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Translocations of little spotted kiwi (*Apteryx owenii*) for genetic management, 2016–17

Hugh A. Robertson, Natasha B. Coad, Rogan M. Colbourne and James R. Fraser



Department of
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Te Papa Atawhai

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Translocations of little spotted kiwi (*Apteryx owenii*) for genetic management, 2016–17

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Abstract

The genetic diversity of little spotted kiwi (*Apteryx owenii*) is extremely low as a result of a founding population of just five birds that were released onto Kapiti Island in 1912 and subsequent extinction of the species elsewhere in New Zealand. This loss of diversity has been further exacerbated during subsequent translocations of small numbers of founder birds to other predator-free islands. Red Mercury Island (Whakau) had 12 founders in 1983, and Tiritiri Matangi Island had 14 founders in 1993–95, and both sites have had strong population growth and are now close to their carrying capacity, despite the small numbers of founders. To improve the genetic diversity of these two populations and reduce the chances of serious inbreeding depression, 10 extra founders from Kapiti Island were added to each population. Space was created for the new birds by removing the same number of birds from the island populations, which in turn became founders for the establishment of other secure populations at Cape Sanctuary (Hawkes Bay) and at Shakespear Open Sanctuary (Whangaparaoa Peninsula). These two triangular translocations were logistically complex, but saved time and resources compared with simply trying to add new founders to populations already close to carrying capacity. This action brings the number of founders for these populations to a least 22 birds, but this is still lower than the recommended 40 unrelated founders. Subsequent changes in genetic diversity of these two island populations can be assessed in 5–10 years, when further founders should be added.

Keywords: little spotted kiwi, *Apteryx owenii*, genetic diversity, translocation, metapopulation

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1. Introduction

Little spotted kiwi (*Apteryx owenii*) are the second rarest of New Zealand's five species of kiwi, and they have the lowest genetic diversity among the species, and among the lowest recorded genetic diversity of all birds (Ramstad et al. 2013). From 14 microsatellite loci isolated in kiwi, little spotted kiwi had fewer alleles per locus (mean 2.4) than the other four species (2.7–3.9) and much lower heterozygosity (mean 0.38 cf 0.58–0.71) (Ramstad et al. 2010). These levels are lower than in most wild birds (see Jamieson et al. 2006) and are also mirrored by extremely low levels of major histocompatibility complex (MHC) diversity (Miller et al. 2011). Extremely low genetic diversity means that little spotted kiwi are likely to be less well equipped to successfully survive new challenges, such as exposure to a novel disease. This amount of genetic diversity loss is consistent with the species having passed through a severe bottleneck. In 1912, just five little spotted kiwi from Jackson Bay, South Westland, were introduced to Kapiti Island and became the founders of the present-day population because the species became extinct elsewhere in New Zealand (Ramstad et al. 2010, 2013). Although this translocation to Kapiti Island saved the little spotted kiwi from extinction, the species still faces challenges from the resulting low genetic diversity. Subsequent translocations from Kapiti Island to nine other sites appear to have been successful in terms of population size (Colbourne & Robertson 1997; Heather & Robertson 2015); however, there has been a further loss of genetic diversity during each of these translocations (Ramstad et al. 2013; Taylor et al. 2017). By 2011, the mean allelic richness on Red Mercury Island (12 founders in 1983) had declined from 2.4 to 2.2 and there had been a 9% loss in heterozygosity, while on Tiritiri Matangi Island (14 founders in 1993–95; two of 16 transferred birds died before they could have bred (Girardet 2000)), the mean allelic richness had declined to 2.1 and heterozygosity had declined by 4% by 2012 (Ramstad et al. 2013). Having greater genetic diversity should help these closed populations cope with future environmental or disease challenges because some individuals may possess the traits to overcome them (Miller et al. 2011; Ramstad et al. 2013).

In 2016 and 2017, further little spotted kiwi were translocated to Red Mercury and Tiritiri Matangi islands to begin to address the issue of extremely low genetic diversity among the kiwi populations on the islands. Because population growth rates on Red Mercury and Tiritiri Matangi had slowed by 2011 and 2012 respectively (Robertson et al. 2019 and in press) compared with their early growth rates (Colbourne & Robertson 1997), we assumed that both populations were approaching carrying capacity, and so planned to remove some kiwi to create space before the new birds were added. The birds that were removed were used to provide some founders for new populations at Cape Sanctuary (Hawkes Bay) and Shakepear Open Sanctuary (Whangaparaoa Peninsula). We decided that the best way to integrate new genetic diversity into the populations was by removing mainly territorial females, thus creating opportunities for new founding adult females to establish partnerships with the resident males of the half-vacated territories. We surmised that the territorial males would retain their existing territories and that complete removal of pairs from the islands would more likely lead to local birds occupying the vacated space rather than newly-translocated pairs. Previous research on Tiritiri Matangi (Girardet 2000) showed that only one of the four surviving translocated pairs of little spotted kiwi remained together after their original introduction, we presume because mate choice was governed more by the quality of the territory than by faithfulness to their previous partner.

The effect of this metapopulation management on genetic diversity of the island populations can be measured during subsequent surveys by comparing DNA samples from new island-bred birds with those samples collected from the populations before the manipulations took place. In the interim, on Tiritiri Matangi Island, transmitters were left on seven of the resident males whose pair bonds had been broken to determine whether they formed pair bonds with newly-translocated females rather than island-bred females, and transmitters were attached to two released females to see if they paired up with any of these males.

2. Triangular translocation in 2016 (Kapiti–Red Mercury–Cape Sanctuary)

In March 2016, 20 Little Spotted Kiwi were transferred from Kapiti Island, 10 to Cape Sanctuary and 10 to Red Mercury Island (Whakau); the latter 10 birds replaced 10 birds that were translocated from Red Mercury Island to Cape Sanctuary at the same time (Fig. 1).

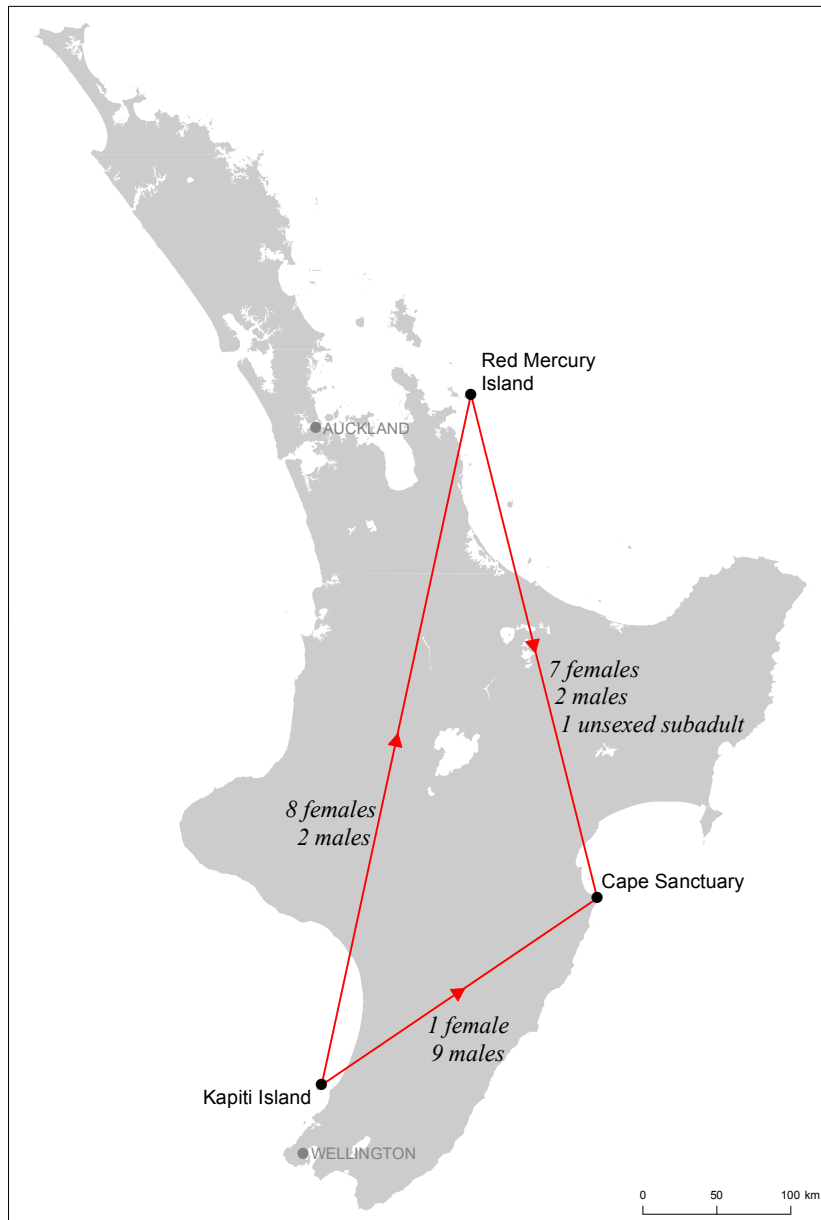


Figure 1. Graphical representation of the triangular translocation of 30 little spotted kiwi (*Apteryx owenii*) between Kapiti Island, Red Mercury Island (Whakau), and Cape Sanctuary in March 2016.

2.1 Kapiti Island

From 8 to 11 February 2016 we caught, banded, radio-tagged and disease-screened 21 adult little spotted kiwi near Seismometer Hut in central Kapiti Island (Appendix 1). Ten of the birds were caught in hand-nets at night, often after being indicated by a night-certified conservation dog or lured to a recorded call; the remainder were found by conservation dogs in their daytime dens.

Ten of the birds were males and 11 were females. An unexpected outcome was the recapture of a female that had been banded (O-13980) as a subadult bird 3 km away at Te Kahuoterangi 32 years and 2 months earlier on 14 December 1983.

Cloacal swabs were taken from all birds at the time of capture and despite an initial false positive result, none showed any sign of either *Salmonella* or *Yersinia*, the two targets of standard disease screening in kiwi. Weights of birds handled in February 2016 (10 males: 1023 ± 26 g, 11 females 1191 ± 80 g); were significantly lighter than their average February weight elsewhere on Kapiti Island (57 males: 1138 ± 92 g, 54 females 1338 ± 115 g; t-test, $P < 0.001$ for each sex; H. Robertson unpubl. data). This may have been due to the drier than normal summer being experienced (161 mm rain in the previous 3 months on Kapiti Island compared with a 30-year normal of 242 mm, NIWA Cliflo data), but the low weights could indicate that the population around Seismometer Hut was close to the carrying capacity for that part of the island, which has never been cropped for a translocation before.

On 13 March 2016, a team of six people caught 10 of the 21 birds that had been radio-tagged in February. These 9 adult males and 1 adult female (Appendix 1), destined for Cape Sanctuary were held overnight in transfer boxes. On 14 March, a further 11 birds (9 radio-tagged adult females and 2 adult males, including 1 untagged male caught with its partner) were caught. One radio-tagged female was set free as being surplus to requirements, with the remaining 10 birds prepared for translocation to Red Mercury Island (Appendix 1).

All 20 birds to be translocated and the catching team were transported by helicopter to Rangatira Point on Kapiti Island, where kaumatua and representatives of Ngati Toa, Te Ati Awa ki Whakarongotai and Ngati Raukawa blessed the birds, which were then taken off the island by charter boat. Half of the birds were driven to Cape Sanctuary and released just after dark, at a maximum of 35 hours after capture. The Red Mercury Island birds were held overnight in Paraparamu and accompanied by a kaumatua of Ngati Toa on a commercial flight from Paraparamu Airport to Auckland the following day. They were then driven to the North Shore and then helicoptered to Red Mercury Island for release at about 1100 hrs, a maximum of 28 hours after capture. Due to time limitations, and the expectation that the birds would disperse widely on the island after release, all birds were released near the helipad on Red Mercury Island.

2.2 Red Mercury Island (Whakau)

During the 5-yearly population assessment of little spotted kiwi on Red Mercury Island, conducted from 3 to 10 March 2016 (Robertson et al. 2019 and in press), a team of DOC Whitianga staff helped us to catch, band, radio-tag and disease-screen a total of 18 birds (Appendix 2), 10 of which were ultimately transferred to Cape Sanctuary.

On 14 March 2016, 10 radio-tagged birds (7 adult females, 2 adult males and 1 unsexed subadult) were translocated to Cape Sanctuary. The transmitter on an adult female (O-28541) that was identified for translocation failed sometime after 10 March, and so an unsexed subadult (O-28534) was sent in her place. The birds were flown by helicopter directly to Auckland Airport, on a commercial flight from Auckland to Napier, and then driven to Cape Sanctuary for release at 1900 hrs, a maximum of 36 hours after capture and one day after the Kapiti birds had arrived.

3. Triangular translocation in 2017 (Kapiti–Tiritiri Matangi–Shakespear Open Sanctuary)

In April 2017, 20 Little Spotted Kiwi were transferred from Kapiti Island, 10 males to Shakespear Open Sanctuary and 10 females to Tiritiri Matangi Island; the latter birds replaced 10 females that were translocated from Tiritiri Matangi Island to Shakespear Open Sanctuary at the same time (Fig. 2).

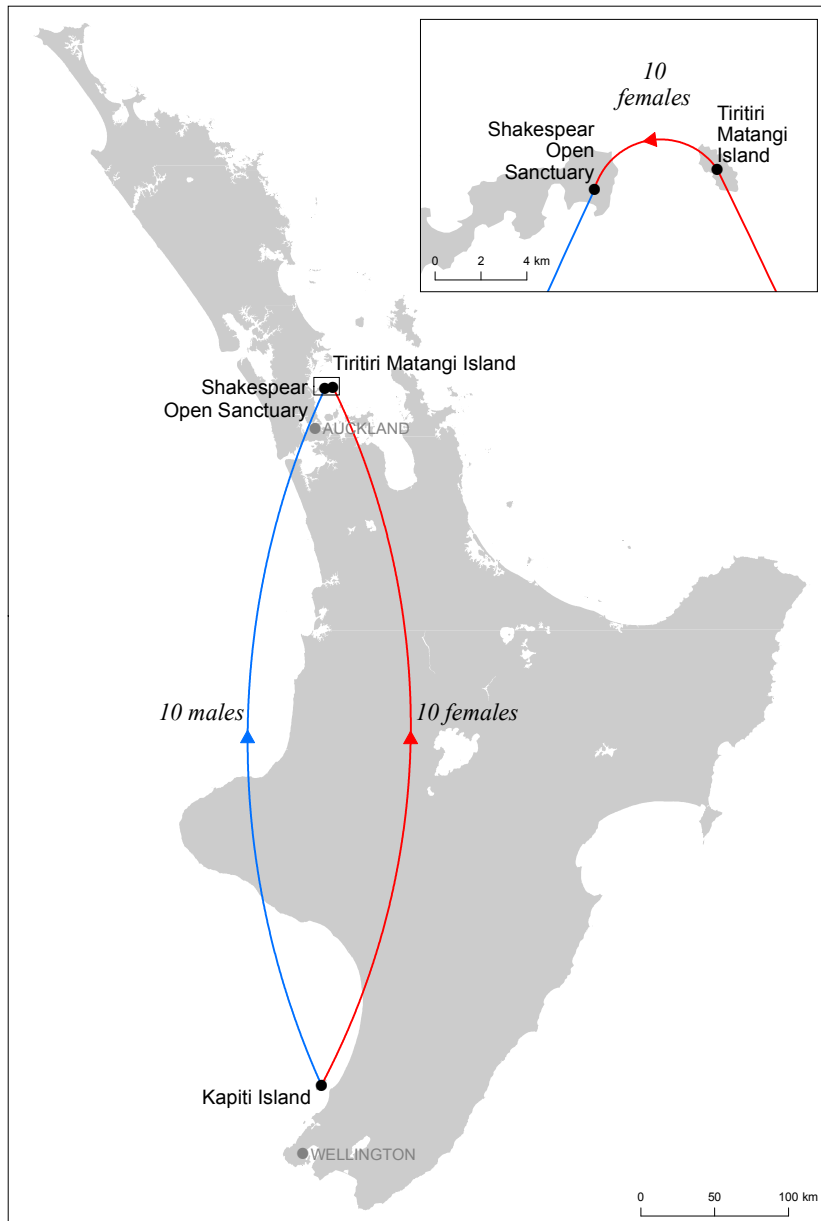


Figure 2. Graphical representation of the triangular translocation of 30 little spotted kiwi (*Apteryx owenii*) between Kapiti Island, Tiritiri Matangi Island, and Shakespear Open Sanctuary in April 2017.

3.1 Kapiti Island

From 27 to 30 March 2017, we caught, banded, radio-tagged and disease-screened 21 little spotted kiwi within 2 km of Wharekohu Hut at the southern end of Kapiti Island (Appendix 3). Most of the birds were caught along the track in the main valley, in the lower parts of side streams on the true left of the main valley or near the hut, but two pairs were also caught on the ridge between Wharekohu and Te Mingi Huts.

Twelve of the birds (including four pairs) were found by conservation dogs in their daytime dens, the remainder were caught in hand-nets at night, often after their presence was indicated by a night-certified conservation dog or lured to a recorded call. Twelve of the birds were adult males and nine were adult females; one chick of the year was found but not handled. One bird (O-32171) had its transmitter removed after a few days because it was distant from the other birds and was living in dense vegetation that made radio-tracking difficult.

Cloacal swabs were taken from all 21 birds at the time of capture, and despite another false positive result, none had either *Salmonella* or *Yersinia*. Birds handled in March 2017 were much heavier (males 1108 ± 76 g, females 1310 ± 74 g) than those caught around Seismometer Hut in February 2016 and this may reflect the wetter than normal conditions in the 2017 summer (i.e. 293 mm on Kapiti Island in the preceding 3 months compared with the 30-year mean of 214 mm; NIWA Cliflo data).

When we returned to the island a month later, from 27 to 29 April 2017, we discovered that one transmitter had fallen off a male, but 18 of the remaining 19 radio-tagged birds were caught. Another male was caught at night, and another female was found by a dog while searching for the missing male. These two new birds were disease-screened at point of transfer, and both tested negative for *Salmonella* and *Yersinia*.

On 28 April 2017, 14 birds were caught and taken off Kapiti Island and released the following day at Shakespear Open Sanctuary (8 males) or at Tiritiri Matangi Island (6 females). On 29 April, the remaining 6 birds were caught, and they were released the following day at Shakespear Open Sanctuary (2 males) and at Tiritiri Matangi Island (4 females). All 10 males released at Shakespear Open Sanctuary were fitted with transmitters to allow their survival and dispersal to be monitored, and 2 of the females released onto Tiritiri Matangi Island were radio-tagged to determine whether they paired-up before the first breeding season.

3.2 Tiritiri Matangi Island

From 17 to 29 April 2017, we were assisted by a rotating team of 14 volunteers from the Supporters of Tiritiri Matangi and Shakespear Open Sanctuary Society and an Auckland Council staff member, to carry out the five-yearly assessment of the population size and structure of little spotted kiwi on Tiritiri Matangi Island.

A total of 30 birds were caught, comprising 18 adult males, 10 adult females, 1 subadult and 1 chick (Appendix 4). It is possible that some males classified as adults, from the combination of bill length and weight, were still subadults because at least one of them used two locations over 500 m apart and appeared to be non-territorial. All of the adult females were fitted with radio-transmitters and transferred to Shakespear Open Sanctuary on 29 or 30 April. Seven of their partners were also radio-tagged and will be monitored by Supporters of Tiritiri Matangi through the 2017 breeding season to see how quickly they re-pair, and to determine how many pair up with the newly arrived female founders from Kapiti Island as opposed to island-bred females. These 10 new Kapiti females were released into the areas where resident females had been removed, and two of them were radio-tagged before they were released.

4. Conclusions and recommendations

The two triangular translocations were aimed at improving the genetic diversity of two populations of little spotted kiwi (on Red Mercury and Tiritiri Matangi islands) that were close to carrying capacity. Birds were removed from each island to help establish new mainland populations and to create possible spaces for the new founders to establish and pair up with resident birds.

This type of metapopulation management, through follow-up translocations or swapping individuals between populations to increase genetic diversity and prevent genetic drift and loss of rare alleles in closed populations, is often noted as a necessary conservation action (Allendorf & Luikart 2007). This is the first instance where this type of management has been documented for kiwi and, in time, an assessment will be made of its effectiveness at increasing genetic diversity of these two closed populations. Some information is being collected on Tiritiri Matangi Island about the mate choice of the males whose pair-bonds with their previous mate were broken, but the best data will be available in 5–10 years when DNA samples (from pin feathers) are next collected from island-bred birds. The genetic diversity of island-bred birds can then be compared with the diversity observed in the years before the genetic management was completed.

A total of 22 birds have now been introduced to Red Mercury Island, and 26 to Tiritiri Matangi, but at least 2 birds on Tiritiri died before they could have bred. The number of founders is still well below the current target of 40 birds which should provide a moderately good representation of common and rare alleles (Weiser et al. 2013). It was simply not practical to create 25 new spaces and transfer 25 new founders into these two populations, and so a repeat of the 2016–17 translocation programme is likely to be necessary in 5–10 years' time to ensure the long-term genetic health of these isolated populations.

The triangular translocations described here were logistically challenging, but were tied in with planned five-yearly assessments of the island populations, when many resident birds were being caught and radio-tagged. Time will tell whether it was beneficial to remove birds to create opportunities for the new founders to become established, but in both cases these birds were used as part of the founding stock for new secure mainland populations of little spotted kiwi.

The total cost of each triangular translocation was about \$120,000, including volunteer hours, salaries and overheads, with the bulk of the expenses being in staff, contractor and volunteer hours, and helicopter access to islands; however, it was calculated that each triangular translocation saved \$60,000 compared with doing the five-yearly monitoring and translocations as separate exercises (Troy Makan, DOC, pers. comm.).

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Appendix 1

Little spotted kiwi (*Apteryx owenii*) caught within 600 m of Seismometer Hut, Kapiti Island, for translocation to Red Mercury Island (Whakau) or Cape Sanctuary in March 2016.

Condition was scored as poor (P), moderate (M) or good (G), or combinations in between, following Robertson & Colbourne (2017).

No.	BAND	AGE	SEX	DATE	BILL (mm)	WEIGHT (g)	CONDITION	DESTINATION
1	O-31333	Adult	Female	8/2/16	84.8	1220	MP	Cape Sanctuary
2	O-31334	Adult	Male	8/2/16	70.7	1025	M	Cape Sanctuary
3	O-31335	Adult	Female	8/2/16	86.5	1110	MP	Red Mercury
4	O-31336	Adult	Male	8/2/16	67.0	1050	MP	Cape Sanctuary
5	O-31337	Adult	Female	8/2/16	82.6	1180	PM	Red Mercury
6	O-31338	Adult	Female	9/2/16	89.5	1330	MG	Not moved (tx removed)
7	O-31339	Adult	Male	9/2/16	67.5	975	PM	Cape Sanctuary
8	O-28520	Adult	Female	9/2/16	82.6	1150	MP	Red Mercury
9	O-32096	Adult	Female	9/2/16	85.2	1100	MP	Red Mercury
10	O-32097	Adult	Male	9/2/16	70.1	1050	MP	Cape Sanctuary
11	O-21302	Adult	Male	9/2/16	70.3	1010	M	Cape Sanctuary
12	O-21303	Adult	Male	9/2/16	68.6	1030	M	Red Mercury
13	O-21304	Adult	Female	10/2/16	82.0	1150	PM	Red Mercury
14	O-32093	Adult	Female	10/2/16	82.2	1210	M	Red Mercury
15	O-32095	Adult	Male	10/2/16	68.7	1000	PM	Cape Sanctuary
16	O-31340	Adult	Male	10/2/16	68.8	1050	M	Cape Sanctuary
17	O-21311	Adult	Female	10/2/16	90.0	1340	MP	Red Mercury
18	O-21312	Adult	Female	10/2/16	82.6	1175	MP	Red Mercury
19	O-21313	Adult	Male	10/2/16	66.1	1000	MP	Cape Sanctuary
20	O-32092	Adult	Male	10/2/16	71.5	1040	MG	Cape Sanctuary
21	O-21314*	Adult	Female	11/2/16	83.1	1130	MP	Not moved (tx failed)
22	O-21315	Adult	Female	13/3/16	86.9	1350	M	Not moved (tx removed)
23	O-21316	Adult	Male	14/3/16	67.3	1020	M	Red Mercury

* = previously banded O-13980.

Appendix 2

Little spotted kiwi (*Apteryx owenii*) caught on Red Mercury Island (Whakau) in March 2016.

Condition was scored as moderate (M), good (G) or very good (VG), or combinations in between, following Robertson & Colbourne (2017).

No.	BAND	AGE	SEX	DATE	BILL (mm)	WEIGHT (g)	CONDITION	DESTINATION
1	O-32032	Adult	Male	2/3/16	65.0	1150	MG	Not moved (tx removed)
2	O-13983	Adult	Male	3/3/16	66.7	1270	G	Not moved (tx removed)
3	O-32031	Adult	Female	3/3/16	78.3	1380	G	Cape Sanctuary
4	R-62626	Adult	Female	3/3/16	77.6	1240	M	Cape Sanctuary
5	O-32013	Adult	Male	4/3/16	63.8	1140	MG	Cape Sanctuary
6	R-62628	Adult	Female	4/3/16	80.7	1340	MG	Cape Sanctuary
7	O-32022	Adult	Female	5/3/16	78.8	1390	VG	Cape Sanctuary
8	O-32066	Adult	Male	5/3/16	67.6	1150	M	Not moved (tx removed)
9	O-32067	Adult	Female	5/3/16	76.8	1300	G	Cape Sanctuary
10	O-28541	Adult	Female	5/3/16	78.9	1260	M	Not moved (tx failed)
11	O-32695	Adult	Male	5/3/16	67.9	1300	VG	Cape Sanctuary
12	O-27487	Adult	Male	6/3/16	65.0	1090	M	Not moved (tx removed)
13	O-32694	Adult	Female	7/3/16	86.1	1610	VG	Cape Sanctuary
14	O-20735	Adult	Male	8/3/16	69.9	1260	G	Not moved (tx removed)
15	O-28534	Subadult	Female	8/3/16	69.2	980	G	Cape Sanctuary
16	O-28542	Adult	Male	8/3/16	61.7	1100	G	Not moved (tx removed)
17	O-31486	Adult	Male	8/3/16	65.5	1040	MG	Not moved (tx removed)
18	R-62625	Adult	Female	8/3/16	83.6	1530	VG	Cape Sanctuary

Appendix 3

Little spotted kiwi (*Apteryx owenii*) caught within 2 km of Wharekohu Hut, Kapiti Island, for translocation to Tiritiri Matangi Island and Shakespear Open Sanctuary, March–April 2017.

Condition was scored as moderate–poor (MP), moderate (M), moderate–good (MG) or good (G), following Robertson & Colbourne (2017).

No	BAND	AGE	SEX	DATE	BILL (mm)	WEIGHT (g)	CONDITION	DESTINATION
1	O-28535	Adult	Female	27/3/17	81.0	1300	MG	Tiritiri Matangi
2	O-28536	Adult	Male	27/3/17	70.0	1220	G	Shakespear Sanctuary
3	O-32171	Adult	Male	27/3/17	65.7	1020	M	Not moved (tx removed)
4	O-31344	Adult	Male	27/3/17	68.4	1030	MP	Shakespear Sanctuary
5	O-31345	Adult	Male	27/3/17	65.9	1240	M	Not moved (tx dropped)
6	O-31346	Adult	Female	27/3/17	85.2	1360	M	Tiritiri Matangi
7	O-31347	Adult	Female	27/3/17	80.6	1190	MP	Tiritiri Matangi
8	O-28537	Adult	Male	28/3/17	70.7	1150	M	Shakespear Sanctuary
9	O-28538	Adult	Female	28/3/17	83.1	1220	M	Tiritiri Matangi
10	O-31348	Adult	Female	28/3/17	85.7	1310	G	Tiritiri Matangi
11	O-31349	Adult	Female	28/3/17	83.5	1400	M	Tiritiri Matangi
12	O-31350	Adult	Male	28/3/17	66.9	1050	MP	Shakespear Sanctuary
13	O-28539	Adult	Male	29/3/17	67.4	1160	M	Shakespear Sanctuary
14	O-28540	Adult	Female	29/3/17	82.1	1280	M	Tiritiri Matangi
15	O-21331	Adult	Male	29/3/17	66.4	1075	M	Shakespear Sanctuary
16	O-21321	Adult	Male	29/3/17	68.4	1040	M	Not moved (tx failed)
17	O-21332	Adult	Male	29/3/17	67.9	1100	G	Shakespear Sanctuary
18	O-21333	Adult	Female	29/3/17	90.1	1290	M	Tiritiri Matangi
19	O-32172	Adult	Male	29/3/17	69.0	1170	MG	Shakespear Sanctuary
20	O-21334	Adult	Male	30/3/17	68.8	1020	MG	Shakespear Sanctuary
21	O-32173	Adult	Female	30/3/17	85.2	1320	M	Tiritiri Matangi
22	O-30503	Adult	Male	27/4/17	68.3	1130	M	Shakespear Sanctuary
23	O-30504	Adult	Female	28/4/17	88.3	1430	G	Tiritiri Matangi

Appendix 4

Little spotted kiwi (*Apteryx owenii*) caught on Tiritiri Matangi Island in April 2017.

Condition was scored as moderate (M), good (G), very good (VG) or combinations in between, following Robertson & Colbourne (2017).

No.	BAND	AGE	SEX	DATE	BILL (mm)	WEIGHT (g)	CONDITION	DESTINATION
1	O-32030	Adult	Female	17/4/17	84.0	1420	MG	Shakespear Sanctuary
2	O-21322	Adult	Male	18/4/17	67.2	1170	G	Not moved (monitored)
3	O-21323	Adult	Male	18/4/17	69.7	1330	VG	Not moved (tx removed)
4	O-31434	Adult	Male	18/4/17	69.1	1070	M	Not moved (tx removed)
5	R-63951	Adult	Female	18/4/17	84.9	1840	VG	Not moved (tx removed)
6	O-31453	Adult	Female	18/4/17	83.3	1890	VG	Shakespear Sanctuary
7	O-32174	Adult	Male	18/4/17	69.0	1125	M	Not moved (monitored)
8	O-32176	Adult	Female	18/4/17	86.9	1450	M	Shakespear Sanctuary
9	nil	Juvenile	Unknown	18/4/17	44.6	500	M	Not moved (not radio-tagged)
10	O-21326	Subadult	Male	19/4/17	65.0	1000	MG	Not moved (tx removed)
11	O-19815	Adult	Male	19/4/17	69.4	1380	VG	Not moved (tx removed)
12	O-21327	Adult	Male	19/4/17	67.5	1240	MG	Not moved (tx removed)
13	O-32175	Adult	Male	20/4/17	66.3	1130	G	Not moved (not radio-tagged)
14	O-31451	Adult	Male	21/4/17	73.2	1190	G	Not moved (monitored)
15	O-21335	Adult	Male	21/4/17	66.2	1100	G	Not moved (tx removed)
16	O-30501	Adult	Male	22/4/17	72.3	1440	VG	Not moved (monitored)
17	O-32177	Adult	Male	22/4/17	66.6	1300	VG	Not moved (tx removed)
18	O-20484	Adult	Male	22/4/17	64.1	1600	VG	Not moved (tx removed)
19	O-28508	Adult	Female	22/4/17	83.2	1580	G	Shakespear Sanctuary
20	R-63952	Adult	Female	22/4/17	81.1	1520	G	Shakespear Sanctuary
21	O-30502	Adult	Female	22/4/17	84.3	1560	VG	Shakespear Sanctuary
22	O-32178	Adult	Male	23/4/17	66.9	1070	M	Not moved (monitored)
23	O-32179	Adult	Female	23/4/17	84.7	1510	G	Shakespear Sanctuary
24	O-21336	Adult	Male	23/4/17	70.2	1290	VG	Not moved (tx removed)
25	O-31452	Adult	Male	24/4/17	66.0	1390	VG	Not moved (monitored)
26	O-21337	Adult	Male	24/4/17	72.4	1230	MG	Not moved (tx removed)
27	O-32180	Adult	Female	24/4/17	84.8	1570	MG	Shakespear Sanctuary
28	O-30511	Adult	Male	25/4/17	65.2	1300	MG	Not moved (monitored)
29	O-20864	Adult	Female	26/4/17	88.2	1570	M	Shakespear Sanctuary
30	O-30512	Adult	Female	27/4/17	84.3	1820	VG	Shakespear Sanctuary