ECOLOGY

Ecology – the study of the ***interactions*** between organisms and the living (biotic) and nonliving components (abiotic) of their environment

- ☺ No organism is isolated
- ☺ Theme of ***interconnectedness*** of all organisms
- ☺ Any small change can have widespread consequences
- ☺ Survival of the organisms depends on ***biotic*** and ***abiotic*** interactions with one another and the environment

Levels of Organization

Biosphere

- ❋ Broadest, most inclusive level
- ❋ Consists of the thin volume of Earth and its atmosphere that supports life
- ❋ 20 km thick (13 miles)
- ❋ Extends 8-10 km (5-6 miles) above Earth's surface to deepest parts of the ocean
- ❋ Living things not distributed evenly throughout biosphere

Ecosystem

- ❋ Smaller units of the biosphere
- ❋ An ecosystem includes all of the organisms and nonliving
- ❋ environment found in a particular place

Community

- ❋ Includes only organisms
- ❋ Consists of all the interacting organisms living in an area

Population

- ❋ Includes all of the members of a species that live in one place at one time

Organism

- ❋ Simplest level of organization in ecology

Example:

A pond ecosystem

It contains a variety of living things – fish, turtles, aquatic plants, algae, insects, and bacteria. It also includes all the nonliving things – chemical composition of the pond, sunlight the pond receives, etc.

A pond community

All of the fish, turtles, plants, algae, and bacteria in the pond make up a community.

A pond population

All of snapping turtles living in the pond at a particular time make up one of the pond populations.

Biotic and Abiotic Factors

There are 2 classes of environmental factors:

1. ***Biotic factors***
   a. All living things that affect the organism

2. ***Abiotic factors*** – not constant; vary from place to place
   a. The nonliving factors – physical & chemical characteristics

i. Temperature, humidity, pH, water, so
ii. Salinity & oxygen conc.
iii. Amt. of sunlight & precipitation
iv. Availability of nitrogen

☺ Biotic & Abiotic factors are NOT independent
☺ Organisms change their environment & are influenced by it

Responses to a Changing Environment

☒ All organisms have the ability to survive within a range of environmental conditions
☒ We can graph each condition, and we call this graph a ***tolerance curve***

Acclimation – an organism's ability to adjust their tolerance to abiotic factors

Example: If you spend a few weeks at a high elevation, you will acclimate to reduced oxygen levels in the air. Eventually, the number of red blood cells in your body will increase; thereby increasing the amount of oxygen you blood can carry.

Acclimation occurs within an organism's lifetime
Adaptation is genetic change over many generations

Control of Internal Conditions

Conformers – organisms that do not regulate their internal conditions. They change as their external environment changes
Regulators – organisms that use energy to control some of their internal conditions.

Escape from Unsuitable Conditions

Dormancy – when organisms enter a state of ***reduced activity***
Migration – movement to another, more favorable habitat

Resources

In order for an organism to survive in a particular habitat, it must have the proper resources

Resources – the energy & materials it needs: food, energy, nesting sites, water, sunlight

The Niche

A species ***niche*** – its way of life; the role it plays in its environment.
The niche includes the ***range of conditions*** that an organism can tolerate:

- ✦ Methods that it uses to obtain its resources
- ✦ Number of offspring it has
- ✦ Time of reproduction
- ✦ Where it lives
- ✦ What it eats

Types of Relationships Among Organisms

Mutualism – both organisms benefit – cooperative relationship
a. Pollination
b. Protists in termites
c. Bacteria in human intestines

Commensalism – one species benefits and the other is not affected
a. Orchid growing on a tree
b. Barnacle on a whale

Parasitism – one individual is harmed while the other benefits
a. Tick on a dog
b. Tapeworm in an animal intestine

Properties of Communites

Characteristics of a Community:

Species richness – number of species the community contains
- ♣ Simple count of the species in the community
- ♣ Varies with latitude (distance from the equator)
- ♣ Greatest in the tropical rain forests
- ♣ Increases with increasing area (species-area effect)

Species diversity – how common each species is in the community
- ♣ The importance of each species

Stability – indicates a community's resistance to change
- ♣ More species (species richness) = better community stability

Succession

Succession – the gradual, sequential regrowth of species in an area

Two types:

1. ***Primary succession***
   a. Development of a community in an area that has not previously supported life

Examples: bare rock, sand dune, new island formed by volcanic eruption

   b. often proceeds slowly because needed minerals for plant growth are unavailable

2. ***Secondary succession***
   a. Sequential replacement of species that follows disruption of an existing community

Example – re-growth of Yellowstone National Park after the fires of 1988

   b. soil has been left intact
   c. commonly takes about 100 years for original ecosystem to return

pioneer species – species that predominate early in succession
- ☑ tend to be small, fast-growing, fast-reproducing

Examples – horseweed, crabgrass, ragweed (weeds)