GLOBAL RE-INTRODUCTION PERSPECTIVES

Re-introduction case-studies from around the globe

Edited by

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Cover photo: Clockwise starting from top-left:

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

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Re-introduction of the Virgin Islands boa to the Puerto Rico Bank

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Introduction

The Virgin Islands boa (***Epicrates monensis granti***), is a small ~1.0 m snout-vent length (SVL) snake endemic to the Puerto Rico Bank, where it inhabits a disjunct constellation of islands from Puerto Rico itself eastward into the British Virgin Islands. It is an attractively blotched brown snake, inconspicuous and rarely seen. Because of its nocturnal habits and retiring nature, this little boa is rarely the victim of human persecution. But a series of events, starting with climatic and eustatic changes on the Puerto Rico Bank in the Late Pleistocene and followed by large scale habitat destruction and the introduction of exotic mammalian predators, such as the black rat (***Rattus rattus***), house cat (***Felis catus***), and the mongoose (***Herpestes auropunctatus***), have put this species in extreme peril over most of its range. Consequently, the Virgin Islands boa was listed as Endangered under the U.S. Endangered Species Act.

Goals

- Goal 1: Collection of data on natural history and habitat use.
- Goal 2: Conservation breeding at multiple zoos.
- Goal 3: Black rat eradication at >3 potential release sites.
- Goal 4: Release of boas at >3 suitable sites.

Virgin Islands boa
(*Epicrates monensis granti*)

Success Indicators

- Indicator 1: Completion of Principal Components Analysis of Virgin Islands boa habitat and basic life history study.
- Indicator 2: Multiple conservation breeding events in AZA zoos.
- Indicator 3: Eradication of black

rats at release sites.

- Indicator 4: Completion of health screening and behavioral testing for release suitability.
- Indicator 5: >50 % one year survival of released individuals.
- Indicator 6: Successful reproduction at release site.
- Indicator 7: >10 year persistence of population at release site with suitable population structure.

Boa crew weighing snakes (left to right) J. Ettling, C. Ellsworth & M. A. García

Project Summary

Epicrates monensis granti was first described by Stull from a specimen captured by a native for Major Chapman Grant on the island of Tortola in 1932. Grant gave no detailed habitat information, remarking only that the boa "inhabits rocky cliffs on Tortola and Guana Island". It was subsequently discovered on several islands and cays throughout the Puerto Rico Bank, but the extremely disjunct distribution of this subspecies provides evidence for a long history of extirpation and decline on the Bank since the Pleistocene. Although we acknowledged that re-introduction of the Virgin Islands boa was problematical because of the almost complete lack of natural history information, we perceived it as a reasonable strategy because of the availability of protected, relatively undisturbed cays on the Bank administered by the Departamento de Recursos Naturales y Ambientales de Puerto Rico (DRNA) or the Division of Wildlife, U.S. Virgin Islands (VIFW).

We commenced a natural history study of the boa in 1984 to collect the information necessary to breed and house this species. This nine year study resulted in >650 captures of >300 marked individuals. Boas were most successful in habitat that had few or no exotic predators and was primarily composed of relatively dense vegetation with an interlocking canopy. Further studies revealed the foraging strategies of these snakes. These data were subsequently incorporated in the U.S. Fish and Wildlife Service (USFWS) Recovery Plan. In 1985 The Toledo Zoo commenced a cooperative breeding program with the USFWS, the DRNA, and VIFW that resulted in the first successful captive-breeding of the species in 1986, publication of the AZA-sanctioned Regional Studbook in 1987, and the Species Survival Plan in 1990. While producing snakes for release, we began to investigate Virgin Islands boa habitat using Principal Components Analysis in order to identify potential release sites on the Bank. We examined prey densities and predator threats as well as vegetation attributes. We selected four potential sites and then began efforts to eradicate black rats (***Rattus rattus***), from the sites by placing 8 - 10 blocks of the anticoagulant poison bromadiolone- currently available as Contrac® and Maki® paraffin blocks- at each interstice of a 10 m^2 grid which covered the entire site. Baits were replenished as they were consumed for a period of three days. This

regimen was repeated on two successive visits spaced six months apart. Pre- and post-poisoning activity by rats at the site was monitored by removal trapping along three 100 m transects. The pre-poisoning rat index of 0.160 rats/trap/h at the site, calculated from trapping on 1st - 3rd September 1991, dropped to an activity level of 0 rats/trap/h on the next two visits after poisoning. To detect low levels of rat activity vegetable oil-soaked chew sticks were placed for one week in each habitat type on the island and were checked for rat chew marks. No rats were detected using this method.

By late 1991 we had more than 100 boas in captivity and began the next phase of the project - preparing the animals for release. We originally fed neonate boas with small ***Anolis carolinensis***, later switching their diet to neonate mice, but as ***E. m. granti*** feeds primarily on ***Anolis cristatellus*** in the wild, we tested each sub-adult and adult boa destined for release for willingness to feed on dead ***A. cristatellus,*** and all fed Immediately. We then tested the snakes for their ability to capture living ***A. cristatellus*** in a 2.0 m x 2.0 m x 1.5 m screened enclosure. Only two snakes of the 31 adults tested failed to capture prey during the first attempt. Snakes underwent a 30-day quarantine period prior to release. None presented with any parasites or medical problems. ***Anolis cristatellus*** densities in June 1993 indicated that the sites had adequate food resources for a re-introduction attempt. After transport to the release sites, snakes were implanted with Trovan transponders and released. During 1993, 28 captive born boas from seven different zoos were released; an additional 13 snakes were released through 1995. Three age classes were used for releases: completely naive neonates, sub-adults from 500 - 600 mm SVL, and reproductively mature adults, >700 mm SVL. In 1996 the VIFW began boa translocations from St. Thomas, USVI to a cay previously cleared of rats. Thirty-one snakes were translocated from 1996 - 2002. These were joined by an additional 11 captive-born snakes from the Toledo Zoo in 2002.

We evaluated success of the re-introductions by repeated visits to the research sites. Boas were monitored quarterly the first year and bi-annually for the first five years. A 10 year evaluation at the Puerto Rico site revealed that the population had increased from the original 41 snakes to nearly 500 snakes (Schnable estimate of 482.7) In the U.S. Virgin Islands the population had increased from the original 42 snakes to nearly 170 snakes (Schnable estimate of 168) in 2004.

Subtropical dry forest in the U.S. Virgin Islands - typical inland boa habitat

Major difficulties faced

- Finding a sufficiently numerous population of boas to conduct the

life history study.
- Attaining permits from the Puerto Rico Environmental Quality Board to conduct rat poisoning.
- Finding the snakes in dense vegetation.
- Limiting visitation to the protected sites by campers and fishermen.
- Preventing habitat destruction by campers and fishermen.
- Convincing management authorities of the necessity of the environmental tradeoffs required for the project.

Littoral forest habitat at Punta Puerca, Puerto Rico - typical boa coastal habitat

Major lessons learned

- Allowing sufficient time for project tasks.
- Importance of adequate human resources and funding.
- Boid snakes are excellent candidates for re-introduction.
- Long-term adequate monitoring is necessary for demonstrating success.

Success of project

Highly Successful	Successful	Partially Successful	Failure
√			

Reasons for success/failure:

- High initial survival of released animals.
- Multiple reproductive events the first and subsequent years.
- Importance of pre-evaluation of release site conditions.