Translocation of the St. Croix ground lizard to Buck Island Reef National Monument, St. Croix, U.S. Virgin Islands

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Introduction

The St. Croix ground lizard (*Ameiva polops*: Teiidae) is endemic to St. Croix, U.S. Virgin Islands, and is listed as Critically Endangered by the IUCN and as Endangered by the U.S. Fish and Wildlife Service. *Ameiva polops* was extirpated from St. Croix proper by invasive mongooses (*Herpestes auropunctatus*), and none have been found there since 1968 (Philibosian & Yntema, 1976). Two natural populations persist on Protestant Cay and Green Cay (<10 hectares each), and in 1990, another population was introduced to a dredge-spoil island, Ruth Island (13 ha), with 10 individuals from Protestant Cay and an additional one from Green Cay in 1995 (Treglia & Fitzgerald, 2010). In 2008, we translocated 57 *A. polops* to Buck Island Reef National Monument, St. Croix, U.S. Virgin Islands to expand its range. The species or a congener may have previously existed there, but if so, was extirpated prior to herpetological exploration (Philibosian & Yntema, 1976). The National Park Service eradicated mongooses and invasive rats (*Rattus rattus*) to protect sea turtle nests and make the habitat suitable for *A. polops* (Z. Hillis-Starr, pers. comm.; Treglia & Fitzgerald, 2010). Three years post-translocation, the effort appears successful, with the population growing in number and distribution.

Goals

- Goal 1: Create a self-sustaining population of *Ameiva polops* on Buck Island, St. Croix, United States Virgin Islands.

Lizard with colored glass beads sutured to its tail for visual identification © Lee A. Fitzgerald

- Goal 2: Achieve a population size of 500 individuals in accordance with the Recovery Plan for the species.
- Goal 3: Establish a population of *A. polops* founded entirely with individuals from Green Cay in order that the new population on Buck Island will serve as a replicate of the genetic diversity of *A. polops* on Green Cay. As such, both extant populations would have a replicate.

Success Indicators

- Indicator 1: *Short-term:* Survival of translocated *Ameiva polops* at the translocation site.
- Indicator 2: *Short-term:* Observations of normal behavior of translocated individuals, including courtship and copulation.
- Indicator 3: *Long-term:* Evidence of successful breeding, including documented presence of hatchlings and juveniles.
- Indicator 4: *Long-term:* Documentation of adults, including gravid females, that were not part of the initial translocated population, evidencing that adults hatched from natural nests on Buck Island are reproducing. Population structure consisting of all age and size classes of *A. polops*.
- Indicator 5: *Long-term:* Expansion of the population outward from the initial translocation site.

Project Summary

Feasibility: This translocation was the result of an interagency effort coordinated by the Division of Resource Management at Buck Island Reef National Monument, U.S National Park Service, and involved the United States Fish and Wildlife Service, Virgin Islands Department of Planning and Natural Resources, and Lee Fitzgerald, Michael Treglia, Toby Hibbitts, Amanda Subalusky, and Daniel Leavitt from Texas A&M University. We collaboratively designed this project, achieving consensus on which source population to use, number and sex of propagules, translocation site on Buck Island, capture, transport, and monitoring protocols, and enclosure design.

We used the Green Cay population of *Ameiva polops* as the source of propagules for two reasons. First, it allowed us to achieve the goal of establishing a replicate population of the Green Cay stock. The Protestant Cay population was the founder stock for the Ruth Island population, as genetic analyses by Hurtado *et al.* (pers. comm.) showed that the sole individual introduced from Green Cay is not represented in that population. Second, population estimates clearly showed the Green Cay population was by far the larger of the two naturally extant populations (Treglia, 2010; Treglia & Fitzgerald, 2010), thus removal of individuals would afford the lowest risk to that population. The translocation site was the northwestern beach-forest habitat on Buck Island, which was similar to the habitat on Green Cay, containing mature trees, a mixed understory, and abundant leaf litter that provided ample thermoregulatory, foraging, burrowing, and refuge opportunities.

Implementation: In May, 2008 we translocated 57 (32 males: 25 females) adult *A. polops* to Buck Island and placed them in eight 10 m x 10 m enclosures. The

enclosures facilitated habituation of the lizards to the new habitat and enabled us to conduct intense monitoring. The enclosures were open-top, walls were buried a minimum of 15 cm to prevent individuals from burrowing out, and were a minimum of 45 cm tall, which was sufficient to prevent *A. polops* from climbing out. Each enclosure contained 4 females and 3 males (except for one enclosure with 4:4). Supplemental food and water was not necessary. We included several gravid females and courting pairs in the translocation to maximize the potential for reproduction in the founding population. All individuals were permanently marked by toe-clipping, measured and photographed, and fitted with a unique combination of colored glass beads sutured to their tails for easier identification during monitoring. We removed the enclosures on 10th July 2008.

Part of the translocation team working around the enclosures © Lee A. Fitzgerald

Post-release monitoring: During the enclosure period one observer conducted standardized surveys to monitor the new population of *A. polops*. Once all *A. polops* were translocated, every other day the observer walked slowly around every enclosure for 10 minutes, searching for individuals with the aid of binoculars. We conducted 26 of these surveys and identified 20 of the 57 translocated lizards. Focal animal observations were made on the alternating days, in which the observer walked around an enclosure for 10 minutes or until an *A. polops* was seen. When a lizard was detected, its behavior was monitored for 30 minutes or until it went into a burrow. If no *A. polops* were detected within 10 minutes, the observer went to another enclosure. Other *A. polops* seen were also noted to identify individuals that may not have been detected during other surveys. The observer spent no more than 30 minutes at an enclosure on a given survey, in attempt to observe many individuals from different enclosures. The 64 focal observations demonstrated the translocated *A. polops* behaved as documented on Green Cay and Protestant Cay (U.S. Fish and Wildlife Service, 1984). These lizards spent their activity time primarily foraging and thermoregulating, with other behaviors interspersed, most notably courtship.

From 3rd to 10th July, we also conducted pitfall trapping to confirm the continued presence of individuals that were translocated but not seen during surveys. We

Zandy Hillis-Starr, Chief of Resource Management, National Park Service releasing one of the first individuals into an enclosure © Lee A. Fitzgerald

used five traps, evenly spaced, per enclosure, and opened them from 09:00 hrs - 16:30 hrs each. We only captured two individuals, one of which had never been seen during any of our monitoring. We also captured lizards by hand. Recaptures allowed us to quantify changes in body condition since the onset of the translocation. Eight of the 10 recaptured *A. polops* had increased in body condition ([mass]/[snout-to-vent length]; Dickinson & Fa, 2000), and the increase was significant (paired, one-way Wilcoxon test: V=4, p=0.0068).

One year following the translocation, we surveyed the translocation site for *A. polops*, and captured 11 individuals. Only two were from the translocation; the others included gravid adult females that had hatched on Buck Island, and we also observed numerous juveniles and hatchlings. A standardized mark-resight protocol is being implemented for future monitoring, which should provide reliable population estimates and documentation of increases in the spatial distribution of the population.

Major difficulties faced

- Post-translocation Monitoring: Low detectability of *Ameiva polops* reduced the utility of visual surveys for monitoring individuals in the enclosures. Although we translocated 57 *A. polops*, we only observed 20 individuals during our visual encounter surveys, and never saw more than 10 on a single survey. The detection probabilities were quantified and published (Treglia, 2010; Treglia & Fitzgerald, *in review*).
- Loss of Visual Marks and Low Recapture Success: The glass bead marks were not reliable in our study and many were lost. Additionally, pitfall trapping and hand-capture at the end of the enclosure period yielded low recapture rates and we failed to capture many individuals we knew were present. We did capture one individual that had never been seen in its enclosure, and we were able to estimate average condition from recaptures.
- Escapes from Enclosures: During the enclosure period we documented one *A. polops* that escaped from an enclosure, and promptly sealed the hole through which we believe it escaped. Although we feel that during our time spent in

and around the enclosures we would have seen other escapees, it is impossible to confirm there were no others.

- Funding and Logistics: Budgetary constraints were a challenge that was met by significant, unplanned, in-kind support from USFWS and USNPS collaborators. Collaborators arranged housing, transportation on St. Croix, and large contributions from volunteers. The project was under-funded, especially regarding funds for construction of enclosures, labor for construction, and the researchers' stipends. Project success depended upon graduate student teaching assistant support from Texas A&M University, volunteer participation by members of Fitzgerald's program, and use of available equipment and supplies. In the end, these important collaborations provided much more information and successful outcomes than originally proposed.
- Capture, Handling and Permits: Agencies were concerned about capture and handling methods for *A. polops* on Green Cay, because capture methods can result in death or injury. We met these challenges by working with agencies to develop protocols that would minimize risk to *A. polops* during capture and transport.

Major lessons learned

- Utility of Enclosures: The use of enclosures for this species was extremely valuable for monitoring. The enclosures allowed us to confirm normal behaviors and presumably protected the *A. polops* to a certain degree, as they located and used refugia inside the enclosures.
- Translocation of Gravid Females: We learned that gravid females translocated to Buck Island laid eggs very soon after translocation and hatchlings appeared within two months after the translocation. This is a valuable lesson that highlights the utility of targeting gravid female lizards as propagules in translocation projects.
- Data on Translocated Individuals: Photos of and notes about the translocated lizards were invaluable for visual identification. Some individuals lost bead marks in the enclosures, but were identified based on scars and other unique traits. Morphological data were valuable for assessing condition and growth. In addition to the variables we did measure, we would take additional morphological measurements on translocated animals in future translocations.
- Recaptures: We did not expect such difficulty recapturing individuals from the small enclosures. In retrospect, we would have planned for more and different styles of traps in the enclosures and trapping for a longer period to increase recapture success.
- Radio Telemetry: Radio telemetry of translocated *A. polops* inside the enclosures at the onset of the translocation would have enabled us to determine what happened to some of the lizards that we never saw during monitoring. However, radio-tagging may create additional challenges that should also be considered, such as increased cost, time investment, and possible stress to the animals.

Success of project

Highly Successful	Successful	Partially Successful	Failure
√			

Reason(s) for success/failure:

- We define our case as highly successful because it exceeded our expectations in almost every way. The short-term indicators of success (evidence of breeding and behavioral normalization in the new habitat) were all met, as were our three long-term indicators: documentation of numerous juveniles within one year of the translocation; individuals hatched at the translocation site are themselves breeding; confirmation that individuals are dispersing from the translocation site and the population is expanding in area. At this time, 3 or 4 cohorts of hatchlings of *A. polops* have been produced on Buck Island and the population is made up of hatchlings, juveniles, and adults.
- The translocation strategy was a primary reason for success. We used a large propagule size, 32 females and 25 males, and translocated them into 8 enclosures. The use of enclosures in excellent habitat kept individuals in close proximity to each other, which facilitated courtship and breeding. Selection of gravid females and courting pairs was an effective strategy to start a growing population. We observed a hatchling in an enclosure, proving that a translocated gravid female nested soon after being placed in the enclosure. We captured a few courting pairs of *A. polops* on Green Cay and placed them together in enclosures on Buck Island. We documented two copulation events in the enclosures. We also confirmed that *A. polops* reach sexual maturity in less than a year, and the relatively fast generation time allowed the population to increase rapidly.
- Interagency and university cooperation was excellent, and set the stage for success. Cooperation and in-kind support from participating groups allowed the team to accomplish more than anticipated despite limited funding. In addition to the actual translocation, the project enabled a graduate masters degree and thesis and at least seven publications will be produced.
- Eradication of mongooses from Buck Island, an effort spanning decades, was critical to making the site suitable for *A. polops*. Eradication of rats further minimizes potential predation on *A. polops* and helps maintain healthy beach-forest habitat and invertebrate prey.
- Genetic samples from translocated animals enabled us to develop collaborative research on the conservation genetics of *A. polops*. This work clarified the phylogenetic position of *A. polops*, and determined the Green Cay and Protestant Cay populations are genetically distinct and should be managed as significant evolutionary lineages. We also conducted an experiment on detectability of *A. polops* to inform monitoring programs, and an experiment on the effects of *A. polops* on the invertebrate prey base on Buck Island.

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***Note: For a more comprehensive list of references, please contact the corresponding author.**