

Population Genetics of the Upland Chorus Frog (*Pseudacris feriarum*) in the Apalachicola Basin

Moses J. Michelsohn and Emily Moriarty Lemmon
 Department of Biological Science, Florida State University Tallahassee, FL 32304-4370
 Correspondence to M. J. M. Atelopus@gmail.com

INTRODUCTION

The Apalachicola River drainage acts as a unique refugium for continental flora and fauna within the Gulf Coastal Plain (Means 1977). *Pseudacris feriarum*, the Upland Chorus Frog, occurs in the river swamps along the Apalachicola deep into the Coastal Plain. Previous phylogenetic research suggests that *P. feriarum* expanded south into this region (Lemmon and Lemmon 2008). The Apalachicola drainage has been shown to act as a major barrier to gene flow in some amphibians (e.g. Pauly et al. 2007) while having little effect on others (e.g. Makowsky et al. 2009). We have begun to investigate whether the Apalachicola acts as a barrier to contemporary gene flow in *P. feriarum* using microsatellite data modeled in MIGRATE-N. We predict that migration is restricted to regions north of the Coastal Plain, closer to the headwaters (Ayres and Clutton-Brock 1992).



METHODS

- Frogs were collected from breeding choruses in four localities (Liberty and Gulf counties, FL; Miller County, GA; and Houston County, AL) during the 2009–10 breeding season.
- Genomic DNA was extracted from liver tissue and samples were genotyped for three tetranucleotide microsatellite loci (CO8b, D6, D12b) using previously developed primers (E. M. Lemmon unpub. data).
- Microsatellite data were analyzed for basic population statistics with GENEPOP (Rousset 2008).
- Five models of migration (Figure 1) were evaluated with MIGRATE-N (Beerli 2006).
- Models were compared using Bayes Factors (Kass and Raftery 1995).

RESULTS

Microsatellite loci did not deviate from Hardy-Weinberg equilibrium for any population except that in Miller County. This deviation probably resulted from combining two nearby sampling localities. Linkage disequilibrium was not detected for any markers.

	Model Description	Bézier ln(mL)	ln Bayes Factor
A	Unrestricted migration	-403767.32	-183662.96
B	Northern and southern populations combined	-471025.12	-250920.76
Best Model C	Migration restricted to a northern route	-220104.36	0.00
D	Migration restricted to a southern route	-307730.07	-87625.71
E	Migration restricted to nearest neighbors	-347234.76	-127130.40

Figure 1. Models compared with MIGRATE-N. Arrows represent migration parameters of the model. Circles represent sampling localities (G = Gulf, H = Houston, L = Liberty, M = Miller).

In MIGRATE-N 3.1.7 (Beerli 2006), a Brownian-motion model with four heated chains was used to explore parameter space. The unrestricted model (Figure 1A) was preferred over a combined population model (Figure 1B). Three restricted-migration models (Figure 1C–E) were compared to the unrestricted model. Bézier approximations were used to compute Bayes factors for model comparison (Beerli and Palczewski 2010).

DISCUSSION

A model restricting migration to the northern end of the sampling range (Figure 1C) was favored over every other model tested. This result suggests that migration across the lower Apalachicola drainage is limited in *P. feriarum* and that migration is potentially restricted to regions north of the Coastal Plain.

FUTURE WORK

- Increase geographic coverage and number of loci sampled.
- Investigate independence of invasion of the Gulf Coastal Plain by *P. feriarum* with PHYLOMAPPER (Lemmon and Lemmon 2008).
- Compare the dispersal pathways of *P. feriarum* and *P. nigrita* with CIRCUITSCAPE (McRae 2006).

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