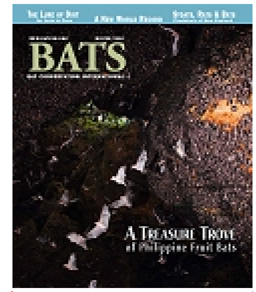
VOLUME 24, NO. 4 Winter 2006



View PDF version [3.05 MB]

Stoats, Rats & Bats

Moira Pryde

Introduced predators threaten New Zealand's long-tailed bat

The sight of long-tailed bats swarming around a tree as they return to their roost at dawn is an enchanting experience that you want to share and protect for generations to come. But, sadly, it is becoming a rare occurrence in New Zealand. Our analysis, based on a decade of capture data, suggests it may disappear completely from some areas within 50 years. Yet our study also points the way to saving this beleaguered bat.

New Zealand, a nation of two large islands and many smaller ones, presents unique environments and conservation challenges. Isolated from other landmasses for more than 80 million years, the islands are home to native flora and fauna found nowhere else. Animals evolved in a world free of mammalian predators – until the arrival of humans.

Polynesian rats arrived with the Maori people about 1,000 years ago, followed 850 years later by ship rats that hitchhiked on European ships. The rats thrived, wreaking havoc on native birds, bats and lizards. Rabbits were introduced by farmers in the mid-1800s; fierce, weasel-like stoats were brought in to control the rabbits in the late 1800s. Stoats also prey on a variety of ground-nesting birds, including kiwi, and on bats. In all, about 65 non-native mammal species have been introduced to New Zealand.

Three bat species are native to New Zealand. One, the greater short-tailed bat (*Mystacina robusta*), was last reported about 1965 and is now considered extinct. The other two – the lesser short-tailed bat (*Mystacina tuberculata*) and the long-tailed bat (*Chalinolobus tuberculatus*) – are declining. They are the country's only native terrestrial mammals.

The long-tailed bat is a small, insect-eating species that evolved in isolation in New Zealand for at least a million years. The Department of Conservation classifies it as endangered, and recent research suggests it is struggling to survive in a land of introduced predators.

The species, which roosts in cavities of tall trees, was widespread throughout both islands of New Zealand in the 1800s, but it clearly was in decline by the 1930s. By the 1990s, South Island surveys revealed that long-tailed bats were regularly encountered in only two areas: the Eglinton and the Dart valleys, both in the Fiordland region.

Declines have been blamed, in part, on the loss of roosting and foraging habitat because of logging and land clearing. But sharp declines also have been documented in areas with little forest modification, suggesting that something else is the main culprit. Introduced predators are the prime suspects.

The rugged Eglinton Valley has been the hub of long-tailed bat research – led by Department of Conservation scientists Colin O'Donnell and Jane Sedgeley – since 1993. I joined the team in 2001, and in addition to fieldwork, I was given the challenging job of

analyzing the mark-recapture data.

So little was known about the long-tailed bat that the initial bat research examined breeding, productivity, population structure and roost selection. As a byproduct of that study, an invaluable long-term, mark-recapture dataset developed, allowing us to investigate population trends. The research showed that the breeding season is highly synchronized, with a single pup produced each year.

Bats captured in harp traps were fitted with transmitters, then followed each night until their transmitters fell off, usually after about two weeks. Roosts were identified at dawn or dusk as the bats flew in or out of the trees, and bats usually changed roosts each day. At some roosts, a harp trap could be hoisted up into the tree and placed in front of the roost entrance to catch all emerging bats. All captured bats were also fitted with individually numbered aluminum bands.

Technology greatly improves the study of small bats such as the long-tailed bat. Tiny radio transmitters, ultrasonic bat detectors, specialized harp traps and miniaturized infrared cameras in the Eglinton project allowed us to dramatically enhance our knowledge of the behavior, habitat use and distribution of the species. Robust new methods of analysis, coupled with powerful computer software (MARK 3.0 in this project), led to much better understanding of population statistics and survival rates.

We used these powerful tools to analyze 10 years (1993-2003) of live-animal recaptures (5,286 captures representing 1,026 individuals) and estimate year-to-year survival rates in this wild population. Our computer model examined key factors believed to affect survival: age, sex, subpopulation, time, winter temperature and the density of introduced predators.

We discovered that survival was higher among adults than juveniles and among females than males. Our analysis showed that survival varied by subpopulation, winter temperature and introduced predators. We also found that each of the three subpopulations in the study had significantly lower survival in 1996, 2000 and 2001 – years in which rat populations were unusually high.

Eglinton valley forests are dominated by beech trees, which flower and seed heavily at irregular intervals, usually three to five years. These heavy-seeding periods, known as "mast years," increase the food supply for introduced mice and rats, often producing a sudden increase in their populations. This results in prolific breeding of stoats, the next link up the food chain, in the following season, with each adult female raising up to 13 young in years of abundant food.

The Eglinton study found that predator numbers were especially high in three years out of the 10, including the uncommon phenomenon of two consecutive heavy mast years in 2000 and 2001.

Low-intensity stoat control was attempted in 1998, with traps placed at 656-foot (200-meter) intervals along the length of the valley. This was enough to protect kaka, a large parrot that lives in the valley, but did not lower the numbers of rats or protect smaller birds and long-tailed bats.

To determine the long-term viability of the long-tailed bat in the Eglinton Valley, we combined the survival figures and levels of productivity (birth rate) in a population

analysis. The results were daunting. Our analysis projects that, with the current scenario of three predator-increasing mast years in 10, the population will decline an average of 5 percent per year. Extinction is highly probable within 50 years. Worse, the three-in-10 scenario may not hold: Temperatures and the frequency of mast years are increasing in New Zealand, apparently as a result of climate change, so higher predator numbers are likely to become more common.

However, our analysis also suggests a solution. An effective management plan can not only halt the decline but, according to our data, allow the population to grow sharply over the next half-century.

We will need to monitor beech flowering to predict when high-predator years are likely, then very aggressively control introduced rats and stoats at those times. Our results also suggest that the major focus of predator control should be on protecting bat maternity roosts as the key to species survival.

As our mark-recapture study continues, we will begin putting our recommendations to the test in the hope of proving that targeted predator control can save the long-tailed bat. We are hopeful that someday those dramatic early-morning swarms of returning bats will no longer be a rare occurrence in the Eglinton Valley.

MOIRA PRYDE is a biologist at the New Zealand Department of Conservationâ€™s Southern Regional Science Center in Christchurch, New Zealand.

All articles in this issue: