



Artigo de Opinião / Point of View Paper: The eradication of feral goats and its impact on plant biodiversity — a milestone in the history of Trindade Island, Brazil

*A erradicação das cabras ferais e seu impacto sobre a biodiversidade vegetal
— um marco na história da Ilha da Trindade, Brasil*

Nilber G. da Silva¹ & Ruy J. V. Alves^{2,3}

Abstract

The recent signs of recovery of the native and endemic flora of Trindade Island, Brazil, are attributed to the eradication of vertebrates which were introduced on the 18th Century. Three centuries of devastation lead to the disappearance of endemic plant species and to a drastic reduction of vegetation cover and sea bird populations. In 2005 the Brazilian Navy concluded the eradication of feral goats, resulting in the early expansion of vegetation cover on previously barren areas. The only remaining invasive vertebrates are the house mice. This fact represents a milestone in the natural history of Trindade and shall encourage new conservation research on the Island.

Palavras-chave: natural regeneration, invasive vertebrates, oceanic island.

Resumo

Os recentes sinais de recuperação da flora nativa e endêmica da Ilha da Trindade, Brasil, são atribuídos à erradicação de vertebrados introduzidos no século XVIII. Três séculos de devastação resultaram no desaparecimento de espécies vegetais endêmicas e na redução drástica da cobertura florestal e das populações de aves marinhas. Em 2005 a Marinha do Brasil concluiu a erradicação das cabras ferais, resultando no início da expansão da cobertura vegetal em áreas previamente nuas. Os únicos vertebrados invasores remanescentes são os camundongos. Esse fato representa um marco na história natural de Trindade e deve incentivar novos trabalhos de conservação na ilha.

Key words: regeneração natural, vertebrados invasores, ilha oceânica.

Trindade (20°30'S, 29°20'W, 10 km²) is an oceanic archipelago of volcanic origin, roughly 1,200 km east of Espírito Santo state, Southeastern Brazil. The Island rises from a depth of 5,800 m, reaches an altitude of 620 m and covers approximately 10 km². Less than 5% is covered by forest, and approximately 60% is covered by herbaceous vegetation. There is no arid season and precipitation exceeds 100 mm from March to July. This Brazilian Federal Territory is not a conservation unit, but is well managed by the Navy's First Naval District, and extends the Brazilian exclusive economic zone (Marliere 2006). The main island harbors significant terrestrial vegetation with over

130 species of vascular plants (Alves 2006). Several sea-bird species are the only native vertebrates (Dias *et al.* 2010). Because of the increasing demand from research, the Interministerial Commission for the Resources of the Sea ("Secretaria da Comissão Interministerial para os Recursos do Mar" – SECIRM) has recently created a science support program (PROTRINDADE) and built logistic structure to favor and facilitate research on the Island (Souza 2011).

In 1700, during a voyage through the South Atlantic, Edmund Halley released goats, hogs and guinea-fowl on the Island hoping these would be survival resources for possible

¹Programa de Pós-graduação em Botânica, Universidade Federal do Rio de Janeiro, Museu Nacional, Quinta da Boa Vista s/n, 20940-040, Rio de Janeiro, RJ, Brasil.

²Universidade Federal do Rio de Janeiro, Museu Nacional, Depto. Botânica, Quinta da Boa Vista s/n, 20940-040, Rio de Janeiro, RJ.

³Author for correspondence: ruyvalka@yahoo.com

castaways. Donkeys, cats, and sheep were also introduced during subsequent occupations by the British (1781-1782) and Portuguese from the Azores Islands (1785-1797) (Brito 1877). House mice must have been introduced accidentally during one of the aforementioned occasions, and became an invasive species.

Goats are the main cause of extinctions on oceanic islands (Campbell & Donlan 2005). In 1916 researchers from the National Museum, Rio de Janeiro, conducted an expedition to Trindade Island and reported that introduced mammals were causing severe damage to vegetation and wildlife as a whole. In 1957 Frigate Captain and oceanographer Paulo Moreira had also concluded that “if the island has some use, it is essential to immediately reforest, extinguish the animals which depredate it and preserve its habitability” (Moreira 1957).

The overgrazing by goats led to local extinction of *Colubrina glandulosa* Perkins (Rhamnaceae), the once dominant tree species which used to cover over 80% of the Island – a fact attested by the occurrence of dead trunks which remain scattered across the entire landscape to the present day (personal observation).

The sheep, pigs and donkeys were eliminated in 1965, according to unpublished internal documents of the Navy. From 1957 onward, the Navy had promoted sporadic eradication attempts aimed at invasive mammals. After new reports about the imminent loss of freshwater streams and vegetation written by researchers in the 1990s, the Navy sent staff to eliminate the population of goats that were still causing ecological damage. However, the rugged hilly terrain of Trindade hinders access to many localities, and only about 200 goats (of approx. 800) were eliminated by hunting in 2002. On one occasion the shooters used a helicopter. Martins and Alves (2007) correlated the decline of the goat population with the recovery of endemic plant populations. However, they referred only to Morro Vermelho, a hill on the island, and they did not refer to complete eradication. Because many goats had found shelter in isolated areas, Marine snipers were finally sent in order to intensify and expedite the eradication. After several four-month missions, the last 251 goats were eliminated by 2005. The same Marines expended another two missions of four months each (2009–2010), and confirmed that all goats had really been eradicated.

We believe that this fact represents a milestone in conservation of the flora, fauna and freshwater sources of Trindade Island. The results of this conservationist effort are expressed mainly by a notorious increase in vegetation cover, number of roosting pairs of several sea-bird species, and volume of fresh water in streams (person. obs.). Although natural regeneration is being studied and some results have already been published (for instance, Alves & Martins 2004 and Martins & Alves 2007), most aspects of the recovery still require further field work, which is difficult due to the remoteness of the island. In general, our results are showing an accelerated process of regeneration of the tree-fern forest composition and especially of the herb layer in exposed sites by endemic plant species in areas which used to be entirely devoid of vegetation when goats roamed the island.

The only remaining invasive mammal is the mouse, with a population of tens of thousands. Preliminary studies are being conducted in order to provide information for a future eradication plan, which shall increase the regeneration process of Trindade’s wildlife even further.

This is an appropriate moment to encourage more scientists to start new conservation research on the Island, as this is an ephemeral and unique opportunity to understand how nature first responds to the removal of an alien species known to be very destructive.

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References

- Alves, R.J.V. & Martins, L.S.G. 2004. Restabelecimento de espécies endêmicas da Ilha da Trindade. *Albertoa, Série Proteção Ambiental* 3: 45-52.
- Alves, R.J.V. 2006. Terrestrial vascular floras of Brazil’s Oceanic Archipelagos. *In*: Alves, R.J.V. & Castro, J.W.A. *Ilhas oceânicas brasileiras – da pesquisa ao manejo*. Ministério do Meio Ambiente, Brasília. Pp. 85-103.
- Brito, P.T.X. 1877. *Memoria historica e geographica da Ilha da Trindade, organizada e dedicada ao Ilmo.*

- e Exmo. Sr. Barão da Ponta Ribeiro. *Revista do Instituto Histórico e Geográfico Brasileiro* 40: 249-277.
- Campbell, C. & Donlan, C. J. 2005. Feral goat eradications on islands. *Conservation Biology* 19: 1362-1374.
- Dias R.A.; Agne, C.E.; Gianuca, D.; Gianuca, A.; Barcellos-Silveira, A.; Bugoni, L. 2010. New records, distribution and status of six seabird species in Brazil. *Iheringia, Série Zoologia* 100: 379-390.
- Marliere, E.R. 2006. Ilhas oceânicas: sentinelas avançadas do Brasil. *In: Alves, R.J.V. & Castro, J.W.A. (orgs.). Ilhas oceânicas brasileiras – da pesquisa ao manejo.* Ministério do Meio Ambiente, Brasília. Pp. 14-25.
- Martins, L.S.G. & Alves, R.J.V. 2007. Regeneração natural do Morro Vermelho, Ilha da Trindade. *Revista Brasileira de Biociências* 5: 39-41.
- Moreira, P. 1957. Prefácio. *In: Mayer, E.S. Trindade, ilha misteriosa do trópico.* Editora Tupã, Rio de Janeiro. Pp: 1-2.
- Souza, C. L. 2011. Pesquisa científica na Ilha da Trindade. Available in <<https://www.mar.mil.br/secirm/trindade.htm>>. Accessed 1 May 2011.