The eradication of *Rattus rattus* from Monito Island, West Indies

M. A. García, C. E. Diez, and A. O. Alvarez
Bureau of Fisheries and Wildlife, Puerto Rico Department of Natural and Environmental Resources, P.O. Box 9066600, San Juan, P.R. 00906-6600. E-mail: miguelag@umich.edu

Abstract Monito Island (15 ha) is located between Puerto Rico and Hispaniola (West Indies). The island is inhabited by the endemic Monito Island Gecko (*Sphaerodactylus micropithecus*), which is scarce and exhibits a restricted distribution. Rat (*Rattus rattus*) predation has been postulated as the most likely explanation for this. The Puerto Rico Department of Natural and Environmental Resources (PRDNER) started a rat eradication programme on Monito in October 1992, using Maki Mini Blocks®. Rodenticide was spread at 10 m intervals over the entire island. Rats declined from a relative estimate of 0.63 to 0.01 rth (rat/trap hour). In April 1993, this project was stopped by the U.S. Fish and Wildlife Service due to concern about the possibility of poisoning geckos with the rodenticide. We proved experimentally that the geckos were not attracted to the paraffinised rodenticide blocks, but in the meantime there was a large increase in rat abundance to 0.28 rth. We started the project again in September 1998, when a surprisingly low rat population was barely detectable using chewing sticks. No rats were caught in snap traps, but the eradication programme went ahead, using Talon-G®. Rodenticide blocks were put in plastic baiting stations, spaced at 20 m intervals. Recent surveys have detected no rats on Monito Island. The rat eradication will have great benefits for Monito's unique biota.

Keywords Rodenticide; *Sphaerodactylus*.

INTRODUCTION

Monito Island (15 ha) is located at Latitude 18° 10' N and Longitude 67° 57' W (Wadsworth 1973), in the Caribbean Sea between Puerto Rico and Hispaniola (West Indies) (Fig. 1). It belongs politically to the Commonwealth of Puerto Rico, and is a unique component of a national system of natural reserves. Subtropical dry forest is the only life zone present in Monito (Ewel and Whitmore 1973). Rainfall is more abundant during September-November, and less abundant during February-April. This island is basically a flat plateau surrounded by vertical cliffs (66 m) with no beach. It is considered to be the most inaccessible island within the Puerto Rican Archipelago.

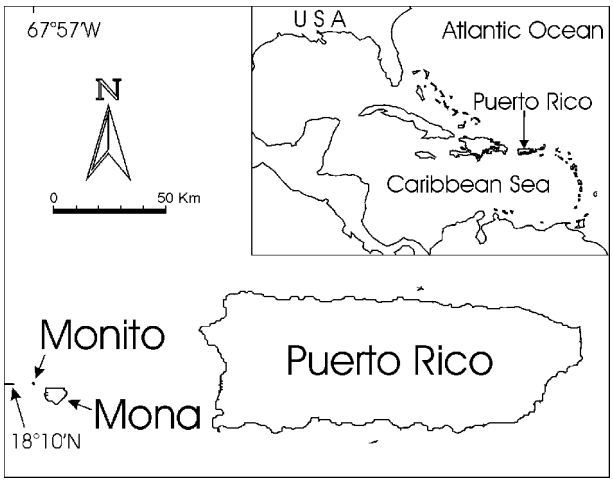

Fig. 1 Monito Island and its location in relation to Puerto Rico and other Caribbean Islands.

Monito Island harbours a unique fauna, including one of the largest seabird nesting colonies in the West Indies, and an endangered species of gecko (USFW 1986). Since its discovery in 1974, this endemic gecko, *Sphaerodactylus micropithecus* (Schwartz 1977) has been considered scarce and restricted in range to Monito Island. In fact, predation by the ubiquitous black rat (*Rattus rattus*) was postulated as the most possible explanation for the current status of this reptile (Dodd and Ortiz 1983). Rats have never been observed preying upon geckos in Monito. However, this rodent has caused the extinction or extirpation of several species of reptiles (Crook 1973; Whitaker 1973, 1978; Lever 1994), birds (See Atkinson 1985 for review; van der Elst and Prys-Jones 1987; Lever 1994), and invertebrates (Ramsay 1978; Howarth and Ramsay 1989).

In October 1992, the Puerto Rico Department of Natural and Environmental Resources (PRDNER) began an eradication programme for black rats on Monito Island, encouraged by the successful rat eradication on Cayo Ratones, La Cordillera Natural Reserve (PR), and on Steven Cay (US Virgin Islands). In both projects, rats were eradicated using anticoagulant rodenticides without affecting non-target species.

The first stages of the eradication campaign with rodenticide produced promising results. Nevertheless, in April 1993, this initiative was restricted to the use of snap traps by the United States Fish and Wildlife Service (USFWS). The USFWS claimed that the PRDNER had not satisfied all the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FRIFRA). The major concern was the possibility of poisoning Monito Island geckos with the

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anticoagulant rodenticide. A previous preliminary experiment using a similar gecko species *Sphaerodactylus macrolepis*, resulted in 15% mortality after exposure to pellets of the anticoagulant rodenticide Talon-G® (Gaa 1986).

We conducted a study to test the effect of anticoagulant rodenticides on captive geckos. We used the Mona Island Gecko, *Sphaerodactylus monensis* as a surrogate species because it is very abundant, lives in a comparable habitat, and is similar in size and in feeding habits to the Monito Island gecko. The experiment was conducted over 22 days. Maki® (Liphatech, Milwaukee, USA) was utilised instead of Talon-G, because it can be purchased over the counter without a license to apply pesticides. Four treated and four control cages were used. Three geckos and two Maki Mini Blocks (bromadiolone 0.05%) were placed within each cage. The results were not statistically analysed since all geckos survived the experiment. We neither observed changes in the behaviour of the geckos which might be related to poisoning (e.g. erratic movements or immobility), nor saw geckos licking or eating the pellets of poison. We re-initiated the second eradication campaign in September 1998, this time, with the approval and commitment of both the USFWS and the PRDNER.

METHODS

1992-93 campaign

The first eradication campaign started in October 1992, when we spread 13 buckets (9.09 kg each) of Maki mini blocks. We distributed the Maki blocks throughout the island, following a grid design. The distance between each pair of grid points was 10 metres, and three to five blocks were deposited at each grid (i.e. baiting) intercept. The rodenticide was also freely dispensed in areas of high rat activity, such as bird rookeries.

We continued the eradication campaign in March 1993. Although we repeated the original methodology, this time we used 20 buckets of baits. We decided to increase the amount of rodenticide for the second event because Monito was topographically more complex than we had previously expected.

We used snap traps to assess and monitor changes in the rat population during the eradication campaign. Twelve snap traps were equally spaced on a 120 m trap-line. We trapped rats over three consecutive nights. Each trap was set around 1900 hours and then checked every hour until 2200. For bait, we used a combination of processed cheese food (i.e. Cheez-Wiz®) and oat flakes to add consistency. An estimate of rat relative abundance was calculated by dividing the total number of rats caught by the total number of hours that traps were set to catch rats (rat/trap hour). Sprung traps without rats were not included in this ratio. We evaluated the status of the rat population seven times during this first campaign. These surveys were conducted before, between and after the poisoning events.

1998-99 campaign

The second eradication campaign consisted of three poisoning events at four-month intervals. On each trip of the eradication, 30 buckets (5.45 kg each) of Talon-G (ICI Americas Inc. North Carolina, USA) were distributed over Monito Island. The first event was conducted in October 1998, following a survey of the island in September to evaluate the status of the rat population. During the first night of the survey no rats were caught in snap traps. We therefore shifted to chewing sticks as a monitoring tool to detect rats at apparently-low population density. Fifty chewing sticks were freely distributed throughout Monito. We marked each chewing stick location with a blue flag.

Blocks (6-8) of Talon-G (brodifacoum 0.05%) were then placed in baiting stations distributed at 20 m intervals forming a grid over the entire island. Baiting stations were used to extend rodenticide availability, increase the chances of consumption, and decrease the chances of poisoning non-target species. We built the stations using plastic (PVC) sanitary pipes (10.16 cm width x 24 cm length).

Once again we evaluated the effectiveness of the eradication every two months using snap traps. Ten snap traps were set every 10 m of each 100 m trap-line. We ran three trap-lines, following the same protocol used during the surveys of the first campaign. We determined the status of the rat population five times during this campaign. One survey was conducted prior to poisoning, two during the poisoning events, and two after.

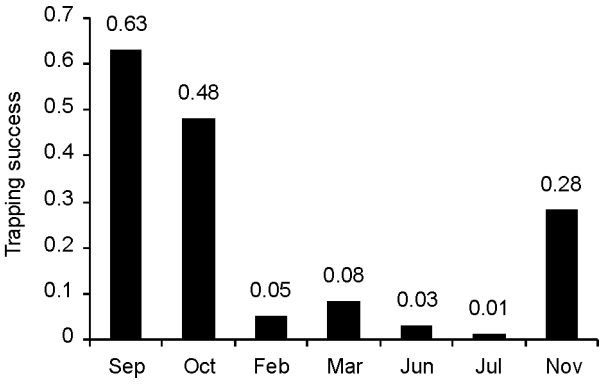

Fig. 2 Effectiveness of rat eradication measured as the number of rats caught per trap hour of effort (Sep. 1992-Nov. 1993). Rodenticide was spread in Oct. 1992, and Mar. 1993.

RESULTS

1992-93 campaign

The first index of rat population was 0.63 rat/trap hours (r/th) (Fig. 2). This catch rate decreased dramatically from 0.48 to 0.05 r/th after the first poisoning in October 1992 (Fig.2). Although the catch rates had risen slightly (0.08 r/th) by the time of the second poisoning in March 1993, it continued to decrease in the surveys of June 1993 (0.03 r/th), and July 1993 (0.01 r/th) (Fig. 2). Unfortunately, by November 1993 the rat catch rate had increased substantially (0.28 r/th) (Fig. 2). The rat population had multiplied to almost pre-poisoning values in only nine months without spreading rodenticide.

1998-99 campaign

During the rat survey in September 1998, only three of the 50 chewing sticks showed rat evidence. These three sticks were found in the south west area of Monito. We did not catch rats in snap traps during any of the five surveys conducted (640 trap hours). These surveys were performed in September 1998, October 1998, April 1999, August 1999, and September 1999. We spread rodenticide in October 1998, April 1999, and August 1999. Since the completion of the poisoning we have not detected the presence of rats in Monito Island. However, we have not yet used chewing sticks to assess the status of the rat population.

DISCUSSION

We found that the main difficulties in eradicating rats from Monito Island were related to the island's inaccessibility. However, with the help of a helicopter to transport the rodenticide buckets and the baiting stations this problem was greatly reduced. Monito Island lacks native terrestrial mammals or resident avian predators. Thus, the probability of secondary poisoning was minimal. The direct risk of poisoning non-target species, such as the endemic yellow-shouldered blackbird (*Agelaius xanthomus*) and the zenaida dove (*Zenaida aurita*), was reduced by the use of baiting stations.

The decline in rat abundance was unexpected between the first and the second campaign in Monito Island. This was especially surprising since during the first campaign, the rat population had increased dramatically in just nine months. After more than five years without poisoning (March 1993-September 1998) we expected to find rat abundance similar to that of 1992. A possible explanation is a prolonged drought. Although rainfall data from Monito does not exist, there are data from Mona Island, which is 5 km south-east of Monito. The monthly climate data does not reflect any lasting decrease in rainfall between 1993 and 1998 and the mean annual rainfall values do not indicate any abnormal reduction in rainfall: 5.72 cm (1998), 5.56 cm (1997), 8.46 cm (1996), and 5.87 cm (1995). Other potential explanations are a disease outbreak and predation. No data are available to support or negate a disease outbreak. With the exception of a pair of migratory peregrine falcons, there are no rat predators on the island.

Eliminating the rat's detrimental effect on Monito Island will undoubtedly have beneficial results for Monito's native and unique biota. To be certain that eradication has been achieved it is essential that the appropriate rat monitoring continues on Monito, especially using chewing sticks. Fortunately, if the eradication has been successful, the probability of re-infestation is extremely low due to the extreme isolation and rugged topography of Monito Island.

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