Organization of Life: Species, Populations, Communities, and Ecosystems

Scientists have recognized that life can be organized into several different levels of function and complexity. These functional levels are: ***species***, ***populations***, ***communities***, and ***ecosystems***.

Species

Species are the different kinds of organisms found on the Earth. A more exact definition of species is ***a group of interbreeding organisms that do not ordinarily breed with members of other groups***. If a species interbreeds freely with other species, it would no longer be a distinctive kind of organism. This definition works well with animals. However, in some plant species fertile crossings can take place among morphologically and physiologically different kinds of vegetation. In this situation, the definition of species given here is not appropriate.

Populations

A **population** comprises all the individuals of a given species in a specific area or region at a certain time. Its significance is more than that of a number of individuals because not all individuals are identical. Populations contain ***genetic variation*** within themselves and between other populations. Even fundamental genetic characteristics such as hair color or size may differ slightly from individual to individual. More importantly, not all members of the population are equal in their ability to survive and reproduce.

Communities

Community refers to all the populations in a specific area or region at a certain time. Its structure involves many types of **interactions** among species. Some of these involve the acquisition and use of food, space, or other environmental resources. Others involve nutrient cycling through all members of the community and mutual regulation of population sizes. In all of these cases, the structured interactions of populations lead to situations in which individuals are thrown into life or death struggles.

In general, ecologists believe that a **community** that has a high **diversity** is more ***complex*** and ***stable*** than a community that has a low diversity. This theory is founded on the observation that the **food webs** of communities of high diversity are more interconnected. Greater interconnectivity causes these systems to be more ***resilient*** to **disturbance**. If a species is

removed, those species that relied on it for food have the option to switch to many other species that occupy a similar role in that ecosystem. In a low diversity ecosystem, possible substitutes for food may be non-existent or limited in abundance.

Ecosystems

Ecosystems are dynamic entities composed of the biological ***community*** and the **abiotic** environment. An ecosystem's abiotic and biotic composition and structure is determined by the state of a number of interrelated environmental factors. Changes in any of these factors (for example: nutrient availability, temperature, light intensity, grazing intensity, and species population density) will result in dynamic changes to the nature of these systems. For example, a fire in the temperate deciduous forest completely changes the structure of that system. There are no longer any large trees, most of the mosses, herbs, and shrubs that occupy the forest floor are gone, and the nutrients that were stored in the biomass are quickly released into the soil, atmosphere and hydrologic system. After a short time of recovery, the community that was once large mature trees now becomes a community of grasses, herbaceous species, and tree seedlings.