Population Dynamics of the Saddleback Population on Mokoia Island and Implications for reintroduction to the mainland

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Abstract

The saddleback (*Philesturnus carunculatus*) is an endemic New Zealand forest bird that no longer occurs on the mainland. It is thought that predation from introduced species (especially rodents) led to its extinction except on offshore islands. In April 1992, 36 saddlebacks were released onto Mokoia Island, a 135 ha island in Lake Rotorua. Using data collected from this population over the following five and a half years, I estimated parameters to describe the population's demography.

Survival was modelled by mark-recapture analysis, using re-sighting data for banded birds. Survival was found to be age dependent, with two classes, adult and juvenile. The juvenile age class consisted of birds in their first nine months. All other ages were treated as adult. Adult survival was density independent, while juvenile survival was density dependent. The juvenile survival rate was initially close to the adult rate, but declined as the number of pairs on the island increased. There was a male bias in the sex ratio of birds surviving their first nine months, but the cause for this was not ascertained.

Reproductive success was related to the age of the parents, with two classes for both males and females. For both sexes, first year breeders produced fewer fledglings than older birds. A density dependent decline in the population's reproductive success was also found.

Using parameter estimates that took these factors into account, I created a model to simulate the Mokoia Island saddleback population. My model predicted a mean population growth trajectory that closely matched the observed population growth on the island. After the establishment phase (a period of rapid growth) the simulated population reached a mean density of 103 pairs, with 44 unpaired males, around which the population fluctuated.

Once the basic model structure had been established, I added a routine to simulate the poison drop that occurred on island in September 1996. Using mark-recapture analysis, I estimated that the poison drop killed 27% of the birds. However, the simulations model predicted that this mortality would not affect the population's viability.

I altered the model structure so that effects of predation could be included, to simulate a reintroduction onto the mainland. I also added annual and biennial poisoning regimes to see if these could be used to counteract the effects of predation, and at what predation levels they would prove beneficial to the saddleback population. To do this I assumed that a poison drop would result in no predation for six months, then predation would return to normal levels. Annual poisoning was better at increasing the population's viability than biennial poisoning, but neither allowed the population's persistence at predation levels that would probably occur on the mainland.

I also looked at the effects of harvesting the island population, to see what the maximum sustainable rates were. The results from this indicated that the up to 139 birds could be harvested from the population at a single occasion without affecting population's viability, if the population was left to recover afterwards.

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