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Additional case-studies from around the globe

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Translocation of lesser short-tailed bats to Kapiti Island, New Zealand: release site suitability and post-release monitoring

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Introduction

The lesser short-tailed bat (*Mystacina tuberculata*, hereafter 'short-tailed bat') is considered Vulnerable by the IUCN, partly due to predation from introduced mammals. The New Zealand Department of Conservation's (DOC's) management plan includes establishing populations on islands free of pest mammals (Molloy, 1995). A small, genetically distinct population was recently discovered in the Tararua Ranges in the south of North Island (Lloyd, 2003). DOC considers this population to be an evolutionarily significant unit, and lists it as Nationally Critical (Hitchmough *et al.,* 2007). To help secure the lineage DOC translocated twenty bats to Kapiti Island, a nearby pest-free island (Ruffell & Parsons, 2009). The few bat translocations that have been attempted elsewhere have failed. Bats have the ability to home, and dispersal from the release site was demonstrated or suggested as the cause of failure of several previous bat translocations (Ruffell *et al.,* 2009). As such, DOC's translocation protocol used techniques to reduce the likelihood of dispersal following release. These included the release of captive-reared juveniles to minimize any imprinting on the source location, a two-month captive period in an aviary at the release site to reduce the stress of translocation and encourage imprinting on the release site, and the provision of supplementary food and roosts inside the aviary following release. The translocation was conceived and implemented by DOC. Our role in the translocation was habitat assessment prior to release and post-release monitoring in the year following release, and this report is restricted to these topics.

Lesser short-tailed bat in the aviary prior to release

Goals

- Goal 1: Prior to release, assess the suitability of

Typical habitat quality at the release site

Kapiti Island as a release site for short-tailed bats in terms of its ability to provide roosting habitat. This was a potential issue because the species roosts communally in large, old-growth trees, whereas much of the island's forest is regenerating (Ruffell & Parsons, 2007).

- Goal 2: Assess the short-term success of the translocation, by 1) determining whether bats remained on the island following release and 2) determining if bats maintained condition in the 12-months following release (Ruffell & Parsons, 2009).

Success Indicators

- Indicator 1: Roosting habitat would be considered suitable if suitably-sized cavity-bearing trees occurred at densities similar to those in forests supporting natural short-tailed bat populations (Ruffell & Parsons, 2007).
- Indicator 2: The translocation would be considered successful in the short term if bats remained on the island and maintained bodyweight in the 12-months following release. Breeding of released individuals would also indicate short-term success, but absence of breeding would not constitute failure because it is unknown whether short-tailed bats breed in their first year of life (Ruffell & Parsons, 2009).

Project Summary

Feasibility: The feasibility stage of the translocation was carried out by DOC and is outside the scope of this report, with the exception of the assessment of the suitability of roosting habitat on Kapiti Island. We sampled cavity-bearing trees in each major habitat type and classified them as potentially suitable roosts if tree and cavity dimensions fell within the range of those of known short-tailed bat roosts. We estimated that the island contained thousands of potentially suitable roost trees, and concluded that roosting habitat on Kapiti Island should be able to support a population of short-tailed bats (Ruffell & Parsons, 2007).

Implementation: The implementation stage of the translocation was carried out by DOC and is outside the scope of this report. Release methods are briefly described in the introduction.

Post-release monitoring: We monitored the translocation in the year following release to determine whether bats remained on the island and maintained condition (body weight) (Ruffell & Parsons, 2009). We used three methods to

Diseased bat with inflamed & scabbed ears

determine how many bats remained on the island following release. First, the aviary (in which they were kept prior to release) was left open following release, and we monitored its entrance each night with an infra-red video camera. By keeping track of every entrance and exit following release we could determine the number in the aviary at any time. The maximum number found in the aviary then gave a lower limit of the number of bats on the island at that point in time. Second, we marked bats by catching them when they roosted in the aviary (but no more than once per week), or by harp-trapping at night in the area surrounding the aviary. The number marked also established a lower limit of the number that remained on the island. Third, we radio-tagged two individuals prior to release so that we could track them if other methods failed. The maximum number of bats found in the aviary by video monitoring was ten, three days after release. The number caught and marked was nine, and these bats were all still alive eight months after release. Both bats fitted with radio-transmitters remained on the island following release (Ruffell & Parsons, 2009).

We monitored the condition of the bats by weighing them whenever they were caught, and tested whether the bats lost weight over time. In addition, supplementary feeding progressed from nightly, to periodic, to no feeding, and we tested if weights varied across these feeding regimes. Bats did not show a significant trend in weight loss when regressed across time, although a decrease in weight between periodic supplementary feeding and no feeding bordered on significance. However, weights of bats at the end of the study were well within the range of weights of bats from natural populations (Ruffell & Parsons, 2009). Although bats appeared to maintain normal weight, all bats captured eight months after release had scabbing on the distal ends of their pinnae, some had infected skin beneath, and two were balding. The bats were held captive in the aviary and examined by a vet, who prescribed a course of antibiotics and anti-parasite medication. At this point the study ended (Ruffell & Parsons, 2009). Bats were later re-released by DOC, but were returned to captivity permanently when the problem recurred (J. McIntosh, pers. comm.). A team of vets working on the problem has been unable to determine its cause (L. Adams, pers. comm.). However, two aspects of the translocation may have increased the likelihood of disease. First, captive-reared juveniles may have been prone to disease because they were immunologically naive to environmental pathogens. Second, the bats used the aviary extensively following release, whereas natural populations

Bat with balding on the ventral surface

change roosts frequently, possibly to prevent a build-up of pathogens and parasites (Ruffell & Parsons, 2009).

Major difficulties faced

- Post-release monitoring was made difficult by the fact that short-tailed bats are highly vagile and difficult to observe in the wild. Our monitoring focused on the area surrounding the aviary because bats could most easily be captured and video-recorded there. However, we have no information on any bats that may have remained on the island but left the area of the aviary.
- Detecting change in the condition of the population was made difficult by small sample size, and by the fact that bodyweight may not have been a sufficient indicator of condition. We were unable to statistically detect a loss of condition based on bodyweight measurements, despite the fact that by the end of the study all bats were diseased.
- We were unable to identify the cause of the disease which affected all bats captured at the end of the study. This made it difficult to understand how best to manage the problem, to predict whether it would affect the success of the translocation, or to make changes to the translocation protocol so as to minimize the likelihood of disease in future attempts.
- DOC conducted the feasibility and implementation stages of the translocation, and we cannot comment on any difficulties that may have been faced at these times.

Major lessons learned

- Short-tailed bats can be kept at their release site and survive initially following translocation using DOC's release protocol. This is the first demonstration that any species of bat can be translocated, and DOC's release protocol may be applicable for translocations of other species of bat (Ruffell & Parsons, 2009).
- The aviary was invaluable for post-release monitoring because it provided a location from which bats could reliably be observed and captured. Without the aviary it would have been exceptionally difficult to establish how many bats remained on the island or to monitor their condition. Because bats are generally highly vagile and difficult to observe this would be true for translocations of other species (Ruffell *et al.,* 2009). However, use of the aviary may have contributed to the disease observed (Ruffell & Parsons, 2009).
- Disease was the determinant of the translocation's outcome. We are uncertain whether this was a random event or if disease would be likely to occur in future

translocations. It is possible that factors such as immunological naivety or high use of the aviary increased the likelihood of disease, and modifying the translocation protocol to avoid these factors could increase the likelihood of long-term success in future translocations (Ruffell & Parsons, 2009).

Success of project

Highly Successful	Successful	**Partially Successful**	Failure
		√	

Reason(s) for success/failure:

- All previous translocations of bats had failed, with dispersal from the release site the likely cause in several cases. Our study provided the first evidence that bats can remain at the release site and survive initially following translocation (Ruffell & Parsons, 2009).
- The translocation was ultimately unsuccessful, with DOC taking bats into captivity due to disease (Ruffell & Parsons, 2009).

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