Community Assembly Of Anurans Across Different Spatiotemporal Scales

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Introduction

Community ecology quantifies the patterns of distributions of species across space and time.

Beta (β) diversity is a useful metric to understand how ecological communities are organized, as it quantifies the difference in species across different sites (Fig.1).

Ecological communities also vary temporally due to seasonal variation or inter-annual variability.

Anurans (frogs and toads) are model taxa to address multi-scale questions in community ecology because:

1) They have complex life cycles (aquatic larva-terrestrial adults) with different ecological requirements

2) They are ectotherms with permeable skin that exhibit strong affinities to a suite of environmental gradients.

3) They are ecologically important in food web structure because they act as prey and predators

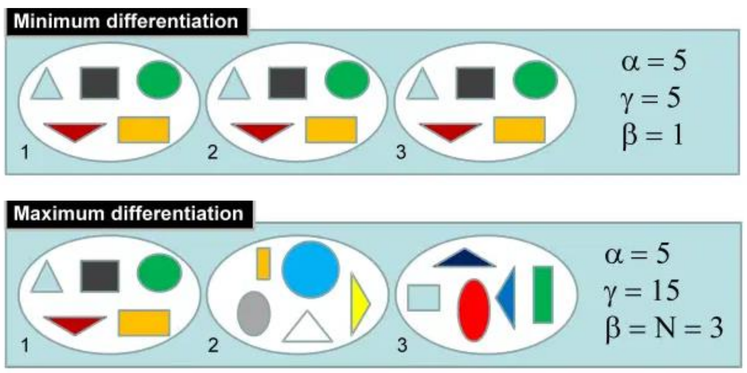

Fig. 1. Representation of compositional differences in a ecological community (i.e. Beta diversity). Image from Baselga (2015).

Objectives

Quantify the variation of anuran community assembly across multiple temporal and spatial scales, while correlating these patterns with abiotic and biotic factors to elucidate the mechanisms structuring these assemblages.

Objective 1. Evaluate the abiotic (e.g. pond area) and biotic (e.g., predator type) factors related to the compositional changes (i.e. beta diversity) (Fig.2) of anuran assemblages across 51 ponds (Fig.3) in east Texas across an 11-year period.

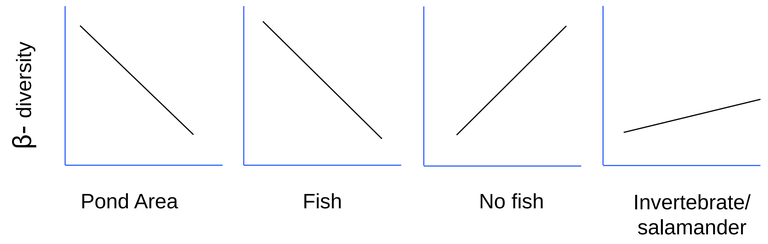

Fig. 2. Predictions for the relationship between abiotic and biotic factors shaping larval anuran communities.

Survey design

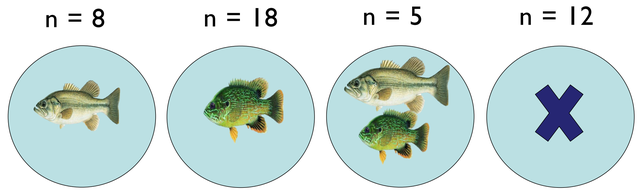

Fig. 3. Ponds with different types of top predators from left to right: Bass, Green Sunfish, Bass + Green Sunfish, No fish.

Beta diversity

For differences in species composition between ponds, we will use the β partitioning method (Baselga 2013, Legendre, 2014)(Fig.4).

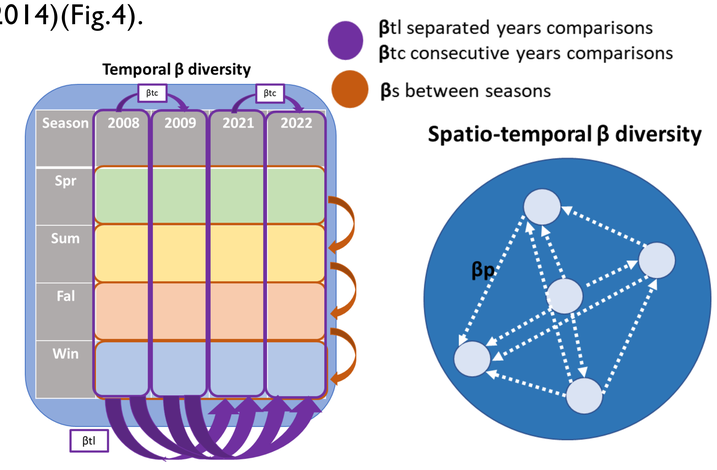

Fig. 4. Proposed pairwise comparisons for temporal and seasonal (left) and spatiotemporal (right) β - diversity values for all ponds with different types of pond predators.

Objective 2. Evaluate abiotic drivers of calling phenology and distribution for six widespread anuran species (Fig.5) that occur across the southeastern United States(Fig.6).

Fig. 5. Species that occur across all in the study sites in the Experimental and National Forests. From left to right: *Hyla versicolor*, *Hyla chrysoscelis*, *Hyla cinerea*, *Lithobates clamitans*, *Lithobates catesbeianus*, and *Lithobates sphenocephalus*. (Photos: Ashley Wahlberg)

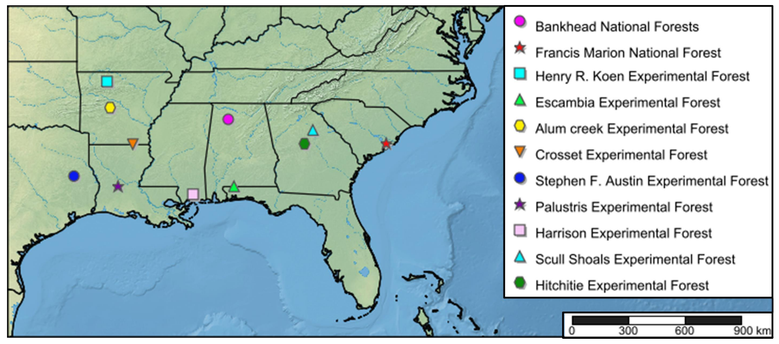

Fig. 6. Proposed study sites in Southeastern United States to assess widespread anuran species phenology.

To quantify anuran calling phenology automated recording units will be placed near breeding ponds at each site and measured continuously for at least one year.

Anuran calling phenology will be analyzed with acoustic software (Kaleidoscope®) and abiotic variables will be obtained from meteorological stations close to the study sites.

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