Eradication of the Black Rat *Rattus rattus* on Nishijima, a small Island in the Ogasawara Islands

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Backgrounds

Nishijima is a small (0.5km^2), uninhabited island near Chichijima Is (Fig. 1). This island has a special significance for the conservation of native flora and fauna of the Ogasawaras, because it has not been invaded by some destructive alien species including the lizard *Anolis carolinensis* and the planarian *Platydemus manokwari,* which are dreadful predators of insects and landsnails, respectively. However, the black rat *Rattus rattus* has been making an impact on the ecosystem of Nishijima particularly by destroying fruits or seeds of native plants. Insects or other arthropods are also included in the potential menu. Further, the rat has invaded many islands of the Ogasawaras, causing various problems in the native ecosystem as is reported in various parts of the world. Our aim was to develop an efficient, but ecologically sound program of eradication of black rat.

Fig. 1 Nishijima Island (left) and main islands of the Ogasawaras (right)

Methods of eradication

Bait box: The population of the black rat on Nishijima was estimated at about 2,500 by a Lincoln-Peterson estimator, a standard mark and recapture method. This population size made it impractical to eradicate rats simply by traps without using raticide. Although aerial applications of raticide are relatively common and effective, we used a bait box (Fig. 2) , which was developed for this purpose, to apply a raticide on the island. This was to minimize the probability that the would fall into the sea or it would be eaten or scattered by non-target animals (e.g. birds or hermit crabs) .

Raticide: The raticide we used was "Yasojion®" (Fig. 3) which includes diphasinone (2-diphenylacetyl-1,3-indandione) as the active ingredient. Diphasinone is an anti-coagulant, and has been widely used for rat control; toxicity to birds or invertebrates is reported to be much weaker than to rodents. No mammals inhabited Nishijima other than black rat.

Procedure: A total of about 600 bait boxes were fixed on the ground over the island (Fig. 4) from March 3 to 8, 2007, and they were baited with the raticide from March 9 on. Pellets of the raticide were placed at the middle of the horizontal tube. Bait boxes were visited almost every day until mid April, and the quantity of lost pellets were recorded to estimate the rate of consumption by the rat. Depleted pellets were reloaded at every visit. Inspection of bait boxes and replacement of the raticide were continued through September, though at a much decreased rate (1 to 1.5 visit per month). Because black rat populations were found reestablished in June 2009, Ministry of Environment made aerial application of raticide in January to March 2010.

Fig. 2 Bait station. Scale: 10cm

Fig. 3 Pellets of the raticide used (circled, about 1cm in diam.)

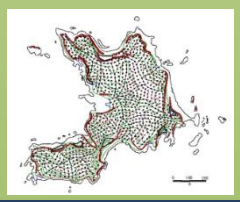


Fig. 4 Bait stations placed all over Nishijima, as indicated by small dots (about 800 in total).

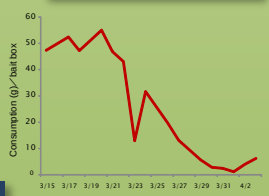
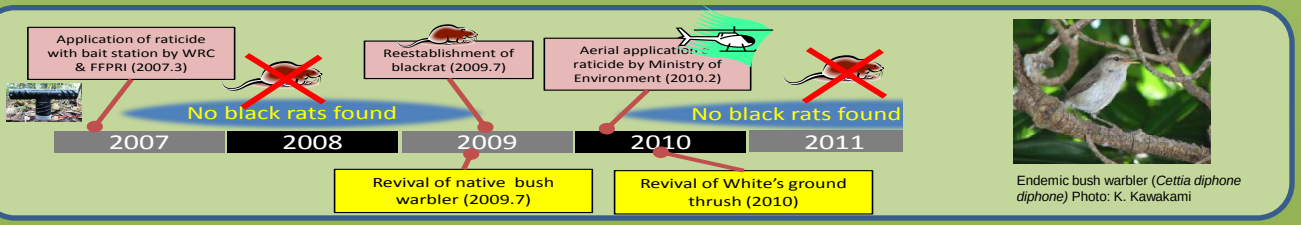


Fig. 5 Changes in the average consumption rate of raticide.

Results

The first rat which was diagnosed as killed by the raticide was found on March 15., one week after the beginning of the operation. The consumption rate of raticide pellets gradually decreased after the first two weeks, becoming nearly zero at the end of March (Fig. 5).

The monitoring of rats or their sign was regularly made from April to October. We thus tentatively concluded that the eradication of the black rat was accomplished. However, black rats were found again in June 2009. Ministry of Environment then decided to practice aerial application of raticide with helicopters in February 2010. Thereafter, no black rats have been found until now. Meanwhile, some native bird species, which had been long absent on the island, have reestablished populations there. This clearly shows positive effects of intensive control of alien invasive species on native biota.



Endemic bush warbler (*Cettia diphone diphone)* Photo: K. Kawakami