

## SHORT NOTE

Notes on the breeding biology of kereru (New Zealand pigeon, *Hemiphaga novaeseelandiae*) on Banks Peninsula, South Is, New Zealand

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Incidental observations of the breeding biology of kereru (New Zealand pigeon, *Hemiphaga novaeseelandiae*) were made during a radio-tracking study in Otanerito Valley, Sleepy Bay gully and Akaroa, Banks Peninsula, South Is, New Zealand (43°49'S, 173°01'E). The study ran from Feb 2005 to Feb 2006 and observations were carried out on 5 consecutive days in each alternate week. Fifteen adult kereru were fitted with Sirtrack® radio transmitters (c.20 g) and were located daily each field week using a Regal® receiver and yagi antenna. Notes on the timing of nesting, the number of nesting attempts made by each pair and nest fate were recorded for each radio-tagged kereru. We continued to check existing nests after Feb 2006 to determine nest fate, but did not attempt to locate new nests during this period.

The study area included a small town (Akaroa) and farmland interspersed with fragments of regenerating native forest. Twelve of the radio-tagged kereru were resident in Otanerito Valley (Fig. 1). Hinewai Reserve, 1050 ha, which encompasses over half of Otanerito Valley is the largest tract of regenerating native forest on Banks Peninsula. Three radio-tagged kereru were resident in Akaroa, and 1 in a forested gully in Sleepy Bay. Brush-tailed possums (*Trichosurus vulpecula*), stoats (*Mustela erminea*), ferrets (*Mustela furo*) and feral cats (*Felis catus*) were common predators in and around Otanerito Valley but it is not known to what extent these predators affect birds in this area.

Male kereru were observed performing display flights from Aug 2005 until Feb 2006. The 1st nests of radio-tagged kereru were found in Sep in Akaroa and in the upper section of Otanerito Valley (600 m asl); eggs in these nests were incubated for a short time but were abandoned after a snowstorm on 19 Sep (Tables 1, 2). Up to 3 nesting attempts were made by each breeding pair during the study period (Table 1). Only 2 pairs fledged chicks, both on the 1st attempt. These kereru did not re-nest before the end of the study so it is unknown whether nesting continued into Mar. A study of kereru reproductive success at 2 sites in the Lyttelton Harbour Basin, Banks Peninsula, did not record laying dates for kereru later than Feb (Schothborgh 2005).

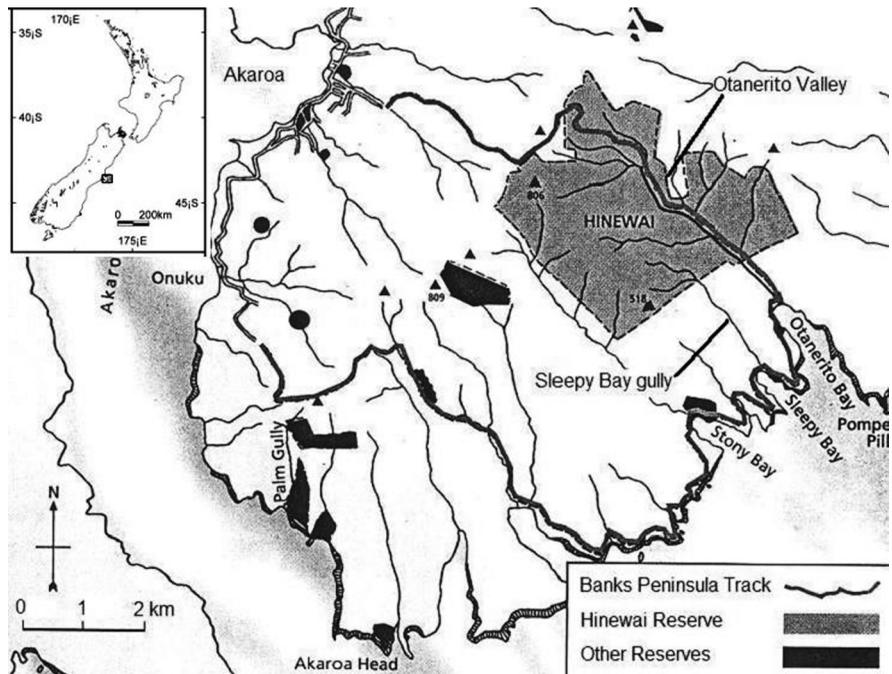
Most nests failed at the egg stage (Table 2). The nest and the ground beneath each failed nest were searched for eggshell or chick remains. Eggshells were recovered from only 2 failed nests, 1 appeared to have been eaten by a possum (S.T. Prendergast, *pers. comm.*) and the other had fallen through the flimsy nest structure. The causes of other failures were unknown, but the lack of eggshell or chick remains in or around the nests suggested that eggs and chicks had been removed by predators. Stoats are the most likely predators involved as they are known to remove eggs and chicks from nests and shell fragments are often not found (King & Murphy 2005). Rats and possums are known to eat eggs at the nest (Innes 2005; Innes *et al.* 2004). Two radio-tagged kereru were found dead during Jul 2005. Both kereru had been dragged beneath scrub and eaten, presumably by cats. Only the transmitters, harnesses, feathers, and leg jesses were recovered. It is not known whether these kereru died of natural causes such as malnutrition, exposure or old age

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**Fig. 1** South-eastern sector of Banks Peninsula, showing the location of Akaroa, Otanerito Valley, Sleepy Bay gully and Hinewai Reserve (adapted from Wilson (1995)).



**Table 1** The timing of nesting attempts for radio-tagged kereru (New Zealand pigeon, *Hemiphaga novaeseelandiae*), South-eastern Banks Peninsula, South I, New Zealand in 2005 and 2006. Bars show time from when nests were found until nest unoccupied by an adult or chick. Nests that fledged chicks shown in bold.

		Nesting attempts, duration by year and month							
		2005				2006			
Locality	Bird(s) radio#	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
Otanerito Valley	40						<b>1</b>		
	42		1		2		3		
	44				1	2			
	<b>46/58</b>				<b>1</b>				
	50	1				2			
Sleepy Bay	62						1		
Akaroa	66	1			2				

and were scavenged, or whether they were killed by the predator that removed and ate them.

Kereru in native forest are known to forgo nesting in years when few fruit are available (Clout *et al.* 1995; Powlesland *et al.* 2003). Powlesland *et al.* (1997) found that parea (*Hemiphaga chathamensis*) on Chatham I bred in all months of the year when the fruits of hoho (*Pseudopanax chathamicus*) and Chatham Is matipo (*Myrsine chathamica*) were abundant. During times of fruit abundance a higher proportion of pairs bred and a greater number of pairs made multiple nesting attempts (Powlesland *et al.* 1997). Kereru in our study fed mostly on the

foliage and flowers of three leguminous shrubs or trees, the introduced broom (*Cytisus scoparius*), introduced tree lucerne (*Chamaecytisus palmensis*), and the native kowhai (*Sophora microphylla*) before the breeding season and did not begin feeding on fruit until it became available in mid-Dec. In the preceding winter fruit had been eaten until the end of Jun. Kereru in the Lyttelton Harbour Basin, Banks Peninsula, also bred successfully when their diet consisted almost entirely of the leaves of introduced legumes and deciduous species (Schotborgh 2005). Both studies found that most kereru made several nesting attempts, and Schotborgh (2005) found

**Table 2** Fate of kereru (New Zealand pigeon, *Hemiphaga novaeseelandiae*) nests during the 2005-2006 breeding season in Otanerito Valley, Sleepy Bay gully, and Akaroa, Banks Peninsula, South I, New Zealand.

Locality	Bird(s) #	Nesting attempt	Nest fate	Cause of failure	Stage of failure
Otanerito Valley	40	1st	Fledged		
	42	1st	Failed	Unknown	Egg
		2nd	Failed	Unknown	Chick
		3rd	Failed	Fell through nest	Egg
	44	1st	Failed	Unknown	Chick
		2nd	Failed	Predation	Egg
	46/58	1st	Fledged		
50	1st	Failed	Abandoned	Egg	
	2nd	Failed	Unknown	Egg	
Sleepy Bay	62	1st	Failed	Unknown	Egg
Akaroa	66	1st	Failed	Abandoned	Egg
		2nd	Failed	Unknown	Egg

that 2 kereru re-nested after fledging chicks. These results indicate that kereru can breed successfully when fruit is not available, if there is sufficient protein-rich foliage such as legumes, or the new growth of deciduous species.

As with previous studies (Clout *et al.* 1995; Pierce & Graham 1995, Powlesland *et al.* 2003; Prendergast, 2006) it appears that predation by introduced mammals was the main cause of nest failure. Of 12 nests, only 2 (17%) produced fledglings. This fledging rate was lower than at sites in the Lyttelton Harbour Basin where chicks fledged from 35% of nesting attempts (Schothborgh 2005), but higher than reported in studies at Mohi Bush, Hawkes Bay, and Wenderholm Regional Park, Auckland where nesting success was 0% (Clout *et al.* 1995) when predators were not controlled. There were large increases in nesting success of kereru at 2 mainland sites after rats (*Rattus* spp.) and possums had been reduced to very low densities (Clout *et al.* 1995; Innes *et al.* 2004). Pierce & Graham (1995) found that 63% of nests were successful on the Chicken Is where only kiore (*Rattus exulans*) were present as against 19% at Maungatapere, a mainland site in Northland, where *R. rattus*, *R. norvegicus*, cats, and possums were present. These results suggest that control of predatory mammals could significantly increase productivity of kereru on Banks Peninsula.

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