

SHORT NOTE

Survival of little spotted kiwi (*Apteryx owenii*) on Kapiti Island

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The little spotted kiwi (*Apteryx owenii*) presently occurs in five viable populations on predator-free islands (Kapiti, Hen, Red Mercury, Tiritiri Matangi, Long; Colbourne & Robertson 1997), and another on the mainland at Karori Sanctuary, Wellington. It totals approximately 1150 individuals (Heather & Robertson 2000). Because it occupies a limited area, it is classified variously as 'vulnerable' (BirdLife International 2000), or 'range restricted' (Hitchmough 2002).

Kapiti Island is the stronghold for the species, with an estimated 1000 birds in 1997 (Heather & Robertson 2000). Little spotted kiwi were first banded on Kapiti Island in the early 1980s during studies in the upper Te Rere and Te Kahuoterangi catchments (Jolly 1989). For our long-term monitoring of this population, we have maintained these two banded populations, and also banded territorial kiwi in two further areas, near Rangatira Point and in Okupe Valley (Fig. 1).

In 1996, rats (*Rattus exulans* and *R. norvegicus*) were eradicated from Kapiti Island (Empson & Miskelly 1999). In autumn 1997, a study of the poisoning operation's impact on little spotted kiwi found 46 of 50 banded birds (25 pairs) known to be alive before poison was applied (Robertson & Colbourne 2001). All four 'missing' birds had been replaced with new birds in the territory-holding pairs, and were assumed to have died. From these observations, Robertson & Colbourne (2001) concluded that, at worst, 8% (3-19%) of little spotted kiwi were killed by accidental poisoning and, if annual survival was in the range of 96-98%, then 2-3 of the 'missing' birds may have died from natural causes between pre- and post poisoning

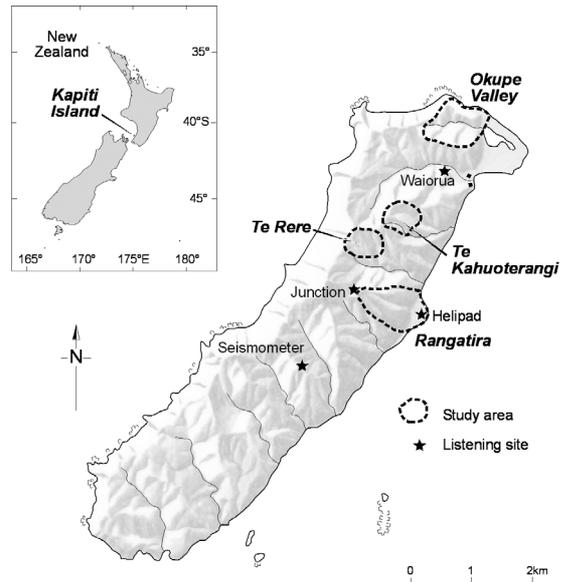


Figure 1 Kapiti Island, showing location of the study areas and listening sites.

encounters, and the toxin-induced mortality would therefore have been much lower.

In autumn 2002, we revisited 24 of the 25 territories belonging to the banded pairs we searched for five years earlier as well as another, more accessible, territory on which we had banded the pair in 1997. We visited traditionally well-used burrows, used dogs to search for resident birds during daylight hours, and played tapes of kiwi calls to attract birds at night. We radio-tagged captured birds and they often led us to their mate on a subsequent day. When normal territory holders were absent, we searched for them in nearby territories. We conservatively assumed that a bird had died if we did not find it. We did not find any of the 'missing' birds from 1997 in our searches.

We found 44 of the 50 birds targeted, all but two of which were within their normal territories. The two exceptions were both females; one had divorced and moved to an adjacent territory, the other was apparently widowed and had moved c. 300 m, across at least one occupied territory. Her original territory was being used by two new pairs and her male was not found. Of the other unlocated birds, one pair disappeared from their original territory and neither bird was found (their territory was occupied in part by a male and in part by another pair), one had been found dead in March 1999 (G. Moorcroft, pers. comm.) and had



Figure 2 At least 22 years old and a successful breeder; a male and its chick sharing a burrow. Photo: R.M. Colbourne.

been replaced by the time of our search in early 2002, and the other two, both males, had also been replaced in their territories.

The proportion of birds encountered after five years was 88% (95% score confidence interval (Agresti 1999) 76.2% - 94.4%). Assuming a constant survival rate over the five years, the corresponding annual survivorship was 97.5% (94.7% - 98.9%). Thus, life expectancy ($= 1/m$, where m = annual mortality) of a territorial adult little spotted kiwi was 40 (19 - 87) years.

The annual survival and longevity of little spotted kiwi are remarkably high, but perhaps not unexpected in the absence of predators of adult birds on Kapiti Island. Additional information supporting such a long lifespan comes from 20 birds banded in the early to mid-1980s by Jim Jolly and Rogan Colbourne (Jolly 1989); 15 were still alive in 2002. By pooling these data with that from our five-year survey, the overall estimate of survival of territorial adult little spotted kiwi on Kapiti Island becomes 97.8% (96.3% - 98.8%), with a corresponding mean life expectancy of 45 (27 - 83) years. One of these original pairs raised a chick in March 2002 (Fig. 2) when both adults must have been at least 22 years old, assuming that it takes at least 3.5 years for a little spotted kiwi to reach adult size.

From our annual survival estimate, we can refine Robertson & Colbourne's (2001) estimate of the impact of accidental poisoning during the rat eradication programme on Kapiti Island. The average time at risk per bird they studied in 1996/97 was 1.57 years (78.6 bird years) and four birds died or disappeared. If we assume that there was a constant background rate of natural mortality

throughout the period the data were collected, with a one-off mortality event due to accidental poisoning, we now estimate that the mortality from accidental poisoning was 4.7% (0.0% - 14.8%), based on a profile likelihood approach (Everitt 1998).

Despite the accidental loss of about 50 birds (i.e. 4.7% of the estimated 1000 birds on Kapiti Island), the population of little spotted kiwi on Kapiti Island has grown since rats were eradicated in 1996. In each of our four study areas, new pairs had become established by 2002 and existing territories had shrunk to accommodate the new birds. Call rates also increased significantly (Mann-Witney U test, $z = 4.64$, $P < 0.001$) at four listening sites (Fig. 1) from 12.0 calls per hour in 150 hours of listening in the autumns of 1994-96 to 20.4 calls per hour in 48 hours of listening in autumn 2002 (H. Robertson unpubl. data). The increase in little spotted kiwi numbers may have been due to good breeding while weka (*Gallirallus australis*), their main predator, were greatly reduced in 1996/97 (Miskelly & Empson 1999) or, due to the removal of food competition with rats.

As long as Kapiti Island, and the other five predator-free sanctuaries they occupy, remain free of mammalian predators, little spotted kiwi are at low risk of extinction, and kiwi recovery efforts can concentrate on the mainland taxa facing more immediate threats.

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