Distance sampling populations of New Zealand birds
—Estimating kaka and kereru abundance

The Department of Conservation monitors the population trends of bird species, particularly in response to management actions.

To date the most common methods used have been indices (particularly 5-minute bird counts) that assume simple linear relationships between the index and density and/or abundance.

Low-cost, simple-to-use indices will only detect large changes in initially abundant populations.

Methods producing absolute estimates of density and abundance, that account for probability of detection, are more appropriate if population trends are required.

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Study area and distribution of sampling points within the Waipapa Ecological Area.

Methods

Populations of kaka (*Nestor meridionalis*) and kereru (*Hemiphaga novaeseelandiae*) were monitored within the Waipapa Ecological Area (WEA) within Pureora Forest Park.

To asssess our ability to satisfy the critical underlying assumptions of distance sampling, the following field methods were applied:

- We chose point counts over transect methods because of the semi-cryptic behaviour of both kaka and kereru and the density and complexity of the forest.
- 131 survey points were distributed systematically using a 300 m grid over the 1150 ha study area.
- Each point was visited once during each sampling occasion in (or near to) October and March (2000 to 2003), between one hour after sunrise and 11:30 hours when the weather was good to maximise seasonal and diurnal detectability.
- Observers approached points with caution to avoid kaka and kereru being flushed. If this occured, the distance from this point to the count point was measured.
- We used a 10-minute period to detect all kaka and kereru observed from the count point out to a maximum radius of 100 m.
- Horizontal distances to each bird (or cluster of birds) were measured to the nearest metre using a laser rangefinder.
- Kaka and kereru flying into or over the plot area were ignored to avoid over-estimating density. Birds flying out of the plot area were only recorded if their point of origin could be identified and measured.
- Following the end of each count, the immediate area surrounding the point was checked for birds that had been present but undetected during the count period.

Data were analysed using program DISTANCE 3.5, after Buckland et al. 2001.* We considered all available models and series expansions. Model selection was based on a combination of AIC, GOF, overall variance estimates, visual inspection of histograms and model averaging procedures.

*Buckland, S.T.; Anderson, D.R.; Burnham, K.P.; Laake, J.L.; Borchers, D.L.; Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, Oxford.

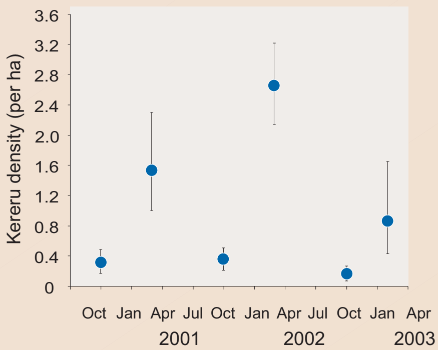
Results

Kaka density within WEA was consistently estimated at between 0.6 and 0.8 birds ha^{-1} over a 3 year period following intensive pest control. The low density figure calculated for October 2002 appears to be an artefact of very low sample size resulting in spurious model-fit precision.

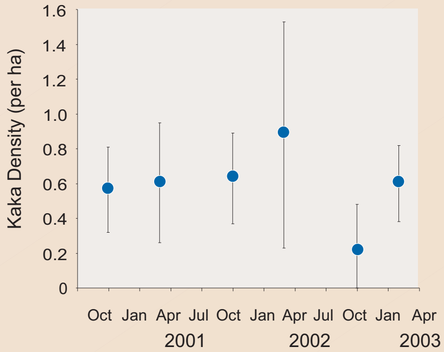
Kereru density showed marked seasonal changes in density (0.14–2.63 birds ha^{-1}) reflecting seasonal movements linked to food availability.

These results are consistent with general impressions of density, productivity and background predator levels.

Density of kereru (birds/ha) from October 2000 to February 2003.



Density of kaka (birds/ha) from October 2000 to February 2003.



Where to now?

- Potential violations of method assumptions require evaluation. The most problematic of these is the accurate measurement of radial distances within dense forest habitats. A sample size of at least 50–60 distances for each species is also required.
- Overall success of the trial has led to the adoption of distance sampling as the standard monitoring tool of kaka and kereru density within the WEA.
- The utility of distance sampling is also being assessed for other New Zealand bird species such as kakariki (*Cyanoramphus* spp.) and robin (*Petroica longipes*).

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Te Papa Atawhai

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