IID209: Microbial Ecology Lecture, Spring 2019

Wednesday 03

Ecology studies overall community structure and interactions.

Abundance = how much of an organism is present.

Prevalence = how many communities it's present in.

Diversity = types and distribution of taxa in a community.

Richness = simple number of taxa.

Qualitative = focus on which organisms are present.

Quantitative = focus on how abundant they are.

Taxonomic = how many different organisms (by some definition).

Phylogenetic = how evolutionarily related.

Alpha = within-sample (like an absolute value), beta = between-sample (like a distance or correlation score).

Ecological interactions:

Symbiosis: any type of close, long-term biological interaction between two different biological organisms

* Mutualism (benefits both)
* Cooperation (same idea but more general)
* Commensalism (one benefits, other is unaffected)
* Predation (one benefits, other is actively targeted)
* Parasitism (one benefits, detrimental to other)
* Amensalism (neither affected)
* Neutralism (same idea but more general)
* Competition (both are actively targeted)

How interactions are implemented:

* Metabolically: ‘a’ needs something ‘b’ makes
* Signaling / regulation: quorum sensing
* Biochemical warfare: antibiotics, bacteriocins
* Spatial interaction/competition

Dynamical systems modeling

ODEs to capture population dynamics

Predator/prey systems (rabbits/lynx)

Captures expected rates at which ‘a’ influences ‘b’

Very detailed model with beautiful temporal dynamics, requires fairly extensive prior knowledge