A survey and discussion of the invasion of *Anolis cristatellus* **and its effects on the endemic** *Anolis oculatus.*

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Abstract

Anolis oculatus is an endemic species to the island of Dominica. It has been able to flourish due to the lack of competition and diversity of habitats on the island. However, the last decade has generated concern for the anole in the Roseau area because an aggressive invasive species is causing havoc for the native Zanndoli. The invasive species, *Anolis cristatellus* was able to come in at the port of Roseau and has begun to expand its distribution ever since. Dominica is not the only place that *A. cristatellus* has become an invasive. Due to the fact that they are aggressive and extremely adaptable, they have been able to establish themselves in other islands. The purpose of this research was to survey the areas of Dominica that were visited on this study abroad trip to assess the invasion and verify the status of the Dominican anole in those areas. Surveys and thirty minute transects were run to get the data. It appears as though the invasion is still relatively contained around Roseau. However, in the areas where the Puerto Rican Crested Anole is found, it is rare or almost impossible to find any Dominican Anoles.

Introduction

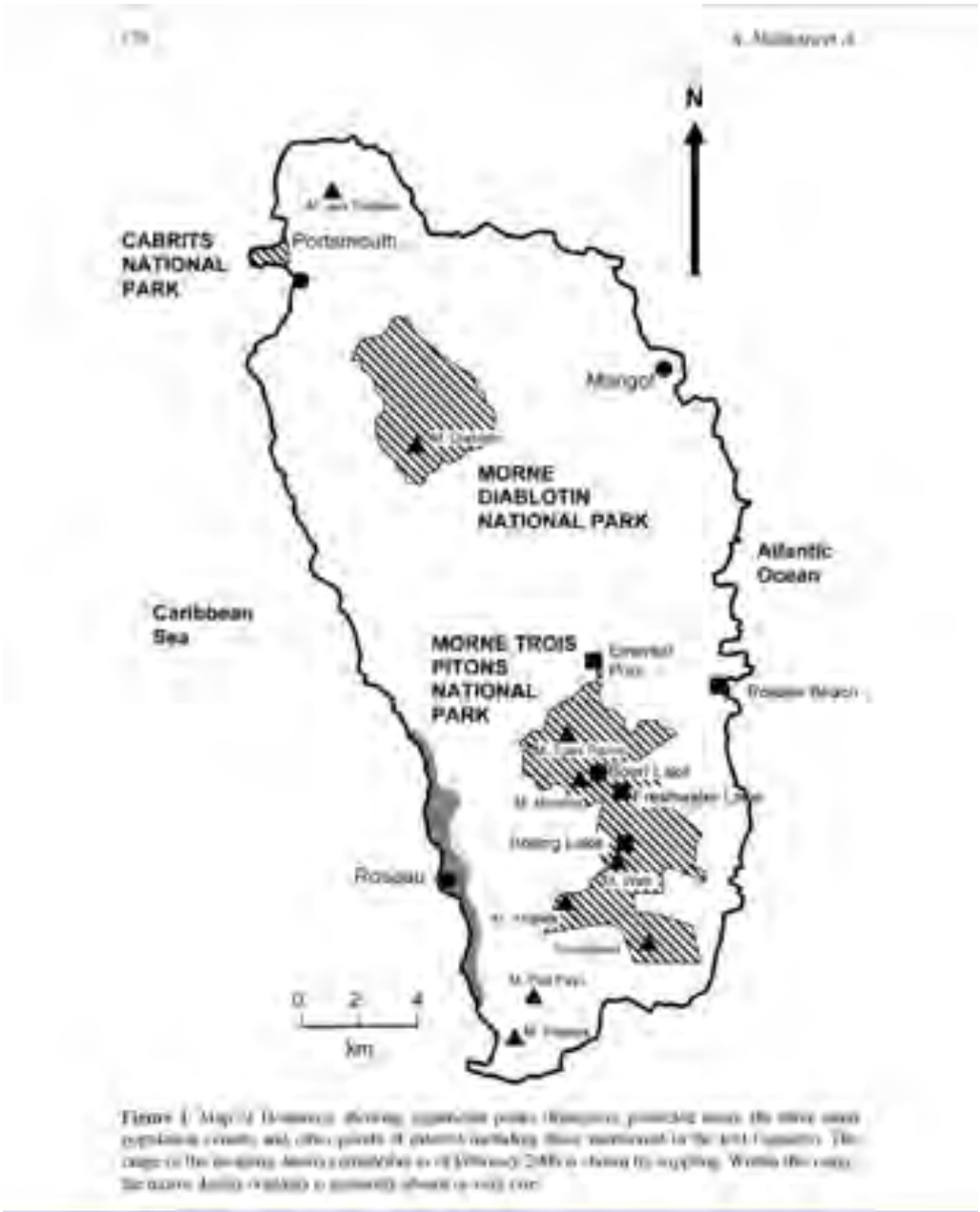
In our ever changing world nature has a tendency to finish last in terms of progress. Development causes habitat loss and species extinctions. However, biological invasions are also a result of progress and it often becomes "survival of the fittest" between native and invasive species. On the beautiful Nature Island of Dominica the impact of habitat destruction has not been the major issue. The island has been able to maintain most of its original species, especially the herptofauna. Dominica harbors four species of snakes, three species of frogs and ten species of lizards (Malhotra & Thorpe 1999). This study focuses on the lizards, one lizard in particular, *Anolis oculatus.* The Zanndoli (common name used by Dominican people) has been able to flourish on the island due to the lack of competition and habitat disturbance. It has a wide variation in its color patterns that range from dark browns to

bright yellow to green. Each color pattern is quite frequently mistaken for a different species. They are beautiful anoles that have adapted and thrived in the different ecosystems of Dominica taking a stronghold in five out of the six anole ecomorphs described by Ernest Williams (Williams 1972). However, as recent as the late 1990s, nature and progress became a threat to these animals. Roseau is the capital and one of the port cities in Dominica. Somehow an aggressive invasive was able to enter by ship and find its way in to the city. This invader is now taking a toll on the Dominican Anole. *Anolis cristatellus* (*Fig. 1*), commonly known as the Puerto Rican Crested Anole, is a very aggressive and highly adaptable species in this genus and also has as much variation in coloration as the Dominican Anole though it is primarily in shades of browns.

Fig. 1: Puerto Rican Crested Anole
photograph by myself at Botanical Gardens in Roseau

It is found in most of the Greater Antilles and is working its way down the island chain. It has also invaded Florida and other islands around Puerto Rico. In 2006, Malhorta, Thorpe, Hypolite and James did a report on the status of the herptofauna on Dominica where they noted the invasion and presented a map (*Figure 2*) showing the progression. Based on this map, I surveyed our research station in Springfield, the Botanical Gardens in Roseau, a trail to Gallion and the areas of the island we have visited

on this study abroad trip, to see how far the invasion has expanded into the island and to determine if the population is being affected via surveys. It would be my hope that the intruder is only pushing the



Zanndoli to a higher canopy ecomorph rather than completely out competing them from each area that they invade.

Materials and Methods

Other than my field notebook, my pen, watch, camera and a good set of eyes, no other materials were needed for this project. I decided to use a survey and transect method to gain my information. On all of the transects, I would bring at least one or two people with me.

I based my initial research in Springfield at the Archbold Tropical Research and Education Centre which is about six miles away from Roseau. There are three trails that stem from the area, the River Trail that heads west down to the Check-Hall River, the Massacre Trail that winds northwest throughout old plantation fields and the Mt. Joy Trail that goes northeast up to an old burnt down house and up to the far edge of the two hundred acre property. I conducted two thirty minute transects for the River and Massacre trail just by starting at the bottom of the trail and timing myself with my watch timer. The Mt. Joy Trail was just a survey because *A. cristatellus* has been known not to prefer higher elevations. On the transects, I counted how many anoles I saw, which species and which ecomorph was first seen. I tallied the results in my field notebook.

Roseau is said to be the place of the initial invasion and after speaking to various people such as Clem James, our driver and Arlington James of the Forestry, Wildlife and Parks Division for Dominica, both informed me that the Botanical Gardens were overrun with the Puerto Rican Crested Anole. I was able to run 4 transects covering most of the garden. All transects were run in a similar manner by walking an area for thirty minutes checking the trees. One of the transects run was called Jack's Trail.

With the help of a guide named West, I was able to run a transect in the southern part of the island between Champagne and Scott's Head called Gallion. It was a steep trail and I was able to make the whole trail in the thirty minutes of the transect, which was done in the same manner as the others.

During my stay in Dominica, we have had the privilege to visit numerous national parks, tourist sites and some eco-lodges on the island due to my group research project. These places include Middleham Falls, Batalie Beach, Cabrits National Park, Syndicate Nature Trail, Castle Bruce, The Carib Territory, Boeri Lake, Freshwater Lake, Boiling Lake, Wotten Waven, Laudat, Traglafar, Picard, Rosalie

and Delices. All places were surveyed just by determining what could be observed on the trails we were on just to see if there was any sign of the invading *Anolis cristatellus*. One timed transect each was run at Batalie Beach and Cabrits National Park on the West Cabrits Trail starting at Fort Shirley and ending at the first set of ruins.

Results

From the areas I was able to visit I have determined that the invasive has stayed fairly close to the Roseau /Canefield area and just along the coast as shown in the map from 2006. From the six transects that were run at Springfield, I have found that *A. cristatellus* has not yet made their way up to this part of Dominica. Also, it appears as though the invasion has also stayed very contained because there was no sign of the Puerto Rican anoles down south at Gallion or at any of the sites visited. I believe that the invasion has stayed contained because *A. cristatellus* tends to prefer dry, highly populated and lower elevation areas. The only place I was able to observe *A. cristatellus* was at the Botanical Gardens in Roseau. The following chart (*Table 1*) contains my transect results.

Transect Area	Date/Time	*Anolis oculatus*	*Anolis cristatellus*
River Trail	5/27/10 1410	4	0
Massacre Trail	5/27/10 1600	5	0
Massacre Trail	5/30/10 1045	10	0
River Trail	5/30/10 1200	3	0
Batalie Beach	5/31/10 0915	13	0
West Cabrits Trail	5/31/10 1200	26	0
Botanical Gardens	6/03/10 0906	0	14
Botanical Gardens #1	6/04/10 0845	1	35
Botanical Gardens #2	6/04/10 0900	1	30
Botanical Gardens #3	6/04/10 0945	0	31
Gallion Trail	6/10/10 1610	13	0

Table 1: This chart shows the place of the transects, date and time and how many anoles were counted. Unfortunately for the population of *A. oculatus*, I was unable to locate the native species at gardens except for one male and one female. The male was of the yellow scalation (*Fig 3*).

Fig. 3: male *A. oculatus*,
photograph taken by Laura Duffie

Valuable information was acquired in an interview with Mr. Arlington James from the Forestry, Wildlife and Parks Division. He believes that the Dominican anole is being eaten by the Puerto Rican Crested Anole. I was not able to find any evidence of this but it is quite possible since the Zanndoli are no longer in the invaded regions. They also have two very distinguishable behavioral traits that the native anole does not express: 1) they hiss while fighting. 2) they possess a slow tail wagging motion when aggressive. Mr. James also explained the fact that the Puerto Rican Anole mates three times out of the year while the Dominican Anole mates only once a year. He also explained that they have been monitoring the invasion and have had reports of *A. cristatellus* in Roseau, Canefield, Grand Bay, Wotten Waven, Laudat, St. Joseph, Cabrits and Longhouse. I was able to visit all but Grand Bay, St. Joseph and Longhouse. The sighting at Cabrits was only one anole and they were able to take care of it. Wotton

Waven was surveyed while I was with my group at Tia's Bamboo Cottages and we were able to sight a pair of mating Dominican Anoles (*Fig. 4*).

Fig. 4: Dominican Anoles mating, male pins down female and bites neck.
photograph taken by Iara Lacher at Tia's Bamboo Cottages in Wotten Waven

This suggests that if the Puerto Rican Anole is there it has not affected them too much in this area since there are still present and reproducing. Longhouse is an interesting case because both species are recorded to be there. I believe that is because this area is just now being invaded and eventually the Zanndoli will be pushed out of this area as well. Mr. James is making sure they are keeping a close eye on this site.

Discussion and Conclusion

Although the population does not appear to be in immediate danger, this is something that should not be ignored. With the Dominican Anole being endemic to the island, it is very important that the species

be maintained and preserved to its most original state as possible.

Fig 5: Dominican Anole named Dude at Springfield
photograph by Amber Bayles

The study was conducted in a manner of survey and did not go into too much detail regarding reproduction and population density estimation. I am sure that a more specific data approach could be performed to get a more accurate and concrete analysis on the invasion and its impact. I would now like to discuss the potential error in the study. First of all, by doing surveys and counts there is a possibility that anoles could be recounted. Second, there is a lot of variation in both species. Sometimes it is very difficult to distinguish between them.

Fig 6: Dominican Anole at Springfield

Fig. 7: Dominican Anole, the dark variation, at Syndicate Nature Trail
photograph by Amber Bayles

Extensive research should be done to ensure the viability of *A. oculatus*. I would highly recommend close observation and a better sense of where *A. cristatellus* occurs, and if they will be moving up the rest of the island or stay contained. It would also be important to know if they really are eating the Dominican Anoles.

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