

SHORT NOTE

Productivity of North Island kaka (*Nestor meridionalis septentrionalis*) on Kapiti Island in the 2003-2004 breeding season

JAYDEN VAN HORIK

School of Biological Sciences, Victoria University of Wellington, Wellington, New Zealand

The New Zealand kaka (*Nestor meridionalis*) is a large (45 cm) parrot endemic to New Zealand (Juniper & Parr 2003). Although once abundant on the New Zealand mainland, kaka numbers have declined since European colonisation, primarily through habitat loss and predation by introduced mammals such as rats (*Rattus* spp.), mustelids (*Mustela* spp.), cats (*Felis catus*), and possums (*Trichosurus vulpecula*) (Dilks *et al.* 2003; Moorhouse 1991; Moorhouse *et al.* 2003; Wilson *et al.* 1998). As a result, North Island kaka (*N. m. septentrionalis*) are classified as a nationally vulnerable subspecies (Miskelly *et al.* 2008) with large populations mainly confined to predator-free offshore islands.

Low productivity, such as low annual fledging rate, is commonly observed in many mainland kaka populations and attributed to mammalian predation. For example, Moorhouse *et al.* (2003) found that 80% of nests within predator-controlled areas produced fledglings compared to < 36% in uncontrolled sites. Nests are particularly susceptible to mammalian predators for approximately 2 months during incubation and fledging periods.

Another cause of low productivity is annual variability in food availability (Moorhouse 1991; 1997). The likelihood of initiating breeding in kaka and another endemic parrot, the kakapo (*Strigops habroptila*), corresponds with inter-annual variation in plant food abundance (Moorhouse & Powlesland 1991). Breeding by South Island kaka (*N. m. meridionalis*) usually coincides with beech (*Nothofagus* spp.) mast years, which occur every 2 to 5 years (Wilson *et al.* 1998). Increased food availability during mast years appears to be vital for the provisioning of offspring, and productivity is greatly reduced in non-mast years (Moorhouse 1991).

One of the largest extant kaka populations is located on Kapiti I, near Wellington (40°51'S, 174°55'E). The last introduced mammals on the island, Polynesian (*Rattus exulans*) and Norway (*R. norvegicus*) rats, were eradicated in 1997 (Fuller 2004). Productivity of kaka on Kapiti I was investigated in 1988 and 1989 (Moorhouse 1991) in the presence of rats. To determine how productivity has changed since the removal of rats, I evaluated kaka productivity on Kapiti I in the 2003-2004 breeding season. Observations were made from 27 Nov 2003 to 27 Feb 2004 and were restricted to the

Table 1. Kaka nest sites found within the Te Rere catchment. DBH refers to diameter of nest height at breast height.

Nest	Tree species	Nest height (m)	DBH (m)	Start date of nest	Finish date of nest	Duration (days)	Fate of nesting attempt
A	<i>Laurelia novaezelandiae</i>	5	0.8	27 Nov 03	16 Jan 04	51	Possibly fledged. Found after nest start date
B	<i>Laurelia novaezelandiae</i>	7	2.1	04 Nov 03	06 Feb 04	72	Suspected failure due to chick mortality
C	<i>Dysoxylum spectabile</i>	1	1.1	02 Dec 03	28 Dec 04	27	Three eggs abandoned and failed to hatch
D	<i>Melicytus ramiflorus</i>	4	0.3	12 Dec 03	29 Jan 04	48	Suspected failure due to chick mortality
E	<i>Laurelia novaezelandiae</i>	12	1.1	04 Nov 03	30 Jan 04	65	Suspected failure due to chick mortality
F	<i>Olearia rani</i>	0	0.6	15 Jan 04	26 Feb 04	42	Two fledglings preyed on or scavenged. Skeletal remains of 1 found

Te Rere catchment on the island. Within this period, 28 days were devoted to (1) finding and monitoring nest cavities that were in use during Moorhouse's (1991) study, (2) searching for new nest sites, and (3) monitoring the fates of occupied nest cavities. I located new nest cavities by observing the movement patterns and behaviour (e.g. copulation) of adults, listening for the begging calls of chicks, and by searching for cavities in tree trunks that might serve as suitable nest holes. Intervals between censuses rarely exceeded 1 week.

Six active nests were found (Table 1), 2 of which (nests C and F) were in cavities close enough to the forest floor to allow direct observation of their contents. Both nests failed. All 3 eggs in nest C failed to hatch and the nest was subsequently abandoned. Two eggs hatched in the other low nest (F) but both chicks later disappeared from the nest cavity prior to fledging and were presumed dead. The skeletal remains of 2 dead chicks, thought to have been killed by a weka (*Gallirallus australis*), were later found nearby.

Four nests were located in tree cavities too high to be observed directly. One nest (nest D) occurred in a previously located nest cavity. Adult birds were observed making repeated visits to this nest and begging vocalisations were heard several weeks later, indicating that >1 chick successfully hatched. However, adult activity halted abruptly 48 days after nest initiation, suggesting the chicks were abandoned and failed to fledge. A similar situation occurred in the other 2 high nests (B and E). Both nest sites were in previously used cavities, nesting began at both sites early in Dec, and adult activity at nest entrances ceased abruptly on 30 Jan (nest E) and 6 Feb (nest B). Because the period of nest attendance was less than the minimum 68

days required for incubation and fledging (Heather & Robertson 2000), I concluded these nests were unsuccessful.

The start date of nest A was unknown, and adult activity at the nest continued well into the breeding season, finishing in mid-Jan. Therefore, fledging was possible at this nest if nesting was initiated in mid-Oct. However, I believe that this nest also failed because no definitive evidence of fledging was ever observed, either throughout the observation period, or in periodic visits thereafter.

Assuming nest A was successful and produced the average of 4 fledglings (Heather & Robertson 2000), productivity during my study would average 0.67 fledglings per pair. Estimates of productivity prior to rat eradication ranged from 0.25 – 0.87 fledglings/pair (Moorhouse 1991). Although my sample size is small, these results suggest that productivity within the Te Rere catchment has not changed substantially since rat eradication. However, there were 2 methodological differences between my observations and Moorhouse (1991) that urge caution. Firstly, my observations were limited to a single catchment whereas Moorhouse (1991) monitored nesting over most of the island. Secondly, I was unable to see directly into higher nest cavities so the outcomes of 4/6 nesting attempts were based on indirect assessments. More direct monitoring of a larger sample sizes over a greater portion of the island is now needed to confirm whether my estimates are representative.

Moorhouse (1991) found that the main cause of nest failure in years of low plant food abundance was not predation but starvation of nestlings. It is possible that my observations were made in just such a year. This conclusion is supported by observations of kaka productivity at the nearby

Karori Wildlife Sanctuary (KWS), a predator-free "mainland island" located 50 km southeast of Kapiti I. Two pairs of kaka successfully bred in the KWS producing 5 fledglings each (*pers. obs.*). The close proximity of both populations suggests that they are exposed to broadly similar environmental conditions, except that kaka at the KWS were supplied with supplementary nectar and fruit. Since both populations lack mammalian predators, differences in their productivity presumably reflect differences in food availability. In addition, overall bird densities are lower in the KWS than on Kapiti I. Although density dependent processes are unlikely to influence productivity in the KWS, they may on Kapiti I, which has much higher bird densities. Assessing the effect of these differences may explain the low productivity of kaka on Kapiti I. However, to determine the effect of rat eradication on kaka productivity additional monitoring in a year of relatively high plant food abundance is required.

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