

Population Assessment of the St. Croix Ground Lizard at Protestant Cay

Jennifer Valiulis

Geographic Consulting LLC, 2012

jvaliulis@geographicconsulting.com

PO Box 6530

Christiansted, VI 00823



Geographic Consulting
Natural Resource Management

Table of Contents

- Introduction 2
 - Population Estimation..... 2
 - Disturbance to Ameiva Population 2
- Methods..... 3
 - Area Surveys 3
 - Paint Marking..... 4
- Results..... 4
 - Area Surveys 4
 - Population Assessment..... 4
 - Distribution 5
 - Mark/Resight 6
- Discusssion 6
 - Methods comparison 6
 - Population status 7
- Literature Cited 8
- Appendix A. Daily counts of *Ameiva polops* from area surveys by section. 10

Introduction

The St. Croix Ground Lizard (*Ameiva polops*) is a federally listed endangered species, endemic to St. Croix. At one time this lizard was found on the main island of St. Croix, but through predation by the introduced mongoose and habitat degradation, their range is now limited to a few small offshore cays (Philibosian and Ruibal 1971, Philibosian and Yntema 1976). Naturally occurring populations are found on Protestant Cay, under the jurisdiction of DPNR-DFW, and Green Cay. Green Cay has been protected by the US Fish and Wildlife Service as a refuge for these lizards and continues to be managed by USFWS. The *Ameiva* has also been introduced (or re-introduced, as the case may be) to Ruth Island on the south shore of St. Croix, managed by DFW, and Buck Island (BUIS), managed by the National Park Service (NPS).

Population Estimation

Estimating the population status of each population of the St. Croix Ground Lizard has been a challenge through the years, especially given the varying but always limited resources of each agency involved in conserving the lizard. Each island that the lizard currently inhabits is also distinct in size, topography and vegetation cover, further complicating attempts to find a universal method to estimate population size across islands.

This issue became especially pressing when it was believed that the lizard's population was in severe decline on Protestant Cay as a result of the construction of a hotel (McNair 2003). Population size pre-construction was estimated at 200 individuals (Philibosian and Ruibal 1971) and later post-construction as 50 individuals (Furniss 1984). Methods for conducting these surveys were inconsistent and in some cases, unclear from reports. Starting in 2002, McNair attempted to implement a survey technique across each island that the ground lizard inhabited (McNair 2003, McNair and Lombard 2004, McNair and Mackay 2005). This method involved simple observation of lizards along transects or within designated areas. Since that time, further study into the detectability of the St. Croix Ground Lizard has since indicated that these surveys may have drastically underestimated the population size due to low detectability of the lizard (Treglia 2010).

More recently, Geographic Consulting has implemented the use of mark/resight survey through paintmarking on Ruth Island and Protestant Cay to estimate population size with some success (Geographic Consulting 2011). The initial mark/resight surveys were conducted in conjunction with the area surveys and, as expected, the area surveys appeared to be greatly underestimating the population size. In this study we repeat both methods of population estimation to determine the current population status of the St. Croix Ground Lizard on Protestant Cay.

Disturbance to *Ameiva* Population

The population of St. Croix Ground Lizards found on Protestant Cay is unique in that it is the only one that has persisted while co-habiting with humans. A working hotel with a restaurant

and water sports vendor exists on Protestant Cay and the beach is a popular destination for locals and tourists alike. As a result, this population has faced regular threats from deleterious landscaping practices and the presence of potential predators such as rats and cattle egrets in addition to several severe disturbance events. In 2002, a major habitat disturbance consisting of the removal of several trees and their leaf litter and the deposition of a concrete rubble pile caused a change in the distribution of Ameiva on Protestant Cay in which individuals appeared to disperse out of the disturbed areas and into the nearby sections (McNair and Coles 2002). However, there was no overall decline in population size.

In mid-December 2011, a large section of the northern part of the island was severely disturbed by un-permitted bulldozing of Ameiva habitat. Portions of sections S, Q and W (see Figure 1) were excavated and the soil was piled to form a temporary road in section W. This soil was piled in a known hotspot for Ameiva. Unfortunately, surveys were not conducted immediately to assess the impact on the Ameiva population.

Methods

As mentioned above, two different population estimation methods were used for the sake of long term comparison.

Area Surveys

Methodology for the area surveys follows that employed in McNair 2002. The island was divided into 23 sections based on easily identified landmarks and walkways (see Figure 1). The area of each section was variable. The observer walks slowly through the area, noting all Ameiva seen and attempting to keep track of individuals so as not to count the same individuals multiple times. Surveys within each section took approximately the same amount of time for each repetition, but surveys take differing amounts of time in different sections. Surveys were conducted on 24 July, 30 Aug and 12 Dec 2012.



Figure 1. Survey sections used for area surveys for *Ameiva polops* population estimate at Protestant Cay, St. Croix

Paint Marking

Paint marking methods followed that employed by Geographic Consulting 2011, based on Heckel and Roughgarden 1979 with some adjustments made for local conditions. Paint marking was conducted on each island on three consecutive days, 25-27 July 2012. Each day a team of observers (usually 3-4 individuals) walked the entire island marking every lizard with latex paint diluted with water at a ratio of 1:1. A different color of paint was used to mark lizards each day. If a lizard was marked from a previous day's survey, it was marked again with the current day's paint color. The number of adult and juvenile lizards marked was tallied each day and the number of resights and from which day, was recorded. Although juveniles and adults were distinguished when recording data, we opted to combine the two into a single count during analysis because many individuals were "on the border" between the two size classes and misclassification could result in errors in data analysis and interpretation.

Population estimation from the mark/resight surveys was conducted using Huggins closed capture model in MARK (White and Burnham 1999).

Results

Area Surveys

Population Assessment

The population estimate based on area surveys was 129 individuals (see Table 1, and see Appendix A for daily counts). This is not significantly different than the population estimate of 136 individuals (t -test = 0.685, $p > 0.5$), from surveys conducted in 2010 (Geographic Consulting

2011). This is, however, a marked increase over the estimates of 30 individuals (McNair 2003) and 36 (McNair and Coles 2003) from surveys conducted in 2002.

Table 1. High counts of *Ameiva polops* by section for each year of area surveys.

Section	2002	2011	2012
A	6	22	19
B	4	7	17
C	1	3	1
D	0	4	2
E	5	1	7
F	0	7	1
G	0	0	0
H	0	0	1
I	0	6	3
J	0	0	0
K	0	2	1
L	0	0	1
M	1	5	4
N	0	7	6
O	0	6	4
P	3	11	12
Q	1	13	9
R	1	0	0
S	6	24	22
T	0	8	3
U	0	1	5
V	2	4	3
W	0	5	8

Distribution

An examination of the distribution of *Ameiva* shows that they have considerably expanded their range into areas that were previously unoccupied in 2002. Section B has seen a steady increase in individuals, likely because the landscaping crew of the hotel has followed through with recommended “lizard friendly” landscaping practices in this section. It is difficult to determine long term trends in distribution of *Ameiva* from examining these numbers as the lizards are free to move between sections. Their distribution appears to be linked to the landscaping practices at the time of observation (Valiulis pers. obs. 2012), although we do not have quantitative data to confirm this.

Mark/Resight

The population estimate based on the paintmark survey was 384 (SE \pm 47) individuals. This is a large increase from the estimate produced using the same mark/resight technique in 2010 of 249 (SE \pm 36) individuals (Geographic Consulting, unpub.). This is also a significantly larger number than the 129 individuals estimated by the area surveys. See Table 2 for a summary of all known population estimates conducted at Protestant Cay.

Table 2. Population estimates of *Ameiva polops* on Protestant Cay (based on McNair 2003)

	1967 ¹	ca.1978 ²	1980-81 ³	1987 ⁴	1994-96 ⁵	2002 ⁶	2010 ⁷	2012 ⁸
unknown	200	50-100	--	--	--	--	--	--
mark/release	--	--	50	--	--	--	--	--
unrestricted search	--	--	--	29	--	--	--	--
searches at points with fixed radii	--	--	--	--	23 (16-26)	--	--	--
area surveys	--	--	--	--	--	30	136	129
mark/resight	--	--	--	--	--	--	249 \pm 36	384 \pm 47

¹Philbosian and Ruibal 1971, ²Dodd 1978, ³Furniss 1984, ⁴Zwank 1987, ⁵Knowles 1997. ⁶McNair 2003,

⁷Geographic Consulting unpub., ⁸This study

Discussion

Methods comparison

The disparity between the population estimates from the two survey techniques is not entirely surprising. The underestimation of the population estimate using the area survey method has long been recognized as a limitation and has become increasingly relevant as the population has increased (McNair 2003, Treglia 2010, Geographic Consulting 2011). A key assumption of this survey technique is that every individual lizard is available for detection and as long as the observer is diligent and methodical in their observations, the population can be accurately assessed. However, a project conducted in association with the translocation of *Ameiva* to BUIS found that the probability that individuals were active on the surface during standard survey hours was 0.094 to 0.251 (Treglia 2010). Thus, on any given day, the observer is only likely to see 25% or less of the population.

The mark/resight technique of paintmarking adjusts for the low detectability of the *Ameiva*, and likely provides a more accurate estimate of the population size. It should be noted, however that the large standard error indicates a wide range for the actual population size. To better pinpoint the actual population would require a greater number of sampling occasions, an option that is not recommended with paint marking because the paint will fade after a few days and lizards that are detected every day will become coated in paint. However, alternative methods for more accurate estimation (eg. mark/recapture) will require substantially more

resources and expertise. The paintmarking is sufficient for monitoring the status of the population and can be conducted in a short time span with minimal resources and expertise.

Population status

The population estimate provided by the mark/resight analysis indicates that the population of *Ameiva polops* on Protestant Cay appears to be increasing, however with such a large standard error, the magnitude of the increase is uncertain. Nonetheless, this is encouraging news in light of the severe disturbance that occurred in December 2011. Despite destruction of a large swath of habitat and the near-certain burial of many of the *Ameiva* in burrows in that area, the population appears to be persisting. The distribution of the lizard does not appear to have been greatly affected by the disturbance either. This is likely because the destructive activity was halted within a day and some vegetation has been allowed to grow into the disturbed area since the disturbance.

A likely contributor to the increased population size is the decrease in nesting cattle egrets and little blue herons. These birds have been one of the primary threats to the *Ameiva* population through predation of the lizards. In 2009, DFW contracted USDA- Wildlife Services to conduct harassment activities to encourage the birds to nest elsewhere. This has worked as a short term solution but without continued harassment, the birds will return. In the long term, the trees that provide ideal nesting habitat for the birds will need to be removed. It is recommended that each time an *Ameiva* population survey is conducted in the future, an accompanying count of cattle egret nests is also conducted. Additionally, continued cooperation with the management staff at Protestant Cay to implement and maintain landscaping practices that maintain lizard habitat is essential to its long term survival.

It is also recommended that the population status of the St. Croix Ground Lizard on Protestant Cay be evaluated on a regular basis. At best, annual surveys to produce a population estimate would be conducted, but in the absence of any major disturbances or habitat alterations, every other year is probably sufficient.

This work was conducted for DPNR-DFW under Endangered Species Research STX018-12 permit issued to Jennifer Valiulis, Geographic Consulting.

Literature Cited

- Diaz, P.M., H. Heinz, J.S. Parmerlee Jr. and R. Powell. 2005. Population Densities and Structural Habitats of *Anolis* Lizards on St. Eustatius, Netherlands Antilles. *Caribbean Journal of Science*. 41:296-306.
- Division of Fish and Wildlife. 2008. Implementation of State Wildlife Grant Wildlife Action Plan. Annual report for State Wildlife Grant VI-T-07-1, unpublished. Department of Planning and Natural Resources Division of Fish and Wildlife, St Thomas
- Dodd, C. K., Jr. 1978. Island lizard in danger. *National Parks and Conservation Magazine* 52(8):10-11.
- Furniss, S. B. 1984. Recovery plan for the St. Croix Ground Lizard, *Ameiva polops*. United States Fish and Wildlife Service, Atlanta, Georgia.
- Geographic Consulting. 2011. The use of paint marking to estimate population size of the St. Croix Ground Lizard (*Ameiva polops*) at Protestant Cay and Ruth Island. Report to U.S. Virgin Islands Division of Fish and Wildlife.
- Heckel, D. G., and J. Roughgarden. 1979. A technique for estimating the size of lizard populations. *Ecology* 60:996-975.
- Knowles, W. C. 1997. Conservation of the St. Croix Ground Lizard, *Ameiva polops*. Final report. Endangered species project, study IIB, job ES 2-1, Division of Fish and Wildlife, United States Virgin Islands.
- McNair, D. B. 2003. Population estimate, habitat associations, and conservation of the St. Croix Ground Lizard *Ameiva polops* at Protestant Cay, United States Virgin Islands. *Caribbean Journal of Science* 39:94-99.
- McNair, D.B. and W. Coles. 2003. Response of the St. Croix Ground Lizard *Ameiva polops* to severe local disturbance of critical habitat at Protestant Cay: Before-and-after comparison. *Caribbean Journal of Science*. 39:392-398.
- McNair, D. B., and A. Mackay. 2005. Population estimates and management of *Ameiva polops* (Cope) at Ruth Island, United States Virgin Islands. *Caribbean Journal of Science* 41:352-357.
- McNair, D. B., and C. D. Lombard. 2004. Population estimates, habitat associations, and management of *Ameiva polops* (Cope) at Green Cay, United States Virgin Islands. *Caribbean Journal of Science* 40:353-361.

Philibosian, R., and R. Ruibal. 1971. Conservation of the lizard *Ameiva polops* in the Virgin Islands. *Herpetologica* 27:450-454.

Philibosian, R., and J. A. Yntema. 1976. Records and status of some reptiles and amphibians in the Virgin Islands. I. 1968-1975. *Herpetologica* 32:81-85.

Treglia, M. 2010. A translocated population of the St. Croix ground lizard: analyzing its detection probability and investigating its impacts on the local prey base. Master's Thesis. Texas A&M University, College Station, TX

White, G. C., and K. P. Burnham. 1999. Program MARK: Survival estimation from populations of marked animals. *Bird Study* 46 Supplement:120-138.

Zwank, P. 1987. Field study of *Ameiva polops*. Report to R. E. Noble. Deposited in the files of the Division of Fish and Wildlife, United States Virgin Islands.

Appendix A. Daily counts of *Ameiva polops* from area surveys by section.

Section	Round 1 (24 July)	Round 2 (30 Aug)	Round 3 (12 Dec)	High Count
A	16	19	14	19
B	11	6	17	17
C	1	0	1	1
D	1	2	1	2
E	1	0	7	7
F	0	1	0	1
G	0	0	0	0
H	1	0	0	1
I	3	1	1	3
J	0	0	0	0
K	0	0	1	1
L	0	1	0	1
M	4	4	1	4
N	3	3	6	6
O	0	4	1	4
P	6	12	8	12
Q	4	9	7	9
R	0	0	0	0
S	13	22	0	22
T	3	2	1	3
U	1	5	2	5
V	1	3	2	3
W	4	8	1	8
Total	73	102	71	129