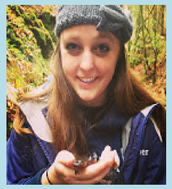
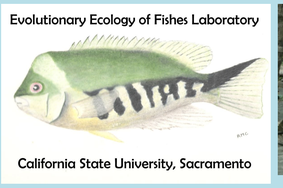
Genetic diversity and population structure of the Central American cichlid, *Amatitlania septemfasciata*



Sasha Watkins, and Dr. Ron Coleman

Department of Biological Sciences California State University, Sacramento



Abstract

Determining the spatial structure of a species is complex, especially in riverine systems. Fishes are able to follow the geography of the rivers to move from population to population, but may also be able to move over land to other rivers via large-scale flooding. Comparing microsatellite loci among populations of *Amatitlania septemfasciata* should give us insight into this phenomenon. Preliminary data has led to the optimization of five microsatellite primers and the use of fry for DNA extraction. Data collection took place in January 2018 and further analysis will be completed in summer of 2018.

Figure 1. Breeding color differences between two populations of *A. septemfasciata* (images from Google).

Introduction

Understanding the distribution and genetic structuring of fishes is complex, particularly when those fishes inhabit complex coastal river systems (McClearn et al. 2016), *Amatitlania septemfasciata* of the family Cichlidae is found in a series of rivers, all of which eventually empty into the Caribbean sea (Bussing, 1998) (Figure 2). In addition, breeding coloration of the females varies along a gradient throughout their range. For example, the breeding colors in the northwest are dark purple, while breeding females in the east are distinctly black and white (Figure 1).

The question becomes: how have the fish become distributed the way they are? Either, the fish have moved out to the ocean and back up other rivers, or the fish are moving across the land between river systems. Even though these river systems are not normally connected hydrologically, this part of the world is subject to frequent massive flooding, such that it is possible that individuals, and hence their genes, could move, in essence, over land, to adjacent rivers.

It is vital to determine the genetic population structure of this species to not only further support the prediction that variation exists but to also determine whether this variation is spatially structured, and why.

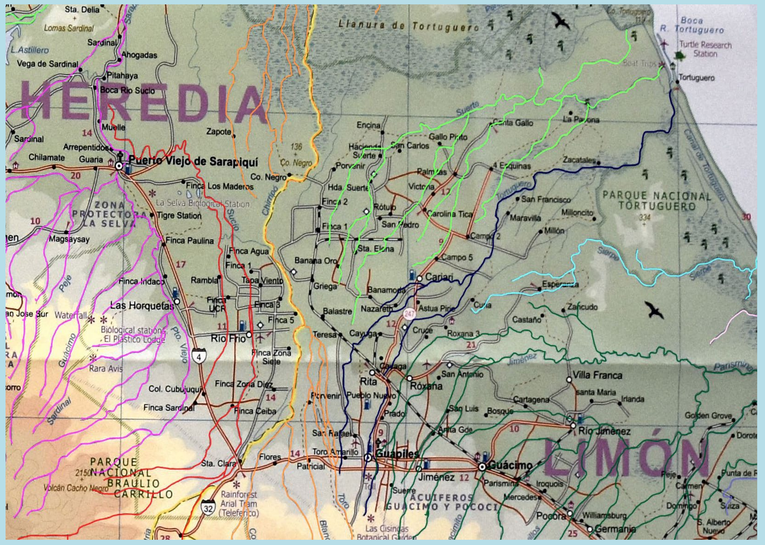


Figure 2. River drainages in *A. septemfasciata'* range.

Methods

Fieldwork was conducted in northeastern Costa Rica, based out of the La Selva Biological Station, near Puerto Viejo in January 2018. Photographs of *A. septemfasciata* were taken at each of fifteen rivers to determine whether variation in coloration exists among populations across the range. Fin clippings were also collected from fifteen fish in each of the fifteen sample rivers.

Samples were stored in 95% EtOH. DNA will be extracted using the DNeasy tissue extraction kit (Qiagen).

Eight microsatellite primers, predicted to amplify loci for a wide range of neotropical cichlids, will be used during PCR. PCR reactions will be run using the Phusion High Fidelity PCR kit from Thermofisher. Gels will be run and then the samples will be sent to Eurofins Operon for sequencing

Preliminary Results

Data collection was done in Costa Rica in January of 2017 and 2018. During the summer of 2017, I was able to practice DNA extractions, PCR, and running gels with samples collected in Costa Rica and from the Evolutionary Ecology of Fishes laboratory.

So far, I have been able to optimize five primers for use during the analysis. Preliminary testing has also determined that using DNA from fry for the genetic analysis is sufficient in amplifying these microsatellite loci (Figure 3).

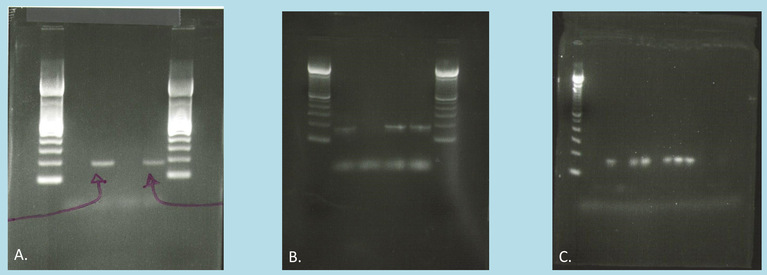


Figure 3. Gel images of *A. septemfasciata* samples from both Costa Rica and the Evolutionary Ecology of Fishes laboratory. 3a is an image using fin clips of *C. septemfasciatus* from Costa Rica. 3b is an image using fin clips from the lab. 3c is an image using fry from the lab.

Discussion

Understanding the forces that structure cichlid populations in the wild is critical for understanding the immense variation within fish species in the family Cichlidae. Though ongoing, this is the first study of its kind to investigate the phenomenon of population structuring of coastal riverine fishes in relation to a high incidence of natural flooding. The results will be valuable for both scientists interested in how natural populations work and for hobbyists interested in preserving the uniqueness of these fascinating fishes.

Acknowledgments

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References:

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