

## ***Protium alvarezianum* and *Protium subserratum***

### **Introduction**

- Changes in population-level gene frequencies can result from variety of processes. The two most important are:
  - Disruption in gene flow with geographic distance
  - Habitat specialization related to environmental variation
- Paper to study the phylogeography of flora occurring on the habitat islands of white-sand and their surrounding counterparts growing on regular soils (clay, brown sand, silt, etc.)
  - ***Protium alvarezianum***-specialist occurring only on white sand, tens to hundreds of km apart
  - ***Protium subserratum***-generalist occurring elsewhere
- How does geographical distance and environmental heterogeneity influence the phylogeographic structure of species with different degrees of edaphic specialization?

### **Materials and Methods**

- 19 samples of *P. alvarezianum* from three known populations collected from white sand islands
- 65 samples of *P. subserratum* from 10 known populations collected outside of white sand islands
  - Very low numbers. Ideal would be 20-30 EACH population
- Sequenced 1209-1211 bp of ITS, ETS and Phytochrome C from both species
- Using MrBayes 3.2, Bayesian inference was constructed with data partitioned by **gene evolution** under different stochastic evolutionary models

#### *Population Structure*

- Using AMOVA, the structure of the populations of two species were investigated to reveal correlations of genetic variation, soil type and geography.

### **Results**

- In Bayesian analysis, both *P. subserratum* and *P. alvarezianum* received strong support as a monophyletic group
- High population structuring among three white sand populations of *P. alvarezianum* when using Population pairwise statistics ( $\phi_{st}$  statistic).
  - Much higher than comparisons with *P. subserratum*
  - Generalists that occur on both soil types could potentially interbreed, reducing the effect of genetic drift among widely separated habitats
- The edaphic specialist exhibited considerable genetic differentiation among geographically distant populations.

- Edaphic generalists showed high haplotype diversity and **shared** haplotypes with distant white-sand habitat islands, indicating that they have either long distance dispersal and/or larger ancestral effective population size
- Generalists showed genetic differentiation between Guianan and Amazon Basin populations.

### **Conclusion**

- Substantial phylogeographic structure in both white sand specialists and edaphic generalists
  - For specialist, high  $\phi_{st}$  values among pop. Are consistent with likely difficulty in flow of genes among geographically isolated habitats
  - For generalists it does not play as important a role at a local geographic scale as it does for the specialist
- Habitat heterogeneity and the spatial arrangement of habitats may be a more general driver of population-level differences than geographic distance for influencing genetic structure and speciation.