

**Yakın Doğu Üniversitesi
Mimarlık Fakültesi
Peyzaj Mimarlığı Bölümü**



**PM 317 Human and Environment
Assoc. Prof. Dr. Salih GÜCEL**

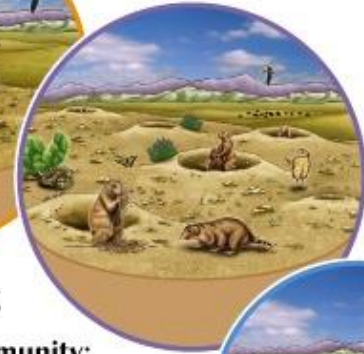
Ecology & Ecosystems



Biosphere:
Global processes



Ecosystem:
Energy flux and cycling
of nutrients



Community:
Interactions among
populations



Population:
Population dynamics;
the unit of evolution

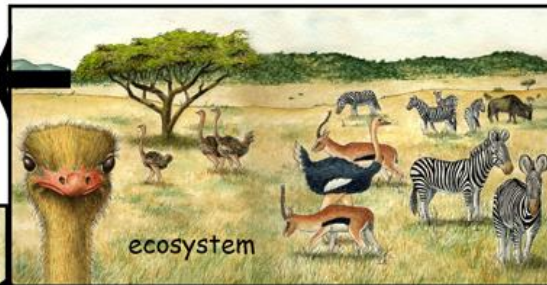


Organism:
Survival and reproduction;
the unit of natural selection

Ecology Organizing Living Things in their Environments

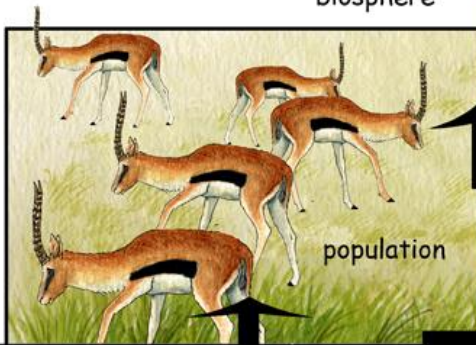


biosphere

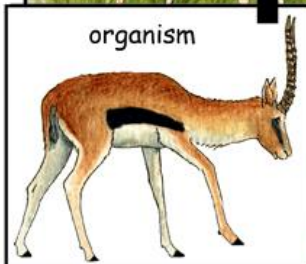


ecosystem

A **community** together with the non-living environment (air, water, etc.) is an **ecosystem**. All the ecosystems on Earth make up the **biosphere**.

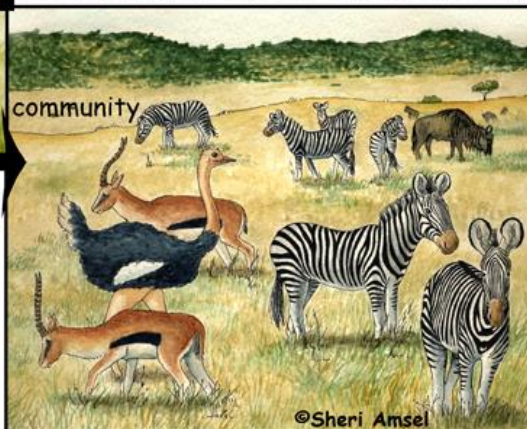


population



organism

Individual living things are called **organisms**. Many organisms of one species living in one area is called a **population**. Many different populations living in one area is a **community**.



community

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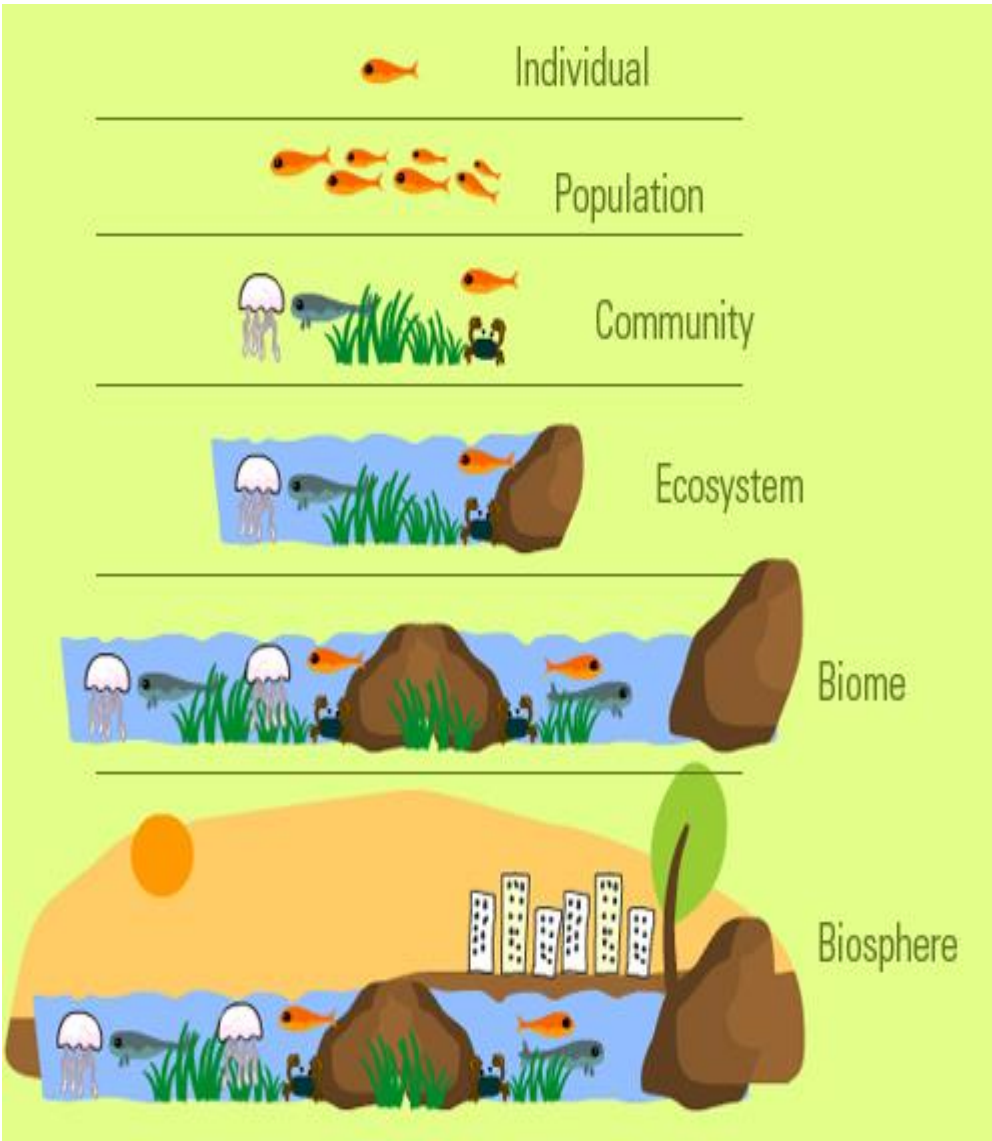
Principles of Ecology

- **Ecology** is the study of the interactions between organisms and the environment they live in.
- Ecology looks at how organisms interact with each other, how they are affected by their environment, and how they, in turn, affect the environment that they live in.



Illustration by Jeff Grader / property of Delta Education

Organizational Levels of Ecology



- Ecology covers a wide array of interactions that are observed on a microscopic scale all the way up to a global scale.

Individual (Organism)



Species:

A group of organisms capable of interbreeding with each other & producing fertile offspring (a closed "gene pool".)

Population

A **population** is a summation of all the organisms of the same group or species, which live in a particular geographical area in a given time, and have the capability of interbreeding



Community

A **community** or biocoenosis is an assemblage or association of populations of two or more different species occupying the same geographical area and in a particular time.



Ecosystem

An **ecosystem** is a community of living organisms in conjunction with the nonliving components of their environment interacting as a system.

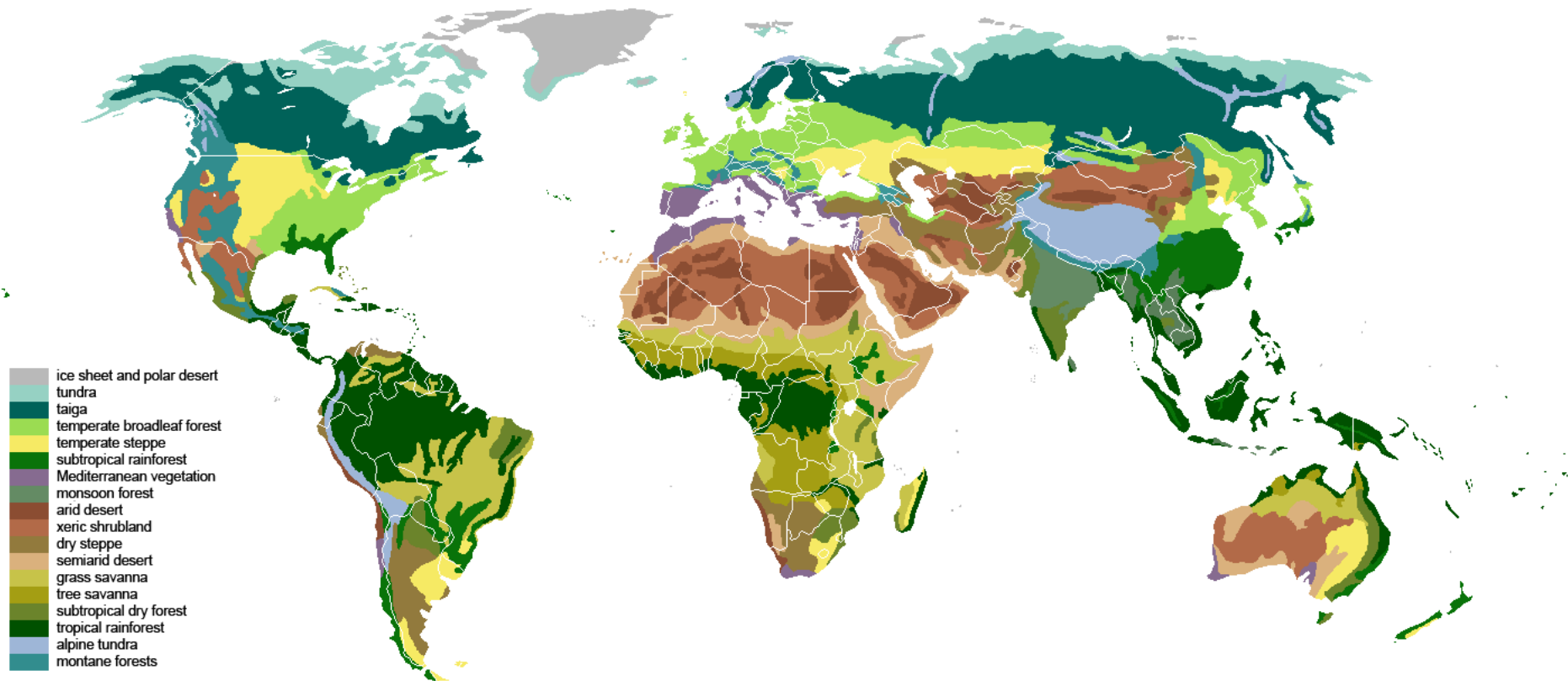


The biotic and abiotic components are regarded as linked together through nutrient cycles and energy flows

Biome and Biosphere

A **biome** referred as the collection of a similar type of ecosystems distributed all over the world.

All the biomes on the earth collectively form the **biosphere**.



Study Methods of Organizational Levels

Study methods of Ecology depends on organizational level. There are three types of study methods, these are;

- **Organismal Ecology**

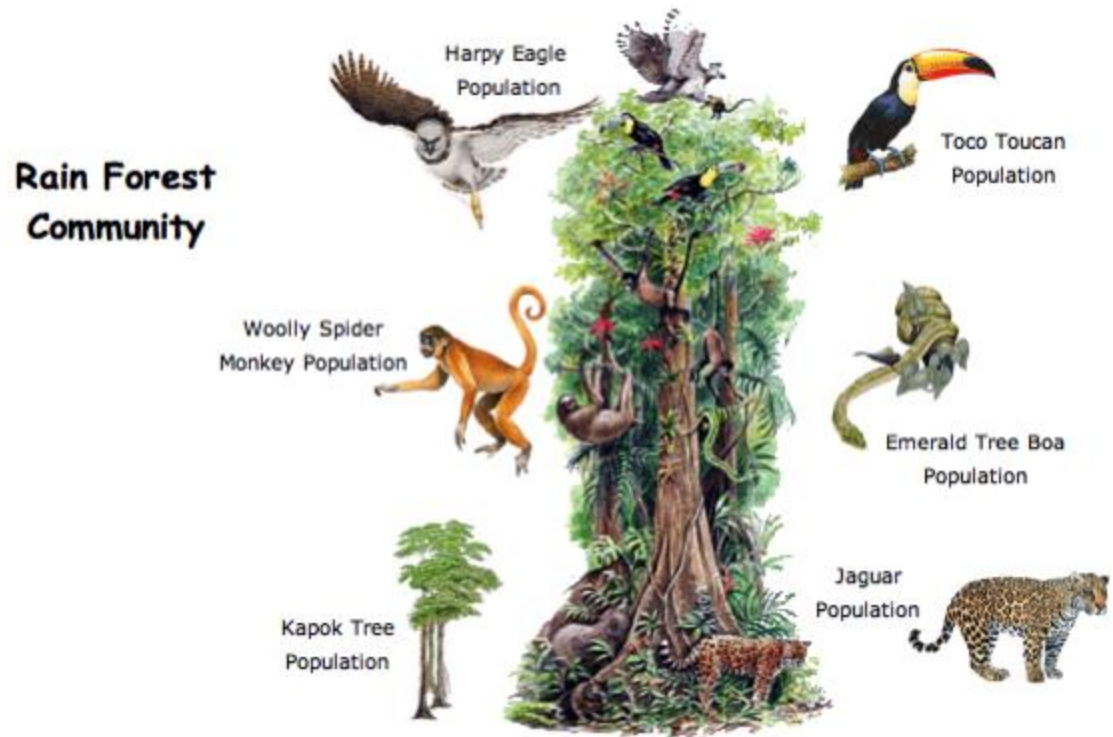
The interactions that an individual organism has with its environment can be referred to as organismal ecology and is the lowest level of ecology that can be studied.

- **Population Ecology**

Population ecology studies the interactions between a particular population and the environment.

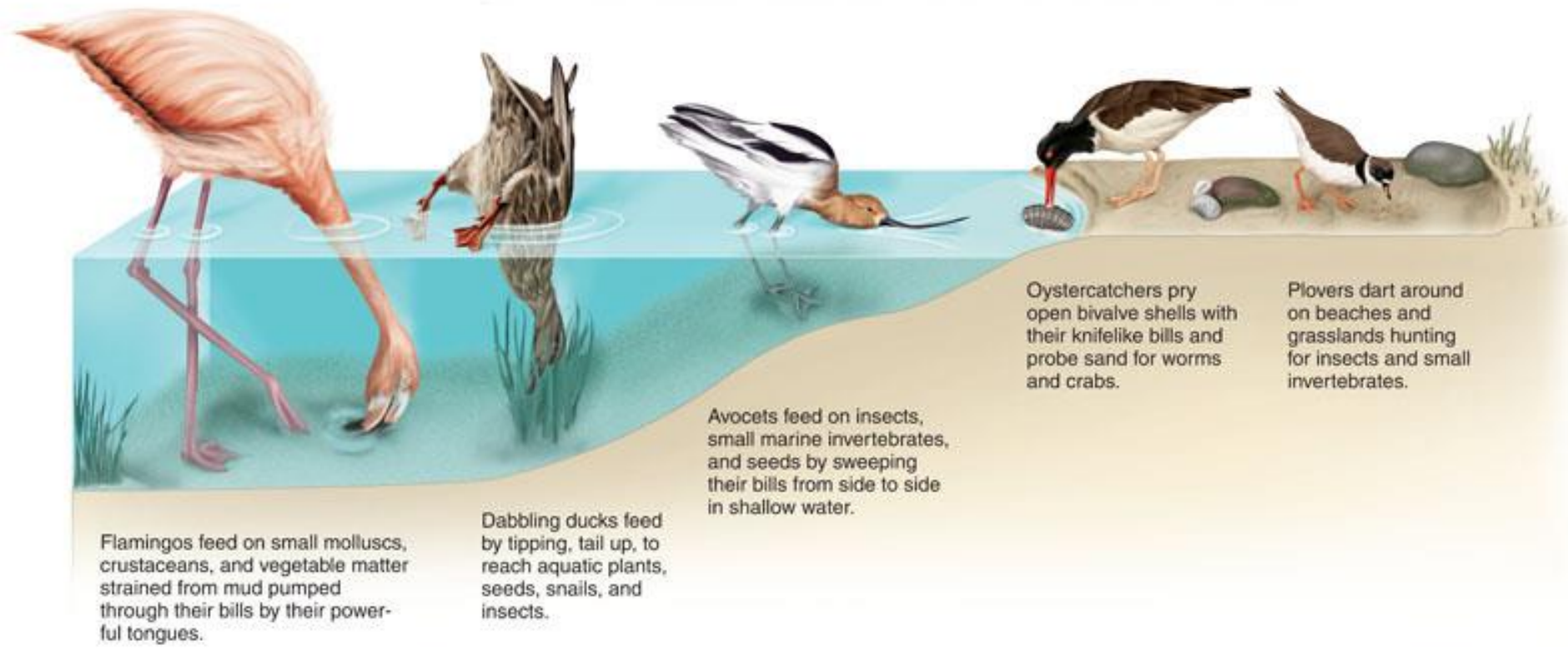
- **Community Ecology**

Community ecology studies the interactions between all organisms of all species in a geographic area.



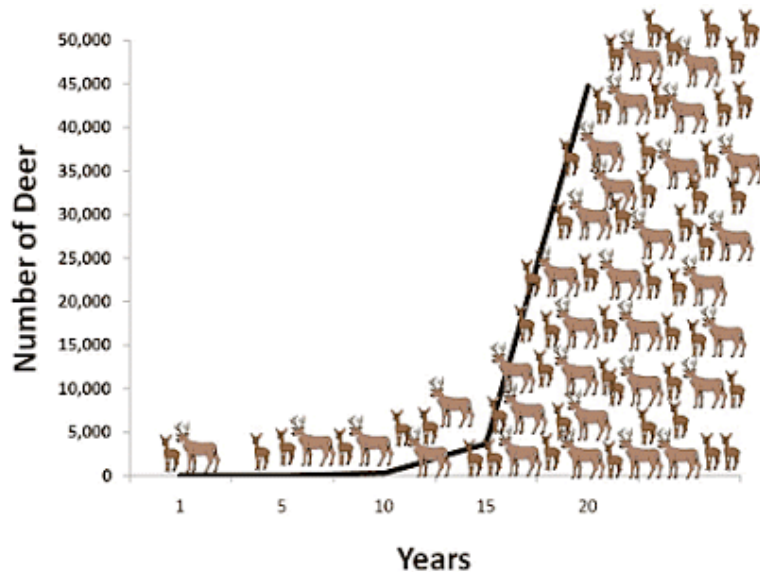
Habitat & Ecological Niche

- A **habitat** is an area that is suitable for a particular organism to live in.
- The **ecological niche** describes how an organism or population responds to the distribution of resources and competitors and how it in turn alters those same factors



Population Density

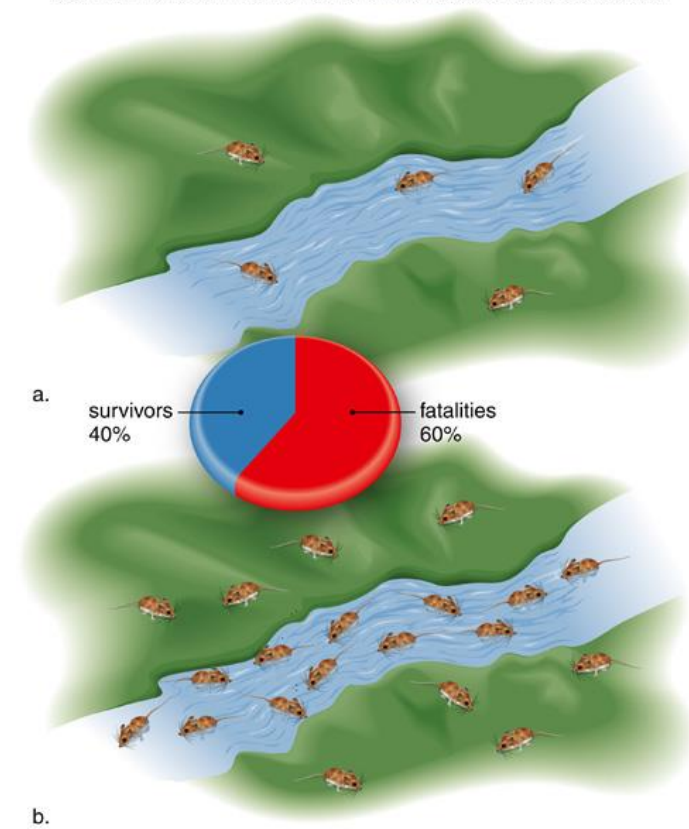
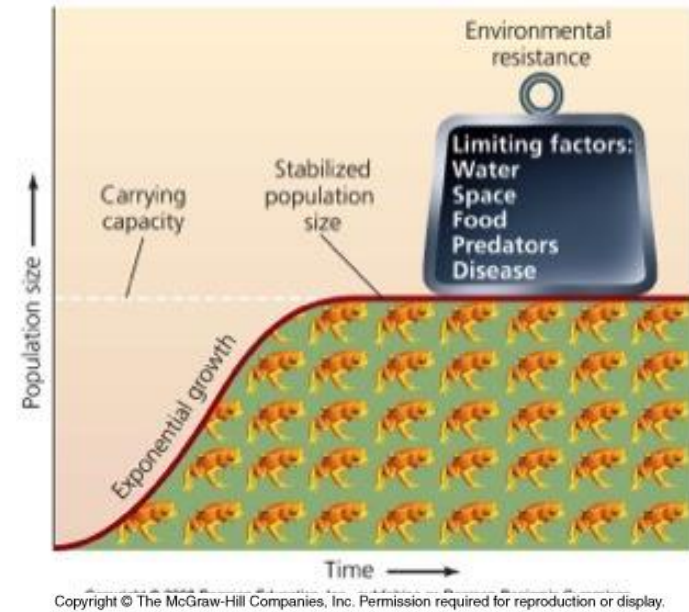
Within an ecosystem, we can measure the density of each population by calculating the number of individuals per unit of area.



Limiting Factors

The density of a population within an ecosystem is determined by a number of factors, called limiting factors these are;

- **Density-dependent factors** become more limiting as the population increases. Eg. amounts of habitat, food, water and shelter that are available.
- **Density-independent factors** exert their influences on population size regardless of the population's density. Eg. weather, climate, predation, disease and reproduction.



What is Global Ecology?

- **Globalization** is defined as the increase in the interconnectedness of human activities, ideas and cultures.
- There are some environmental problems that are even larger in scale and can influence the whole planet.
- **Global ecology** is the study of the interactions among the Earth's ecosystems, land, atmosphere and oceans.

Population growth



Acid rains



Global warming



What is Biodiversity?

Did you know there are more than 10,000 species of birds, 300,000 species of flowering plants and almost one million species of insects in the world?



The number of species identified has increased substantially in recent years, and there are over 1.5 million species currently known.

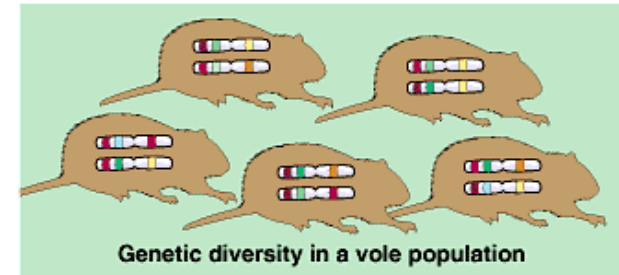
Although this number might seem large, it is thought that this number is actually only a fraction of the number of species that exist today. New species are being identified every day, and it is estimated that there are anywhere between three and fifty million different species living on earth.

Biodiversity, also known as biological diversity, is the variety of life on earth across all of the different levels of biological organization.

Types of Biodiversity

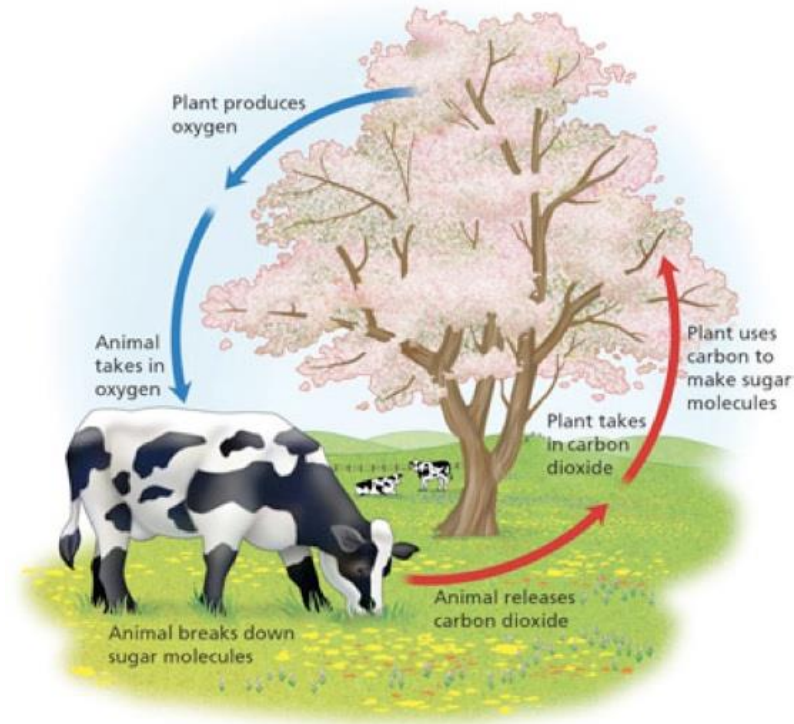
Biodiversity is a very broad term and is often divided into three types.

- **Genetic diversity** is the amount of variation in genetic material within a species or within a population.
- **Species diversity** is defined as the number and abundance of different species that occupy a location.
- **Ecological diversity** is the variation in the ecosystems found in a region or the variation in ecosystems over the whole planet.



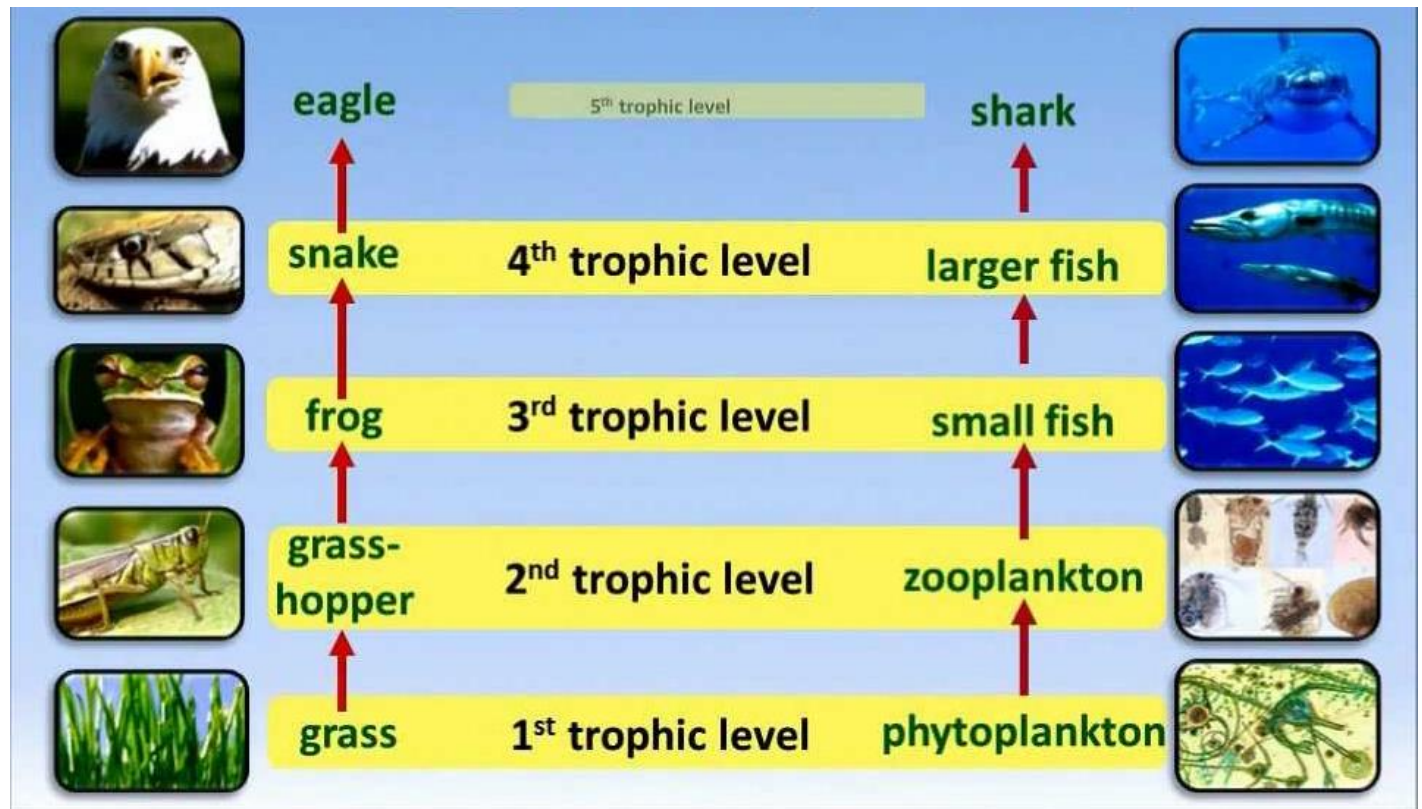
Biodiversity and Ecosystem Stability

- All animals must eat other organisms to acquire energy and contribute to ecosystem stability.
- Many different animals which rely on plants or other animals are called as a **consumer (heterotroph)** because it gets its energy from other organisms.
- A **heterotroph** is an organism that cannot fix carbon and uses organic carbon for growth.
- An organism that gets its energy from an abiotic source is called a **producer (autotrophs)**. An **autotroph** or **producer**, is an organism that produces complex organic compounds (such as carbohydrates, fats, and proteins) from simple substances present in its surroundings, generally using energy from light (photosynthesis) or inorganic chemical reactions (chemosynthesis).



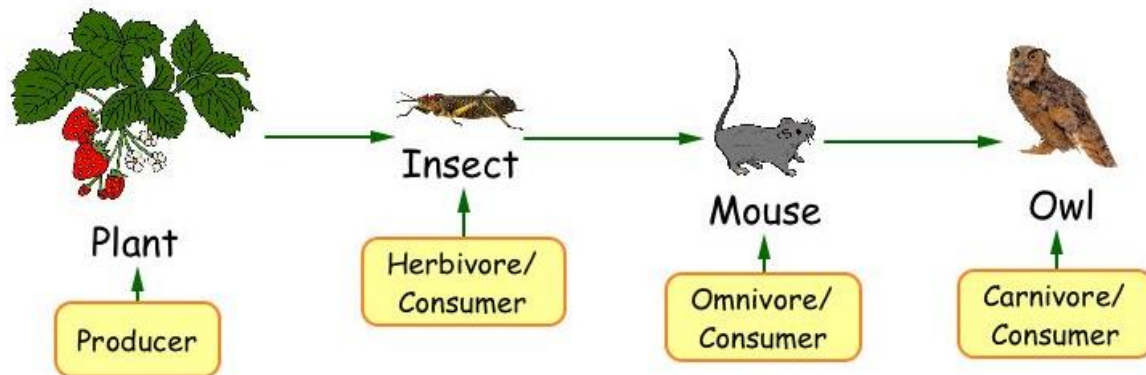
Trophic Levels & Food Chain

- Trophic levels are the levels of a food chain where organisms obtain their energy by consuming the other from previous levels. Food chains can be divided up into different trophic levels.



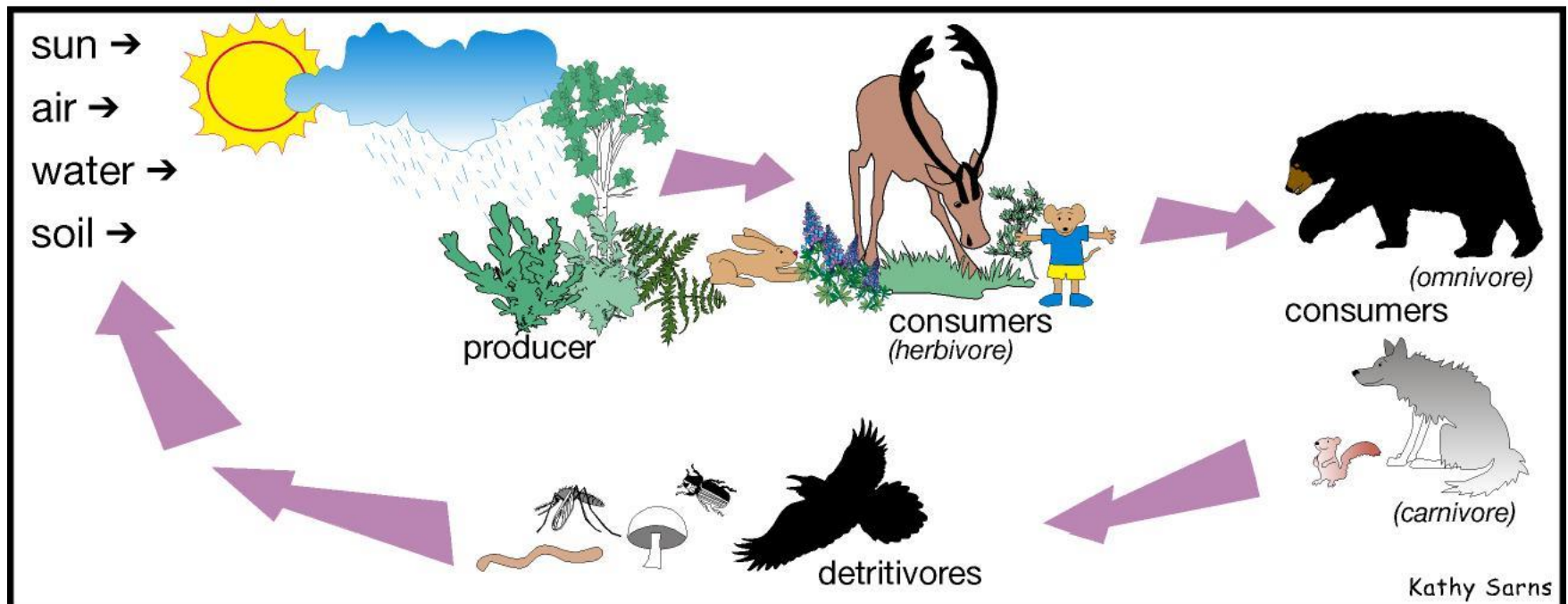
- Since a food chain follows the sequence of organisms that feed on each other, it always starts with an organism that gets its energy from an abiotic source, which is usually light from the sun (producer).
- The plant is eaten by an animal, which is the first consumer in the food chain.
- Other animals feeding animals are consumers too.

The Food Chain Of An Owl



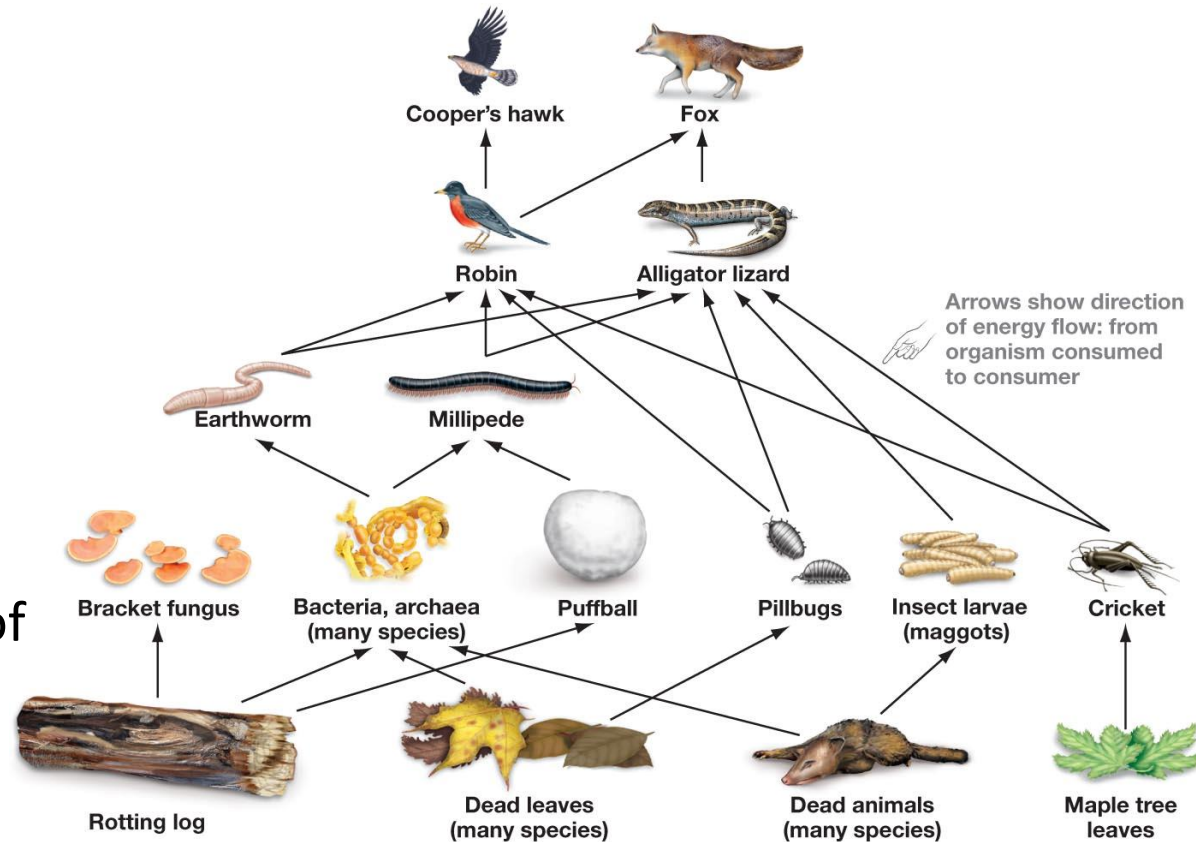
A food chain shows the path of energy from one living thing to another.
Decomposers like bacteria, are necessary for all food chains.

- Plant-eating animals, or **herbivores**, such as grasshoppers and butterflies feed at the trophic level of the primary consumer.
- **Carnivores**, or animals that only eat other animals can feed at the trophic levels.
- There are some animals that eat both plants and animals, called **omnivores**. Omnivores, such as humans, can potentially feed at any of the consumer trophic levels.
- **Detritivore (Decomposers)** is an organism that feeds on waste products or dead organic material.



- Just like a food chain, energy enters the food web at the trophic level of the producers, which can also be called **autotrophs**.

- Each of the animals in the food chain is usually capable of eating other food items and eaten by other animals as well.
- This means that there are limitless number of other possible food chains.



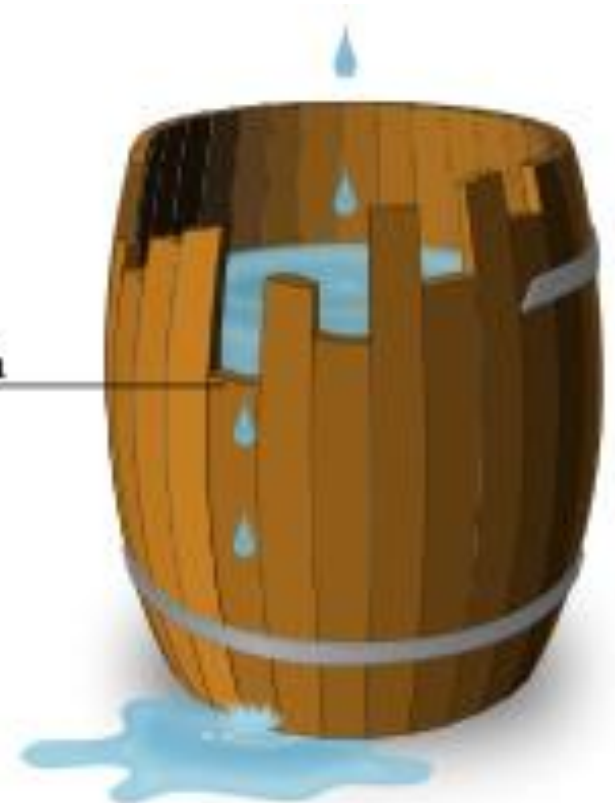
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- So, to more accurately describe energy flow through an ecosystem, ecologists can construct a **food web**, which is a combination of food chains that are interconnected to create a network of feeding relationships.

Biotic interactions

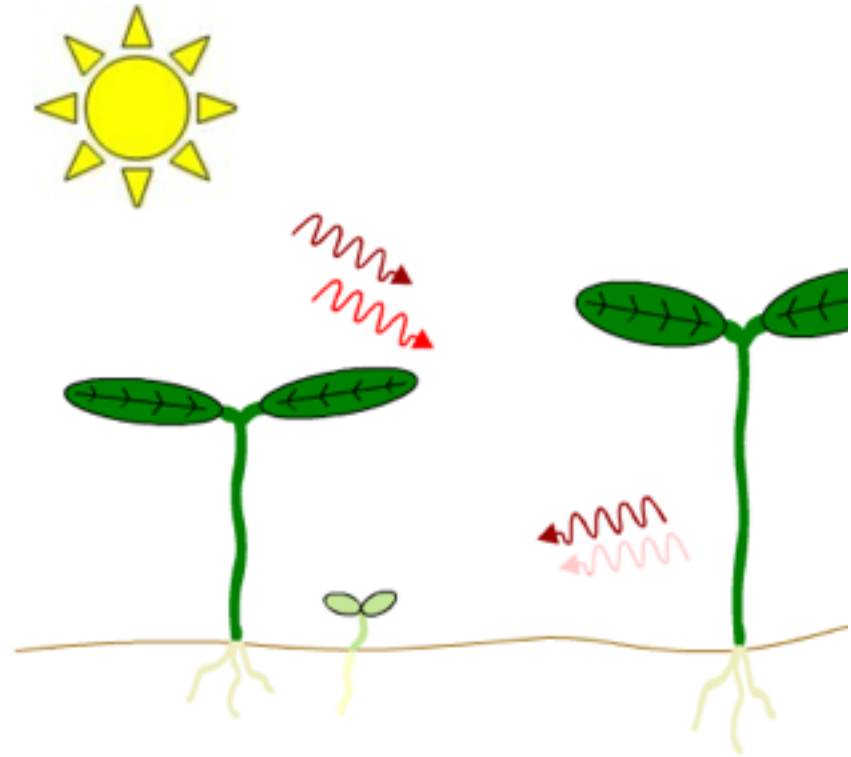
- Although ecosystems vary in size, there is a limit to the number of organisms an ecosystem can support. Abiotic factors limit the number of organisms that can live in an ecosystem.
- **Liebig's law** or the **law of the minimum**, states that growth is controlled not by the total amount of resources available, but by the scarcest resource (limiting factor).

Minimum



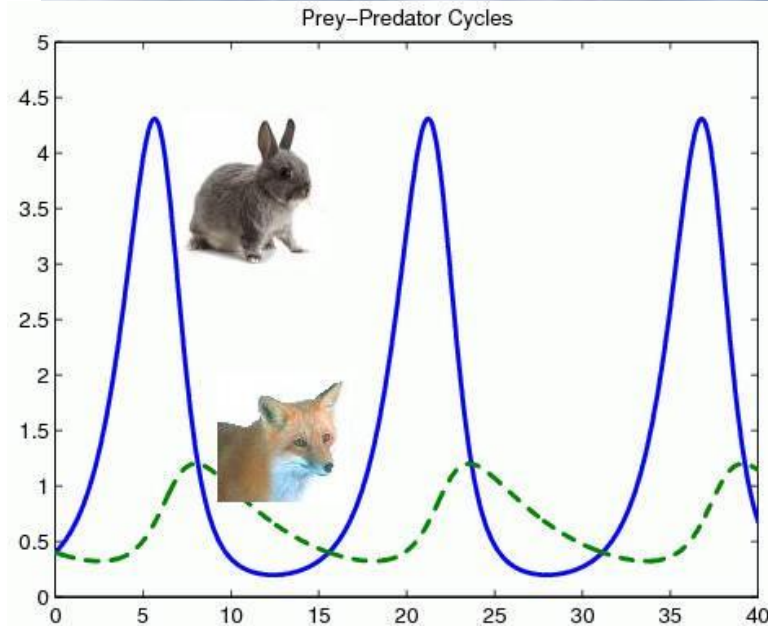
Competition

- Competition is the struggle that happens when organisms in the same habitat try to use the same resources.
- If these resources are limited, some plants may become small and thin, and some may die. This leaves more water, sunlight, and nutrients for the remaining plants, which survive and grow strong.
- Competition controls the population size by limiting the number of organisms that can survive on the resources in the area.



Predation

- An animal that hunts other animals for food is called a predator. The animal that is hunted by the predator is called the prey.
- The population of predators is affected by the population of prey and vice versa.



Herbivory

- Herbivory is the process where an animal eats a plant or a plant-like organism such as a seaweed or phytoplankton.
- Herbivores are important as they are the first link in connecting the energy locked within plants to the vast number of animals within ecosystems.
- Additionally, herbivores often regulate the species composition of plant communities, the total amount of plant biomass in the ecosystems, and the magnitude of ecosystem functional processes such as primary production, decomposition, and transfer of energy and materials up the food chain.



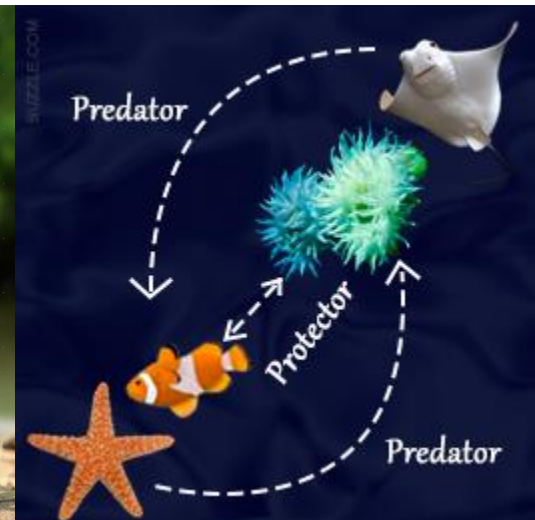
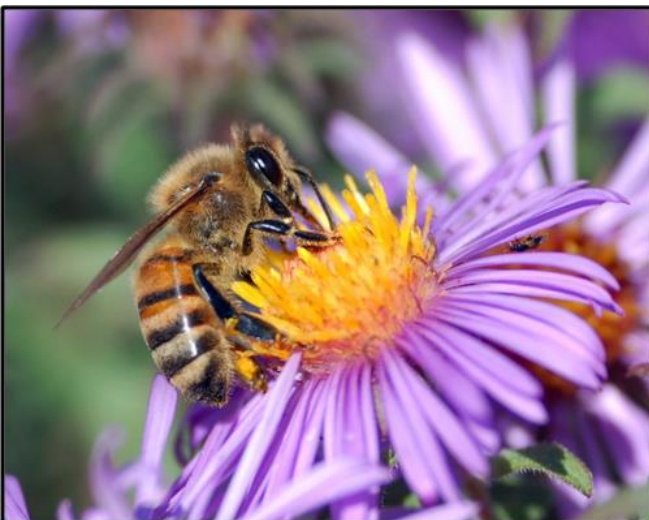
Parasitism

- In parasitism, an individual organism, the parasite, consumes nutrients from another organism, its host, resulting in a decrease in fitness to the host. In extreme cases, parasites can cause disease in the host organism; in these situations, we refer to them as pathogens. We divide parasites into two categories: endoparasites, which live inside the body of their hosts, and ectoparasites, which live and feed on the outside of the body of their host.



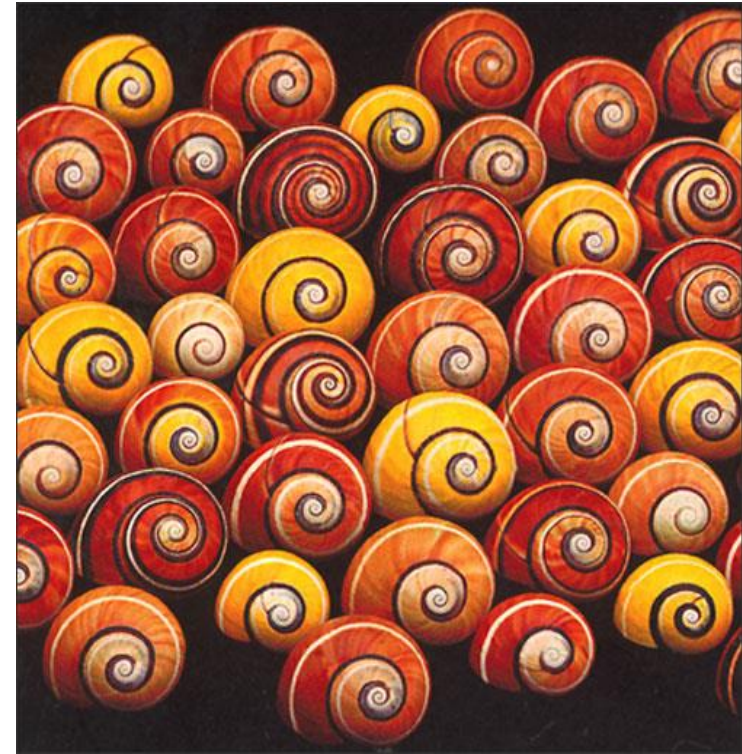
Mutualism

- In competition and predation, one organism usually “wins” while another “loses.” However, there are some interactions between organisms in which both organisms “win.”
- Mutualism is an interaction between individuals of different species in which both individuals benefit.



What is natural selection?

- **Natural selection** is the differential survival and reproduction of individuals due to differences in phenotype.
- Variation is genetic diversity, differences within a species
- Variation is necessary for natural selection. Recall that natural selection favors individuals with characteristics that are best adapted to their environments. Variation is therefore necessary for species to become adapted to their environment and it enables them to change when the environment changes.



Natural selection occurs because

- Individuals within a population vary; they are not all identical.
- Some variants are “better” than others.
- The traits that vary are heritable.
- The “better” individuals will have more success reproducing; they will have more offspring.

