Notornis, 2014, Vol. 61: 84-90
0029-4470

Post-translocation movements of pre-fledging Hutton's shearwaters (*Puffinus huttoni*) within a newly established colony (Te Rae o Atiu) on the Kaikoura Peninsula

LINDSAY ROWE
Hutton's Shearwater Charitable Trust, 11 Margate Street Kaikoura 7300, New Zealand

Abstract Over 100 Hutton's shearwater (*Puffinus huttoni)* nestlings were translocated to the Te Rae o Atiu colony on the Kaikoura Peninsula in February and March 2013. Passive integrated transponder (PIT) tags were implanted in all translocated nestlings and their movements were monitored using both visual observations and recording devices at nest-box entrances. Once nest-box entrances were unblocked about 5 days after birds were translocated, 29 nestlings were resighted 81 times outside their home nest-boxes either in the open (14 nestlings) and/or other nest-boxes (29 nestlings). From the PIT tag records, 37 birds were observed visiting at least 49 nest-boxes on 109 occasions. The most mobile bird made 15 visits to 12 other nest-boxes over 9 nights; another bird visited 6 boxes in one night; and 1 box had 3 visitors in a single night. Nestlings moved within the colony in the period between 1 and 16 nights before fledging, with an average of 8 nights with movement before fledging. The PIT tag readers also showed that the use of pins outside nest-box entrances to determine movements can be misleading as pins were moved up to 13 nights before the nest-box occupant emerged, the pins being moved either by visitors to the nest-boxes or by nestlings wandering past the entrance.

Rowe, L. 2014. Post-translocation movements of pre-fledging Hutton's shearwaters (*Puffinus huttoni*) within a newly established colony (Te Rae o Atiu) on the Kaikoura Peninsula. *Notornis 61(2)*: 84-90.

Keywords post-translocation monitoring; Hutton's shearwater; movements; passive integrated transponders; fledgling behaviour

INTRODUCTION

The Hutton's shearwater (*Puffinus huttoni*) was first described by Mathews (1912) and is a small black and white shearwater whose breeding grounds were unknown to ornithologists until 1965. Anecdotal reports of "muttonbirds" nesting in burrows high in the Kaikoura Ranges led to confirmation of the breeding sites in the headwaters of the Kowhai River at altitudes between 1200 and 1800 m asl by Harrow (1965). Extensive searching led to the discovery of further populations but only the Kowhai River and Shearwater Stream colonies survive today (Marchant & Higgins 1990; Cuthbert 2001; Sommer *et al.* 2009). Birdlife International (2013) placed the Hutton's shearwater in the IUCN Red List "endangered" category and under the New Zealand Threat Classification it is considered to be at risk and declining (Miskelly *et al.* 2008).

The Department of Conservation (DoC) identified the Hutton's shearwater as a threatened species requiring medium term action for its recovery (Molloy & Davis 1992). As a consequence a draft recovery plan was drawn up that recommended the creation of a third colony at a lowland site (Paton & Davis 1997). A later review of the status of Hutton's

Received 26 September 2013; accepted 15 May 2014
Correspondence: *lindsay.jan.rowe@xtra.co.nz*

Fig. 1. Aerial view of the Te Rae o Atiu colony on the Kaikoura Peninsula. The nestbox area is below the hut in the bottom half of the enclosure (Photo: Andrew Spencer).

shearwater (Cuthbert 2001) also recommended a site be found for a third colony. Early in 2005, an agreement was reached between DoC and Whale Watch Kaikoura for a new colony to be established on the Kaikoura Peninsula (Fig. 1).

In April 2005, a trial translocation of 10 nestlings was undertaken and up to 100 additional nestlings were moved annually each March for the next 3 years. The Hutton's Shearwater Charitable Trust (HSCT) was established in October 2008 and built a predator-proof fence around an extended 2 ha site (Te Rae o Atiu). The fence was completed in February 2010, 5 years after the initial translocation. In March 2012, ~100 more nestlings were translocated. During the feeding programme in each of these translocations many nestlings were found outside their "home" artificial burrows (nest-boxes) in another nest-box, under a hut built on the site, in vegetation, or out in the open (where they were vulnerable to predation). In contrast, observations at the Kowhai River colony showed that nestlings approaching fledging age spent 4 or 5 nights at the burrow entrances before fledging, and only rarely were they seen or captured out of their burrows (Cuthbert 2001; Cuthbert & Davis 2002). Nestlings were never seen exercising their wings at night before fledging (Harrow 1976; Cuthbert 2001; Cuthbert & Davis 2002). This suggests that activities and movements outside the burrow are unusual.

Passive integrated transponder (PIT) tags are devices that can be implanted in birds and allow movements to be monitored with minimal disturbance or handling. If the receiving antenna is fitted to burrow entrances, the movements of birds into and out of burrows can be monitored (see Taylor *et al*. 2012 for the use of this technique in Chatham Island taiko (*Pterodroma magentae*)). PIT tagging of Hutton's shearwater nestlings at Te Rae o Atiu was implemented to determine when birds arrive back first from their initial, and then their subsequent winter, migrations to Australian waters and their movements as adults in the colony. As PIT tags were implanted into nestlings prior to fledging, they can also be used to monitor prefledging movements. Here I report the movement of Hutton's shearwater nestlings as they are about to fledge based on the monitoring of PIT tagged birds.

METHODS

The study site is the new Te Rae o Atiu colony on the Kaikoura Peninsula (42º 25′ 41′′ S 173º 42′ 10′′ E) (Fig. 1). The nucleus of this colony is 40 returning adult birds of the 270 successful fledglings translocated during 2005-2008 and one bird attracted by a sound system playing Hutton's shearwater calls every night during the breeding season (Rowe *unpubl. data*). A further translocation of 100 nestlings was undertaken in February 2012 but none of these birds are expected to return until late 2014. During the 2012-13 breeding season, PIT tags were inserted into many of the returning birds from the 2005-2008 translocations. PIT tag readers were installed on 23 nest-boxes to track the movements of these older birds (Fig. 2). The readers were designed by DoC and the operating system has been described by Taylor *et al.* (2012). Each PIT tag reader assembly was powered by a 10 w solar panel connected

Fig. 2. Nestbox 90 with pins at the tunnel entrance and the PIT reader assembly.

via a solar regulator to a 12 v 7 ah battery. The antenna coil connected to the reader was placed around the nest-box tunnel ~15-20 cm from the entrance to reduce the likelihood of passing birds triggering the sensor without entering the nest-box chamber. There were occasions when birds were known to have entered or left the nest-boxes without triggering the sensors. The reasons are not known but one possibility may be lack of sensitivity through the antenna detuning after it was put in place and subjected to excessive moisture (Taylor *et al*. 2012). The 2013 translocation involved the movement of 103 nestlings from the Kowhai colony to Te Rae o Atiu; 17 birds were translocated on 26 February 2013, 28 on 27 February and the remainder on 8 March. All translocated nestlings were banded at the Kowhai colony and the bands checked on arrival at Te Rae o Atiu, after which they given 10 ml of water to prevent dehydration, and placed in nest-boxes that had not been used by returning birds from the 2005-2008 translocations. From the next day, they were fed sardine "smoothies" (1 tin of Brunswick™ sardines in soya oil blended with 50 ml of water (Miskelly *et al*. 2008)). Body mass and wing growth was monitored to ensure birds were being fed sufficiently. Birds were confined to their nest-boxes between 2 and 7 days to acclimate them to the new conditions at which time blocks were removed and the birds could move freely in and out of the nest-boxes. Prior to the removal of the blocks the nestlings were PIT tagged.

Shortly before the 2013 translocated nestlings arrived, the new readers were installed on a further 73 nest-boxes to be occupied by nestlings. Most additional readers were set to record between 2000 h and 0600 h to conserve battery power; sunset times (calculated for Kaikoura at www.sunsetsunrisemap.com) varied between 2015 h on 26 February at the start of feeding to 1915 h when the last birds left the colony on 2 April. As in previous translocations, each nest-box had 3 pins placed at the tunnel entrance to assess bird movements: pins remaining up during a monitoring visit meant that no birds had moved in or out of the nest-box while pins down means nestlings had either moved in or out, or that birds knocked down the pins when passing.

Before each day's feeding, a search was made for birds that had left their nest-box and not returned or had not managed to get into another nest-box by morning and were hiding in the vegetation or under the hut. These birds and others found at another bird's nest-box were noted and returned to their home nest-box after feeding. Birds not found or in a nest-box were considered to have fledged.

For consistency of comparisons between recordings made in the morning during nestling feeding and from the PIT tag readers, the night of, *e.g.*, 13-14 March is referred to as 14 March. For this paper bird number refers to the "home" nest-box where it was placed on arrival at the Te Rae o Atiu colony (*i.e.*, bird 1 was placed in next-box 1).

RESULTS

Visual sightings

Throughout the feeding programme, 14 birds were found in the morning outside of nest-boxes either under flax (*Phormium cookianum)* bushes, grass tussocks (*Poa* sp.) or the hut. Twenty-nine birds including 6/14 found outside of nest-boxes were

Fig. 3. Extent of movements (white lines) of some nestlings away from their home nest-boxes before fledging.

found in other nest-boxes. In total, 81 observations were made of 37 birds found outside their home nest-boxes. One bird (number 118), was found in an adjacent nest-box 8 days in a row, bird 22 was found 5 mornings in nest-box 4, bird 82 was found in 4 different boxes on 5 occasions, and bird 84 visited 3 boxes over 4 nights. No more than 2 different visitors were seen in any nest-box.

PIT tag records

Records were obtained from 84 readers of which 23 with the new nestlings did not record visitors; 12 of the readers on the original 23 nest-boxes without nestlings did not record visitors either. Thus, at least 49 nest-boxes received visitors as some nest-boxes did not have readers installed. Four birds were seen in nest-boxes but were not detected by the readers.

Thirty seven nestlings visited the 49 nest-boxes on 109 occasions. Some birds moved between nest-boxes more frequently than other individuals with the most mobile bird (number 65) making 15 visits to 12 nest-boxes over 9 nights, 4 boxes in 1 night, 3 boxes in another night, 2 boxes in another night, and the other 6 boxes only once each. Another highly mobile bird (number 100), made 9 visits to 8 boxes, visited 6 boxes in 1 night and 3 boxes in another night. Other frequent movers were bird 84, which visited 7 boxes on 4 nights with 1 box visited 3 different nights, and bird 82 which made 9 visits to 4 boxes, including 4 boxes visited in a single night and 1 box visited 4 times. These birds had more visits logged than visual sightings, indicating that they did return to their home nest-boxes on some nights as did 24 of the other birds not seen elsewhere. There were multiple visitors to some boxes in one night. For example, nest-box 54 had 3 visitors recorded on 18 March. Birds were found in all directions relative to their home nest-boxes (Fig. 3).

First emergence

First emergence of nestlings from the nest-boxes is commonly determined by noting the first time the pins at the entrances of the tunnels were down or had been moved before the time of feeding (Fig. 2). The PIT tag readers on the boxes provided an opportunity to test the reliability of using pins alone to assess movements of birds. In total, 60 comparisons could be made between the readers and observations of pins noted down for the first time.

Only observations of pin movement at 23 nest-boxes were in agreement with the readers. There were 9 observations where the reader indicated emergence 1 or 4 nights before the pins were noted as down. One explanation is that the birds moved down the tunnels triggering the antennae coil but not venturing outside and then to have backed up the tunnel (there is not enough room to turn around). In the 8 instances where the visual sign of emergence was 1 day after the reader record, the reader had the birds in the tunnel for one continuous block of time ranging in length from 3 to 42 minutes; the ninth bird made many forays down the tunnel on its nest-box. Another explanation is for the pins to have been sufficiently wide apart for the bird to go out and come back in without enough disturbance

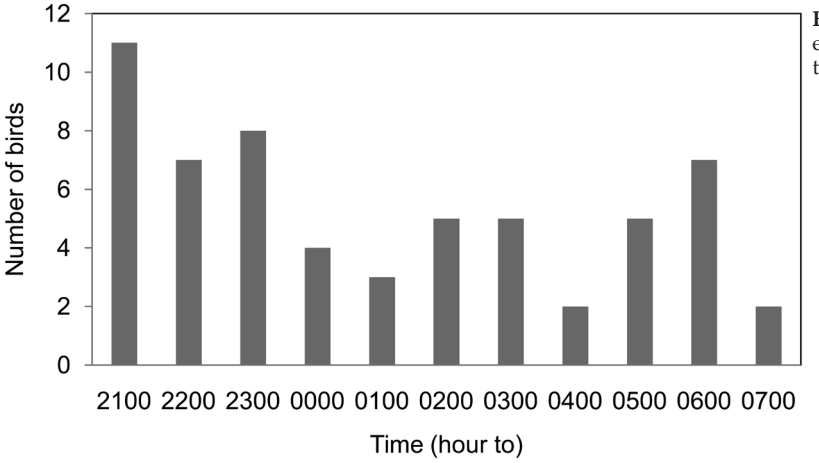

Fig. 4. Time of day of the first emergence of 59 nestlings (time is the hour up until listed time).

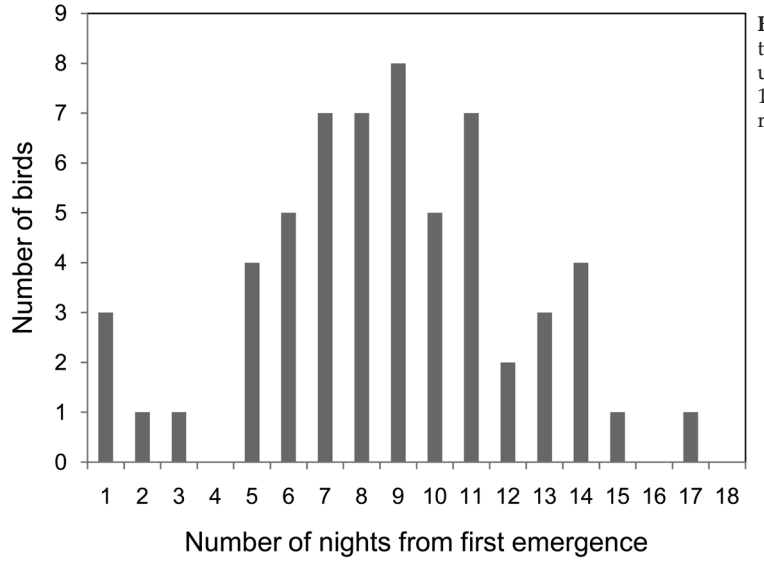

Fig. 5. Length of time determined from the PIT tag readers from first emergence until 59 nestlings left the colony. Night 1 is the first night after the blocks were removed from the burrow.

to register with observers, but that would also have required a rapid turnaround as the readers record at 1 minute intervals. At 27 nestboxes, the pins were knocked down between 1 and 13 nights before the readers recorded emergence. The readers recorded visitors at only 5 of these so the rest of the knockdowns were caused by nestlings wandering past.

The time of first emergence of 59 birds was recorded from the PIT tag readers. The earliest that birds emerged was just after 2000 h and the last in the early morning at 0622 h. Almost half of the birds were out before 2300 h but some did not emerge first until nearly daylight (Fig. 4). Data from the readers also gave an indication of the length of time after first emergence at which 59 birds left permanently for the season, presumably for the start of their journey to Australian waters for the winter. In all cases there was coincidence between the day following the last recorded observation while feeding and the last reader time record. Three birds left the site the night that they first left the nest-box (night 1) and the last bird took stayed around for 16 nights. The average was 7.7 ± 0.9 (95% confidence limits) nights (Fig. 5). This compares to calculations based on "first pin down" data of 9.3 ± 0.9 nights with a maximum of 21 nights

DISCUSSION

Movements of pins at the entrances of burrows are often used as an indicator of birds entering or leaving the burrow (*e.g.*, Miskelly *et al.* 2008; Taylor *et al*. 2012) and have been used to indicate emergence of nestlings during the previous translocations of Hutton's shearwaters. Pins have also been used

by the HSCT to monitor movements of returning adult birds from previous translocations. Johnston (*unpubl. quote* in Taylor *et al*. 2012) noted that pins can be moved by wind or other animals. This was apparent during early work at Te Rae o Atiu as rabbits (*Oryctolagus cuniculus)* (and possibly magpies (*Gymnorhina tibicen)*) knocked over many pins; rabbits and rabbit sign were seen in nest-boxes before the predator fence was erected (*pers. obs*.). To reduce the numbers of false movement reports, and with the absence of mammals within the colony (though magpies can still enter) a second set of pins is now set just inside the chamber of unoccupied nest-boxes and, only if these are moved as well, is it concluded that a Hutton's shearwater has visited the chamber (though the identity of the bird is still unknown).

This study using PIT tags confirmed visual observations that showed nestlings were moving around for up to 16 nights before fledging. During these period, birds were knocking over pins at some nest-boxes, but not entering them, up to 13 nights before the occupants ventured out. Thus, pin movement data alone must be used with caution.

The use of PIT tags and readers is not without its problems. In several instances nestlings were found in nest-boxes other than their own and these movements had not been recorded by the PIT tag readers. Detuning of the antennae can occur and has been blamed for loss of data (Taylor *et al.* 2012) and might explain some of the mis-assignments observed in this study. There was also the loss of records through timing and the malfunction of some readers; these can be attributed to both recorder and operator error.

The use of PIT tagging in this study has shown that translocated Hutton's shearwater nestlings move around for considerable periods prior to fledging, at this site at least. They visit other nest-boxes often but do not always return home, they can visit several nest-boxes in a night or over several nights, and may possibly get lost and be forced to stay out in the surrounding vegetation. Whether these latter birds would return home or fledge is not known as the birds that were found away from their nest-box in the morning were always returned to their home nest-box after feeding.

During the 2013 translocation, PIT tagging confirmed that Hutton's shearwater nestlings move around the colony and visit other nest-boxes for up to 16 nights before fledging. Movement by pre-fledging nestlings is not uncommon for shearwater species (Brooke 1990; Warham 1990; Gummer & Adams 2010). The average number of nights that nestlings were out of their nest-boxes based on observations of entrance pins was 2 nights longer than the average for the 2005-2008 translocations. However, the longest period (21 nights) was less than the 27 nights in Miskelly *et al*. (2008) whose estimates from pin movements could have been confounded by other birds or rabbits. The observations in this study confirm those in Miskelly *et al.* (2008) who note that Hutton's shearwater nestlings may spend many nights on the surface, unlike previous reports from the Kowhai River colony where they were rarely seen on the surface and spent 4-5 nights at the burrow entrances before fledging (Harrow 1976; Cuthbert 2001; Cuthbert & Davis 2002).

Emergence periods based only on pin movements reported for other translocations of Hutton's shearwaters are, in many cases, likely to be overestimates. Some caution may be needed when using this type of data for nestling management at new colonies, especially when emergence behaviour is often factored into the nestling feeding programme together with weight and age (wing length) (Mike Bell, *pers. comm.*). Since some birds left the colony the first night after their next-box was unblocked while others stayed in the area for 16 nights, it will be interesting to see how this range might be reflected in the birds returning to Te Rae o Atiu as adults in future years.

ACKNOWLEDGEMENTS

Funding for the PIT tags and reader assemblies was provided by the New Zealand Lottery Grants Board Environment and Heritage grant 272944, and the Mohamed bin Zayed Species Conservation Fund project 0925432. Sistema Plastics donated the reader boxes and Reid Technology supplied the solar panels, batteries and solar regulators. Stuart Cockburn at DoC provided advice on the use of the DoC supplied readers. Wildlife Management International Ltd and many volunteers recorded the visual observations during the 2013 translocation and helped put out and retrieve the readers. Mike Bell and Phil Bradfield are thanked for helpful comments which improved this paper.

LITERATURE CITED

Birdlife International. 2013. Species factsheet: *Puffinus huttoni*. Downloaded from http://www.birdlife.org on 05/07/2013.

Brooke, M. 1990. *The Manx shearwater.* T. & A.D. Poyser. London.

Cuthbert, R.J. 2001. Conservation and ecology of Hutton's shearwater (*Puffinus huttoni*). *Conservation Advisory Service Note No. 335*. Department of Conservation. Wellington. 35p.

Cuthbert, R.; Davis, L.S. 2002. The breeding biology of Hutton's shearwater. *Emu 102:* 323-329.

Gummer, H.A.; Adams, L. 2010. *Translocation techniques for fluttering shearwaters (Puffinus gavia): establishing a colony on Mana Island, New Zealand*. Department of Conservation. Wellington. 52p.

Harrow, G. 1965. Preliminary report on the discovery of the nest site of Hutton's shearwater. *Notornis 12:* 59-65.

Harrow, G. 1976. Some observations of Hutton's shearwater. *Notornis 23:* 269-288.

Marchant, S.; Higgins, P.J. (Eds). 1990. *Puffinus huttoni* Hutton's shearwater. *Handbook of Australian and New Zealand birds. Vol 1:* 655-662. Oxford University Press. Melbourne.

Miskelly, C.M.; Dowding, J.E.; Elliot, G.P.; Hitchmough, R.A.; Powlesland, R.G.; Robertson, H.A.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A. 2008. Conservation status of New Zealand birds, 2008. *Notornis 55*: 117-135.

Mathews, G.M. 1912. *Puffinus reinholdi huttoni*. *The birds of Australia.* Vol 2: 47. Witherby. London.

Molloy, J.; Davis, A. 1992. *Setting priorities for the conservation of New Zealand's threatened plants and animals.* Wellington, Department of Conservation. 44 p.

Paton, B.; Davis, A. 1997. Hutton's shearwater recovery plan (*Puffinus huttoni). Threatened species recovery plan series.* Department of Conservation. 12p.

Sommer, E.; Bell, M.; Bradfield, P.; Dunlop, K.; Gaze, P.; Harrow, G.; McGahan, P.; Morrissey, M.; Walford, D.; Cuthbert, R. 2009. Population trends, breeding success and predation rates of Hutton's shearwater (*Puffinus huttoni*): a 20 year assessment. *Notornis 56:* 144-153.

Taylor, G.; Cockburn, S.; Palmer, D.; Liddy, P. 2012. Breeding activity of Chatham Island taiko (*Pterodroma magentae*) monitored using PIT tag recorders. *New Zealand journal of ecology 36:* 425-432.

Warham, J. 1990. *The petrels: their ecology and breeding systems*. Academic Press. London.