Summary: Community Structure and Dynamics

Dowland Aiello

May 28, 2020

Contents

1 Overview: The Community as a Hierarchy

In order to better analyze the various actors involved in some process, one might find that grouping various actors involved at a certain geographical location or in respect to some inquiry can provide utility and make answering such an inquiry easier. In doing so, one must analyze the various **populations** or groups of interacting organisms of the same species, and, on a larger scale, the biological **communities** or groups of geographically proximate populations that one deems paramount to successfully addressing the matter of inquiry.

In addition to the above classifications, a researcher may choose to bear regards to the composition of a community –the feeding relationships, species, and number of populations within the community–, as well as the interactions between the populations, which each may differ in their importance and scope. Over longer periods of time, these interactions may manifest themselves in the study of community dynamics, which deals with the analysis of patterns in the populatiion makeup of a community.

2 Interactions in a Community

Among the members of a community, **interspecific interactions** can be classified according to their effects on the two populations involved. Interspecific *competition*, for example, is generally a mutually harmlful act, whereas **mutualism** (e.g., dichotomy of pollinators and flowers) is, in most cases, mutually beneficial. A third class of interspecific relations, by contrast, bears benefit to only one of the involved parties. Examples of such a relationship are:

- **Predation**: predator benefits, while the prey does not (+/-). Encourages adaptation in the prey population.
- **Herbivory**: consumer benefits, while the plant or algae does not (+/-). Encourages development of defense mechanisms in plants (e.g., thorns and spines), as well as chemical defense toxins, while bringing about reactionary adaptations in consumers–**coevolutioon**.
- **Parasite-host interactions**: parasite benefits, while the host does not (+/-). Can cause rapid and dramatic changes in community dynamics by systematically wiping out entire chains of interspecific interactions (e.g., attacking chestnut trees, upon which a great number oof populations rely for survival).

2.1 Interspecific competition

The **ecological niche** of a specific species describes the biotic and abiotic resources that a species consumes to survive. When the niches of two species overlap—that is, both species require access to the same resource—, interspecific competition ooccurs, resulting in a decrease in carrying capacity.

The effects of interspecific competition on the carrying capacity of distinct populations has been proven in experiments conducted by Russian ecologist G.F. Gause: three populations of similar ciliates grew to a smaller popullation size in each oother's presence than in distinct environments, thus, proving the importance of interspecific competition.