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**The ecology of ship rats (*Rattus rattus*) on Ponui
Island: implications for North Island brown kiwi
(*Apteryx mantelli*)**

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A thesis submitted in fulfilment of the requirements for the degree of
Master of Science in Biological Science

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Drawing by Silver Bishop

The University of Auckland

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Abstract

This research investigated the population dynamics and habitat use of a ship rat population on Ponui Island, in the Hauraki Gulf. Ponui Island is also home to what is thought to be one of the highest densities of North Island brown kiwi (*Apteryx mantelli*) in New Zealand. A recent investigation discovered an overlap in the number and type of surface-dwelling invertebrates in the diet of kiwi chicks and ship rats. However, with the majority of the kiwi chick diet being formed of soil-dwelling invertebrates it was concluded that this competition may only be manifest in times of dry weather or poor soil condition. In times such as these, kiwi chicks, having shorter bills than adults, may have a reduced ability to probe the soil and so rely more upon surface-dwelling invertebrates to form the bulk of their diet. Potential competition will depend on the density and distribution of ship rats, kiwi chicks and invertebrates on Ponui Island. This research aimed to continue investigation into the ship rat population on Ponui Island with the overall outcomes of assessing the scale of potential competition in months subsequent to those in which observations were initially made, and adding to the body of knowledge on ship rat island populations.

This investigation had three individual aims. First, the population density of ship rats was estimated during the winter/spring of 2005, a period where previous density estimates were lacking. Comparison between estimates was then made. Second, home ranges of ship rats on Ponui Island were calculated after radio-tracking a sample of ship rats. In addition the extent to which the ship rats fully utilised the available three dimensional habitat was assessed. Third, the proportion of vegetation in the ship rat diet was accurately quantified to assess its importance in the diet relative to other food types, such as invertebrates that are also consumed by kiwi.

Population density of ship rats on Ponui Island was higher than estimates made in the same area seven months previously. This increase is believed to be due to recruitment after the recent breeding season. Ship rats on Ponui Island were found to occupy smaller home ranges than previously recorded for the species on the mainland, perhaps due to the high density estimated within the study area. Ship rats were highly arboreal in December, with this arboreality proposed to lessen during autumn and winter.

Vegetation was more important to the ship rat diet on Ponui Island than was previously thought; however it remained the minor constituent with the diet dominated by other material presumed to be invertebrate.

The predominance of what is assumed invertebrate material in the ship rat diet suggests a high reliance on this food type, and thus there is potential for overlap in ship rat and kiwi chick diet to occur during that time. The high population density estimated in this study means more ship rats are sharing habitat with kiwi than previously thought. This would imply increased intensity in potential competition at this time. However, the high degree of arboreality observed in ship rats is suggestive of reduced competition during this time due to differences in foraging style between kiwi chicks and ship rats. Although the adult forms of larval invertebrates that are important to kiwi chick diet will remain accessible to arboreal ship rats, thus it was concluded that differences in foraging style do not necessarily equate with decreased competition.

Findings of this study are discussed in relation to the design of future ship rat management strategies, and are also used to evaluate the scale of potential competition between ship rats and kiwi chicks.

It is recommended that similar investigation of the population of ship rats, combined with quantification of the invertebrate fauna biomass, be conducted on Ponui Island for twelve consecutive months to ascertain fluctuations in the scale of competition between ship rats and kiwi.

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