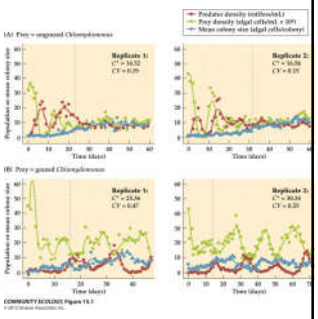
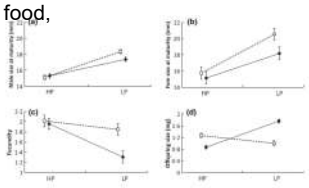
Evolutionary Community Ecology

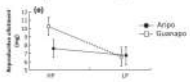
- We have discussed various ways populations can evolve in response to the biotic and abiotic environment
  - Character displacement
  - Evolution of predator/prey systems (optimal foraging)
  - Life history evolution
  - Various trade offs



Guppy Evolution

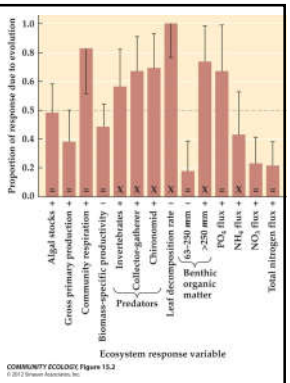
- *Poecilia reticulata* evolutionary response to predation
  - Early maturation
  - Higher fecundity, greater energy allocation to reproduction
  - Greater food selectivity (preference for invertebrate food, less algae)





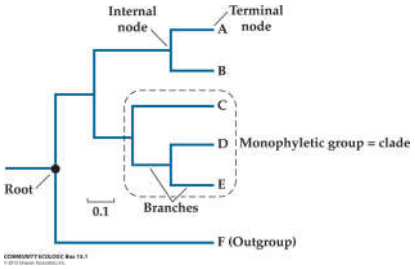
Ecosystem Effects

- Evolution of guppy traits has ecosystem effects.
- In mesocosm trials, guppies from high predation populations:
  - Trophic cascade
    - Larger standing stock of algae
    - Lower invertebrate biomass
    - Lower decomposition rate
    - Greater NH_4 excretion (higher protein diet)



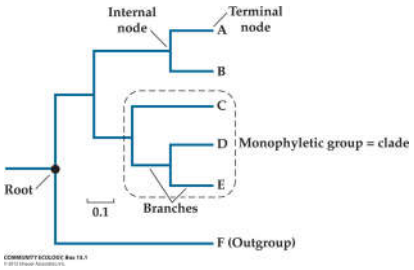
Community Phylogenetics

- We said earlier we expect stronger intraspecific competition than interspecific competition.
- That is because we expect organisms that are more similar to have greater niche overlap (and compete).
  - **Niche conservatism**: tendency for closely related species to have similar niches.



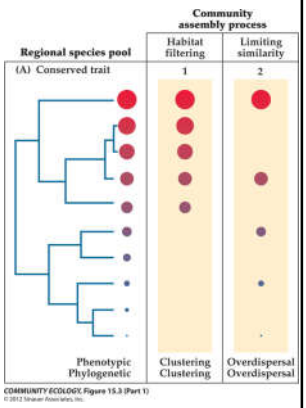
Community Phylogenetics

- Recall that "species" is an arbitrary delimiter.
- What we expect then, is that competition will be stronger for more closely related organisms (within or among species).
- Put this in a phylogenetic context:



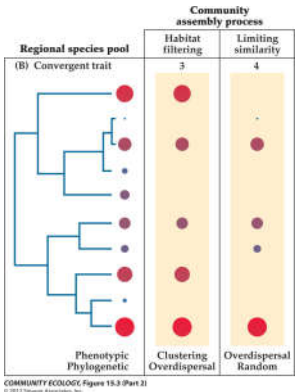
Community Phylogenetics

- We also expect similar habitats (similar niches) to favor similar species.
- This sets up two different expectations:
  - **Phylogenetic clustering** – similar habitats will present similar niches, resulting in similar species occupying. Implication is competition is not a strong factor, communities should feature many closely related species.
  - **Phylogenetic overdispersal** – Closely related species have similar niches and can't coexist. Competition is strong. Communities do not feature closely related species.
    - Recall Hutchisonian Ratios



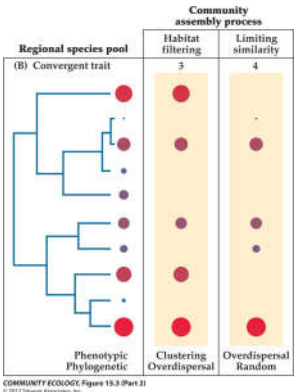
Community Phylogenetics

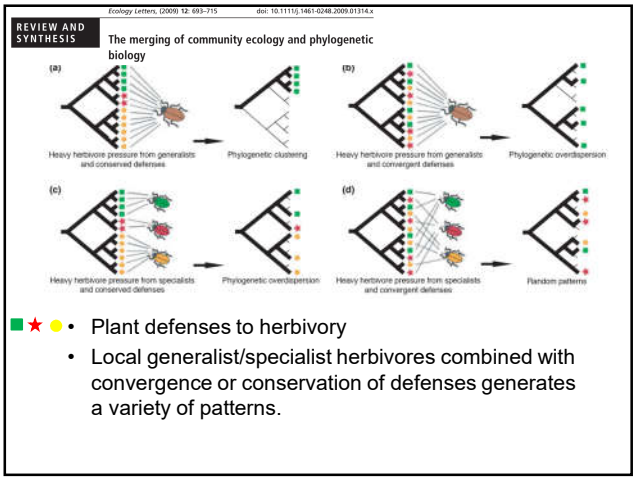
- Some traits may also be shaped by **convergent evolution**.
- **Phenotypic clustering**: A specific niche will select for phenotypes to maximize fitness, ultimately increasing species similarity in that trait.
- This would erode patterns of niche conservatism (phenotypic similarity among distantly related species)



Community Phylogenetics

- **Phenotypic overdispersal**: Competition is strong, and similarity due to convergence reduces coexistence.

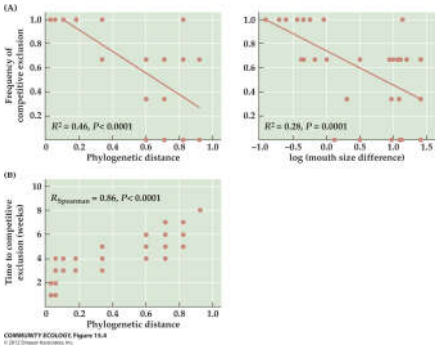




- Plant defenses to herbivory
  - Local generalist/specialist herbivores combined with convergence or conservation of defenses generates a variety of patterns.

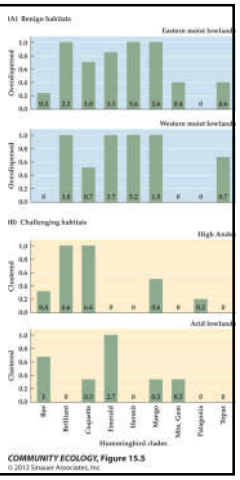
Experimental Evidence

- Simple 2-species experiments in mesocosms.
- More closely related species more likely to result in competitive exclusion. Competitive exclusion faster with more closely related species.



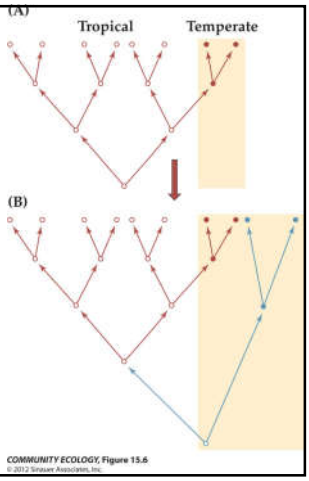
Environmental Input

- Humming bird communities tend to show stronger patterns of phylogenetic clustering, phylogenetic overdispersion rare.
- A) benign, B) harsh habitats
- Y-axis is the proportion times a clade is present in the community.
- Arid habitats are harsh resulting in high habitat filtering (similar trends in other datasets).
- Less harsh lowlands are phylogenetically dispersed.



COMMUNITY ECOLOGY, Figure 15.5

- Interpretations can change with the scope of the study.
- A) Ancestor tropical. Evolution and niche conservation.
- B) Larger phylogeny reveals ancestral temperate form. Convergence in one temperate clade. High rate of diversification in tropical clade.



COMMUNITY ECOLOGY, Figure 15.6