GLOBAL RE-INTRODUCTION PERSPECTIVES

Re-introduction case-studies from around the globe

Edited by

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The World Conservation Union

Published by: IUCN/SSC Re-introduction Specialist Group

Citation: Soorae, P. S. (ed.) (2008) GLOBAL RE-INTRODUCTION PERSPECTIVES: re-introduction case-studies from around the globe. IUCN/SSC Re-introduction Specialist Group, Abu Dhabi, UAE. viii + 284 pp.

ISBN: 978-2-8317-1113-3

Cover photo: Clockwise starting from top-left:

- Formosan salmon stream, Taiwan
- Students in Madagascar with tree seedlings
- Virgin Islands boa

Produced by: IUCN/SSC Re-introduction Specialist Group

Printed by: Abu Dhabi Printing & Publishing Co., Abu Dhabi, UAE

Downloadable from: ***http://www.iucnsscrsg.org*** (downloads section)

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Re-introduction of tuatara as part of an ecological restoration project on Wakatere-papanui Island, Marlborough Sounds, New Zealand

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Introduction

Tuatara (***Sphenodon***), medium sized reptiles originating in the Triassic and sole living representatives of the Order Sphenodontia, were formerly widespread throughout New Zealand. Introduced mammalian predators reduced tuatara to small isolated populations on offshore islands. One of the three recognized variants of tuatara, ***S. punctatus*** Cook Strait, is known from four islands between the two main islands of New Zealand. These islands range in area from 1 - 150 ha and are home to approximately 80% of all tuatara (Gaze, 2001). This subspecies is no longer listed on the IUCN Red List. The New Zealand Department of Conservation's Threat Classification System List 2005 lists the subspecies as range-restricted. We report on the re-introduction of tuatara (***S. punctatus*** Cook Strait) to Wakatere-papanui Island, Cook Strait, New Zealand from nearby Stephens Island. Wakatere-papanui Island had no resident tuatara, probably due to the invasion by introduced mammalian predators (rodents ***Rattus norvegicus*** and ***Rattus exulans***) in the last few hundred years.

Tuatara (*Sphenodon punctatus*)

Goals

- Goal 1: Restoration of a self-sustaining population of tuatara to an island within their former range.
- Goal 2: Initiation of ecological restoration of an island by rat removal.
- Goal 3: Using an ecological restoration project to build relationships and potential for skill

transfer among researchers, managers and the community.

Success Indicators

- Indicator 1: Recapture of 30% of founders within three years post-translocation.
- Indicator 2: Increase in length and weight of all founders recaptured within one year post -translocation.
- Indicator 3: Identification of recruitment of young into the population within 10 years.
- Indicator 4: Evidence of a self-sustaining population within 100 years.

Transporting tuatara to Wakatere-papanui Island

Project Summary

Feasibility: Wakatere-papanui is a 61 ha island administered by the New Zealand Department of Conservation. It belongs to a chain known as the Rangitoto Islands, with its nearest neighbour only 210 m away. Wakatere-papanui Island has a history of burning and grazing but still has many elements of the original coastal forest typical of islands in Cook Strait. It has long been recognised as having great potential for the restoration of natural communities characteristic of Cook Strait if rodents were eradicated (***Rattus norvegicus*** & ***Rattus exulans***). If rats are present, revegetation would be slow, and restoration of invertebrates, reptiles and birds would be even slower or non-existent. Wakatere-papanui is also within the swimming distance of rodents from neighbouring islands. In order to prepare Wakatere-papanui Island for a tuatara re-introduction, rodents were eradicated from all three islands in the Rangitoto group in 1999 with funding from the San Diego Zoo and Pacific Development and Conservation Trust. The eradication involved extensive negotiation with owners of other islands in the group, including the local Māori (New Zealand's indigenous people), Ngati Koata no Rangitoto ki te Tonga. Domestic sheep had to be removed from one of the islands until after the eradication poison's withholding period.

Implementation: Translocated tuatara were sourced in two groups from Stephens Island, within the same ecological region as Wakatere-papanui. Tuatara sourced directly from the wild were removed from an area of native frog habitat to relieve predation pressure on endangered frogs. This group, comprising 89 individuals ranging from adults to hatchlings, was translocated within a week of collection directly to Wakatere-papanui in November 2003. The second group was sourced as eggs and newly hatched juveniles (that had not yet left their nests) from nesting rookeries across the eastern face of Stephens Island in 1998/99. Eggs finished incubation at Victoria University of Wellington, and all hatchlings were head-started at Nga Manu Nature Reserve, Waikanae, in semi-

natural conditions where they were protected from predators. In October 2004, 343 juveniles aged approximately five years old, were translocated to Wakatere-papanui. The sex ratio of the founding population was approximately 1 male to 0.75 females; juveniles taken directly from Stephens Island were too young to sex using external characteristics. Tuatara were weighed and measured, and samples for health screening were taken in the week prior to translocation of each group, including cloacal swabs for ***Salmonella***, blood smears for white blood cell counts and investigation of blood parasites, and faecal material for investigation of internal parasites. All tuatara were externally inspected to ensure they appeared healthy. Tuatara were moved in each instance prior to knowledge of results from the health screening, due to lack of knowledge on implications of results for the translocation. Ecto-parasites (ticks and mites) on tuatara moved directly from the wild were left attached due to the uncertainty of negative impacts on tuatara and the threatened status of the tuatara tick (***Amblyomma sphenodonti***: Family Ixodidae). Tuatara were packaged individually in aerated postal tubes, and carried in groups in mesh bags or boxes for transportation by helicopter. They were released on the afternoon of the same day as packaging occurred. Burrows were prepared for adults, comprising holes approximately 50 cm long under vegetation. Thirty-one of the tuatara taken directly from the wild were released in two groups with neighbors from their capture location. The rest were randomly allocated to release burrows. Release habitat for juveniles comprised a rocky area with crevices and vegetation for cover; no burrows were prepared.

Post-release monitoring: A search by five people comprising one day and three nights was conducted for the tuatara released in 2003 during preparation for the 2004 translocation. A second monitoring trip was conducted in November 2006 where 3 - 6 people spent five days searching the 2003 and 2004 release sites and 5 nights searching the 2003 release area. A total of 25% of the 2003 and 6% of the 2004 founding tuatara were relocated. All re-located tuatara had gained weight and length, even those translocated as adults (tuatara have an indeterminate growth pattern). For example, mean percent increase in mass of adult males was 43% and snout-vent length was 9% for those recaptured in 2006, three years after relocation. No evidence of recruitment into the population was observed. These results are similar to findings from other tuatara translocations (Nelson ***et al.***, 2002). Monitoring of this population is expected to continue for decades to evaluate whether a self-sustaining population has established, as tuatara may live for 100 years and females reproduce on average every four years.

Major difficulties faced

- Relocating cryptic and especially small juvenile tuatara in their new habitat.
- Searching for tuatara on a cliff bound island with difficult terrain in an early stage of revegetation.
- Lack of knowledge of tuatara diseases and therefore interpretation of health screening results.
- The logistics of transporting three tonnes of brodifacoum poison to the site and arranging thorough distribution by helicopter over all three islands.

- Obtaining consent from other island owners for the eradication of rodents which included multiple Maori owners of one island.

Major lessons learned

- Adult sized tuatara are easier to recapture, therefore surveys for juveniles are more productive if a big search effort is initiated once they reach sub-adult size (e.g.10 years old).
- Each search uncovers founders that have not been seen since translocation, therefore recapture numbers must be treated as minimum number alive, and are likely to be a result of limitations of surveyor abilities and behavior of juvenile tuatara, not lack of translocation success.
- A major conservation achievement was possible through the joint commitment of university staff and students, the resident community, a government department, zoos and financial sponsorship.
- Evaluating success and lessons is long term.

Success of project

Highly Successful	**Successful**	Partially Successful	Failure
	√		

Reasons for success/failure:

- Founders have survived and are in good health, therefore tuatara can survive in this location.
- More founders are relocated on each search, therefore more are likely to be alive.
- Life history of tuatara (i.e. long-lived, infrequent breeders) means we can only define success in the short term by survival, growth and condition of founders. It is too early to tell if recruitment has occurred and whether this or any tuatara translocation is going to be self-sustaining in the long-term.

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