



## **REPORT ON FOURTH TRANSFER OF GREY-FACED PETREL (*Pterodroma macroptera gouldi*) CHICKS FROM TARANGA (HEN) ISLAND TO MATAKOHE-LIMESTONE ISLAND (DECEMBER 2007)**

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for the Friends of Matakohē-Limestone Island, January 2008.

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### **ABSTRACT**

Twenty-two grey-faced petrels (oi) were transferred from Taranga (Hen) Island to Matakohē-Limestone Island by boat on 15 December 2007. This was the fourth 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.

In the first two years there had been some difficulty finding enough chicks of suitable maturity for transfer. The collection trip was carried out a week later in 2006 and 2007. A good number of chicks were available for selection in 2007, though more extensive searching was required to obtain these numbers. Due to weather conditions, however, the chicks could not be transferred when planned. Collection was carried out a week later and 22 chicks, which met the selection criteria, were transferred.

Once on Matakohē-Limestone Is., 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 a transitional diet of small watery meals initially. 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. Some chicks approaching fledge had difficulty retaining their feeds and were given electrolytes to maintain their fluids. All chicks appeared to do well on the diet and fledged within the normal fledging weight range, including some birds transferred at lower weights.

One bird developed septic arthritis of the left elbow and was euthanased.

Three birds developed neurological symptoms close to fledge. All three recovered and went on to successfully fledge several days later.

21 chicks (95%) were presumed to have successfully fledged from Matakohē-Limestone Is.

After a mean of 24 days on the island, the chicks fledged at a mean weight of 538 gm and mean wing length of 317 mm.

A total of 113 Grey-faced Petrels have fledged over the four years of the project to date.

## **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 Is. 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 Is.

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 Is. 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 Is. 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 Is. 28 chicks were presumed to have fledged from the Matakohe-Limestone Is. colony site from the 2004 transfer.

For the second transfer in 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, 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.

The third and fourth transfers were managed by Cathy and Peter Mitchell, resident rangers on Matakohe-Limestone Is. Cathy is an NZVA registered Veterinarian. In the third year (2006), the collection trip was carried out a week later than the two previous years and a good number of suitable birds were available for selection. Forty birds were transferred, 1 became lost and was not found, and 39 birds are presumed to have successfully fledged.

This report details the fourth Grey-faced Petrel transfer to Matakohe-Limestone Island carried out in December 2007.

All transferred chicks have been banded. Three to five years after fledging the first birds should begin returning to Matakohe-Limestone Is. 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 survey on Taranga (Hen) Is., October 2007

In a change from the method of previous years the October survey trip was carried out over one day only, rather than 3-4 days. It was felt that the collection team were sufficiently experienced to locate good numbers of chicks on the collection trip in December. The purpose of the one day trip was to collect preliminary data on the chicks for this season. This would then be compared to the October data from the 3 previous translocations to confirm that the chicks were on track to fledge at a similar date.

On this one day trip, 22 birds were located and measured. Data was similar to previous years (see Appendix 1). Fewer chicks were located in the areas searched than had been found in the same areas the year before (22 vs 42), so it was realised that there would possibly be less chicks available for selection on the collection trip and that searching may need to be carried out over a wider area.

### Planned Collection trip, December 5<sup>th</sup> to December 11<sup>th</sup>

A team of 6 people arrived on Taranga Is. on December 5<sup>th</sup> with the intention of being on the island for 4 nights and leaving first thing on the fifth morning with the selected chicks.

On arrival on the first day camp was set up and the remainder of that day was spent locating chicks at the eastern 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. 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 weather deteriorated that afternoon, with wind and rain. This made for challenging working conditions keeping the chicks and equipment dry, and due to the low cloud, visibility was poor making orientation difficult.

On the second day (Dec 6<sup>th</sup>) searching and measurement of chicks at the eastern end continued. As with the October trip in general less birds were found in these areas than in 2006, possibly in part due to the poor weather making it harder to locate burrows. In the afternoon the team moved

to the western end of the island, re-measuring the chicks found in October. Some new birds were found and the Hanging Petrel site was also searched. This site had been extensively damaged by winter storms and once again less birds than usual were found.

On December 7<sup>th</sup> searching was carried out around camp to increase the pool of birds available for selection. This was fruitful with 28 new birds located above the camp and around the Wahine Bay track.

On December 8<sup>th</sup> a small group returned to the sites visited on the 5<sup>th</sup> and 6<sup>th</sup> to re-weigh the chicks. On December 9<sup>th</sup> the birds located at the eastern end on the 6<sup>th</sup> were re-weighed. On the 10<sup>th</sup> the birds around the camp were re-weighed.

The weather deteriorated on the afternoon of the first day with wind and rain, which continued off and on for the whole time on the island. The uncertain nature of the weather meant that the chicks could not be removed from their burrows for transfer, due to the risk that we would not be able to get them off the island. During the time on the island searching for and measurement of chicks continued. Second measurements were also carried out on as many chicks as possible so that any which were suitable could be taken if a break in the weather eventuated. From these return visits a shortlist of suitable birds was drawn up for potential collection should that prove possible.

The trip was eventually abandoned as there was no weather improvement forecast and it was not considered safe even to take the team members off by boat. The team was taken off by helicopter during a break in the weather on the afternoon of December 11<sup>th</sup>.

#### Collection trip December 15<sup>th</sup>

After discussion with Graeme Taylor (Senior Technical Support Officer, RDID, DoC), it was felt that the collection trip should proceed despite the likelihood that less than the full quota of 40 birds would be available. The emerging wing length is variable between birds, (250 mm is the minimum emerging wing length) with many not emerging till 280 mm or longer wing length. On this basis the selection wing length was increased to 272 mm provided that there was no sign that the chick was emerging (wet feathers/down, down at burrow entrance).

On December 15<sup>th</sup> a team of 6 left early in the morning arriving at Taranga by 8.30 am. A shortlist of potentially suitable birds had been drawn up using the data collected on the previous trip. All birds were re-measured and suitable birds were placed in pairs into corflute boxes lined with shredded paper. The burrow number was recorded for each chick. In addition some nest material was collected into a plastic bag from each burrow and the burrow number recorded, so that the material could be placed into the Matakohe-Limestone Island burrow with the chick. Two boxes (4 chicks) at a time were transported down to Wahine Bay, strapped securely onto pack frames. Once down at Wahine Bay the chicks were placed in individual boxes which were left in a cool shady location until the transfer to the boat.

Forty-eight chicks were checked on this visit, 22 of these were suitable for transfer. The remainder were either too mature or were below target weight.

The chicks were transferred to the boat by 3 pm. The trip to the mainland took approximately 2 hours during which time the birds appeared well and were not distressed. The chicks were transferred to a van at Urquharts Bay, driven to Onerahi then transferred to Matakohe-Limestone Island via the island barge.

#### Arrival and installation of chicks on Matakohe-Limestone Is.

The barge arrived at Matakohe-Limestone Is. at approximately 5.30 pm. The chicks were loaded onto a trailer and taken up to the artificial petrel colony site. The chicks were welcomed onto the island by Freddie Tito of Te Parawhau. Approximately 30 people were present, with representatives from Te Parawhau, Ngatiwai, FOMLI, and the local community.

The chicks were placed in the shade of the petrel feeding station shelter as quickly as possible. 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 with its own nest material. On arrival all chicks appeared bright and alert.

The straw of the burrows had been removed at the completion of the 2006 transfer. The wooden burrow walls were sprayed with Trigen and the burrows were left open for several months to assist disinfection. Just prior to the arrival of the chicks, 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 the chicks on December 18<sup>th</sup>. A new set of bands proved to be faulty so the bird in burrow 22 was not able to be banded. Unfortunately this bird subsequently fledged before the replacement bands arrived. The tunnels were unblocked the day after banding, December 19<sup>th</sup>.

### Supplementary feeding

Chicks were fed the same diet as in 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 2004-2006 transfers (see Appendices 6, 7, 8 and 9).

A feeding regime, which would allow the chicks to make a gradual transition from natural to artificial diet, was adopted on arrival at Matakohē-Limestone Island (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 in the evening
- Day 1: 40 ml runny puree (50:50 sardines: water) fed to all chicks
- Day 2: 50 ml runny puree fed to all chicks
- Day 3: 100 ml runny puree fed to all chicks
- Day 4: None fed
- Day 5: All fed 100 ml normal puree mix (66:33 sardines: water)

All chicks were fed every second day thereafter.

Cod liver oil was once again used to supplement the diet of lighter chicks needing to gain weight. This is to avoid overfilling the crop by feeding large volumes of the sardine puree. These chicks 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.

Chicks approaching fledging often have trouble taking food and regurgitate feeds, thus maintaining their weights and hydration can be difficult. Birds also seemed to fledge more slowly this year so their management over this critical time became more problematic. These chicks were also supplemented with cod liver oil where needed, at a rate of 5 ml oil to 50 ml puree. Maintaining hydration was also focused on this year and up to 35 ml oral electrolytes in the form of Lactated Ringers Solution (LRS) was also used in many birds. They tolerated this well and often were able to retain these fluids even when they had regurgitated their regular feed.

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 183 tins (106 g) of sardines were used to feed the grey-faced petrel chicks in 2007.

### Chick and burrow monitoring

The process for checking, handling and feeding the chicks was the same as in previous years (see Appendix 8). On 19th December, after 4 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), fence status recorded, and the chicks sighted and checked for any signs of ill health.

All chicks were weighed and fed daily for the first 3 days, thereafter they were weighed every second day before feeding. Weight losses recorded at the first weighing (the morning after transfer), ranged from 10 to 130 gm, average 47 gm. Subsequent weight changes were relatively minor, ranging from -30 to +30 gm between feeds, with most chicks maintaining or gaining weight.

### Disease screening

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

Ten chicks were screened on 20th December 2006 on Matakohe-Limestone Island. The chicks in burrows 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 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* culture. Faecal samples were taken from 1, 2, 6, 8, 9, 10, 11, 13, 15 and 16 as the birds obliged, and were tested for *Cryptosporidia*. Samples were tested at New Zealand Veterinary Pathology in Hamilton.

Most results returned negative or normal. One exception was a low level of *Cryptosporidia* in the bird from Burrow 13. This bird appeared quite healthy and went on to fledge successfully. The stress of the transfer and subsequent immunosuppression could have led to shedding of this organism.

In addition the blood smear from bird from Burrow 5 was abnormal, showing an elevated white cell count with heterophilia and lymphopaenia. This blood picture is indicative of an active infection. All other tests on the bird were negative. See below for further discussion.

### Health problems and mortality

**Burrow 5:** As mentioned above the bird in Burrow 5 had a blood picture indicative of an infection on the routine screen carried out on December 20th. A few days had passed before the abnormality was noticed. The bird appeared well at this stage, was feeding well and was of a good weight. It was decided not to administer treatment and to monitor the chick's progress.

On January 11<sup>th</sup> it was noticed that the bird had a swollen left humero-ulnar joint. On closer inspection a lesion on the right hock and a swollen joint on the lateral toe of the left foot were also found. The bird was still not emerging at night despite having recently reached the wing length at which chicks usually emerge. This failure of emergence was possibly due to pain.

Antibiotic and anti-inflammatory treatment was commenced (Marbocyl and Metacam given orally). Over the next few days there was no improvement, the chick was still not emerging and the movement of the wing joint was still very limited. In view of the very poor prognosis for the bird, euthanasia was considered to be the most humane option and this was carried out on December 16<sup>th</sup>. The bird was sent to Massey University for postmortem examination. Final results have not been received at the time of completing this report.

In retrospect, treatment of the chick at the time of the first blood test might have prevented the development of the chronic joint changes, though this is not certain. Although the consequences of this infection were devastating for the individual bird, there are limited implications for the health of the group as a whole. Infections of this type tend to be sporadic occurrences in individual animals, particularly when they are housed and raised in separate spaces.

As a precautionary measure, the artificial burrow of this bird will be removed and replaced with a new burrow before the next transfer.

**Neurological problems:** Three birds developed neurological symptoms towards the end of the rearing period. The birds from Burrows 2 and 15 were noted to be sick on January 1<sup>st</sup> and the bird from burrow 4 was sick on January 9<sup>th</sup>. Similar symptoms had been noted in one of the birds in the 2005 year (Burrow 31). All affected birds were of fledge weight and wing length and potentially could have fledged at any time.

Symptoms were mainly opisthotonus (arching the head back), though one showed ventroflexion (arching the head down to the chest). Head tremors and eyelid flickering were also noted, but none had nystagmus. Incoordination was evident when birds were placed on the ground or returned to their burrows. Symptoms appeared to worsen with the stress of handling, in some cases symptoms were not noted until after weighing and feeding. Some birds appeared distressed, with vocalisation and some normally quiet birds attempting to bite. All of the birds remained strong and maintained their weights despite an apparent increased tendency to regurgitate their feeds, though this is not uncommon close to fledge.

The first 2 birds were given oral fluids (LRS), and Clavulox. Two days later oral B Vitamins and Metacam (anti-inflammatory) were also given. The third bird to develop symptoms was given all these treatments from the start. A blood smear was taken from this bird (burrow 4) and Uric Acid and Bile Acids were measured. These were all normal.

One bird (burrow 15) was found to have left its burrow when checked in the afternoon of the day symptoms were first noted. It was found in vegetation on the edge of the site. It was returned to its burrow and blocked in for the day, as was the other bird (burrow 2) which was sick that day. The burrows were left blocked for that night and unblocked the following day.

All birds recovered gradually over a period of 2-3 days, emerging and returning to their burrows at night. All were absent, presumed fledged, 1-2 days after recovery.

The cause of the neurological problems remains unclear. Possibilities include stress/dehydration as the birds became sick after a period of hot weather. This potentially could be exacerbated by the changing metabolic state the birds are in prior to fledge. Another possibility is a nutritional imbalance due to the period of time on the artificial diet, for example Vitamin B1 deficiency.

#### Burrow hygiene and temperature

Burrow hygiene was closely monitored throughout the rearing period. If the straw was damp it was topped up with fresh straw. This was a change from the previous year when the damp straw was removed. This was done so that the burrow still held a familiar smell. 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. When the birds arrived on Matakohē-Limestone Island the soil was very damp and temperatures were cool. The site dried out rapidly after three days of hot weather. Water was sprayed onto the sacks and the ground at tunnel entrances in an attempt to keep the burrows cooler and lift the humidity. Manuka branches were also laid over some of the more exposed burrows and entrances and also kept damp.

Two chicks were found in tunnels:

- Burrow 4 - found in tunnel once when it was sick (see above)
- Burrow 13 - found in tunnel once 2 days before fledge

## Emergence and fledging

Emergence and fledging dates are recorded for each chick in Appendix 4.

Chicks usually start emerging after their wing length has reached 250 mm; this year only one bird emerged at a wing length of less than 250mm. However, sixteen birds already had a wing length above 250mm by the time their burrows were unblocked on Matakohe-Limestone Island, and of these 9 emerged the first night.

Any absent chicks were presumed to have fledged. Burrows 3 and 20 were absent one day, but reappeared the next. They subsequently fledged the following day.

A number of chicks were found in burrows other than their own, usually after the original occupant had fledged. These birds were all close to fledging. The birds were left in their 'adopted' burrow if it had no other occupant.

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

- Burrow 2 - moved into burrow 3, 6 days before fledge and 2 days before becoming sick
- Burrow 7 - moved into burrow 23, 4 days before fledge
- Burrow 12 - moved into burrow 8, 9 days before fledge
- Burrow 14 - moved into burrow 22, 2 days before fledge
- Burrow 15 - found in burrow 18, then burrow 16 with bird 17, thereafter remained in own burrow
- Burrow 17 - found in burrow 16 with bird 15 the day before fledge

The first chick was assumed to have fledged on 26 December 2007 (burrow 1), and the last chick left on 16 January 2007 (burrow 21). The 21 surviving chicks had a mean emergence period of 16 days and spent a mean of 24 days on Matakohe-Limestone Is.

## **DISCUSSION / RECOMMENDATIONS**

### Availability of Chicks

On the October trip to Taranga the areas searched only yielded 22 birds compared to 42 birds from the same areas the year before. This was found to also be true of the areas searched during the December trip, with 31 birds found in areas which had yielded 39 birds in 2006. Good numbers of birds were found in the vicinity of the camp but these areas had not been searched in depth in 2005 and 2006.

The reduced number of chicks may have been due in part to the severe storms experienced in the area over the preceding winter. Significant damage to vegetation was noted in places, and the Hanging Petrel site and burrows had been badly damaged. Possibly these storms also meant that chicks starved as parents were unable to obtain food/return to feed chicks.

Nevertheless, with the extra day of searching a good number of birds were available (90) for selection on the December trip. Unfortunately the adverse weather meant that the chicks could not be taken at the time originally planned.

### Timing of the transfer

The survey trip in October was valuable in locating some birds. Information was gained which gave confidence regarding the timing of the collection trip (chicks were of similar maturity to previous years – see Appendix 1). Also the fact that less chicks were located on this trip, gave advance warning that more extensive searching was going to be necessary on the collection trip in order to have enough birds available for selection.

If birds had been collected when planned it is likely that close to 40 chicks would have been selected. Most of the birds were of suitable maturity, though as with previous years a number were too light. It appears that collection at the end of the first week of December gives the best proportion of birds of suitable maturity and weight for collection.



It is recommended that the survey/collection trips be carried out as they were for 2007. That is, there should be a one day survey trip in October. The collection trip should be timed so that the chicks come off Taranga around the 6<sup>th</sup> – 9<sup>th</sup> December. This trip should be planned to be of a minimum 4 days, coming off on the 5<sup>th</sup> morning, to allow time to find enough chicks and to allow for 2 weights 2-3 days apart. If necessary a second one day collection trip could be carried out a week later to collect sufficient chicks.

### Selection of chicks for transfer

Once again the selection criteria aimed for chicks to be above 500 gm weight and between 180 and 250 mm wing length. After discussion with Graeme Taylor the wing length criteria was extended to 272 mm. Ten of the chicks eventually selected were above 250 mm wing length.

With the 2 weights completed on the first December trip a short list of potential birds was drawn up for the second trip. Most birds only had to be over 470 gm weight and between 180 and 272 mm wing length to be selected. For birds having only one weight from the first trip, the selection weight was 570 gm to ensure the unfed weight would be above 470 gm. These criteria worked well in most cases. Three birds weighed 450 gm or less the day after transfer, despite having met the selection criteria. However these birds gained weight and all 3 fledged at the good fledge weight of 530 gm.

On the collection trip on December 15<sup>th</sup> a number of the short-listed birds were no longer suitable. Of these birds, 3 were now too mature (wing length above 272 mm). Interestingly, 13 potential birds were no longer suitable due to unexpected weight loss, in that they were now below the 470 gm cut-off weight. At least one of the birds revisited, BT2, had been of good weight on the first 2 visits (580 and 540 gm). At the time of the collection trip leaves had drifted over the burrow entrance and there was no sign that the chick was emerging or that the parents had been visiting. The weight of the chick had dropped to 450 gm. Possibly the same poor weather which had prevented collection of the chicks a week earlier also meant that the parents had been unable to return to feed them.

It is recommended that the selection criteria remain the same. That is, birds should be weighed twice 2-3 days apart to obtain their unfed weight. Birds with both weights above 500 gm and wing lengths between 180 and 250 mm are ideal for selection. If there is difficulty getting sufficient birds the selection weight can be lowered to 470 gm and the wing length increased to 272 mm. If only one weight is available, the selection weight should be increased to 570 gm to allow for up to 100 gm weight loss during transfer.

### Feeding

As with previous years, significant weight losses (up to 130 gm) occurred during transfer. This potential for significant weight loss needs to be kept in mind when selecting chicks for transfer. It is likely that most of the weight loss is the difference between fed and unfed weight (lost via regurgitation and faeces), but possibly is also due to some dehydration. Administration of fluids on arrival at Matakoho-Limestone Island is important to counter this fluid loss.

It is recommended that the 2007 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. Where weight gain is needed supplement with cod liver oil, and if there is difficulty taking feeds use electrolyte solution to ensure fluid intake is maintained. Continue to be aware of the potential for prefledging weight loss and aim to feed 100 – 130 gm for as long as the chick will take it.

### Site Management

The chicks this year seemed to settle into their burrows well, perhaps assisted by the addition of nest material from Taranga. This should continue to be part of the protocol in subsequent years.

While the chicks are occupying the burrows, the condition of the straw should be closely monitored

and topped up as needed. Straw should only be changed if absolutely necessary so that the burrow retains its distinctive smell which helps the chick to locate it. For the same reason, on Graeme Taylor's advice, the straw is now left in the burrows between seasons.

Once again it was found very helpful to have key staff assigned specific roles during feeding. The 3 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.

Ambient temperatures were high at times. The vegetation on the site offers more shade than in the first years of the translocation, though there had been some damage during the winter storms. Attempts were made to moderate the burrow temperatures and increase their humidity by hosing the sacks, the ground at tunnel entrances and cut manuka branches which were laid over the entrances.

### Returning Birds

It is now four years since the first translocation and it is possible that the first birds could return this autumn. A solar powered sound system has been set up at the petrel site. This plays grey-faced petrel calls each night from approximately 9.30 pm until 4 am. It is hoped that these calls will help guide any returning birds to the site. Sticks have been put up at the tunnel entrances and are checked regularly, though it is possible that other species of birds could enter the burrows. Kiwi have been found in the burrows in the past. The site is also checked for petrel-like droppings or other signs of returning birds.

### Between-year Comparison

Adjusted data for the transfer years has been compared (see Appendix 5).

For the 2007 year the transfer weights were in the mid range but the transfer wing length was the longest over all the years. This is not surprising, given that the transfer was carried out 1-2 weeks later than previous years and the selection wing length was also increased.

This year the birds gained weight between transfer and fledging, as they had done in the 2004 year, and fledged at the highest average weight of all the years. The fledge wing length was also the longest over all the years, probably reflecting the weight/wing ratio needed for successful flight.

The median fledge date was significantly later than previous years despite the birds being more mature at collection. This may be due in part to the heavier fledge weights (needing longer wing lengths/greater maturity for fledge). Often fledging appears to be delayed when winds at the site are light and it has been noted in the past that birds often fledge in groups on windy nights. In 2007 winds were often light during January so this may also have delayed fledging.

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- The experienced Taranga team members; Tanya Munro, Grant Stevens, and Lawrie Mead, whose accumulated knowledge and dedication over the 4 years of the project has been a

- big factor in its ongoing success.
- The well-documented experience of the three 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 for the Taranga collection trip.

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## APPENDICES

- Appendix 1: Comparison of Grey-faced petrel data between years – October survey trip
- Appendix 2: Locations of grey-faced petrel burrows on Taranga (Hen) Island, 2007
- Appendix 3: Weights, wing measurements and health status of chicks found on Taranga (Hen) Island, 2007
- Appendix 4: Transfer, emergence and fledging data for 22 grey-faced petrel chicks transferred to Matakohe-Limestone Island in December 2007.
- Appendix 5: Comparison of (adjusted) data from Grey-faced Petrel translocations over four years, 2004 – 2007
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**Appendix 1: Comparison of Grey-faced petrel data between years - October survey trip**

Year	Number	Weight (gm)	Range (gm)	Wing (mm)	Range (mm)	Date
2004	40	451	285-650	96	75-130	22nd
2005	72	356	170-590	73	48-112	17th
2006	87	327	160-630	58	30-118	6th
2007	22	379	290-680	83	54-156	22nd

**Note :** Data given for 2004 is from the 40 birds which were actually collected in December, so is not directly comparable. The range of wing lengths for the 50 birds surveyed in October 2004 was 38-148 mm, individual data not available.

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**Appendix 2: Locations of grey-faced petrel burrows on Taranga (Hen) Island, 2007**

Location	Burrow ID	Comments – 22nd October 2007
<b>A block towards TM 14, west of B block</b>		
20 mtr below blue tag	AT1	rock lid, tag in tree & on burrow R
<b>B block @ TM 15 (2 blue tags)</b>		
Directly below lunch rock, middle of track	BT1	R
	BT2	rock lid
<b>Labyrinth. "Spongy" area east of B block, below large rock, (to TM 16)</b>		
3 mtr below track, eastern Labyrinth, before TM 16	LabC1	R
<b>C block – east of TM 16 extending to TM 17</b>		
Start C Block past TM 16, immediately above track	CC1	R Pb
5-8 mtr above track	CT1	
Next to CT1	CC2	
Next to CC1 Left of track, above TM 16	CC3	
	CT2	rock lid R Pb
<b>D block – vicinity of TM 18</b>		
	DT1	rock lid
100 mtr east, similar level to TM 18, towards big rock	DC1	rock lid R Pb
<b>E block 20m east of TM 18, blue TM</b>		
	ET1	
just above main track, tape on track	ET2	rock lid
Right next to ET2	ET3	rock lid R
below ET2	ET4	
<b>F block east of E block, TM 20 approx</b>		
2 <sup>nd</sup> flat above track, start F Block	FC1	
1 <sup>st</sup> flat start F Block, not extracted	FC2	rock lid, under rock
across from FC1	FC3	
	FT1	rock lid R
approx 10-15 mtrs before rock on main track	FT2	R
approx 10-15 mtrs before rock on main track	FT3	R
	FT4	rock lid R
<b>Hanging Petrel (HP) site is located on steep, eastern track down to Dragon Mouth Cove camp site (from TM 22 at ridge)</b>		
1 mtr below tawa, beginning of site	HP1	
2 mtr west of HP1, below punga	HP2	
1-2 mtr west of HP2, below coprosma	HP3	
right next to HP 3	HP4	
2 mtr above HP 1 mtr above lge tawa	HP5	
at top of ridge, at TM 22	HP6	
<b>Astelia Knoll (AK) from TM 22 round to south side, blue marker on main track</b>		
double entrance, 1.5 mtr east of track	Astelia Trk	
3 mtr west of track, between whiteywood & taraire	AKLT 1	
between rock face & lge taraire, side tunnel	AKLT2	
Emma's tree	AKC1	rock lid R Pb
Emma's tree	AKT1	R
	AKT2	R
Blank white tape	AKT4	
Gully below main rock	AKC2	rock lid R Pb
very bottom of gully	AKC3	R Pb
<b>G block 50m west of TM 26 (Nic's knoll), right around knoll, back to track (most birds on Nthern side)</b>		
Below fallen puriri, approx 200 mtr from main track	GT1	
up first crevice, above GT1, almost at top	GT2	
past fallen trees, below med rock, 2 entrances	GC1	
down from GT2, above GC2, at base of rock face	GT3	
below GT3, orange marker on puriri	GC2	
approx 15 mtr west of orange marked puriri	GT4	
along from GC2, below GT4	GC3	
approx 5 mtr west of GT4	GT5	
200 mtr past puriri	GC4	
between GT4 and GT5	GT6	

Location	Burrow ID	Comments – 22nd October 2007
<b>H block – before/below lunch knob</b>		
on main track	HC1	
before large puriri	HC2	
main track between H & I block	HAT	
<b>I block - TM 47 junction &amp; moving to north side of Knob</b>		
Very beginning I block, below track, 2 entrances	IC1	
just below side track, blue marker	IC2	
approx 20 mtr east of main track, blue tape	IT1	
1 mtr from blue tape trail	IT2	
1 mtr from blue tape trail	IT3	
above blue trail, before IT4	IC3	
below rock face, 2 mtr past IC3	IT4	
	IC4	
2-3 mtr from IT3, just below blue marker	IC5	
far end of blue trail	IC6	
follow blue tape markers	IT5	
approx 20 mtr above IT5, below rock	IT6	
<b>Camp – above and to right of main WB Camp</b>		
(Grants) 4 <sup>th</sup> ridge, deep rock lid	Camp T2	Rock lid
20 mtr above big nikau grove, blue & white tags	Ridge3 T1	
5 <sup>th</sup> ridge, lower down than Camp C1	Camp C2	
2 <sup>nd</sup> ridge, below penguin tree	Camp C1	
2 <sup>nd</sup> ridge, above camp C1, blue markers on both ridges, RHS large puriri	Camp C3	
next to Camp C3	Camp C20	
next to Camp C3	Camp C4	
next to Camp C3	Ridge2 T1	
approx 10 mtr above Camp C3	Ridge2 T2	
15-20 mtr above R2T2, below lge kohekohe	Ridge2 T3	
approx 20 mtr above R2T3, between lge puriri & tawa	Ridge2 T4	
6-7 mtr left of R2T3, below lge kohekohe	Camp C5	
high on track ridge, below large puriri, out with bag on stick	Camp C6	
below Camp C6	Camp C7	
below Camp C7	Camp C8	
below Camp C9	Camp C9	
above Camp C8	Ridge1 T1	
above Camp C9	Ridge1 T2	
<b>Wahine Bay track</b>		
straight up bank before first river crossing, large dead puriri	WB1	
above large tree above & to right of WB1	WB2	
next to WB2	WB3	
next to WB3	WB4	
1-2 mtr across slope from WB4, towards sea	WB5	Rock lid
very beginning main track, under large Pohutukawa, caught with bag	WB6	
LHS main track, under lge Pohutukawa, blue marker on track	WB7	
next to WB7	WB8	
RHS main track, round side, 10 mtr above WB8	WB9	
LHS main track, where starts to sidle to right, blue marker	WB10	

#### 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. WB before the junction, Block G – I and Rock Wall after the junction on this track
- R = regurgitated, Pb = previously occupied burrow

**Appendix 3: Weights, wing measurements and health status of chicks found on Taranga (Hen) I. 2007**

Taken √	Burrow	Wgt Oct 22	Wgt Dec 1st	Wgt Dec 2nd	Wgt Dec 15	Wing Oct 22	Wing Dec 1st	Wing Dec 2nd	Wing Dec 15	Health comments	M-L burrow no.
	AT1	310	350			63				too light	
	BT1	680	560			130	300+			too mature	
	BT2	310	580	540	450	67	240	213	233	too light	
√	LabC1	420	620	570	700	93	226	223	253		2
	CC1	280				70				Gone	
	CT1	290	450			78	179			too light	
	CC2		560	520			225	241		new bird (missed on collection trip)	
	CC3		400		360		165		184	new bird, too light	
	CT2	350	380			70	175			too light	
	DT1	400	530	480		84	214	226	252		
	DC1	300	460			63	157			too light	
	ET1	400	580	470	380	96	236	246		too light	
	ET2	610	530			110	270			too mature	
√	ET3	320	600	560	480	67	162	171	198		21
√	ET4				590				252		20
√	FC1	470	530	480	540	79	199	209	239		16
	FC2		350				-			too light	
	FC3		590	540	400		167	179	207	too light	
	FT1	290	550		510	64	170		215	too light (one weight)	
	FT2	470	550			64	155			too immature	
	FT3	560				156	300+			too mature	
	FT4	480	540			97	265			too mature	
√	HP1		620	-	500		240		265		11
	HP2		410				235			too light	
√	HP3		540		530		252		(243)		19
	HP4		530				274			too mature	
	HP5		410				180			too light	
	HP6		390				150			too immature	
	AK Track		640				260		>272	too mature	
√	AKLT1		640	510	490		218	232	262		15
√	AKLT2		520	520	480		197	220	240		18
	AKC1	410	440	420		108	249	-		too light	
	AKT1	380				71				could not be extracted on return visits	
	AKT2	300	570	420		54	168	170		too light	
	AKT4		430	450			227	179		too light	
√	AKC2	380	750	720	700	56	167	172	177		5
	AKC3	390	470	420		81	215	218		too light	
√	GT1		530	-	530		180	-	235		6

Taken √	Burrow	Wgt Oct 22	Wgt Dec 1st	Wgt Dec 2nd	Wgt Dec 15	Wing Oct 22	Wing Dec 1st	Wing Dec 2nd	Wing Dec 15	Health comments	M-L burrow no.
	GT2		470				145			too immature	
	GC1		500	450			249	261		too light	
	GT3		600	540	630		245	254	290	too mature	
	GC2		580				230			too light	
√	GT4		510	520	550		228	242	272		1
	GC3		490	470	430		226	241	272	too light	
√	GT5		540	600	500		210	224	251		17
	GC4		600		440		212		255	too light	
	GT6		470	380	330		170	180	-	too light	
	HC1		640				155			too immature	
	HC2		620				270			too mature	
	HAT		400	490			191	202		too light	
√	IC1		560		620		227		270		12
	IC2		370				120			too light	
	IT1		640				161			too immature	
	IT2		720		450		235		277	too light/mature	
√	IT3		670		600		220		262		3
	IC3		500		500		237		282	too mature	
√	IT4		500	490	480		217	235	265		8
	IC4		760				278			too mature	
	IC5		430				166			too light	
	IC6		580				284			too mature	
	IT5		510	470	390		219	236	-	too light	
√	IT6		660		510		181		227		22
√	CampT2			590	500			210	234		7
√	Rge3T1		610	610	530		232	242	270		10
	CampC2		540				262			Too mature	
	CampC1		470	390			172	185		Too light	
√	CampC3		600	570	710		206	223	243		4
	CampC20			430				237		Too light	
	CampC4		580				274			too mature	
	Rge 2T1		540	530	450		205	213	-	Too light	
	Rge 2T2		410	620	470		163	172	-	Too light	
	Rge 2T3		510				275			too mature	
	Rge 2T4		490	470	460		195	290	-	Too light	
	Camp C5		550	560	440		237	246	-	too light	
√	Camp C6		495	660	520		183	191	220		13
	Camp C7		490	430			211	222		Too light	
	Camp C8		530				263			too mature	
√	Camp C9		510	500	570		191	202	225		14
	Rge 1T1		550				272			too mature	
	Rge 1T2		540	490	400		178	190	-	too light	
	WB1						>270			Too mature	



Taken √	Burrow	Wgt Oct 22	Wgt Dec 1st	Wgt Dec 2nd	Wgt Dec 15	Wing Oct 22	Wing Dec 1st	Wing Dec 2nd	Wing Dec 15	Health comments	M-L burrow no.
	WB2		460				182				
	WB3		470	450			180	197		Too light	
	WB4						>270			Too mature	
	WB5		560	510	420		212	235	248	Too light	
	WB6		500				222			Could not extract again	
	WB7		520	500			223	239		Could not extract at collection visit	
√	WB8		510	450	720		181	194	216		9
	WB9		470	350			173	188		Too light	
	WB10		690				291			Too mature	

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Appendix 4: Transfer, emergence and fledging data for 22 grey-faced petrel chicks transferred to Matakahe-Limestone Is. in December 2007.

Mat. Is. burrow no.	Band	Taranga burrow	Transfer weight (g)	Transfer wing (mm)	Fledge weight (g)	Fledge wing (mm)	First emergence date (pm)	Fledge date (pm)	Emergence period (nights)	Total no. days on Matakahe
1	E212196	GT4	520	272	510	306	19/12/07	26/12/07	8	12
2	E212197	LabC1	630	253	570	315	19/12/07	4/01/08	17	21
3	E212199	IT3	590	262	560	322	19/12/07	4/01/08	17	21
4	E212200	CampC3	640	243	530	318	25/12/07	12/01/08	19	29
5 #	E212681	AKC2	570	177	-	-	-	-	-	-
6	E212682	GT1	510	235	550	322	25/12/07	10/01/08	17	27
7	E212684	CampT2	470	234	510	320	24/12/07	10/01/08	18	27
8	E212685	IT4	450	265	530	307	19/12/07	30/12/07	12	16
9	E212686	WB8	610	216	570	319	25/12/07	10/01/08	17	27
10	E212687	Ridge3T1	510	270	550	327	20/12/07	4/01/08	15	21
11	E212689	HP1	460	265	520	324	24/12/07	4/01/08	12	21
12	E212690	IC1	580	270	540	324	19/12/07	10/01/08	22	27
13	E212691	CampC6	490	220	540	320	29/12/07	10/01/08	13	27
14	E212692	CampC9	480	225	540	322	24/12/07	13/01/08	21	30
15	E212693	AKLT1	460	262	520	322	20/12/07	4/01/08	16	27
16	E212695	FC1	500	239	530	305	19/12/07	31/12/07	13	17
17	E212696	GT5	490	251	520	309	19/12/07	4/01/08	17	21
18	E212697	AKLT2	420	240	530	315	25/12/07	10/01/08	17	27
19	E212698	HP3	510	243	520	315	20/12/07	27/12/07	8	13
20	E212699	ELawrie	550	252	560	329	20/12/07	10/01/08	22	27
21	E212700	ET3	440	198	530	316	25/12/07	16/01/08	23	32
22	-	IT6	490	227	570	307	24/12/07	8/01/08	16	25
			Transfer weight (g)	Transfer wing (mm)	Fledge weight (g)	Fledge wing (mm)			Emergence period (nights)	Total no. days on Matakahe
		Mean	516.8	241.77	538.1	317.3			16.2	23.6
		Standard deviation	62.6	24.5	19.4	7.1			4.1	5.6
		Range	420-640	177-272	510-570	305-327			8-23	12-32
		Sample size	22	22	21	21			21	21

Notes:

- Total number of days on Matakahe-Limestone I. 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.
- 5 # This bird was euthanased – see main text.

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**Appendix 5: Comparison of (adjusted) data from Grey-faced Petrel translocations over four years, 2004 – 2007**

Year	Transfer date	Number	Transfer Weight (gm)	Transfer Wing (mm)	Fledge Weight (gm)	Fledge Wing (mm)	Median Fledge Date	Days on Mat. Is.
<b>2004</b>	Dec-1	27	486	220	535	312	Dec-26	26
<b>2005</b>	Dec-3	26	501	195	498	311	Dec-31	28
<b>2006</b>	Dec-8	39	537	224	516	314	Dec-29	21
<b>2007</b>	Dec-15	21	514	242	538	317	Jan-4	24

Adjustments:

- Deceased/missing birds not included
- The transfer weight was taken as the lightest weight on either the collection day or the day after, as this is most likely to reflect the true unfed weight of the chick. This also allows for a more reliable comparison between years as weighing was carried out at different times due to the different transfer methods.
- 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.

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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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