P	470	X			75	X		Chick not there.	
X	E2P	380	430			63	160		Too small.	
√	E3P	540	540	500	I	100	250	254	Vomited on first handling.	15
X	E4P	370	360			75	168		Too light.	
X	E5P	290	X			65	X		Chick not there.	
X	E1T	330	240			68	95		Very weak, gummy eyes, shaky, very sick.	
√	E2T	450	435	520	D	78	190	193		7
X	E3T	340	X			70	X		Chick not there.	
X	F2P	330	405	380	I	70	163		Too light.	
X	F3P	360	460	390	I	78	161	163	Vomited oil first handling. Too light to transfer.	
X	F4P	170	X			48	X		Chick not there.	
X	F1T	365	310			80	160		Weak, eyes closed, very sick.	
X	F2T	320	400			70	150		Slightly weak, too small.	
√	F3T	470	470	600	I ?	65	184 ?	173		8
X	F4T	295	360			53	89		No primaries, vomited on handling.	
√	G1P	360	560	650	D	70	172	176		33
X	G1T	420	375	360	I	100	235		Too light.	
√	G2T	590	480	560	D	110	253	257		22
X	G3P	350	510			60	140		Vomited oil first handling. Too small to transfer.	
√	T block	455	590	720	D	80	176	179	Vomited on first handling.	17
X	Lawrie	330	515			54	135		Too small.	
X	HP1	400	485	430	I	78	192	198	Vomited first handling. Too light to transfer.	
√	HP2	350	490	510	D	75	189	196	Vomited first handling.	1
X	HP3	350	370			50	99		Vomited first handling. Too small.	
X	HP4	315	520	450	I	80	162	160	Vomited first handling. Too small.	
X	HP5	250	450	440	I	48	160	165	Vomited first handling. Too light to transfer.	
√	HP6	560	520	600	D	87	210	215		14
√	H1T	290	440	500	D	72	173	173		10
X	I1T	340	410	440	D	86	173		Too light.	

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Appendix 3: Transfer, emergence and fledging data for 31 grey-faced petrel chicks transferred to Matakohe-Limestone Island in December 2005.

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	E212661	HP2	510	196	480	315	21/12/05	30/12/05	10	28	
2	E212655	L2T	540	175	540	320	23/12/05	05/01/06	14	34	
3	E212652	O1T	550	197	500	315	10/12/05	28/12/05	19	26	
4	E212653	M4T	650	230	525	320	08/12/05	26/12/05	19	24	
5	E212614	J1P	460	205	460	305	13/12/05	24/12/05	12	22	
6	E212610	L4P	540	178	480	307	10/12/05	31/12/05	22	29	
7	E212618	E2T	520	193	500	310	08/12/05	26/12/05	19	24	
8	E212619	F3T	600	173			17/12/05				Died 2/1/06
10	E212620	H1T	500	173	510	307	17/12/05	03/01/06	18	32	
11	E212654	M3T	540	165	400	295	07/12/05	09/01/06	34	38	Sick for 2 weeks before leaving
12	E212608	Q1P	485	225	510	315	13/12/05	24/12/05	12	22	
13	E212615	J2P	570	169			17/12/05				Died 7/1/06
14	E212662	HP6	600	215	500	310	09/12/05	24/12/05	14	22	
15	E212616	E3P	500	254	480	320	07/12/05	20/12/05	14	18	
16	E212621	B2T	460	228	490	315	12/12/05	30/12/05	19	28	
17	E212663	T Block	720	179	480	322	09/12/05	05/01/06	28	34	
18	E212611	L3P	580	166	460	305	13/12/05	03/01/06	22	32	
19	E212607	P1P	510	172	520	303	11/12/05	31/12/05	21	29	
20	E212609	M1P	460	167			09/12/05				Died 7/1/06 Only emerged 4 times before 23/12/05
21	E212660	K4P	610	176	500	305	08/12/05	01/01/06	25	30	
22	E212617	G2T	560	257	540	310	06/12/05	14/12/05	9	12	
23	E212613	K2P	590	170	550	305	07/12/05	01/01/06	26	30	
24	E212659	K2T	550	196	530	305	08/12/05	31/12/05	24	29	
25	E212658	K1P	600	210	450	310	10/12/05	26/12/05	17	24	
26	E212665	A2	670	200	490	317	18/12/05	01/01/06	15	30	
27	E212612	L2P	450	194			11/12/05				Died 25/12/05
28	E212656	L3T	670	190	550	320	07/12/05	31/12/05	25	29	
29	E212664	A3	620	173			22/12/05				Died 26/12/05
30	E212657	L4T	500	170	500	322	17/12/05	10/01/06	25	39	Sick briefly & recovered before fledge
31	E212651	O3T	660	166	520	305	24/12/05	05/01/06	13	34	
33	E212601	G1P	650	176	490	308	24/12/05	03/01/06	11	32	Sick for 1 week & recovered before fledge
			Transfer weight (g)	Transfer wing (mm)	Fledge weight (g)	Fledge wing (mm)			Emergence period (nights)	Total no. days on Matakohe	
		Mean	562	192	498	311			19	28	
		Standard deviation	72	26	34	7			6	6	
		Range	450 - 720	165 - 257	400 - 550	295 - 322			9 - 34	12 - 39	
		Sample size	N = 31	N = 31	N = 26	N = 26			N = 26	N = 26	

Note: Total number of days on Matakohe-Limestone Island included transfer day.

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Appendix 4: Predicted (October 2005) and actual fledge dates for 31 grey-faced petrel chicks transferred to Matakohe-Limestone Island in December 2005.

Matakohe burrow	Taranga burrow	wing length (mm)	days to emergence	days to fledging	expected fledging date	actual fledge date
1	HP2	75	58 (13-Dec)	73	28-Dec	30-Dec
2	L2T	75	58 (13-Dec)	73	28-Dec	05-Jan
3	O1T	72	59 (14-Dec)	74	29-Dec	28-Dec
4	M4T	93	49 (04-Dec)	64	19-Dec	26-Dec
5	J1P	80	55 (10-Dec)	70	25-Dec	24-Dec
6	L4P	90	50 (05-Dec)	65	20-Dec	31-Dec
7	E2T	78	57 (12-Dec)	72	27-Dec	26-Dec
8	F3T	65	63 (18-Dec)	78	2-Jan	Dead
10	H1T	72	59 (14-Dec)	74	29-Dec	03-Jan
11	M3T	62	65 (20-Dec)	80	4-Jan	09-Jan
12	Q1P	95	48 (03-Dec)	63	18-Dec	24-Dec
13	J2P	80	55 (10-Dec)	70	25-Dec	Dead
14	HP6	87	51 (06-Dec)	66	21-Dec	24-Dec
15	E3P	100	46 (01-Dec)	61	16-Dec	20-Dec
16	B2T	112	41 (26-Nov)	56	11-Dec	30-Dec
17	T block	80	55 (10-Dec)	70	25-Dec	05-Jan
18	L3P	80	55 (10-Dec)	70	25-Dec	03-Jan
19	P1P	61	66 (21-Dec)	81	5-Jan	31-Dec
20	M1P	75	58 (13-Dec)	73	28-Dec	Dead
21	K4P	90	50 (05-Dec)	65	20-Dec	01-Jan
22	G2T	110	42 (27-Nov)	57	12-Dec	14-Dec
23	K2P	87	51 (06-Dec)	66	21-Dec	01-Jan
24	K2T	70	60 (15-Dec)	75	30-Dec	31-Dec
25	K1P	95	48 (03-Dec)	63	18-Dec	26-Dec
26	A2	80	55 (10-Dec)	70	25-Dec	01-Jan
27	L2P	105	44 (29-Nov)	59	14-Dec	Dead
28	L3T	70	60 (15-Dec)	75	30-Dec	31-Dec
29	A3	70	60 (15-Dec)	75	30-Dec	Dead
30	L4T	65	63 (18-Dec)	78	2-Jan	10-Jan
31	O3T	76	57 (12-Dec)	72	27-Dec	05-Jan
33	G1P	70	60 (15-Dec)	75	30-Dec	03-Jan

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Appendix 5: Grey-faced petrel chick weights and wing lengths recorded on Taranga (Hen) Island on selection trip 30 November – 2 December 2005, in order of wing length at transfer.

Taranga burrow	Nov 30 weight (g)	Dec 2 weight (g)	Nov 30 wing (mm)	Dec 2 wing (mm)	Matakohe burrow	
M3T	495	540	157	165	11	Sick
L3P	390	580	155	166	18	
O3T	505	660	166	166	31	
M1P	520	460	166	167	20	DIED
J2P	405	570	155	169	13	DIED
K2P	650	590	163	170	23	
L4T	570	500	164	170	30	Sick
P1P	610	510	168		19	
H1T	440	500	173	173	10	
A3	520	620	160	173	29	DIED
F3T	470	600		173	8	DIED
L2T	570	540	172	175	2	
K4P	430	610	170	176	21	
G1P	560	650	172	176	33	Sick
L4P	450	540	170	178	6	
T block	590	720	176	179	17	
L3T	575	670	176	190	28	
E2T	435	520	190	193	7	
L2P	415	450	184	194	27	DIED
K2T	540	550	186	196	24	
HP2	490	510	189	196	1	
O1T	640	550	189		3	
A2	600	670	190	200	26	
J1P	505	460	198	205	5	
K1P	560	600	205	210	25	
HP6	520	600	210	215	14	
Q1P	510	485	219		12	
M4T	700	650	222		4	
B2T	515	460	224		16	
E3P	540	500	250	254	15	
G2T	480	560	253	257	22	

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Appendix 6: 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).

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Appendix 7: 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

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Appendix 8: 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!

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Appendix 9: 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.

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COMMENTS

Both the kidney and gastrointestinal problems are likely to be caused by dietary/management

File Nos.:

Students:

Date: 26 January 2006

Pathologist M R Alley

Copy Kathy Mitchell

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