

# Black rat *Rattus rattus* eradication by trapping allows recovery of breeding roseate tern *Sterna dougallii* and common tern *S.hirundo* populations on Feno Islet, the Azores, Portugal

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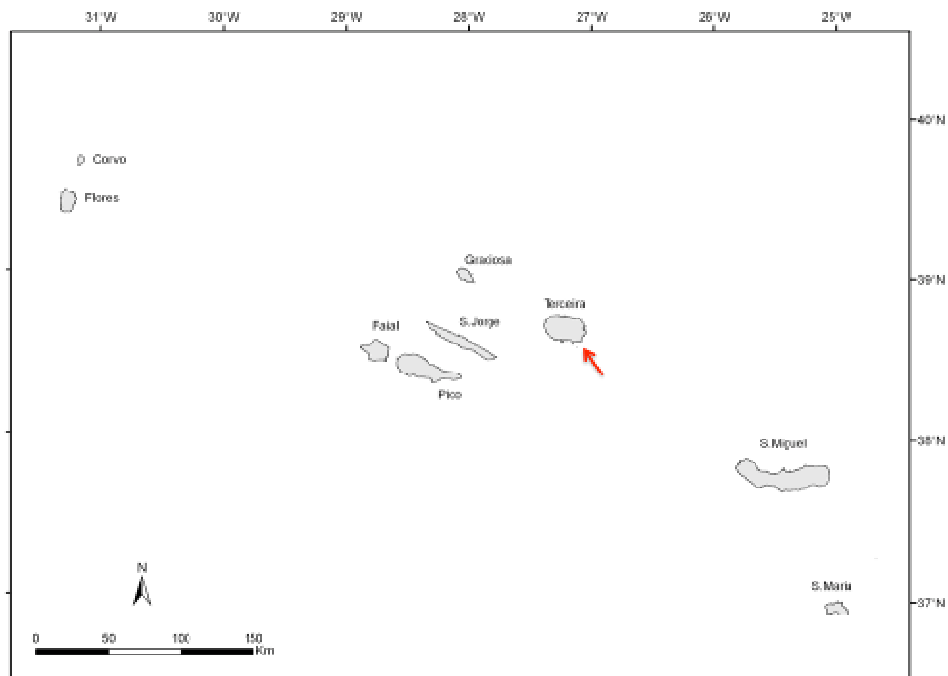
## SUMMARY

Mass trapping successfully achieved elimination of black rat *Rattus rattus* on Feno islet (1.6 ha), Terceira island (Azores archipelago), thus enabling roseate terns *Sterna dougallii* and common terns *Sterna hirundo* to recolonize the islet. Rats were first detected on Feno in 2003, when tern breeding-numbers had decreased dramatically. During 2005 no terns bred on the islet and in 2006 fewer than five common tern pairs attempted to nest. Rat eradication was initiated in September 2006. The last rats were captured in March 2007. Monitoring conducted in September 2007, and May and September 2008 indicated that rats had not recolonized. Common terns quickly resumed breeding on Feno islet but numbers (c.120 pairs in 2009) are still below peak levels (c.240-280 pairs) recorded before rat infestation. Roseate terns on the other hand were slower to return but recovered faster with around 260 pairs in 2009, representing 22% of the Azores population. The success of the black rat eradication shows that surveillance and timely action are fundamental to conserve tern colonies vulnerable to rat predation in the Azores.

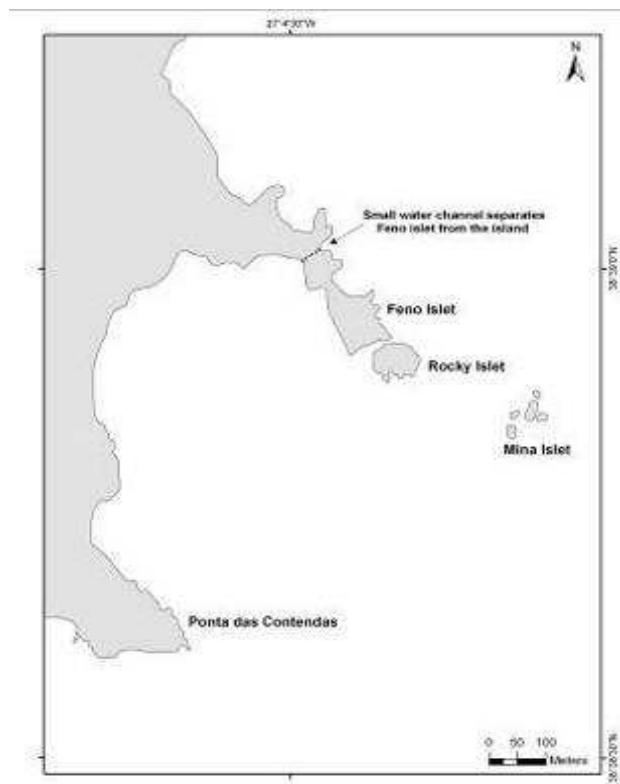
## BACKGROUND

In 2009 the Azores archipelago (Portugal) held 1,198 pairs of the endangered roseate tern *Sterna dougallii*, representing 47.5% of the European breeding population (Neves 2009). The species has bred in over 30 colonies spread across the nine main islands and associated islets. Most colonies are small, having fewer than 20 breeding pairs. Only a few sites may hold larger numbers, with five of the main colonies generally holding up to 80% of the breeding population each year. One such colony is Feno islet, a small islet located at the southeastern tip of Terceira island (Fig. 1a).

From 1997 to 2002, Feno held on average 32% of the Azorean roseate tern population. The islet also holds a colony of common tern *Sterna hirundo*. Between 1997 and 2002, Feno held on average 10% of the Azores population (average 2,147 pairs over the same period; Neves, 2006), which overall represents less than 1% of the entire European breeding population (BirdLife International 2004). The islet is separated from the main island by a narrow sea channel about 2 m wide. The edges of the islet are rocky and low and there is a plateau rising to 14 m above sea level, covering about a quarter of the total 1.6 ha islet. To the south of Feno there is a small rocky islet (0.6 ha) rising 3 m above sea level (Fig. 1b).



(a)



(b)

**Figure 1a.** The Azores archipelago, the red arrow indicates the location of Feno Islet; **1b.** Feno Islet and adjacent rocky islet.

Until 1995, there was a small bridge connecting Feno to the main island, which was regularly used by fishermen, snorkelers and casual visitors to the islet. At this time, terns only bred on the adjacent rocky islet (virtually devoid of vegetation) where there was no human access. The rocky islet, however, provided only very poor nesting habitat with few opportunities for successful fledging of young. Small rocky depressions caused by wave-spray erosion were used as nest sites. However these depressions tended to easily become water-filled under inclement weather (sea surge and spray, or heavy rainfall) causing loss of eggs and young chicks. The other only breeding bird present is rock pigeon *Columba livia*.

In October 1995, the bridge collapsed and the following year common and roseate terns started to colonize Feno itself, which provides much better nesting habitat. It has a lower rocky area on its west side and a sedimentary plateau, where some low halophytic vegetation grows. This plateau is the favoured breeding habitat of the roseate terns in this colony. Within a few years after roseate terns started using Feno, their breeding numbers more than tripled (peaking at 342 breeding pairs in 2001) and the site became the most important roseate tern colony in the Azores.

However, a sudden decline in tern numbers in this colony was noticed in May 2003 (only around 60 pairs each of roseate and common terns), when several eggs were also found predated, apparently by rats (Fig. 2). In August 2003, the presence of rats on the islet was confirmed by deploying butter-dipped wooden tongue depressors, which showed signs of rat presence (incisor marks, chewed edges etc.) upon recovery three days later (Neves *et al.* 2003). In 2004, tern breeding numbers declined even further (c.40 roseate and 45 common tern pairs) and half of the roseate tern eggs found were predated or abandoned. In the case of the common tern only 10% of the eggs were predated or abandoned. Local extinctions of island-nesting seabirds due to introduced rats are well documented worldwide (Blackburn *et al.* 2004). Given the importance of this colony to the Azores roseate tern population, rat elimination was undertaken.

## ACTION

**Study site:** Feno Islet is a small islet (1.6 ha) and is included in the Special Protection Area (EU Birds Directive 79/409/EEC) of “Ponta das

Contendas”, located on Terceira Island, Azores (Fig. 1).



**Figure 2.** Roseate tern egg remains, apparently rat predated, Feno islet (Terceira), May 2003.

**Evaluation of rat infestation:** An evaluation of the level of infestation and species identification took place between 12 and 14 September 2006. Lines of live traps (64 traps in total) were distributed throughout the islet: 18 Tomahawk (19 x 6 x 6”), 18 Sherman (XLF15 – Extra Large Folding 15”; 4 x 4 x 15”), 18 Sherman (LFATDG; 3 x 3.5 x 9”) and 10 Longworth. Half were baited with cheese and the other half with a mix of canned sardines, soya oil and wheat bran. On 13 September, one adult female, three juvenile female and two juvenile male black (ship) rats *Rattus rattus* were captured (and removed). No captures occurred on 14 September. Given this low capture rate, the rat population size was considered probably to be small.

**Rat eradication:** Mass trapping in an attempt to eradicate the rats was undertaken from 26 March to 16 April 2007 (i.e. before the arrival of breeding terns). A total of 140 Sherman traps (XLF15 – Extra Large Folding 15”; 4 x 4 x 15”), baited with cheese, were distributed evenly over the islet. Traps were checked daily (weather permitting) and bait was replaced as needed.

**Monitoring:** Using the same trapping methods as during the eradication phase (but using a reduced number of traps), monitoring to determine eradication success was conducted during the following periods: 3-17 September 2007 (100 traps), 8-17 May 2008 (40 traps) and 17-24 September 2008 (80 traps).

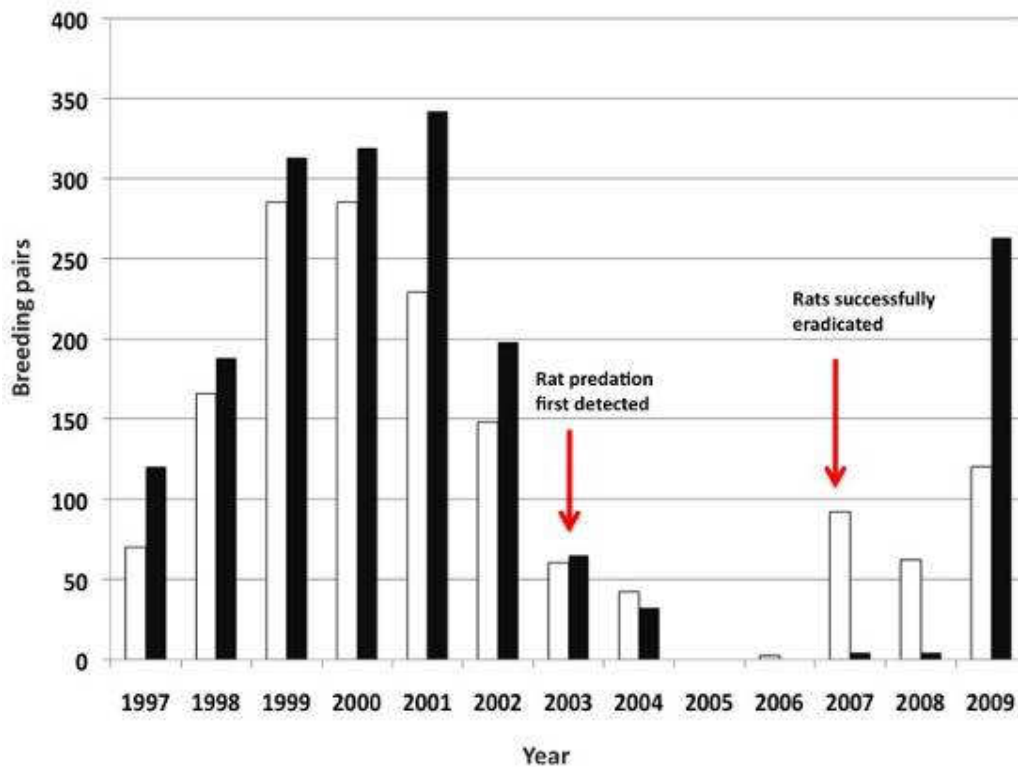
**CONSEQUENCES**

**Eradication success:** Four black rats were caught and removed: one female (on 27 March), one male (28 March) and two males (31 March). No rats were caught during the subsequent monitoring phases and no signs of rat presence were detected 17 months after the last capture. Thus it appears that eradication was achieved.

**Effect on the tern population:** After rat eradication both species of terns recolonized Feno islet. Over the first couple of years after eradication breeding roseate tern presence on the islet was residual (<5 pairs) but in 2009 numbers increased spectacularly to around 260 pairs (Fig. 3). In 2009, Feno once again supported the largest roseate tern colony in the archipelago (equivalent to 22% of the Azores breeding population; Neves 2009). Whilst

common tern numbers built up sooner (apparently in response to rat eradication) the number of breeding pairs in 2007-2009 has been fairly stable (60-120 pairs each year) but still below the peak levels (around 240-280 pairs) recorded in the three years before rat infestation

**Conclusions and recommendations:** The removal of rats through trapping probably led to roseate and common terns successfully recolonizing Feno islet. The proximity of Feno to the main island of Terceira presents the risk that rats may re-colonize. Therefore we recommend the establishment of a regular monitoring and response system. Close monitoring of all potentially susceptible main tern colonies in the Azores is also recommended to allow prompt recognition of rat presence and ensuring that action is undertaken as soon as the problem is detected.



**Figure 3.** Breeding populations of roseate and common terns on Feno islet from 1997 to 2009 (Key: black columns = roseate tern; white columns = common tern).

## ACKNOWLEDGEMENTS

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