Community structure

Different ecological communities can be very different in terms of the types and numbers of species they contain. For example, some Arctic communities include just a few species, while some tropical rainforest communities have huge numbers of species packed into each cubic meter.

One way to describe this difference is to say that the communities have different structures. **Community structure** is essentially the composition of a community, including the number of species in that community and their relative numbers.

Two important measures ecologists use to describe the composition of a community are species richness and species diversity

Species richness

Species richness is the number of different species in a particular community. If we found 30 species in one community, and 300 species in another, the second community would have much higher species richness than the first.

Communities with the highest species richness tend to be found in areas near the equator, which have lots of solar energy (supporting high primary productivity), warm temperatures, large amounts of rainfall, and little seasonal change. Communities with the lowest species richness lie near the poles, which get less solar energy and are colder, drier, and less amenable to life.

Species diversity

Species diversity is a measure of community complexity. It is a function of both the number of different species in the community (species

richness) and their relative abundances (species evenness). Larger numbers of species and more even abundances of species lead to higher species diversity. For example:

- A forest community with 20 different kinds of trees would have greater species diversity than a forest community with only 5 kinds of trees (assuming that the tree species were even in abundance in both cases).
- A forest community with 20 different kinds of trees in even abundances would have greater species diversity than a forest community with the same number of species in very uneven abundances.

The structure of a community is the result of many interacting factors, both abiotic (non-living) and biotic (living organism-related). Here are some important factors that influence community structure:

- **The climate patterns of the community's location.**
- **The geography of the community's location.**
- **The heterogeneity (patchiness) of the environment.**
- **The frequency of disturbances, or disruptive events.**
- **Interactions between organisms.**

Foundation species plays a unique, essential role in creating and defining a community. Often, foundation species act by modifying the environment so that it can support the other organisms that form the community. For example: Kelp (brown algae) is a foundation species that forms the basis of the kelp forests off the coast of California. Kelps create environments that allow the survival of other organisms that make up the kelp forest community. The corals of a coral reef are another foundation species. The exoskeletons of living and dead coral make up most of the reef structure, which protects other species from waves and ocean currents. Beavers, which modify their environment by building dams, can also be seen as a foundation species.

Photograph of coral reef.

Keystone species

A **keystone species** is a species that has a disproportionately large effect on community structure relative to its biomass or abundance. Keystone species differ from foundation species in two main ways: they are more likely to belong to higher trophic levels (to be top predators), and they act in more diverse ways than foundation species, which tend to modify their environment. For example- The Fig trees in the Forests serve as food for many species including birds, bats etc. They have a large effect on the population of these animals and birds.