Environment Class 02

22nd February, 2024 at 1:00 PM

A BRIEF OVERVIEW OF THE PREVIOUS CLASS- 1:11 PM

EXAMPLES OF ADAPTATION- 1:20 PM

- **1.** Kangaroo rats in North American deserts are capable of meeting their water requirements through the internal oxidation of fat.
- **2.** It also urinates in concentrated form to reduce water losses.
- **3.** Many other desert animals such as camels are nocturnal, have long legs can survive at 45 degrees Celsius without sweating, and have massive ears.
- **4.** Many desert plants have thorns instead of leaves to reduce transpiration, extensive root systems to find moisture, and succulent stems to reduce water loss, seeds can remain dormant for long until they get water.
- **5.** Many polar animals have dense fur, a blubber of fat below the skin, small limbs, and ears **(Alen's rule)**, but generally a large body size **(Bergmann's rule).**
- Ears and limbs are small because of less surface area thus less heat loss similarly body size is large because compared to the volume of large animals surface area is less. (they have small ears and small limbs so that surface area will be less and heat loss will be less)
- Acclimatization
- **~~Acsimilitization~~-** Process in which an individual ~~animal~~ organism adjusts to a change in its environment such as ~~attitude~~ altitude, temperature, etc.

POPULATION ECOLOGY- 1:39 PM

- A population is a group of organisms belonging to the same species that live in the same area and interact with one another.
- population ecology
- In ~~population~~, we study how and why population changes over time and population distribution ~~over others~~. patterns among others.
- In population ecology we will look to -
  -> Total Number
  -> Population density
  -> Growth rate
- **Population growth -**
- There are two models of population growth-
- **1. Exponential growth -** If there are unlimited resources in a habitat then there can be unimpeded growth of population in a very short time enormous population number will emerge.
- **2. Logistic growth-** No population has unlimited resources at its disposal and species compete for resources because of this a given habitat has enough resources to support the maximum possible number for a particular species.
- This is called the carrying capacity for that species in that habitat.
- number
- All the factors that control the population size are called limiting factors.
- **For example-** Availablity of food water, essential nutrients etc., natural disaster.

R vs K selection-

- R-selected species have a high growth rate but low survivability. Ex: Insects in rain
- This reproductive strategy often occurs in unstable environments, the offspring require little parental care.
- K-selected species- have a low growth rate but high survivability, this strategy pre-dominates in stable environments.
- There are few offspring, more parental care, and thus low mortality.

COMMUNITY ECOLOGY- 2:20 PM

- Community is all of the population of different species that live in the same area and interact with one another.
- The study of community ecology is **called synecology.**
- In this, we can study the interaction among species, and the composition of the community among others.
- In contrast, the study of individuals and populations is called **Aut ecology**.
- In this, we study the habitat requirement of species, and population dynamics among others.
- **Ecological niche-** (in Synecology)
- It can be defined **as sum total of all the ecological requisites and activities of a species**, it encompasses both the physical and environmental ~~process~~ conditions it requires and the interactions it has with other species.
- Niche requirements can be further divided into -
- 1. Habitat niche- Where it lives, food niche
- 2. Reproductive niche
- 3. Physical and chemical niche (temperature, land shape, humidity and other requirements)
- **Competitive exclusion principle-** (within Ecological niche)

Gauss's Law-

- Two species can't co-exist if they occupy exactly the same niche.
- Two species whose niche ~~overall~~ overlap may evolve by natural selection to have distinct niches resulting in resource partitioning.
- For example, when **Darwin studied Galapalgo finches** he found there are differences in their morphology and behaviors.
- He concluded that when similar species ~~are in habit in~~ inhabit the same area natural selection may favor divergence in characteristics for better resource partitioning.
- This revolutionary change is **called character displacement.**

BIOTIC INTERACTION- 2:54 PM

- **Mutualism-**
- Example- Bees and flowers- Plants need the help of pollinators such as Bees in pollination, these are rewarded with nectar.
- Lichens - They represent an intimate mutualistic relationship between a fungus and ~~photosynthesis~~photosynthetic algae.
- Mycorrhizae association between fungi and roots of some plants.
- Fungi help in the absorption of nutrients, plants provide them with carbohydrates.
- Legume crops- Rhizobium bacteria, Coral and ~~Zoothanzalee~~Zooxanthellee.

Commensalism-

- Example- Remora and shark, whales and barnacles.
- **Epiphytes-** Small plants living on the surface of larger trees for sunlight and shelter.
- These are most commonly found in tropical rainforests.

Predation-

- In this interaction predator captures, kills, and eats prey in a large ecological context.
- Herbivores are not very different from predators. (bz they eats seeds of plants so loss for plants and benefit for that animal)
- Predation is very important in **an ecosystem because -**
- 1. They help in maintaining species diversity by reducing the intensity of competition among prey species. (else one diversity will grow more and one will be on extinction)
- 2. A Predator can also help in controlling the spread of diseases.
- In the absence of natural predators, some alien species can become invasive.
- Prey species have evolved various defences to lessen the impact of predation, often predators and prey can co-evolve. (Ex: Deer can make sharp 180degree turn so Tiger also get learned to make same sharp turn)
- If a predator is too efficient and over-exploits its prey, then the prey might become extinct following it so does the predator.
- Predators in nature are prudent because of this reason.

OTHER INTERACTIONS- 3:31 PM

- **Parasitism-**
- Parasites are usually small-sized animals living in endoparasites or living on ectoparasites on another living species which is called the host.
- Many parasites have evolved to be host-specific, some parasites have complex life cycles, and they can depend upon one or two intermediate hosts before infecting the primary host.
- **Examples are flees** and Ticks on animals, Tapeworms in vertebrates, and Mistletoe a parasitic plant that is attached to tree branches, they penetrate the branches to draw water and nutrients from the host tree.
- **Brood parasitism-** A bird laying eggs in the nest of other birds.

Amensalism-

- Examples- Large animals crumble in their path as they move - elephants in Savannah grasslands, shaded by large plants
- Large trees inhibit the growth of smaller plants by absorbing most of the sunlight.
- Penicillium mold is a fungi that secretes an enzyme called Penicillium which inhibits the growth of bacteria.
- Allelopathy- Some plants secrete chemicals in the surroundings inhibiting the growth of other plants- Black walnut tree.
- **Competition-** Both species are harmed to some extent. (Ex: one Lion and many Hynas)
- **Neutralism-** True neutralism may be an ideal scenario.
- **Symbiosis** is a broader term that encompasses intimate association between organisms but such association can be mutualistic, commensalistic or even parasitic.

The topic for the next class- Functions of ecosystems