A Comparison among *Ameiva fuscata* Between Habitats and Sexual/Age Groups

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Abstract

A morphological comparison study was done on *Ameiva fuscata* in two differing locations, Batalie Beach and Springfield, along with a male, female, and juvenile comparison study. The strategic placement of a black net and a chicken wire net were used for their capture. The measurements taken were run through a Principal Component Analysis for location differences and a Discriminant Analysis for group differences. Between the different locations, on Springfield *A. fuscata* were found to have larger big toes on their hind limbs and smaller head width and snout to vent lengths. Between males, females, and juveniles, males where found to have larger heads and females had longer snout to vent lengths and were relatively lighter.

***Keywords*:** *Ameiva fuscata*, Dominica, habitat variations, sexual dimorphism

Introduction

The Caribbean island of Dominica located in the Lesser Antilles, provided a large number of distinct habitats, among them are coastal and secondary forest habitats. Throughout the island of Dominica, lives an endemic ground lizard known commonly as the Dominican Ground Lizard or *Amieva fuscata* (CITE). *Ameiva fuscata* can be found in multiple habitats, including those previously mentioned. This project was completed to see if there were significant differences between the same species of lizards in differing habitats. Male, females, and juveniles were distinguished and a study was conducted to see if there were significant differences between those three groups.

Two different locations were assessed, the Archbold Tropical Research and Education Center located at Springfield, which was classified as secondary forest, and the Batalie Beach, considered dry coastal habitat.

Material and Methods

Ten individuals were collected from each location. A large black net was used for their capture. On Batalie Beach, the net was placed in three different locations. The first location was an alleyway between two nearby abandoned buildings relatively close to the sea. The net was placed in front of the opening on the porch and held there with rocks. The net was held very loosely so that the lizards would be easier entangled. Several *A. fuscata* were caught by chasing them into the alley and grabbing them as soon as they were tangled. The next location chosen was in a mango grove, where the net was balanced on trees and placed alongside a wall. With a three person tactic, the lizards were chased towards the net by two people and a third stood by the net to force them into it. Fewer *A. fuscata* were caught with this tactic. The final area used was farther down the

road to a place with large boulders. The net was placed in a “V” shape funnel between trees. Similar tactics were used to scare the lizards but unfortunately all escaped. At the field station, the net was placed along side a wall and bush, where the *A. fuscata* would regularly bask. Whenever spotted, they would be chased from the bush into the net and became tangled inside. A chicken wire trap was also constructed with “V” shaped openings along two sides. It was baited with mango, papaya, and muffins and two *A. fuscata* were caught. This trap was also used on the field station. Once the lizard entered, it was not able to escape. The trap was placed by concrete stairs where the lizards had been seen basking and running under rocks.

Once the lizards were captured they were measured using a NEIKO 0-150m digital caliper and a Lufkin 50M tape measurer. They were weighed with 100g, 300g, or 500g, scales depending on the size of the lizard. Weight was measured by placing the specimen in a plastic bag and subtracting the weight of the bag. Before they were released, a photo was taken of their femoral pores and a mark was placed with a permanent marker on their thigh, to avoid recapture of the same lizards.

Measurements taken include head width, head length, tail to vent length, vent to head length, right long finger length, right back leg length, and femoral pore count. The head width was taken from between the inside eye margins. The head length was measured from the tip of the snout to the last noticeable scales on the neck. Tail to vent length was measured from the tip of the tail to the cloaca. The vent to head length was taken from the cloaca to the tip of the snout. The toe length was measured from the nail of the longest toe to its attachment to the palm. The right back leg length was taken from

its attachment to the body, to the beginning of the hand. Femoral pores were counted through use of the photos.

Each individual was then sexed. Males were sexed by the presence of jowls under their jaws, significantly noticeable femoral pores, and large, blunt heads. Females had narrower heads, were generally smaller and had less noticeable femoral pores. Juveniles were not sexed but treated as a third group. They had distinct yellow lines and smaller body mass on average.

Results

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.417	90.285	90.285	5.417	90.285	90.285
2	.342	5.693	95.979	.342	5.693	95.979
3	.093	1.543	97.521	.093	1.543	97.521
4	.063	1.052	98.573			
5	.061	1.020	99.593			
6	.024	.407	100.000			

Extraction Method: Principal Component Analysis.

Figure 1: Total Variance from 6 Principal Components Derived from Morphological Variables Between Springfield and Batalie Beach *A. fuscata*

Component Matrix[a]

	Component		
	1	2	3
head width	.959	-.168	.168
head length	.986	-.001	.000
vent to snout	.961	-.180	.036
big toe length	.849	.524	.036
back right leg	.962	-.065	-.248
Weight	.978	-.049	.013

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Figure 2: Component Matrix for 6 Morphological Variables in Components 1, 2, and 3

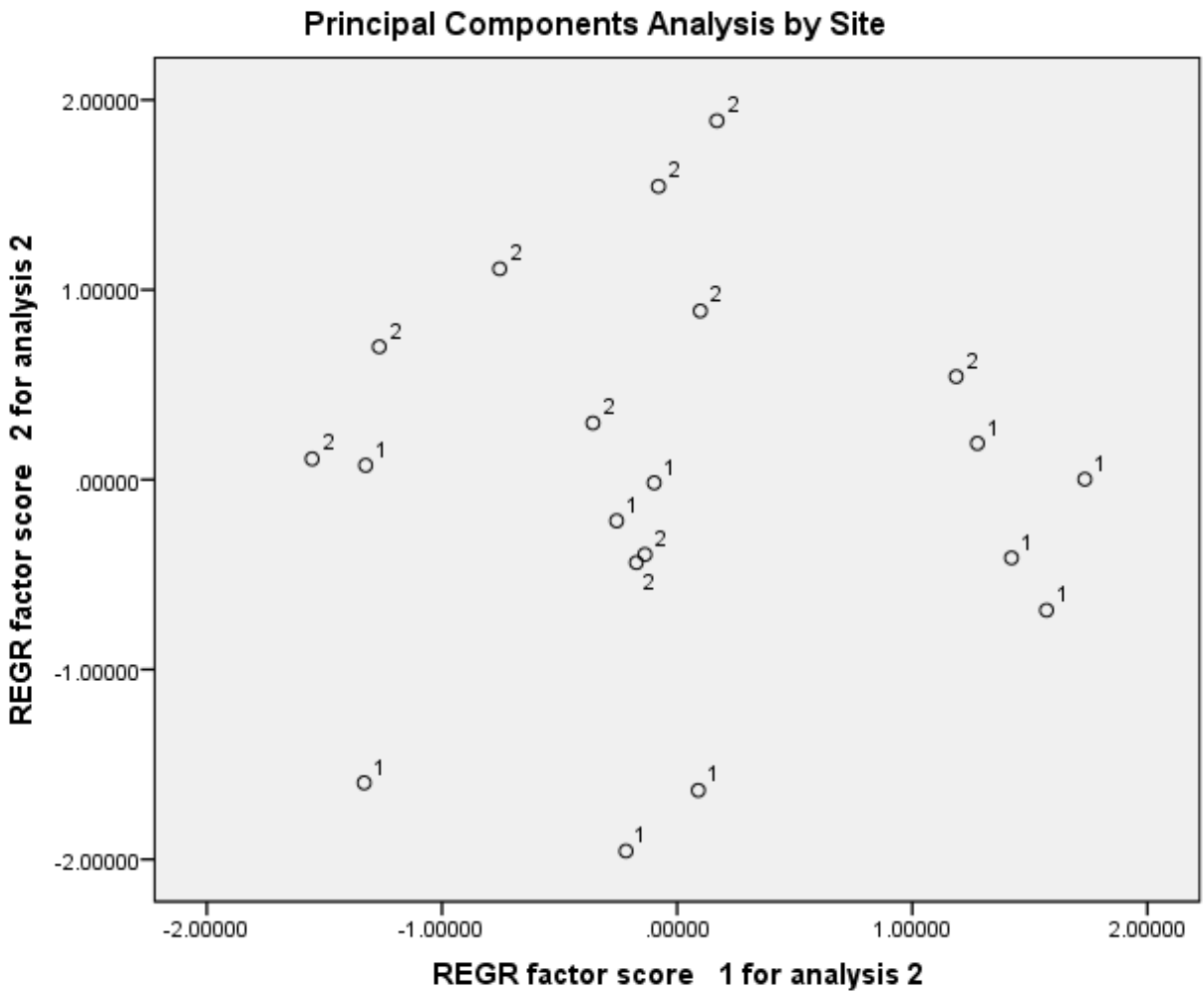

Figure 3: Components 1 Plotted Against Components 2 with *A. fuscata* from Batalie Beach labeled as 1 and Springfield as 2

Group Statistics

SexN		Mean	Std. Deviation	Valid N (listwise)	
				Unweighted	Weighted
1	head width	15.2600	2.16184	8	8.000
	head length	41.3513	6.16977	8	8.000
	vent to snout	181.5000	30.81280	8	8.000
	big toe length	36.2388	2.36866	8	8.000
	back right leg	59.6988	10.48591	8	8.000
	Weight	167.2500	66.52980	8	8.000
2	head width	13.5350	.31075	4	4.000
	head length	29.9475	2.47699	4	4.000
	vent to snout	160.0000	20.00000	4	4.000
	big toe length	24.8300	3.48560	4	4.000
	back right leg	47.7050	5.14057	4	4.000
	Weight	74.5000	17.15615	4	4.000
3	head width	11.6425	2.10073	8	8.000
	head length	23.9200	5.53019	8	8.000
	vent to snout	121.0000	19.47893	8	8.000
	big toe length	23.7088	5.17688	8	8.000
	back right leg	38.0875	7.45042	8	8.000
	Weight	42.5000	31.45064	8	8.000
Total	head width	13.4680	2.47369	20	20.000
	head length	32.0980	9.56272	20	20.000
	vent to snout	153.0000	36.55421	20	20.000
	big toe length	28.9450	7.16715	20	20.000
	back right leg	48.6555	12.79436	20	20.000
	Weight	98.8000	73.98193	20	20.000

Figure 4: General Group Statistics for Groups 1, 2, and 3, or males, females, and juveniles

Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	12.842[a]	90.0	90.0	.963
2	1.431[a]	10.0	100.0	.767

a. First 2 canonical discriminant functions were used in the analysis.

Figure 5: The Percent of Variance Between Each Discriminant Function

Standardized Canonical Discriminant Function Coefficients

	Function	
	1	2
Head width	-3.429	-.437
Head length	3.282	1.003
Vent to snout	-.134	2.664
big toe length	.753	-.280
Back right leg	-.414	.089
Weight	.630	-2.791

Figure 6: The Standardized Canonical Discriminant Function Coefficients for 6 Morphological Characteristics

Classification Results[a]

		SexN	Predicted Group Membership			Total
			1	2	3	
Original	Count	1	8	0	0	8
		2	0	3	1	4
		3	0	0	8	8
	%	1	100.0	.0	.0	100.0
		2	.0	75.0	25.0	100.0
		3	.0	.0	100.0	100.0

a. 95.0% of original grouped cases correctly classified.

Figure 7: Predicted Classification Based On Figure 6

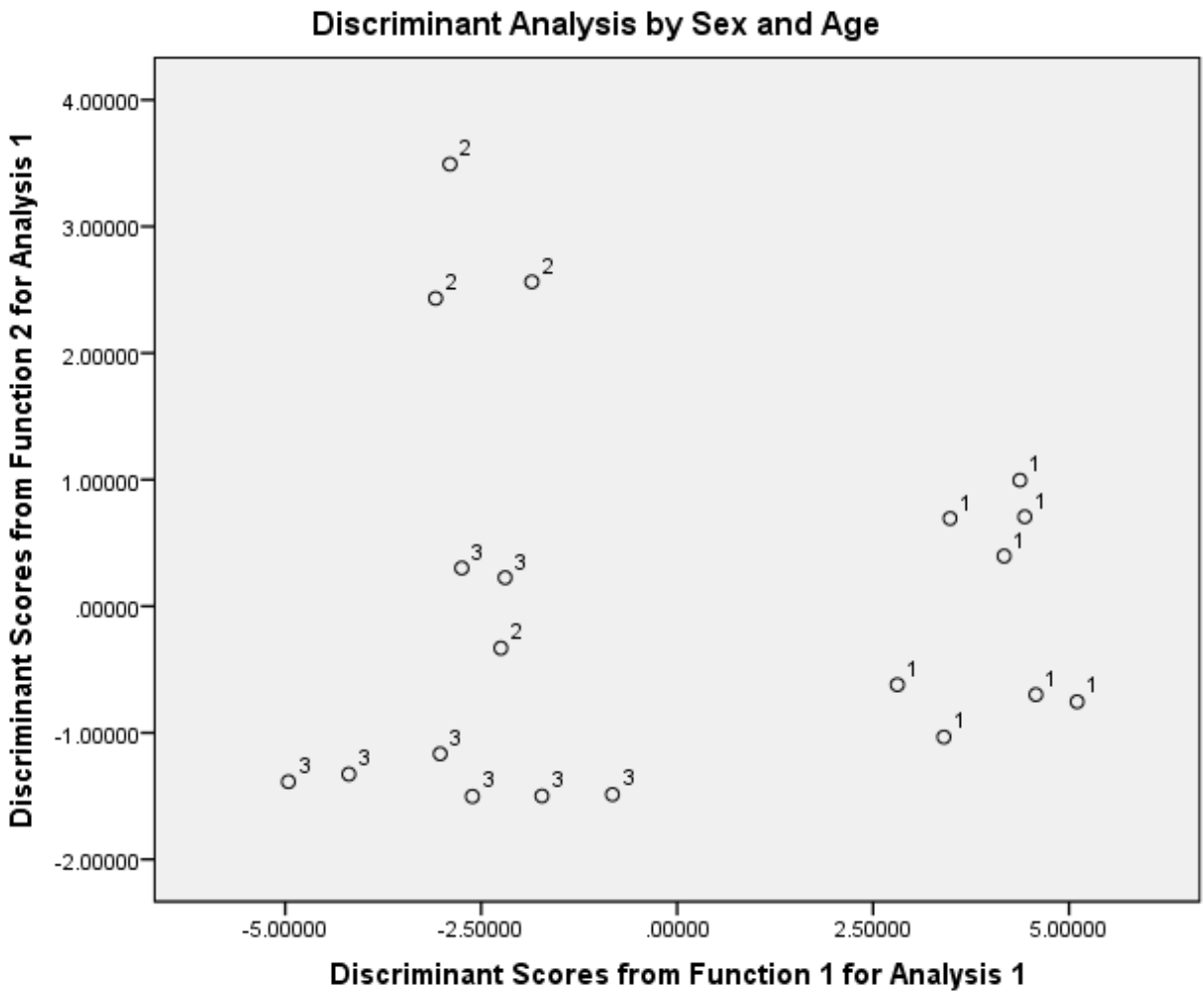

Figure 8: Function 1 Plotted Against Function 2, Where 1 Represents Males, 2 Represents Females, and 3 Represents Juveniles

Discussion

A Principal Component Analysis was performed through Microsoft Excel. Tail to vent length and femoral pore count were not included because several lizards had partial tails and not all femoral pores were accounted for. Figure 1 showed that out of the six components, the first three accounted for 96% of the variance among individuals and

only those were further analyzed. In figure 2, the first component represents the differing sizes of *A. fuscata* because everything was positive. The second component shows a strongly positive value for the big toe length and a strongly negative value for head width and vent to snout length. Those were the variables that were significantly differing between the two groups of lizards. Figure 3 showed component 1 and component 2 representing the "x" and "y" axes. Individuals from Springfield, marked with 2's, tended to score high on the "y" axis while the 1's. *A. fuscata* from Batalie Beach, scored low on that axis. This showed that *A. fuscata* on Springfield tended to have longer toes than their Batalie Beach counterparts. Similarly Valentine (2002) and Loughridge (2006) found that *Anolis sp.* on Springfield had long front and hind limbs. It was theorized that lizards in secondary forest have special limb adaptations. Larger limbs and hands might make traversing larger amounts of vegetative growth easier. The *A. fuscata* on Springfield also tended to have smaller head widths and vent to snout lengths compared to the Batalie Beach ones.

A Discriminant Analysis was then conducted. Males, females, and juveniles were all categorized and analyzed. Figure 4 showed a summary of the statistical values for each group. Figure 5 showed that 90% of the separation between the three groups was done for separating groups 1 from the other two. The rest of the 10% of the separation was then done between groups 2 and 3, or females and juveniles. Figure 6 showed that within the first axis, the main variables separating the males from the others were the head width, which scored strongly negative, and the head length which scored strongly positive. In the second axis, which separated the females from the other groups, the variable of significance were vent to snout length, which both scored strongly positive,

and weight, which scored strongly negative. Figure 8 showed each group clearly plotted in separate regions of the graph. The males, group 1, scored high on the x axis, stating that in relation to their head width, their snouts are longer. In other words, males have larger head compared to females and juveniles. This sexual dimorphism was also found in *Ameiva ameiva*, where males also had larger heads in comparison to their bodies (Rocha 2008). *Ameiva fuscata* males may have larger heads for territorial and combat purposes. In the y axis, females are the ones separated from the rest because of the vent to snout length and weight. Females have longer bodies than males and juveniles and in relation to the rest of their bodies, are lighter than those groups. Figure 7 shows that based on the variability and classifications just given, how the program would group each individuals. It would group males and juveniles the same, but one female it would count as a juvenile, making all the results significant.

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Acknowledgments

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