

CASE STUDY

Brodifacoum rodenticide - assessing non-target risk to Galápagos tortoises and other reptiles

The general issue

Eradication of invasive rodents from islands has often been achieved through the aerial application of pellet bait containing the anticoagulant rodenticide brodifacoum. While significant biodiversity gains are expected from such eradications, these need to be balanced against the potential non-target impacts of distributing a highly toxic bait into an island environment. Thus an essential part of any eradication planning is an assessment of risk posed to non-target wildlife by the eradication method(s), so that non-target mitigation measures and monitoring can be implemented as part of an operational plan.

Non-target risk assessment can be undertaken by considering information available about 'hazard' (toxicity of a compound to the species) and 'exposure' (the environmental pathways through which the species might be exposed to the compound). Brodifacoum has high toxicity to other mammals besides rodents and also to birds, posing an unwanted hazard to those non-targets that ingest bait (primary exposure) or ingest live animals or carcasses that contain brodifacoum (secondary exposure).

However, relatively little information was available about the toxicity of brodifacoum to reptile species – creating a high level of uncertainty when attempting non-target risk assessments for lizard, snake and tortoise species. Addressing this information gap was especially important in planning rodent eradications in the Galápagos Islands.

Background

The Galápagos National Park and partners are undertaking phased eradication of rodents from islands in the Galápagos, using aerial baiting with brodifacoum. Completed first phases have been North Seymour Island in 2007, and Rabida, Bartolome and other smaller islands in 2011. The next islands proposed for 2012 include Pinzon, which has a wild population of giant Galapagos tortoises.

Given the endangered conservation status of these tortoises and their iconic, international profile as a unique and important wildlife species, it was considered essential to better understand the non-target risk before proceeding with the next phase of rodent eradication. This was also considered important for other Galapagos native reptile species, including lizards, geckos and snakes – Pinzon also has an island endemic lizard.



A giant Galápagos tortoise approaching a bait pellet wrapped in a leaf (Penny Fisher, photo)

The important question was whether amounts of brodifacoum that could realistically be ingested following aerial application of bait were likely to produce detectable adverse effects on the metabolism, behaviour or survival of tortoises and other reptiles. The most direct approach to providing applicable new information was to undertake research with animals in captivity.

Our approach

With support from the Galápagos National Park and the Charles Darwin Research Foundation, ISI was contracted by Island Conservation to design and lead research trials with captive tortoises and reptiles. These were carried out on Santa Cruz Island, Galápagos in 2011.

Captive tortoises were presented with bait pellets and also with brodifacoum in palatable plant food (cactus pulp). After measuring the amount of brodifacoum that each tortoise ate, monitoring over the following two weeks included use of an automated coagulometer to test tortoise blood samples for clotting times. The key parameter here was significant changes, especially increases, in coagulation time, which could indicate a reduced ability of the blood to clot (a typical toxic effect of brodifacoum seen in mammals and birds).

Trials with small numbers of reptiles (lava lizards, geckos and snakes) brought into captivity were also undertaken. Reptiles kept in laboratory housing were offered bait pellets, and also offered live invertebrates (cockroaches) that had been feeding on bait pellets and thus contained residual concentrations of brodifacoum. Any uptake of bait or invertebrates was measured, and daily monitoring undertaken afterwards.

The outcome

Captive Galápagos tortoises did not find the pellet bait very acceptable in this trial, indicating that bait uptake by tortoises in field conditions is likely to be low when natural food is readily available. Following ingestion of brodifacoum in palatable food, no effects on tortoise blood coagulation times were measured. In field conditions this suggests that toxic effects are unlikely even if tortoises do find and consume some brodifacoum bait pellets after aerial application.

Some of the lava lizards sampled had very small quantities of bait, and also cockroaches that contained residual brodifacoum, but this did not produce any visible adverse effects e.g. on weight, food intake or behaviour. However, it is possible that some individual lizards could ingest sufficient bait, or contaminated invertebrates, to produce toxic effects of mortality in field applications and this requires further investigation through operational monitoring.

None of the geckos or snakes showed interest in consuming bait over a five day period, so while no conclusions about the toxicity of brodifacoum to these species could be drawn from the 'nil exposure' results, it seems unlikely that either would be at risk of through brodifacoum bait ingestion.

These results will be used to update non-target risk assessments for the upcoming rodent eradications in the Galápagos and also to inform the design of on-ground monitoring protocols for non-target species during and after the operations.

For further information contact:

Penny Fisher
Landcare Research
Ph: +64-3-321 9665
Email: fisherp@landcareresearch.co.nz

Alan Saunders
Invasive Species International
Ph: +64-7-859 3720
Email: saundersa@landcareresearch.co.nz