

Color pattern polymorphism in
Eleutherodactylus coqui: selection in
Puerto Rico and founder effects in Hawai'i



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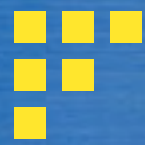
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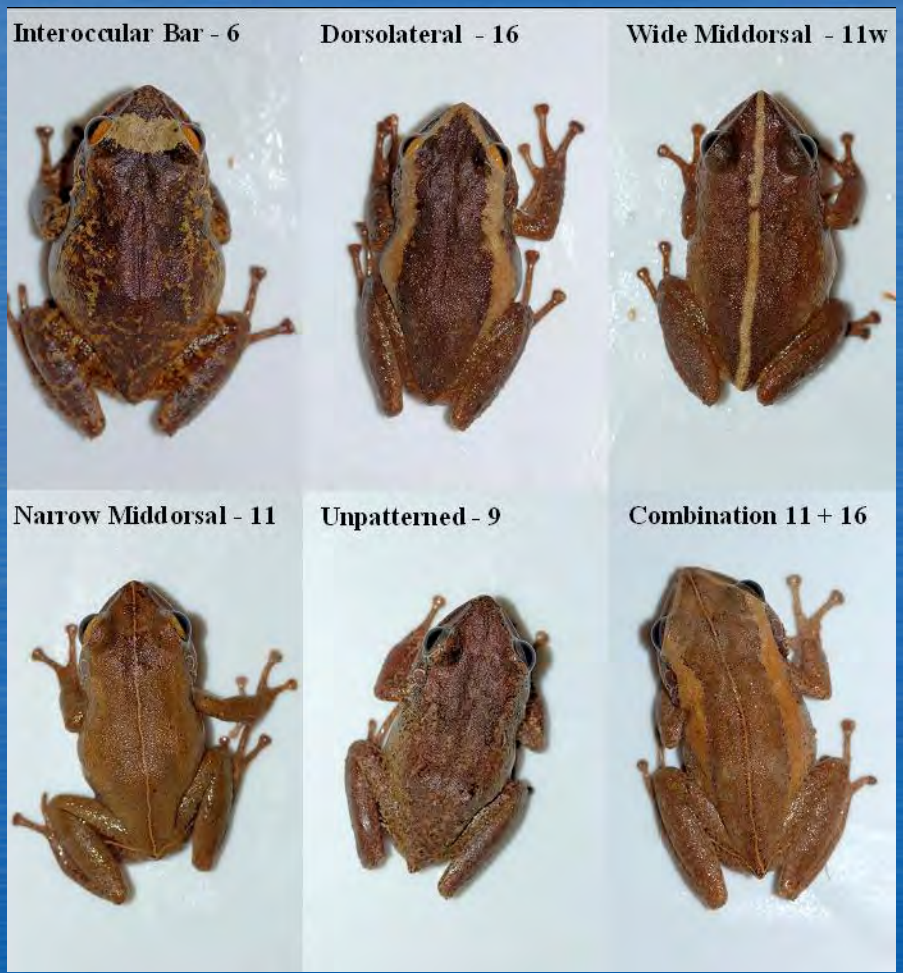
Background

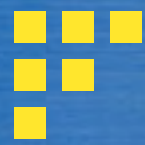


- Color patterns polymorphisms have historically been instrumental in studies of evolution
- *E. coqui* exhibits distinct color patterns (Woolbright, 2005)
- *E. coqui* was introduced to Hawai'i in the late 1980s and appears to have undergone a loss of genetic diversity in mtDNA (Velo-Antón et al., 2007)



Color patterns in *E. coqui*

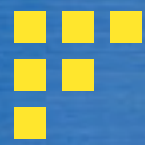




Goals



- Determine the mode of inheritance
- Characterize color patterns in native and introduced ranges
- Test for founder effects in Hawai'i
- Test for selection in Puerto Rico



Mode of Inheritance

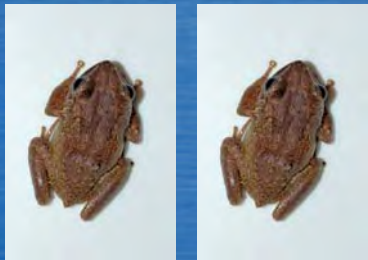


- In nature
 - Do frogs have multiple color patterns?
 - Yes, but only 2
 - Are color patterns sex limited?
 - No, all patterns seen in males and females

- In lab
 - Mendelian crosses
 - Number of loci and alleles
 - Dominance / recessive relationships

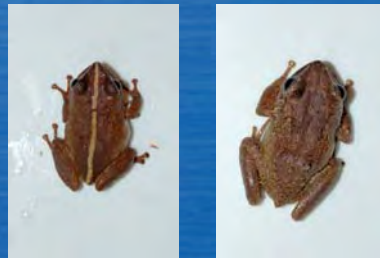
Crosses performed in the Lab

9 x 9



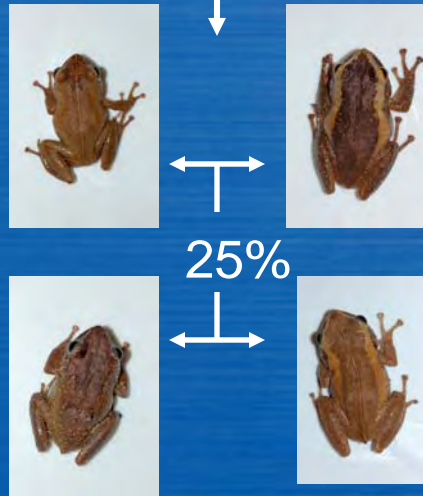
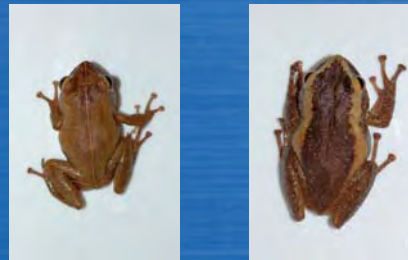
100%

9 x 11w



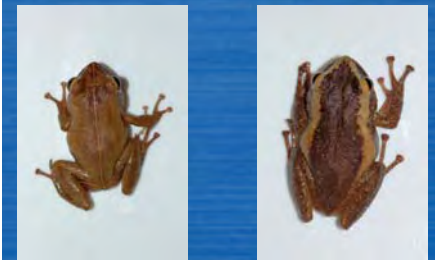
50% 50%
100% 0%

11 x 16

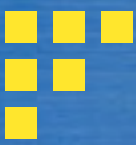


25%

9 x 11/16



50% 50%



Results

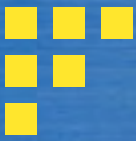


- Lab data
 - all stripe patterns dominant to unpatterned
 - all stripe patterns are codominant with each other
 - χ^2 tests indicate single autosomal locus, with 5 alleles

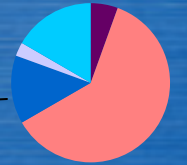
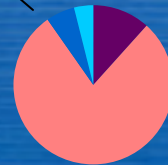
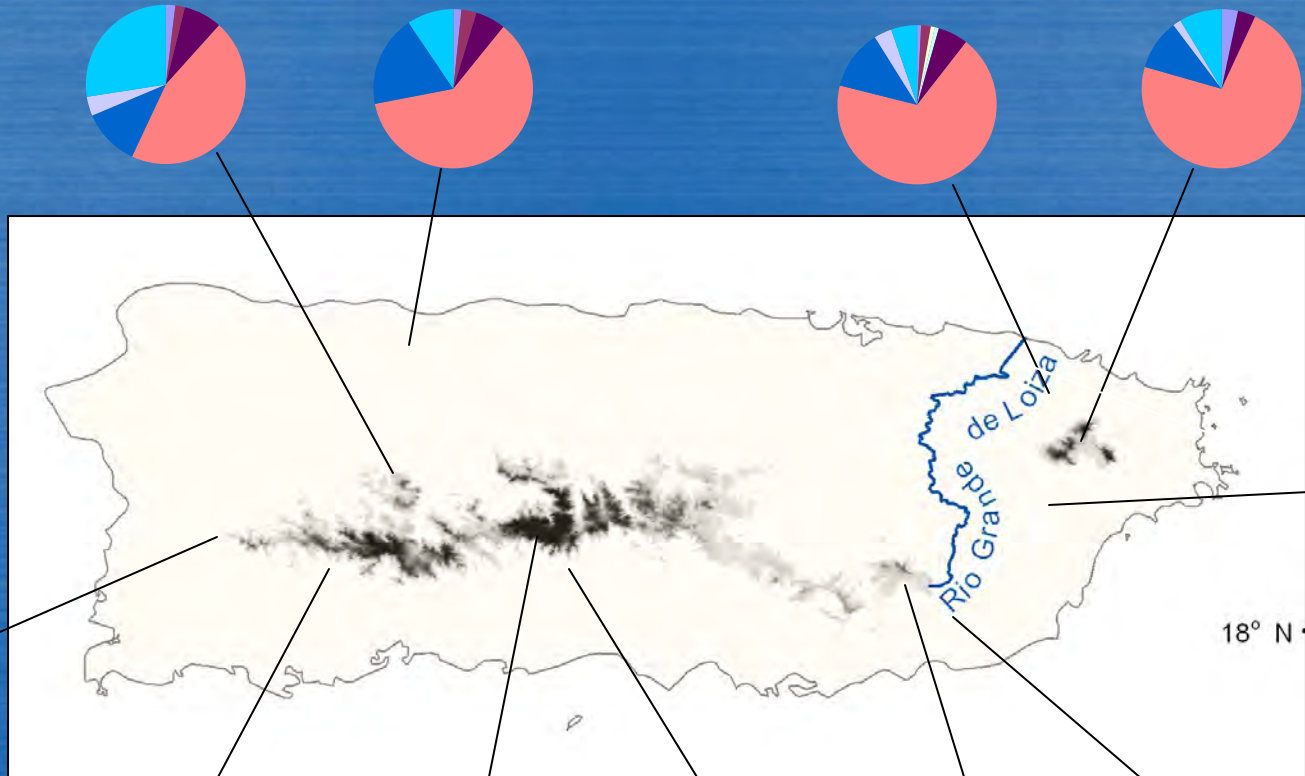


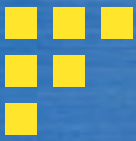
Color patterns in native and introduced ranges

- Sampled multiple populations from across both ranges
 - PR: n=11
 - HI: n=14
- Counted number of frogs with each color pattern
- Used results of breeding experiment to determine allelic richness
- Compared allelic richness among PR and HI

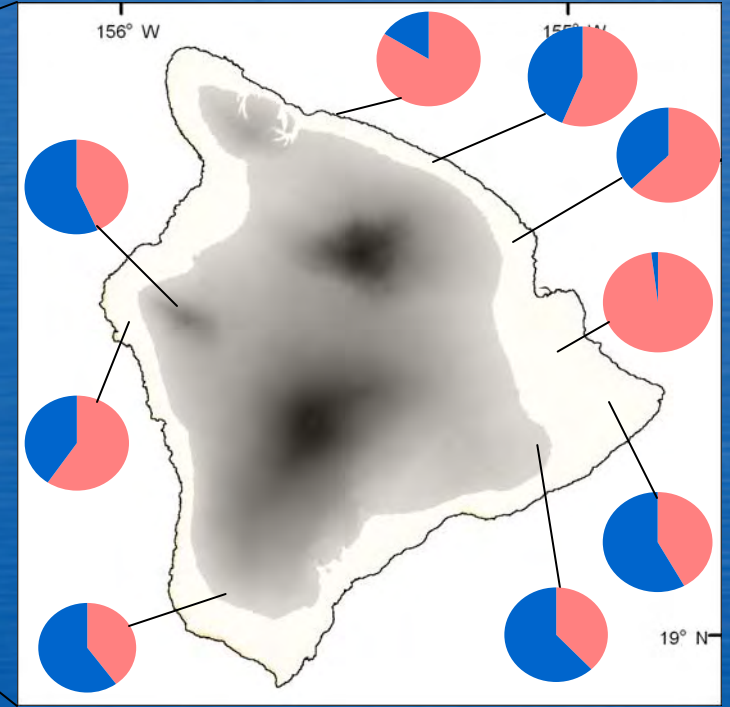
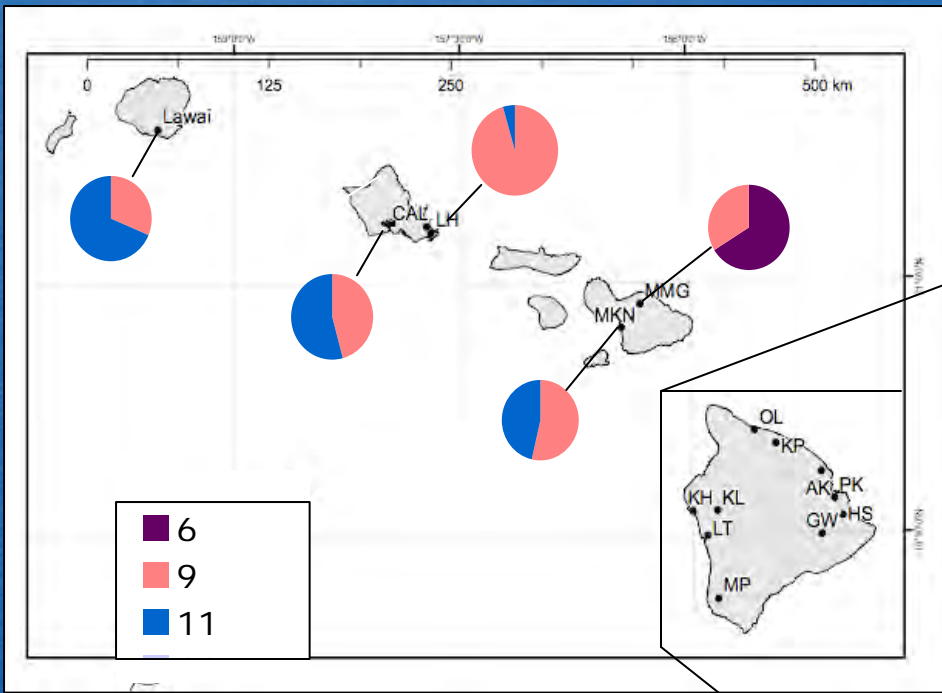


Color patterns in Puerto Rico





Color patterns in Hawai'i



Results



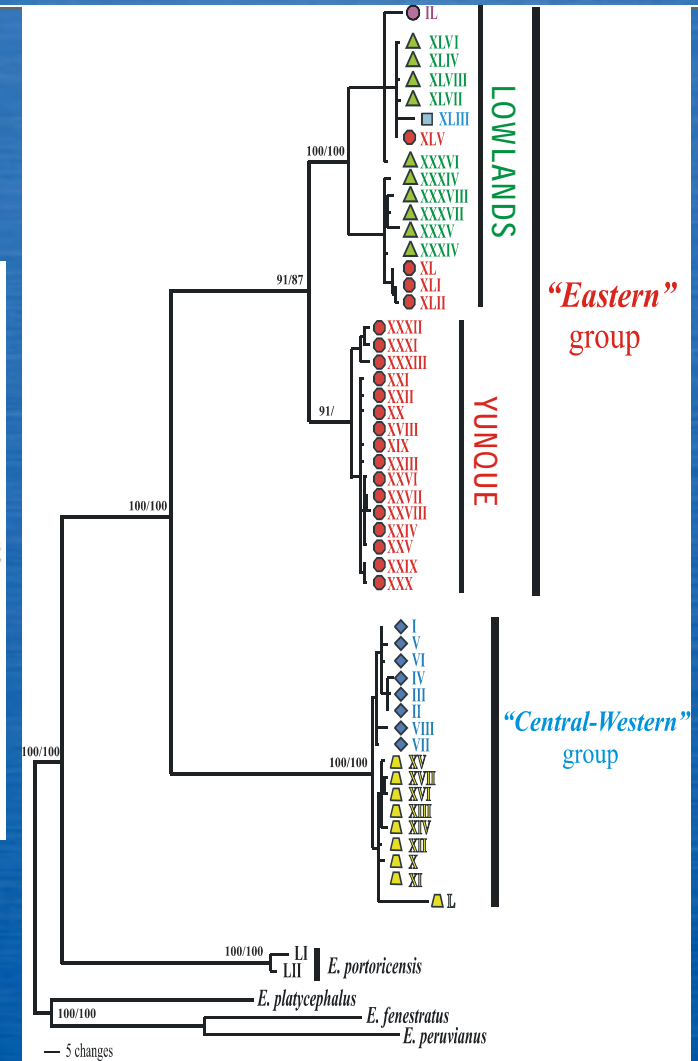
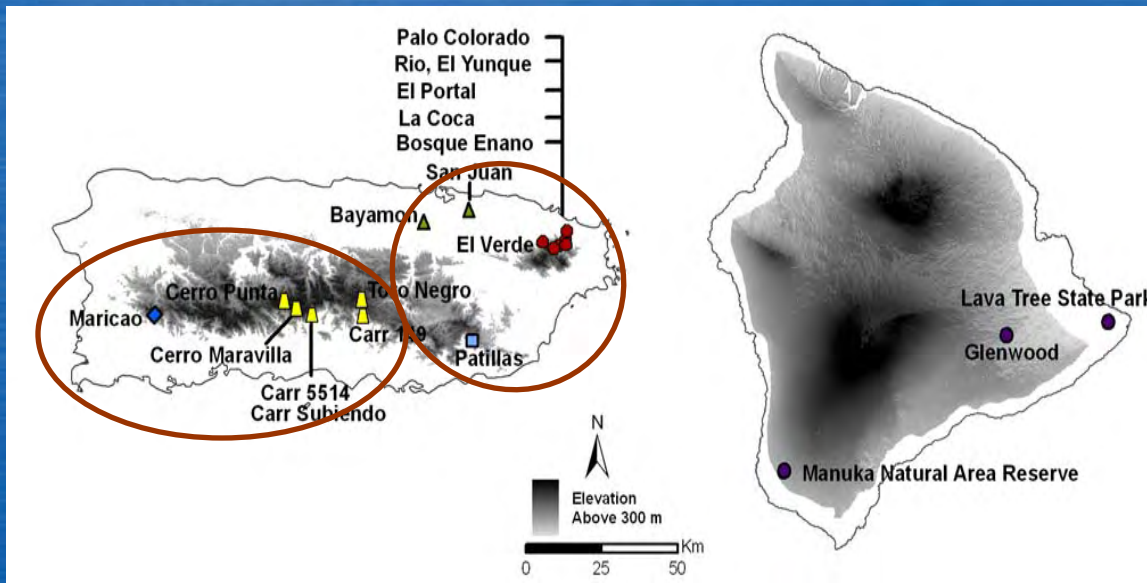
- Puerto Rico
 - $\bar{x} = 4.3 \pm 0.2 \text{ SE}$
- Hawai'i
 - $\bar{x} = 2.0 \pm 0.0 \text{ SE}$
- Loss of color patterns may be result of founder effects



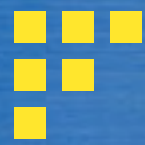
Test for selection on color patterns in Puerto Rico

- Locus comparison approach
 - Compare population differentiation (ϕ_{ST}) among neutral and test loci
 - differentiate between drift/migration and selection
- Neutral: mtDNA from Velo-Anton et al. (2007)
- Test: Color pattern allele frequencies estimated from field data, single locus, 5 allele
- Compare estimates of ϕ_{ST} using Arlequin 3.1

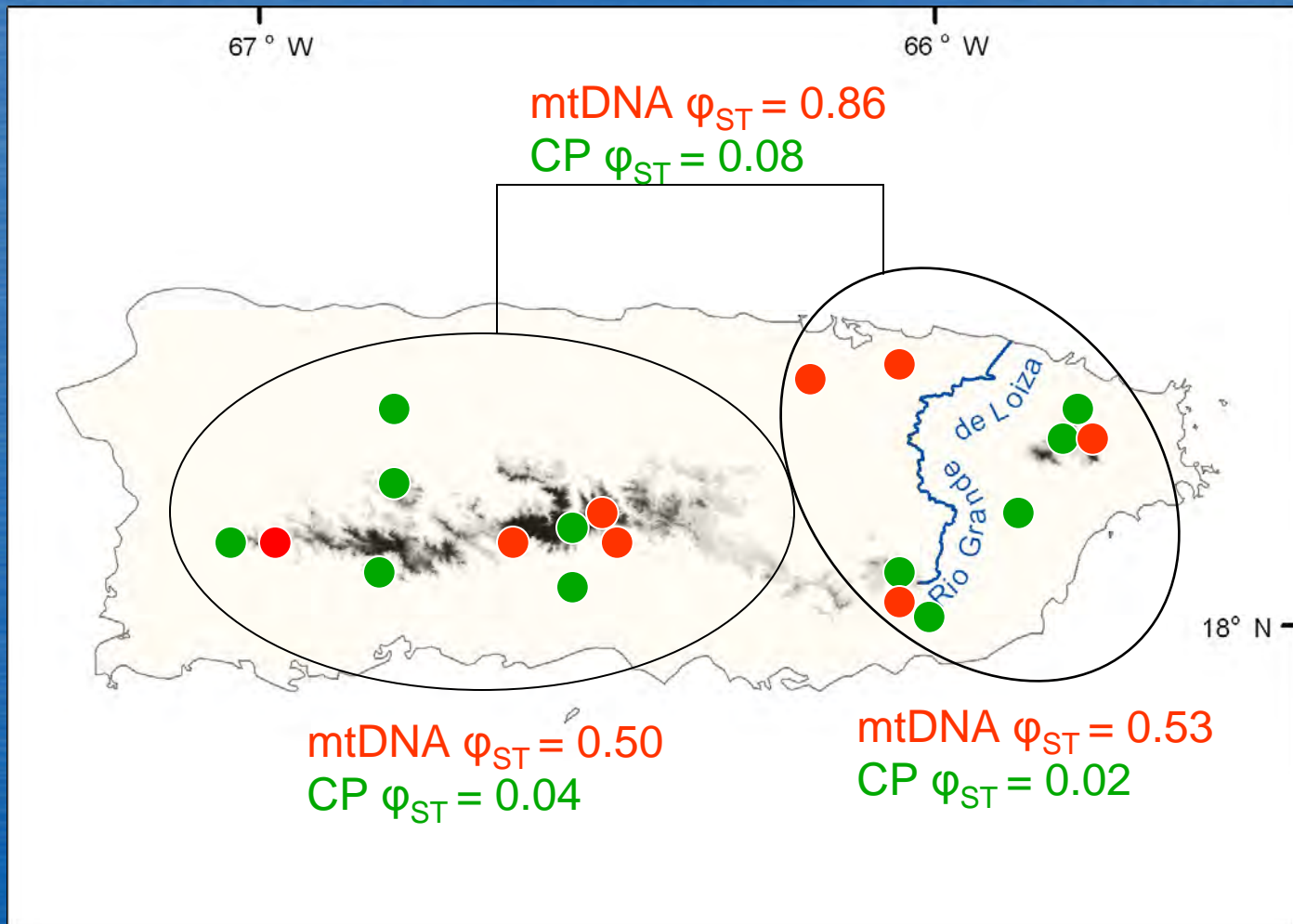
mtDNA phylogeography of *E. coqui*



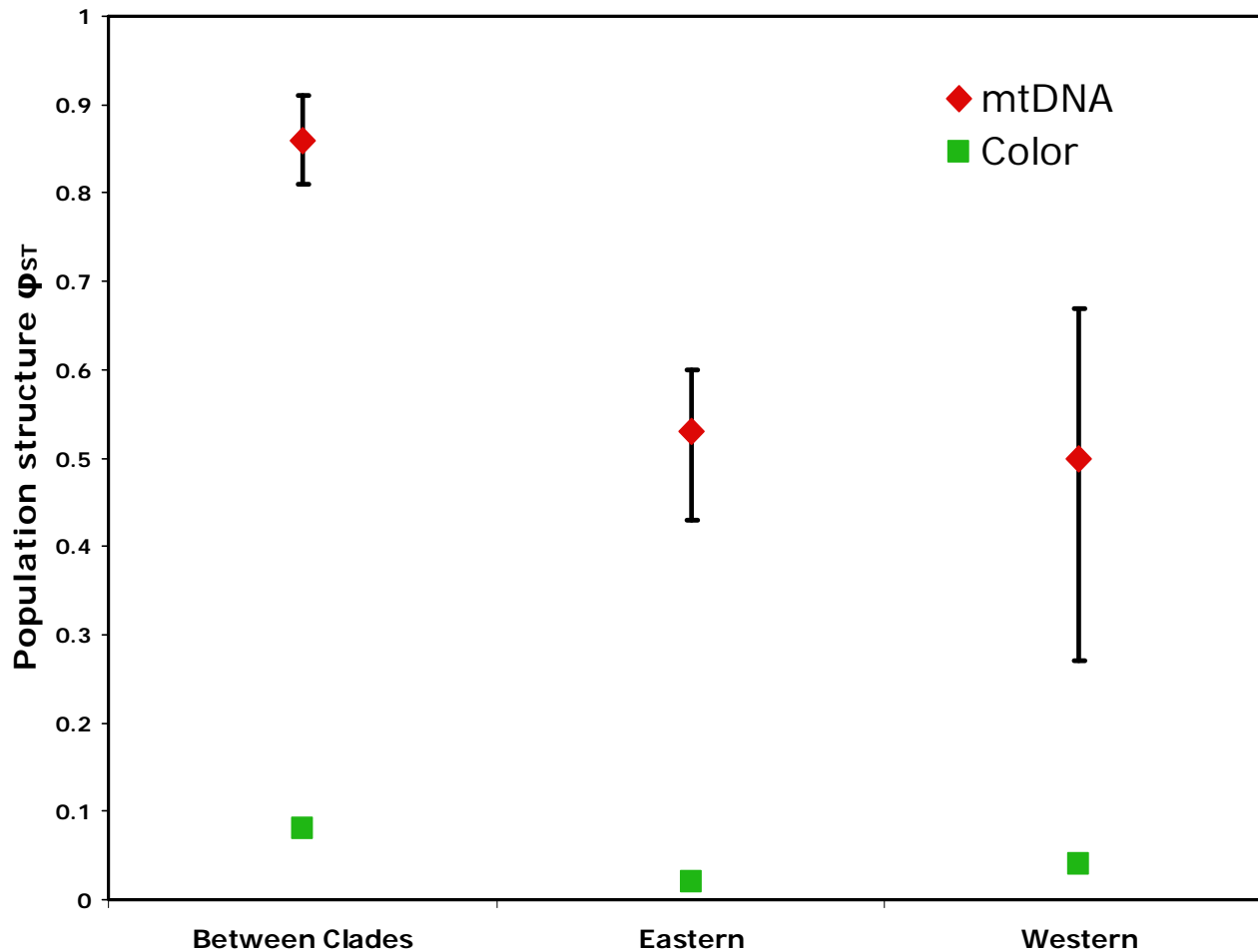
G. Velo-Antón et al. (2007) *Molecular Phylogenetics and Evolution*



ϕ_{ST} across Puerto Rico



ϕ_{ST} Estimates for Puerto Rico





Conclusions



- Color patterns result from a single autosomal locus with 5 alleles
 - Stripes are codominant, unpatterned is recessive
- Fewer alleles in Hawai'i may be result of founder effects
- Color patterns are under balancing selection in Puerto Rico



Acknowledgements

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