Population Genetics during a Mangrove Range Expansion

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Introduction

Black mangroves (*Avicennia germinans*) typically grow in tropical environments. However, mangroves have been experiencing population growth along the northern range limit in Florida due to a decrease in freezes, associated with climate change.

Figure 1: Black mangroves at the northern range limit in Florida

Research Question

Are there different patterns between nuclear and chloroplast diversity at a species range limit, associated with pollen and seed dispersal respectively?

Hypothesis

Avicennia germinans will have less genetic diversity at the northern range limit and have higher seed than pollen dispersal.

Figure 2: Black mangrove propagule

Methods

Field:

- Collected leaf tissue from 4 populations (30 individuals each)

Lab:

- CTAB procedure carried out for DNA extractions
- Sequenced chloroplast DNA at 2 noncoding regions
- 9 neutral microsatellite markers for nuclear DNA

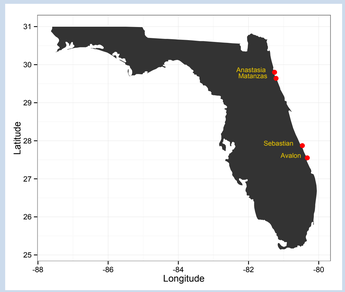

Figure 3: Map of populations

Results – Nuclear DNA

Population Pairwise Fst Values from GenAlEx

Avalon	Matanzas	Anastasia	Sebastian	
0.000				Avalon
0.158	0.000			Matanzas
0.149	0.039	0.000		Anastasia
0.036	0.138	0.124	0.000	Sebastian

Table 1: Pairwise Fst values measure genetic differentiation among populations.

STRUCTURE Bar plot

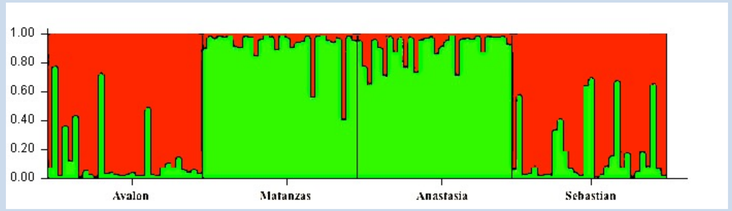

Figure 4: Bar plot for all populations in Florida. Population structure demonstrated 2 distinct genetic clusters.

Results – Chloroplast DNA

- 10 haplotypes from 18 individuals
- Haplotype diversity (H_d) = 0.70
- Fst from haplotypes (Gst) = -0.08.
- Pollen to seed flow ratio (r) = -0.41

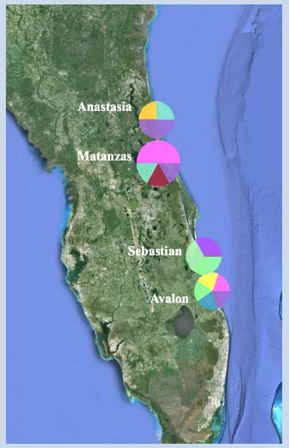

Figure 5: cpDNA Haplotypes in Florida

Conclusion

Nuclear DNA revealed 2 genetic clusters that correlate to the geographic distance between populations (Fig. 4). The northern range limit populations were moderately isolated and genetically different from southern populations in Florida (pairwise Fst = 0.124-0.158). Chloroplast DNA displayed high genetic diversity with 10 haplotypes (n=18), but haplotype diversity was lower in Florida (H_d = 0.70) compared to previous research in Panama (H_d=0.84). During its range expansion, *A. germinans* does not appear to have less genetic diversity at its range edge. Also, the pollen to seed ratio emphasizes that there is higher seed migration than pollen flow (r = -0.41).

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