

Definitions

Ecology

The **scientific study** of the **interactions** among **organisms** and the **environment**

Biotic

living (producers, reducers)

Abiotic

nonliving (air, energy)

Environmentalism

The study of **ecological problems** in the **human context** (economics, morals)

Dynamic steady state

occurs when gains and losses are in balance (matter and energy)

Species Interactions

Predation an organism kills and consumes another

Parasitism one organism lives in or on another

Competition when 2 organisms have negative effect on each other because they depend on the same resource

Mutualism when 2 species benefit from each other

Commensalism when 2 species live closely, one benefits but the other is unaffected

Amensalism when 2 species living close to each other, one is negatively affected, but the other is unaffected

Solar Energy Terms

Electromagnetic Radiation

Energy from the Sun; packed in particles called photons

Photosynthetically active region

wavelengths of light that are suitable for photosynthesis **400 nm** (Violet) to **700 nm** (red)

Solar Energy Terms (cont)

Chloroplasts

specialized cell organelles. Chlorophylls are pigments that absorb the light.

Light Reactions

convert energy from **photons** into **chemical energy**

Dark Reactions

aka Calvin cycle, use **chemical energy** and **CO₂** to make **sugar**

Photorespiration

RuBP combines with a molecule of **O₂**, resulting in **CO₂** and **loss of energy**. reverses the gains made by photosynthesis

C3 Photosynthesis

$\text{CO}_2 + \text{RuBP} \rightarrow 2 \text{G3P}$

-catalyzed by RuBP

-Disadvantages: they need a large amount of Rubisco, and need a lot of O₂

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Heat Gain and Loss Terms

Radiation

the emission of electromagnetic energy by a surface

Conduction

the transfer of the kinetic energy of heat between substances in contact

Convection

the transfer of heat by movement of liquids and gases

Evaporation

water goes from liquid to gas. removes heat from a surface

large organisms lose and gain heat

less rapidly than smaller organisms due to surface area

When temps vary

it is **easier** for a large animal to maintain a constant internal temperature

Heat Gain and Loss Terms (cont)

Thermal Inertia

the resistance to a change in temp due to a large body volume

Organization in Ecology

individual => population => community => ecosystem => landscape => biosphere

Individual approach

understands how **adaptations** enable it to survive

Population approach

examines **variation** in the number, density, and composition of individuals

Community approach

understands **diversity and interactions** of organisms living in the same place

Ecosystem approach

describes the **storage** and **transfer** of energy and matter

Biosphere approach

Examines **movements of energy** and chemicals over the earth's surface

Habitat and Niche

Habitat

place or physical setting in which organism lives

Examples

freshwater, coastal, forests, deserts

Niche

range of conditions tolerated, resources required. No 2 species have the same niche

Examples

different insects prefer to feed on different plants that might be in the same field

Thermal Optima

Thermal Optima the temperature in which an organism best performs

Thermal Optima (cont)

Its determined by the properties of an organism e.g. enzymes and lipids, body form, cells and tissues

Temps that exceed thermal optima can hurt e.g. Coral Bleaching

Photorespiration

- Reverses the gains made by photosynthesis
- catalized by Rubisco
- becomes more problematic in hot and dry conditions
- Rubisco has a greater tendency to react with O₂ when **O₂ concentration is high, CO₂ concentration is low, or temperature is high**
- when its hot or dry, stomata will partially close and CO₂ concentrations in leaves will be low

C4 Photosynthesis

- adds a more efficient enzyme
- CO₂ + PEP → OAA
- adds a CO₂ concentrating mechanism
- disadvantages: less tissue is used for photosynthesis. energy needed for the CO₂ pump
- C4 plants are more active at hot times of the year
- C4 grasses occur primarily in warm climates

CAM Photosynthesis

CAM photosynthesis is a pathway in which the initial assimilation of carbon into OAA occurs at night

like C4 plants CAM plants are better adapted to warm

Thermoregulation

Thermoregulation the ability of an organism to control their body temp

Thermoregulation (cont)

Homeotherms organisms that maintain constant temp. allows biochemical reactions to work most efficiently (humans)

Poikilotherms organisms that do not have constant body temperature (reptiles)

Endotherms Organisms that can generate metabolic heat to raise body temp

mammals and birds, requires a lot of work and energy

Ectotherms Organisms with body temp determined by their external environments

Reptiles, amphibians, insects. tend to be smaller.

Food Chain

Producers (autotrophs) convert light/chemical energy into resources

Consumers (heterotrophs) obtain their energy from other organisms

Mixotroph can switch between producers and consumers

Scavengers consume dead animals

Detritivores break down dead organic matter (detritus) into smaller particles

Decomposers break down detritus into simpler elements that can be recycled

Salt Balance in Aquatic Animal

Solute a substance dissolved in water. Always different than the concentration in the surrounding water.

Salt Balance in Aquatic Animal (cont)

Semipermeable Membranes membranes that allow only particular molecules to pass through. Reduces free movement of solutes

Osmosis net movement of water across a semipermeable membrane, towards a higher solute concentration

Osmotic Potential the force with which a solution attracts water by osmosis. expressed in pressure units (MPa)

Osmoregulation mechanisms organisms use to maintain a proper solute balance

Hyperosmotic tissue solute concentrations are **higher** than surrounding water

Freshwater Fish

Hyposmotic tissue solute concentrations are **lower** than surrounding water

Saltwater Fish

Salt Balance in mangroves mangrove roots are in salt water, so its hard to take up the water with a high salt load. they have developed special salt glands on leaves, their cells maintain high sugar, and roots exclude salt by active transport back into the water