Environment Class 01

20th February, 2024 at 9:00 AM

INTRODUCTION TO ENVIRONMENT CLASSES (09:09 AM)

- 1. Module 1: Basics of Ecology
- 2. Module 2: Biodiversity
- 3. Module 3: Climate Change, Ozone Depletion, Land Degradation, etc.
- 4. Module 4: Pollution and related issues
- 5. Module 5: Sustainable Development
- **Sources:**
- Any Value Added Materials
- The Hindu -> Planet Earth documentary by BBC.
- Monthly Magazine
- Our Planet Documentary
- Down to Earth (It is a Magazine and it is optional)
- Annual Reports of MoEFCC and Down to Earth

ENVIRONMENT & ECOLOGY (09:20 AM)

- ***Evolutionary Biology:***
- *Studies the diversity of life and its origins.*
- *Explores mechanisms of change and adaptation.*
- *Integrates genetics, ecology, and paleontology.*
- *Investigates how species evolve and diversify over time.*
- ***Darwin's Idea:***
- *Proposed natural selection as a mechanism for evolution.*
- *Emphasized the importance of variation and adaptation.*
- *Argued for descent with modification.*
- *His work laid the foundation for modern evolutionary theory.*
- ***Genetic Differences within Species:***
- *Variations exist due to genetic diversity.*
- *Arise from mutations, gene flow, and genetic drift.*
- *This can lead to phenotypic differences.*
- *Form the basis for natural selection and evolution.*
- ***Natural Selection:***
- *A process where traits beneficial for survival are favored.*
- *Acts on heritable variations within populations.*
- *Leads to adaptation and evolutionary change.*
- *Results in the survival of the fittest individuals.*
- ***Four Principles:***
- *Variation exists within populations.*
- *Some variations are heritable.*
- *More offspring are produced than can survive.*
- *Individuals with advantageous traits are more likely to survive and reproduce.*
- ***Adaptation:***
- *Traits that enhance an organism's fitness.*
- *Result from natural selection.*
- *Allow organisms to survive and reproduce in their environment.*
- *Can be behavioral, physiological, or structural.*
- ***Mutation:***
- *Source of genetic variation.*
- *Involves changes in DNA sequence.*
- *Can be caused by errors in replication or environmental factors.*
- *Provides raw material for evolution and adaptation.*

- **Ecology:**
- It is a subject that aims to understand the relationship of living organisms with each other and with their natural surroundings.
- This term was coined by German biologist **Ernst Haeckel.**
- It is derived from two words**,*Eikos* which means home, and*Logos*which means study.** (i.e. Study of Home of living organisms.)
- Natural Environment encompasses all ~~other~~ living and non-living things occurring naturally.
- The components of the environment can be divided into:
- i. Lithosphere
- ii. Hydrosphere
- iii. Atmosphere
- iv. Biosphere
- The biosphere refers to all the regions of Earth where living organisms exist.
- Species are defined as genetically related organisms that can reproduce and have fertile offspring.
- Impact of Humans on Evolution: Peppered moth evolution, Different Dog Breeds

ECOSYSTEM (10:19 AM)

- An ecosystem is a geographical area where plants, animals, and other organisms (Biotic Factors), as well as landscape and weather (abiotic factors), work together to form a bubble of life.
- Ecosystems can be small or large. The whole surface of the earth is a series of connected ecosystems.
- Every factor in an ecosystem directly or indirectly depends upon other factors.
- **Habitat:** It is a physical environment in which an organism lives, each organism has a particular set of requirements for its survival habitat provides those requirements.
- **Biotic and Abiotic Factors:**
- We can divide biotics into three groups:
- **Producers:**
- The green plants manufacture food for the entire ecosystem through the process of photosynthesis.
- Producers are
- Also called Autotrophs.
- **Consumers:** Also called heterotrophs.
- **Decomposers:**
- These are mostly bacteria and fungi that decompose dead organic matter and play a very important role in the recycling of nutrients.
- They are called Saprotrophs.
- Even abiotic components can be grouped into three categories:
- **Physical Factors:**
- This includes Sunlight, Temperature, Rainfall, and Humidity.
- **Inorganic Factors:**
- Oxygen, Nitrogen, Sulfur, etc. , CO_2, Phosphorous and other minerals.
- **Organic Compounds:**
- This includes carbohydrates, proteins, lipids, etc.

LEVELS OF ECOLOGICAL ORGANIZATIONS (11:06 AM)

- ***Individual - Population - Community - Ecosystem - Biome - Biosphere***
- At the level of organism, we aim to understand how organisms are adapted to their environment in terms of survival and reproduction.
- Abiotic conditions of Many habitats may drastically vary in time. Species cope with these changes ~~sing~~ using following mechanisms.
- **1. Regulate:**
- Many species have evolved to have a relatively constant internal environment such as optimal temperature, and concentration of salts in the body.
- This is called **Homeostasis**. For example, mammals are capable of thermoregulation ~~in~~ i.e. almost constant temperatures.
- 2. **Conforms**
- The majority (99%) of animals and nearly all plants cannot maintain a constant internal environment. Their body temperature changes with ambient temperature or bodily fluid changes with the water concentration of surroundings.
- These species are called conformers.
- If the stressful conditions are localized, ~~they~~ and remain only for a short duration.
- Organisms have two other alternatives:
- **Migrate:** They can temporarily move away from stressful habitat, to a more hospitable area and return when the stressful period is over.
- **Suspend:** If unable to migrate, species can survive by skipping time.

Ex:
- a) **Hibernation-** Some species go into winter sleep.
- Their metabolic ~~speed reduces~~ activities reduces but they can survive. Example: Bears in winter.
- Some snails and fish reduce their metabolic activity to avoid summer-related stress.
- This is called Aestivation. b)
- c) **Diapause:** Under unfavorable conditions, many zooplankton in lakes and ponds are known to enter diapause, a state of suspended development.
- d) **Adaptation:**
- It is an attribute of an organism that enables it to survive and reproduce. Many of these adaptations have evolved over long evolutionary times and are genetically fixed.
- We can further divide adaptation into three groups:
- **1. Physiological adaptation:**
- This refers to changes in organisms' internal functions which are not necessarily visible.
- These changes occur at tissue, cell, and organ levels.
- **2. Morphological adaptation:**
- This involves changes in the physical form which are usually visible enabling an organism to better survive.
- **3. Behavioural Adaptation:** Something an organism does in response to external factors to survive.

Topic for the next class: Adaption, Population Ecology

-> search about Tardigrades