

# Ship rat *Rattus rattus* eradication on Nahkapw Island, Federated States of Micronesia, Pacific Ocean

Alexander Wegmann<sup>1\*</sup>, Jalene Braun<sup>1</sup> & Rachel Neugarten<sup>2</sup>

<sup>1</sup> *Island Conservation, Island Conservation, Center for Ocean Health, University of California, 100 Shaffer Road, Santa Cruz, California 95060, USA*

<sup>2</sup> *The Nature Conservancy, 821 SE 14<sup>th</sup> Avenue Portland, OR 97214, USA*

\*Corresponding author e-mail: [alex.wegmann@islandconservation.org](mailto:alex.wegmann@islandconservation.org)

## SUMMARY

As part of a larger project attempting to reduce predation pressure from introduced rats *Rattus* spp. on native fauna and flora on several islands off Pohnpei main island (Pacific Ocean), a rat eradication program was undertaken on the small island of Nahkapw (1.58 ha). Prior to commencement of eradication, a pre-treatment rat population assessment was undertaken; only a single female ship rat *R.rattus* was caught (subsequently fitted with a radio-collar and released) and wax indicator success was also very low, suggesting that the island hosted a very low density of rats.

Bait-stations were positioned on the ground along two transects that ran the length of the island spaced approximately 20 m apart; the distance between the two transects varied but was never less than 10 m or more than 30 m. After 2-weeks of inactivity, these stations were supplemented with 22 bait stations attached to tree trunks adjacent to each ground-based bait station. These tree bait stations were maintained until the radio-collared rat died (25 days after initial bait placement). There was no evidence of non-target species being adversely affected by the bait.

## BACKGROUND

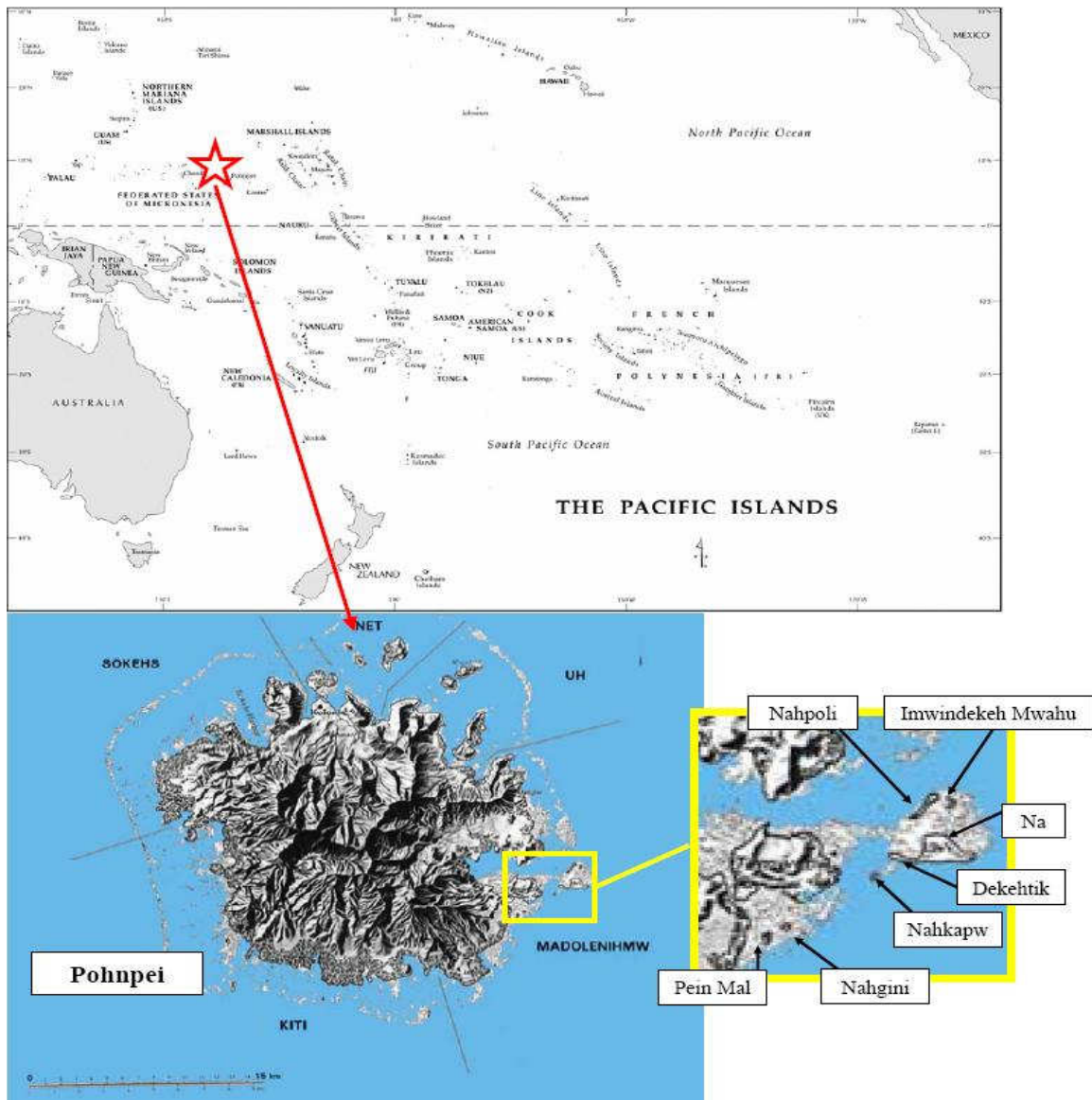
Considered the “emerald” of Micronesia, Pohnpei, including its surrounding smaller islands, is a lush, green oceanic island formed five million years ago by turbulent volcanic activity. The islands are home to a wide variety of natural marine and terrestrial habitats including barrier reefs, lagoons, mangrove forests and upland forests. It is one of the wettest places on earth, with an average annual rainfall in excess of 1,000 cm (400 inches). Pohnpei’s dwarf cloud forests are altitudinally among the lowest in the world at 450 m, and the volcanic bowl of the island boasts the largest intact lowland tropical forest in the world. These habitats support a remarkable abundance of unique flora and fauna, with 16% of species being endemic, including the Serehd or Pohnpei lory *Trichoglossus rubiginosus*, and the tiny Pohnpei mountain skink *Emoia ponapea*.

Unfortunately, over the past 25 years, deforestation for agricultural purposes has reduced the interior rainforest of Pohnpei by more than 25%, and as well as habitat loss and degradation, native plant and animals are being further threatened through predation and competition from introduced non-native species, e.g. alien rats *Rattus* spp., feral pigs *Sus scrofa*, feral cats *Felis catus* and Philippine sambar deer *Cervus mariannus*. Tropical oceanic islands represent some of Earth’s most biologically unique ecosystems, yet the very remoteness that fuels high levels of endemism and fantastic species radiations also renders such systems vulnerable to invasive species (Mooney & Cleland 2001, Rodriguez *et al.* 2006). Invasive mammal eradications are a proven, effective method of restoring damaged ecosystems and preserving biodiversity (Townes & Broome 2003, Zavaleta *et al.* 2001).

Within the scope of a larger study, The Conservation Society of Pohnpei (CSP) and Island Conservation (IC) selected three of five small islands for rat eradication which constituted the Pohnpei Rat Eradication Research Project: Dekehtik (2.63 ha), Pein Mal (2.17 ha), and Nahkapw (1.58 ha) (Fig. 1). A fourth island, Nahpoli, was selected as a control where no rat eradication attempt was undertaken. Island selection was based on the following criteria: presence of rats, lack of human habitations, a distance of no less than 0.5 km from Pohnpei, and accessibility to the project team undertaking the work. This case study describes attempts to eradicate ship rats *R.rattus* on Nahkapw Island.

**ACTION**

**Study area:** The rat eradication attempt took place January and February of 2007 on Nahkapw Island (1.58 ha), one of several small islands adjacent to Pohnpei (Fig. 1.), Federated States of Micronesia, Pacific Ocean. Nahkapw is a small, rocky island (maximum elevation 3 m a.s.l.) with a dense mixed coconut palm *Cocos nucifera* and tropical broadleaf tree forest, approximately 500 m from Pohnpei main island. Unlike nearby Dekehtik Island, which is only 150 m away and where only Pacific rats *R.exulans* were present, only ship rats *Rattus rattus* were found on Nahkapw.



**Figure 1.** Map of study area; Nahkapw lies 500 m off Pohnpei main island.

**Pre-treatment rat population assessment:**

Prior to initiating the eradication attempt, an assessment was made of the rat density on Nahkapw over a 3-day period (23-25 January) using a combination of live traps and wax indicator chew blocks. Only one rat (*R. rattus*; adult female) was caught and wax indicator success was very low, suggesting that the island hosted a low density of rats.

**Treatment:** Given the low rat density, rather than hand-broadcast rodenticide across the entire island at an application rate of 50 kg/ha as undertaken on two nearby islands harboring higher rat densities (Wegmann *et al.* 2008a, Wegmann *et al.* 2008b), on 30 January, 22 Rat-Go™ Elevated Bait-stations (Marine Endeavors) were positioned along two transects that ran the length of the island (Fig. 2). The bait stations were spaced approximately 20 m apart while the distance between the two transects varied with the shape of the island, but was never less than 10 m or more than 30 m. Bait-stations were checked frequently (daily if possible) for visitation, bait presence, bait condition (mouldy, crumbly, etc.), and station-condition. Because these ground-based bait stations did not experience any activity for the first 2 weeks, 22 wax-based bait stations (identical to the bait stations used in the mangrove forest on Pein Mal; Wegmann *et al.* 2008b) were attached to tree trunks (1.5 m to 2 m above ground level) adjacent to each ground-based bait station (Fig. 3). These tree bait stations were maintained until the one radio-collared rat died. The bait-station placement was considered tight enough to ensure that all rats had access to at least one station.



**Figure 2.** Marine Endeavor bait station, Nahkapw Island.



**Figure 3.** Tree bait station.

**Effect of bait on non-target species:** During the course of the project three methods were used to assess any associated effect of the rat bait on non-target species, including bats, birds and land crabs. The researchers performed pre- and post-application index of abundance surveys, in combination with observations and carcass searches to assess if there were direct effects of the rodenticide bait on native wildlife.

**Monitoring:** To monitor eradication efficacy, three methods were used: live-trapping, wax chew blocks, and radio telemetry. Live trap transects paired with wax chew blocks were randomly established and opened prior to activation of the bait stations and were kept open for the remainder of the project to monitor rat presence throughout the island. The sole trapped rat was fitted with a radio-collar to observe rat movement, behavior, and circumstance of mortality if applicable.

## CONSEQUENCES

On Nahkapw, only a single ship rat was caught in a live trap prior to activating the bait-stations. Trap success (rat captures/ trap nights) prior to bait-station activation was 4%. The first record of bait take from a station occurred 14 days after the stations were activated but post bait-station activation trap success was 0%.

Rat traps on Nahpoli (the reference island) were opened at the same time as traps on Nahkapw. After the active bait-station period on Nahkapw, the traps on Nahpoli caught rats, while no rats

were caught on Nahkapw. The trap success on Nahpoli indicated that the lack of rat detection on the Nahkapw was an isolated circumstance, and a likely result of the eradication.

Pre-bait application wax indicator success was 13%. Post-bait application wax indicator success was 4%, including rat chew marks found while bait-stations were active. Rat eradication indicator success on Nahkapw is summarized in Table 1.

The radio-collared rat on the island was active prior to bait application and was found dead within 25 days after activation of bait stations. At six months post-bait application, the live trap and wax indicator stations were reactivated and kept open for 3 days; no rats were detected.

bait-stations armed with 25 ppm brodifacoum bait appeared an effective eradication method on Nahkapw, as 6-months post-bait application, monitoring detected no rats.

Bait-station eradication projects should allow time for rats to become acclimated to the bait-stations. Because of our tight operational timeline, we were not able to “field-season” the bait stations for this eradication project; in an ideal setting, bait stations are placed at the eradication site 1-2 months prior to activation to allow rats to “acclimatize” to them.

Rats at low densities are difficult to detect; therefore it is prudent to employ several detection methods (e.g. live traps, wax chew blocks etc.) in the pre and post eradication efficacy testing phases.

**Table 1.** Rat eradication indicator success on Nahkapw.

Bait period and indicator technique	% trap/ indicator success
Pre-bait application trap success	4%
Post-bait application trap success	0%
Pre-bait application wax block indicator success	13%
Post-bait application wax block indicator success	4%

**Effect of bait on non-target species:** Non-target interference with traps was moderate to high (45%). Landbirds, shorebirds and bats that forage on land could potentially be at risk of exposure to the applied bait, although 28 person hours spent searching for carcasses failed to detect any dead or moribund non-target species. Land crabs, which commonly interfered with the live traps and bait, are not affected by the bait used. The bait-station design used was also such that whilst rats had easy access to the bait, most non-target species were effectively excluded from it.

**Conclusions and discussion:** Pre-eradication live trapping showed that Nahkapw was home to at least one adult female ship rat. Radio-tracking indicated that this individual persisted for 25 days post bait-station activation before being found dead, yet the live traps failed to recapture this rat or capture any other rats, and the indicator blocks showed very low levels of rat activity. Despite this low recorded activity, the

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