

2009 Motuora diving petrel monitoring report

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Background

Diving petrel translocations have been carried out annually on Motuora from 2007 to 2009. The aim of the translocations is to establish a self-sustaining diving petrel population on Motuora and the translocations are part of the wider ecosystem restoration project currently underway on Motuora (see Motuora Native Species Restoration Plan for further details). A total of 190 chicks have been transferred to Motuora and 178 of these chicks have fledged from Motuora (24 in 2007, 62 in 2008, and 92 in 2009). Most diving petrels return to their fledging site and begin breeding when 2-3 years old (although younger birds will often visit their fledging site and occasionally birds begin breeding as 1 year olds). Systematic monitoring on Motuora was therefore started in 2009, when birds from the first transfer year were most likely to begin returning to Motuora for breeding.

Monitoring protocols

Monitoring protocols (Appendix 1) were developed by HG and RGG in consultation with Colin Miskelly and Graeme Taylor (Department of Conservation). The highest priority of the Motuora diving petrel translocation project is that birds settle at the new site, hence the protocols were designed to minimise any unnecessary disturbances at the site while still enabling new burrows in the area to be located and the following data to be collected:

- Identity of breeding adults—to determine return rates of translocated birds.
- Breeding outcome of all burrows found.

In addition, all island-born chicks are to be banded (to facilitate future monitoring of birds of known age and origin) and all new immigrants are to be banded (to determine their fidelity to the site and to determine the relative contributions that immigrants and translocated birds make to the new colony). Systematic monitoring using the protocols in Appendix 1 was carried out from March 2009 to the end of the monitoring period (November 2009) by the Motuora rangers (Deane Weatherspoon and Andrea Ravenscroft) and the translocation project manager (Robin Gardner-Gee). Volunteers assisted with burrow maintenance and night monitoring.

Results: Artificial burrows

Artificial burrows were checked weekly by DW and AR from late April 2009 but no signs of use or visitation were detected throughout the winter or early spring. The first signs of use were detected immediately prior to the first diving petrel transfer for 2009, when diving petrel feathers were found in five artificial burrows (7, 8, 18, 22 and 23) on 11 November when burrows were being prepared for transferred chicks by HG and DW. Two-stick fences were erected at the entrances to these burrows to monitor night-time activity by visiting birds. Fence status at each entrance for 12 to 20 November is presented in Table 1.

Feathers had not been observed prior to this indicating that diving petrels had only recently been prospecting in these burrows. Activity was considered to be by one bird, initially visiting five burrows (fairly close to each other) but developing a greater interest in burrow 18; this is where some fresh grass had been taken into the chamber and most feathers were found. Burrow 18 was marked and was not used at all for transferred chicks. Burrows 7 and 8 were used to house transferred chicks for up to two nights only, and burrows 22 and 23 were utilised for a single

night only (no blockade gates installed). After 20 November there was no further sign of use detected at any of these burrows.

Table 1. Fence status (morning) at tunnel entrances of artificial burrows visited by prospecting diving petrels in November 2009.

Burrow	Date (November 2009)								
	12th	13th	14th	15th	16 th	17th	18th	19th	20th
7	I	I	I *	Gated (chick present)	I (chick present)	D (chick fledged)	I	I	I
8	PD	I	I *	Gated (chick present)	D (chick fledged)	I	I	I	I
18	D	D	D	D	D	D	D	D	I
22	D	D	I **	D (chick fledged)	I	I	I	I	I
23	I	D	I **	D (chick fledged)	I	I	I	I	I

* Burrow used to house Transfer 2 chick.

** Burrow used to house relocated Transfer 1 chicks ready to fledge on same night.

Key: D= fence down; PD= fence partially down; I= intact.

Results: Natural burrows

Monitoring tracks were established in March (lower track), May (upper track) and July (southern track). Tracks were walked by RGG on a total of 8 evenings (28 Mar, 3 May, 30 May, 31 May, 26 July, 27 Sept, 28 Sept, 1 Nov), usually for 60-90 mins, beginning shortly after dusk. A male diving petrel call was heard overhead on 3 May (8.30pm) and on both 30 May (7.45pm) and 31 May (6.45pm) male calls were heard repeatedly from within deep kikuyu grass along the lower track. On 26 July (7pm to 8.30pm) both male and female diving petrel calls were heard from the same kikuyu patch and the entrance into a kikuyu burrow (labelled DP1) was located (Figure 1). DP1 is approximately 30 m from the lower speaker in the acoustic attraction system and approximately 15 m from the closest artificial burrow. On 28 Sept an adult bird (presumably incubating) was felt within DP1 during the day. On 1 November male and female calls were heard from within DP1 between 9.30pm and 10pm and a chick was felt within the burrow. One banded adult was caught within the burrow, but the band number was incorrectly recorded on this occasion. HG was present on Motuora from 11 November (supervising chick-feeding) and staked out DP1 on the night of 14 November with the aim of catching one or both adults for identification purposes. Both adults arrived within minutes of each other around 9.30pm, each landing within a few metres of the burrow. One banded bird was captured at the nest around 10.20pm and identified as D-191078. This bird, likely to be the male based on calls heard, was found to have fledged from Motuora in 2007 (fledging weight 142 g and wing length 123 mm) from burrow 8 after 4 days on the island following transfer. The female was heard in the grass near the nest and may have exited the chamber via another route through the grass; she was not captured, avoiding disturbance to the nesting site and released male and chick. A further attempt

to catch the second adult on 17 November was abandoned because too many transferred chicks were attempting to fledge in the vicinity of this burrow and one adult heard in the burrow feeding the chick moved quickly away through the grass on approach. This bird was thought to be the already captured male (vocalisation). The chick in DP1 was banded by day on 21 November by RGG (D-191027; weight 135 g; wing length 87 mm; Figure 1).



Figure 1: Diving petrel burrow (DP1) in kikuyu grass on Motuora (left) and chick from burrow (right).

Further diving petrel activity was detected in the area on 1 November, when another male was heard calling from near the top speaker (approximately 50 m from DP1). The calls were from an area with low shrubs and deep kikuyu grass. A daylight search the next morning located an area within the kikuyu grass with signs of repeated visits (feathers and guano) but no burrow was located. On the evening of 14 November further calls were heard at the same area but no evidence of breeding was found during a careful inspection the following day.

Conclusions

The first year of systematic monitoring successfully detected one breeding attempt in the vicinity of the artificial colony on Motuora (burrow DP1). One adult from this burrow was identified and the chick was banded and measured. It was decided that further attempts to identify the second adult were not warranted as the kikuyu burrow was poorly defined and we were concerned that further disturbance may make the chicks move into more exposed areas or wander from the burrow. The monitoring also detected diving petrel visits to another area of kikuyu grass as well as visits to five artificial burrows. These visits were probably made by immature birds prospecting for future burrow sites. The activity detected in 2009 is heartening and it is recommended that monitoring (following the same protocols) is repeated in 2010 (Appendix 2).

Appendix 1

2009 monitoring protocols for diving petrels on Motuora

Background

Prior to transferring diving petrels to Motuora, there has been one previous translocation project involving this species: between November 1997 and December 1999, a total of 239 diving petrel chicks was transferred to Mana Island and hand-fed to fledging; and of the 118 chicks that fledged, 20 birds had returned to Mana Island and 15 bred there by 2004. The Motuora and Mana Island transfer procedures and set-ups are similar (i.e. both have an array of artificial burrows near cliff edges and both have an acoustic system) hence the Mana Island project gives us an idea of what to expect in terms of chick return and monitoring. In the Mana Island project 3-4 nocturnal searches per year were made initially, but search effort was later increased to 3-7 nocturnal searches per year, with searches in later years being conducted in both the pre-breeding season (Jan to August) and the breeding season when eggs and chicks are present in burrows (September to December). Initially searches concentrated on the area around the loud speakers and the artificial colony, and searchers looked for signs of occupation. Later however acoustic searching was used: the sound system was turned off to reduce background noise and birds were induced to call by mimicking their calls. Whenever good weather provided good listening conditions this method was used to search cliff areas around the artificial colony. Most birds detected were in natural burrows or dense vegetation on the cliff edge below the artificial colony, or on the cliff face itself. Breeding birds were mostly within 150 m of the loud speakers but in 2004 a small peripheral colony was found 1.5 km away from the artificial colony area.

Aims of Motuora monitoring

The highest priority is that birds settle at the new site on Motuora, hence all unnecessary disturbances at the site are to be avoided. However, careful monitoring of the site will provide valuable information that can be used to assess the success of the Motuora transfers and guide future transfers.

Basic monitoring efforts on Motuora will include:

- Identifying adults—to determine return rates of translocated birds.
- Banding new immigrants—to determine proportion of new immigrants to birds that fledged from the site.
- Marking all burrows found—to establish breeding outcome.
- Banding chicks—to facilitate future monitoring of birds of known age and origin.

Outline of monitoring and burrow maintenance proposed for 2009

Month	Project manager (and volunteers)	MRS rangers (and volunteers)
March	<ul style="list-style-type: none"> • Clean out artificial burrows and weed entrances • Night check for activity • Cut first night monitoring track 	<ul style="list-style-type: none"> • Weed-eat artificial colony tracks and sound system tracks (check burrows immediately before weed-eating)
April	<ul style="list-style-type: none"> • Check artificial burrows • Night check for activity • Cut remaining night monitoring tracks 	<ul style="list-style-type: none"> • Weed-eat artificial colony tracks and sound system tracks (check burrows immediately before weed-eating) • Commence weekly daytime burrow checks in late April
May	<ul style="list-style-type: none"> • Night check for activity in late May (along with annual grey-faced petrel burrow check) • Trim night monitoring tracks 	<ul style="list-style-type: none"> • Continue weekly daytime burrow/fence checks • Weed unused burrows • Trim colony tracks after night check
June-July	<ul style="list-style-type: none"> • Night check if required for track weed-eating • Trim night monitoring tracks 	<ul style="list-style-type: none"> • Continue weekly daytime burrow/fence checks • Weed unused burrows • Trim colony tracks if needed • Visual check of occupied burrows in late July to determine incubation
August	<ul style="list-style-type: none"> • Night checks for activity in late August • Day check on any natural burrows located to determine incubation • Trim night monitoring tracks 	<ul style="list-style-type: none"> • Continue weekly daytime burrow/fence checks, leave incubating birds undisturbed • Weed unused burrows • Trim colony tracks after night check
September	<ul style="list-style-type: none"> • Night checks for activity in late September • Day check on any natural burrows located to determine incubation • Trim night monitoring tracks 	<ul style="list-style-type: none"> • Continue weekly daytime burrow/fence checks, leave incubating birds undisturbed • Weed unused burrows • Trim colony tracks after night check
October	<ul style="list-style-type: none"> • Night checks to identify breeding pairs (artificial and natural burrows) in late October • Day banding of chicks • Installation of any inspection holes needed 	<ul style="list-style-type: none"> • Continue weekly daytime burrow/fence checks • Weed unused burrows • Trim colony tracks after night check • Visual check of burrows with incubating birds (10 weeks

	<ul style="list-style-type: none"> Trim night monitoring tracks 	after incubation detected): adults with chicks by day can be inspected for bands
November		<ul style="list-style-type: none"> Translocation of 60-80 further chicks from Wooded Island: end weekly checks once new chicks arrive

Artificial colony maintenance through year: MRS ranger/s

NB: from March onwards, do weekly burrow check immediately before beginning maintenance work so you know if birds are present or not. On Mana Is. birds came back during the day as early as March and its common from May onwards to have a few staying over by day. If birds are present in artificial burrows then weed-eating tracks is fine several metres away but not right around burrow (i.e. don't weed-eat within a 5 m radius of a burrow with a bird in it). Before weed-eating block the entrance of any occupied burrow with grass ball just to be sure the birds stays in the burrow and doesn't bolt into the path of the weed-eater. Make sure you remove the grass ball once maintenance work is finished for the day. From May onwards only do weed-eating after a night check, so the location of all burrows is known.

- a) Maintain the sound system volume at a relatively high setting throughout the year—it should be too loud to stand directly near a speaker, and the calls should be heard (loud) at the cliff edge. These sounds need to be able to project out to sea across all weather conditions.
- b) Maintain burrows: unused burrows should be well-maintained at all times with no grass growing in tunnels or chambers, and a smooth, level layer of sand in box. Check regularly and if necessary clear entrances by hand pulling grass within 50cm of the entrance so birds can easily locate them. Also hand weed around burrows if necessary to prevent grass growing inside burrows. However, as soon as the weekly checks show any evidence that a burrow is being visited or occupied, mark the burrow and exclude it from regular maintenance: it is likely that the regular activity of birds in a burrow will slow or stop grass growth within, and any grass taken in needs to be left (as nest lining).
- c) Maintain the access track through the artificial burrow site, the diagonal track up to the sound system and the track to the second speaker. Keep the grass on these tracks short throughout the year: weed-eat regularly in summer and autumn (Jan-April) then from May onwards trim tracks only as needed (once a month max) and only immediately after a night check so the location of all burrows is known. If new tracks are needed at any stage, arrange this with Project manager: a night check will need to be done before new tracks are cut to ensure no nesting birds are in new pathway. Hand trim tracks near any occupied burrows. Project manager will maintain night monitoring tracks.
- d) Keep rest of area in long grass. All long grass in the artificial colony area is out-of-bounds to everyone. Diving petrels will nest underneath long grass (as observed on Mana, G. Taylor pers, comm.) so it is critical that people monitoring or doing maintenance work keep to the access tracks as much as possible to prevent crushing birds and nests.
- e) Maintain fence along edge of main walking track to discourage public from entering artificial colony.

Monitoring artificial burrows for returning adults: MRS ranger/s

- f) Avoid disturbing the Motuora colony site at night throughout the year. There is nocturnal activity at diving petrel colonies most of the year, and all night-time disturbance should be avoided.
- g) At all times (day and night) keep to the access tracks within the colony site as some birds may choose to nest under the grass and can be easily crushed if stood on.
- h) Monitoring artificial burrows:
 - Commence weekly day-time inspections of all artificial burrows in late April.
 - Check entrance first for signs of activity, e.g. feathers, excrement, digging.
 - Slowly open chamber lid (in case a bird is present inside), remembering to block the entrance with the other hand to prevent the escape of a bird that might be in the tunnel. A torch may be useful to quickly shine into the burrow to see contents, particularly on a dull day, rather than opening lid up wide.
 - If a bird is present:
 - Gently close lid: don't handle the bird, just record presence (but if you happen to catch a glimpse of a band, note that down as well). It is essential that the lid is closed tight (i.e. lightproof) – failure to do this could cause the bird to change location as they are a light sensitive species. Place a sand bag on top to ensure the burrow is dark and to identify it as occupied.
 - Erect a light 2 or 3 stick fence at the entrance (**thin**, short straight sticks **lightly** placed). Mark the burrow with flagging tape as occupied and exclude it from regular maintenance but continue weekly fence checks (no visual checks). Record state of sticks each week and re-erect if knocked down. These regular fence checks will enable us to get a handle on visitation and commitment to the burrow.
 - If the burrow continues to be occupied, the birds may be a breeding pair. Egg laying usually takes place in August and once laid the egg is incubated for the next two months. To determine if incubating birds are present, do a cautious visual check of all occupied burrows in late July, and continue with weekly fence checks and cautious fortnightly visual inspections of the occupied burrow until incubation is detected (as indicated by a bird present during day from late July onwards, or egg actually sighted under or next to bird).
 - Once incubation has been confirmed, **leave the burrow undisturbed for at least 10 weeks** (incubation period c.53 days and adults will then brood the chick for 10-15 days). If no incubation detected, continue weekly fence checks and cautious fortnightly visual inspections of the burrow.
 - Ten weeks after incubation was first detected (if all goes well) the egg will have hatched, the chick will be about 2 weeks old, and rearing will be well underway with both parents feeding the chick nightly. There is less risk of abandonment once the rearing is underway so another cautious inspection can be made of burrows that had incubating birds to determine breeding outcome (presence of an unhatched egg, a live chick or dead chick). Any adult birds found in the burrow with a chick at this stage can be handled for identification; confirm presence of chick, pick up the adult, close the lid, record the band number, then return adult to the closed burrow via the entrance to allow it to find its own way to the chamber and chick. If the adult is unbanded, record that. Do not handle

- the chicks. If no chick is visible, close the burrow without handling the adult in case the egg it is just hatching or is still being incubated.
- If no bird is present in burrow:
 - Check chamber for feathers, excrement, digging or nest material. Remove a few feathers (place in labelled paper envelope for storage and later identification if needed), and hide the rest under chamber floor material so that at the next inspection it can be easily seen if more feathers have appeared (i.e. the burrow is still active), but some scent still remains. Rub any excrement into the dirt so the scent remains, but any new excrement will be obvious at the next inspection. NB: Once a nest has formed, leave all nest material (grass, twigs, leaves, excrement) as found, and simply continue cautious checks for birds each week.
 - If there has been extensive digging at the back of a chamber, you can remove any of the soil if it is filling up the artificial chamber as there is a risk the pipe will block up. Note that such a burrow may have to be treated as a natural burrow if the chamber is no longer accessible (i.e. too deep to reach).
 - If there is any evidence of a visit, mark the burrow as visited and exclude it from regular maintenance: it is likely that the regular activity of birds in a burrow will slow or stop grass growth within, and any grass taken in needs to be left (as nest lining). Continue to make cautious checks of visited burrows as part of the weekly monitoring. If visiting birds do breed, an incubating adult will be present through the day after the egg is laid (late July onwards). Once a bird has been detected in a visited burrow, follow the procedures outlined above for occupied burrows.
 - Make notes at each burrow so that there is an entry recorded for every burrow, e.g. record the number of feathers found, or the amount of nest material, the number faeces etc, or if the burrow has clearly not been used.
 - Input all findings weekly into a spreadsheet, and let Project manager know asap if a bird is found in a burrow (Robin: rgg@clear.net.nz).

Searching for natural burrows: Project manager (with volunteers)

The following monitoring methods will be used to detect natural burrows formed by returning birds and determine the breeding outcomes of the birds in order to achieve the monitoring objectives outlined above (monitoring methods proposed by C. Miskelly and G. Taylor pers. comm.):

- i) Target main monitoring efforts for late August, September and October (when breeders will be incubating).
 - Additional night monitoring may be useful earlier in year to pick up early activity and become familiar with procedures.
 - Avoid disturbing the Motuora colony site at night at all other times.
 - This species can be present at the colony site at night through most of the year, but nocturnal visits increase from March onwards with a peak of activity in late May as birds prepare their burrows. Potential breeders are then ashore most nights from June on, especially dark and/or misty nights (C. Miskelly pers. comm.). Most of the prospecting by young birds (1-2 year olds) occurs in the period July-Nov. Breeding pairs incubate eggs (night and day) from laying in August through to hatching 8 weeks later and then brood the chicks for another fortnight. After that, both parents feed the chick each night until it fledges in late November/early December. In other words, there is nocturnal activity at diving petrels colonies most of the year, and all night-time disturbance except targeted monitoring should be avoided.

- j) On night monitoring trips March to September:
 - Turn off sound system early in the evening, then mimic calls after dark when methodically walking through the colony area (by tracks). This can be achieved by vocally imitating the call, or by carrying a portable player around, with a speaker, that can be started and stopped in short bursts.
 - Listen for any responses from the ground. It can be useful to work as a pair so that there is greater listening coverage but avoid larger groups. Keep torches switched off. Repeat (as few times as possible to avoid habituating birds to the call) until the source of the call is located. This may only be a call from underground but is sufficient to locate the burrow and entrance. NB Most birds respond very readily to mimicked calls, but one pair on Mana I. close to a speaker does not. It is presumed that they have become habituated to loud, persistent diving petrel calls.
 - Males in particular are often very responsive to mimicked calls, and may come up to the burrow entrance where they can be caught with little impact on the breeding activity. Return the banded bird well inside the burrow entrance so that it has to go back up its burrow.
 - Try to identify the sex of the responding bird through its call—diving petrels have a sexually dimorphic call (males have a plain, single-note call; females have a stutter) which means that if you have identified one sex at a burrow, you can tell if there is a partner in the same burrow on a subsequent monitoring night (without having to handle any birds).
 - Clearly mark the burrow but do not inspect it at night at this stage; to minimise disturbance, we will *not* pull birds out of burrows at night until they have large chicks.
 - Search on several consecutive nights if possible as not all birds come ashore every night. Dark moonless nights with lighter winds are best for searching.

- From August onwards inspect any burrows found at night the next day; there should be a low risk of desertion during a day check. Use bird presence during the day to indicate probable incubation, without removing the bird or feeling or seeing the egg. NB It is unlikely that burrows at this stage on Motuora will be long enough to require study holes, but if the chamber cannot be reached, leave the inspection until later in the chick rearing period to avoid disturbing the adults.
- k) On monitoring trip in October and November:
- Once the chicks are 2+ weeks old (usually mid-October onwards), the burrow can be monitored at night to capture the adults for identification if they have not been previously handled (there is little risk associated with handling the whole family unit at night once the rearing is well underway). Both parents almost invariably feed the chick every night, and so all the band recoveries can be obtained then. Mark the first adult handled in each burrow with a small dot of twink on forehead. Don't re-handle twink-marked birds and once the two parents have been identified, do not handle the adults further. NB Adults feeding chicks usually return early, in the first hour of darkness, and most chicks typically have both adults in attendance for the first 2 hours of darkness. Adults often retreat to a nearby hole or second chamber (typically within 1 m of the burrow entrance), or stay in the tunnel near the burrow entrance. It has been speculated that they are avoiding persistent begging by the chick. Adults rarely regurgitate during handling, and adults placed back in the burrow typically stay there (and so are likely to keep feeding the chick).
 - If any modifications are required at the burrow (e.g. inspection hole) these should be made by day when the chick only is present and > 2 weeks old (i.e. on October or November trips)
 - The chick can be banded by day at any stage prior to fledging.

Appendix 2

Outline of monitoring and burrow maintenance proposed for 2010 (see Appendix 1: 2009 monitoring protocols for further details)

Month	Project manager (and volunteers)	MRS rangers (and volunteers)
Feb-March	<ul style="list-style-type: none"> Weed burrows and repair hinges Cover burrow 18 with sandbags Mark out new monitoring tracks Clear gorse from slopes below colony 	<ul style="list-style-type: none"> Weed-eat artificial colony and monitoring tracks (check burrows immediately before weed-eating)
April		<ul style="list-style-type: none"> Commence weekly daytime burrow checks in early April, fence any with signs of activity and mark as “occupied”
May-July	<ul style="list-style-type: none"> Night checks for activity (May check to coincide with annual grey-faced petrel burrow check/banding) Weed unused burrows 	<ul style="list-style-type: none"> Continue weekly daytime burrow/fence checks Weed unused burrows as needed, leave occupied burrows undisturbed Trim tracks (if needed) after night check and burrow check Day check of occupied burrows in late July to determine incubation
August-September	<ul style="list-style-type: none"> Night checks for activity Day check on any natural burrows located to determine incubation Weed unused burrows 	<ul style="list-style-type: none"> Fortnightly day checks of occupied burrows until incubation confirmed Continue weekly daytime burrow/fence checks Weed unused burrows as needed, leave occupied burrows and incubating birds undisturbed Trim tracks (if needed) after night check and burrow check
October	<ul style="list-style-type: none"> Night checks to identify and band breeding pairs (artificial and natural burrows) in late Oct Installation of any inspection holes needed Weed unused burrows Band all chicks (artificial and natural burrows) by day in late Oct 	<ul style="list-style-type: none"> Continue weekly daytime burrow/fence checks Weed unused burrows as needed, leave occupied burrows and incubating birds undisturbed Trim tracks (if needed) after night check and burrow check Day check of burrows with incubating birds in late Oct for hatching outcome: don’t handle chicks but inspect any adults present for bands
November	<ul style="list-style-type: none"> Night checks to identify and band breeding pairs if not already done Band all chicks (artificial and natural burrows) if not done 	<ul style="list-style-type: none"> Continue weekly daytime burrow/fence checks to end November