Breeding biology of laughing Kookaburra (Dacelo novaeguinea) in New Zealand

John Perrott

Executive Summary

In the last year we have identified six nesting areas from which we have collected nest debris and behavioural observations. From this data we have identified all animal remains within the debris. In addition, we identified the New Zealand kookaburra population range margins and distribution. We have tested tracking methods and conducted nest site protection measures at the six breeding sites (e.g., protecting kookaburra nesting sites from possum damage). We have developed and distributed media and public information packs to private land owners north of Auckland and on Kawau Island to gain access to private lands used by kookaburra. To date, we have all the prerequisite information required to apply for additional external research grants and publish one paper on kookaburra nest debris and predation of native species in New Zealand forests.

Background

Ecology is "the scientific study of the interactions that determine the distribution and abundance of organisms", hence a fundamental component of ecology is attempting to understand factors limiting species' ranges. Ranges are tightly connected to population dynamics, in that range limits are constrained by survival, reproduction and dispersal rates, and the environmental conditions allowing positive population growth constitute the fundamental niche of a given species. The relationship between niche limits with range margins is also highly relevant to evolution, as intraspecific niche evolution is necessary for range expansion and conversely range limits arise because of constraints on niche evolution via natural selection.

A mechanistic understanding of range limits requires data on the relationship between habitat conditions and vital rates (survival and reproduction) throughout species' ranges, with marginal populations expected to have lower and/or more variable rates than central populations if range limits coincide with niche limits. Such mechanistic understanding is needed for predicting changes in distributions due to species introductions or habitat change, including anthropogenic climate change. However, few such data have been collected. There has recently been increased emphasis on trying to understand factors constraining range margins by obtaining data on vital rates of marginal populations, but the data remain extremely sparse compared to the other areas of ecological research. While this dearth of data seems surprising given how fundamental the understanding of ranges is to ecology, the problem is that it is logistically impossible to collect demographic data throughout the ranges of most species.

The enigma of the New Zealand kookaburra (Dacelo novaeguineae) population provides a fantastic opportunity for research in this area. Kookaburra were introduced to several locations in New Zealand in the 1860s and 1870s, and one population has persisted over a range of about 2500 km2 on Kawau Island and the adjacent mainland. The population is well known and of great public interest, but there are no published studies on New Zealand kookaburra to compare to the large body of demographic and habitat data available from Australia. The population is enigmatic because it is unknown why they have remained constrained to such a small area. However, given that the New Zealand range of the kookaburra appears to have stayed relatively constant for 150 years and there is no obvious constraint to dispersal, it seems clear that

particular habitat conditions within this restricted range must allow for positive population growth. The population provides an ideal system for understanding the relationship between range of population dynamics because: 1) kookaburra are easily monitored; 2) we have a good prior understanding of their population ecology from several studies in Australia; and 3) we can collect intensive data throughout the population's range as well as around the margins.
We aim to not only assess how vital rates vary over the range and relate this to habitat factors, but also isolate the behavioural and physiological factors underlying this relationship. In particular, kookaburra are communal breeders with frequent siblicide within broods, hence there is reason to believe that there will be interrelationships between habitat type, food availability, helping behaviour, chicks growth and health, and siblicide frequency. In combination with data from the kookaburra's natural range in Australia, our data will be fitted to alternative niche models to understand how adaptations evolved in one habitat can become constraints following changes in niche.

Aims and Objectives

- To develop kookaburra abundance and distribution measures
- To collect breeding data from at least six breeding sites
- Collected nest debris from nest cavities
- Determined diet of chicks on the nest
- Investigate internal and external kookaburra parasites

Methodology

The methodology has not been altered from what was outlined in the research application.

Outcomes/findings

- Identified kookaburra range limitations
- Identified 6 breeding sites and gained permission to access nests
- Collected 5 nest samples and one full term nest sample
- Determined diet of chicks on the nest
- Discovered a new genus of lice in New Zealand parasitising kookaburra

Conclusions

This project has provided new information on kookaburra ecology in New Zealand. In particular, we have identified a variety of New Zealand native species prone to kookaburra predation. Results suggest that adult kookaburra are predating relatively large numbers of native geckoes and birds from our forests. This information is presently being used by the Department of Conservation to develop a kookaburra management plan. We have 20 nest boxes at breeding locations and we hope to have kookaburra using these artificial nesting sites this breeding season (Nov 2011- May 2012). This will allow for better monitoring of nest sites and control of possum damage.

To date, we have already collected preliminary data on range margins and distribution of the New Zealand kookaburra population, as well as data on dietary components and nest survival. Therefore, we have already ascertained that the research is feasible, and have prior data that can be used to develop plausible models. We anticipate that a by-product of our research will be development of improved methods for identifying behavioural and physiological constraints underlying range declines of native New Zealand species, and therefore improved diagnostic tools for species recovery programmes.

Recommendations (optional)

This research and the results link directly into the teaching of the Bachelor of Applied Science students and helps creating interesting negotiated studies for 3rd students.

Publications and dissemination

We have two papers in progress for submission to Notornis Journal this year. The first paper outlines information collected from nest debris and reports the high numbers of endangered geckos in kookaburra nests. The second paper is still in progress and will outline the heath/disease status of New Zealand kookaburra.