Assessing the use of artificial nests for predicting predation pressure in New Zealand forest fragments

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THESIS ABSTRACT

Using artificial nests to predict the predation pressure on natural bird nests has been the subject of over 400 publications, the vast majority quantifying aspects that affect nest success. However, these studies have usually invoked the assumption that artificial nests accurately reflect the success of natural nests. The intention of this thesis was to evaluate the technique of using artificial nests to predict natural nest success, with the aim of establishing the main factors influencing its success as a monitoring technique. This was done by addressing three main questions a) Can artificial nests be used to predict natural nest success in forest fragments?, b) What aspects of the methodology influence the precision, practical application and interpretation of the results from artificial nests in New Zealand forest fragments?, c) What external factors, i.e. habitat structure, confound interpretation of artificial nests results in New Zealand forest fragments?

Artificial nest experiments were conducted concurrently in nine reserves, with estimates of nest success calculated for each reserve using the known fate model in MARK. These estimates were then correlated with the success of North Island Robin nests (estimated using Stanley's (2000) method of stage specific nest success) in the corresponding reserves. General linear modelling was used to fit a log-log relationship between artificial and natural nest success estimates using parametric bootstrapping to account for error in the estimates. The Akaike's Information Criterion (AIC) model selection procedure was used to select the model for estimating both artificial and natural nest success and for selecting the best model for predicting natural nest success using artificial nests.

The evidence from the results revealed that artificial nests could be used to predict natural nest success. However, imperative to achieving this result was having the ability to identify and conduct independent analysis for each predator group (all predators, 'rats and possum', birds and mice). AIC selection

procedure selected nest success estimates derived from predation by rats and possum as the most parsimonious model, hence the best at predicting natural nest success.

Investigation of methodology showed that: (1) data from artificial nests left out for one week gave better predictions than data collected over four consecutive weeks; (2) leaving nests out longer than one week before checking increases the chance of the marks becoming obscured, hampering predator identification; (3) adding a quail egg has little effect on predation rate, particularly on the rate of predation by mammals; and (4) it is necessary to include clay eggs in artificial nests as marks left on quail eggs and damage done to artificial nests were not reliable indicators of predator type.

Investigation of external factors revealed: (1) no strong or consistent evidence that the fine-scale habitat at nest sites affected predation on artificial nests; (2) reserve size may affect the rate of rat and possum predation, but not bird predation; and (3) the proximity of artificial nests to a bait station may influence the rate of predation by mammals.