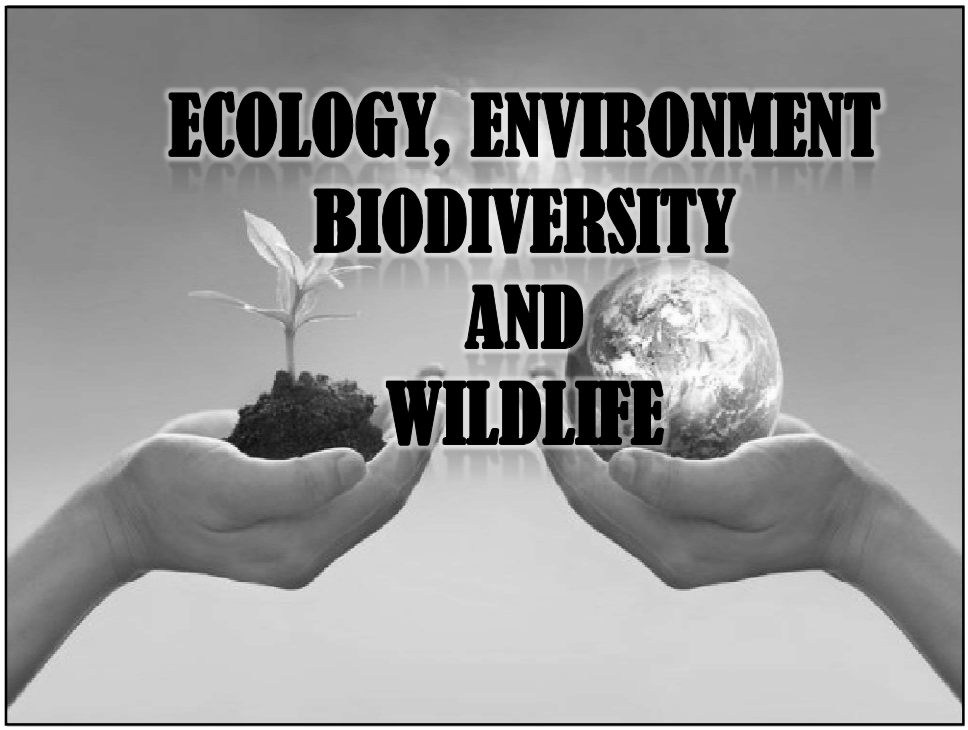
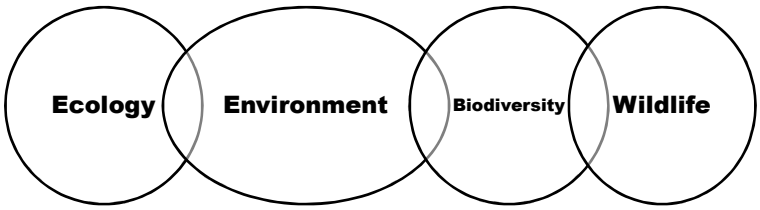


Broad breakup



Introduction

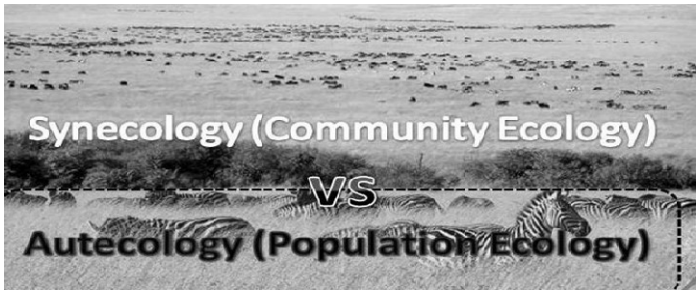
- Ecology = *oikology* (*Oikos* + *logos)*
- Coined by - **Ernst Haeckel** (a German zoologist)
- Ecology means ***the study of the house or the habitat of an organism, a living animal or plant.***

Some definitions

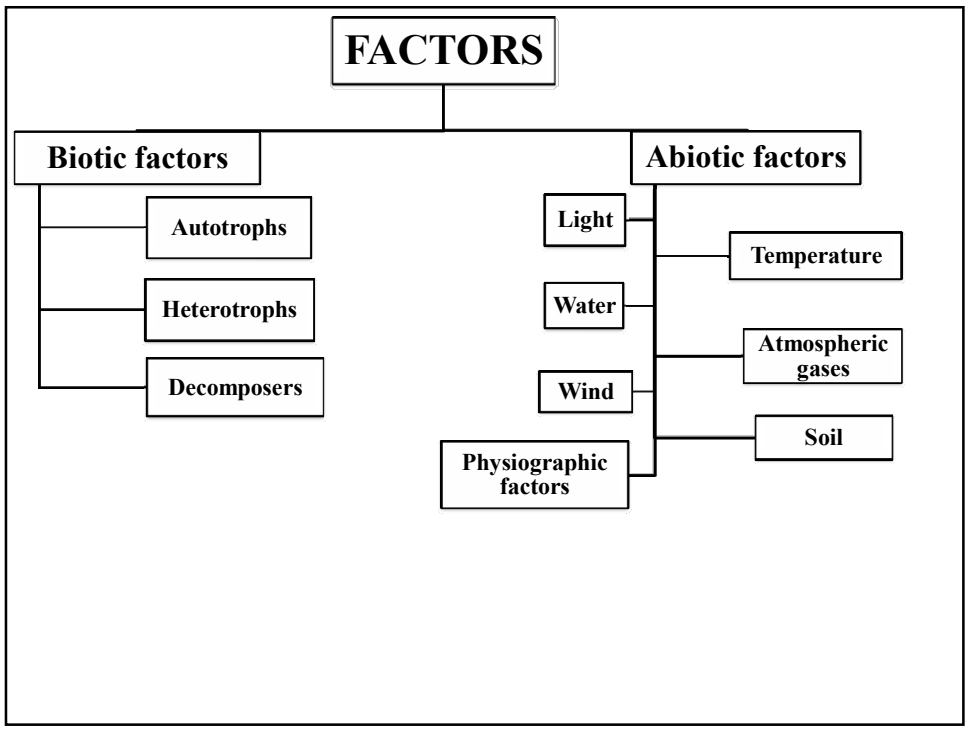
- "***The study of animals and plants in relation to their habits and habitats***" - **Elton** (1927)
- "***Scientific study of the structure and function of nature***" - **Odum** (1971)
- "***The scientific study of interactions that determine the distribution and abundance of organisms***" - **Krebs** (1978)

Branches

1. ***Autecology***
2. ***Synecology***



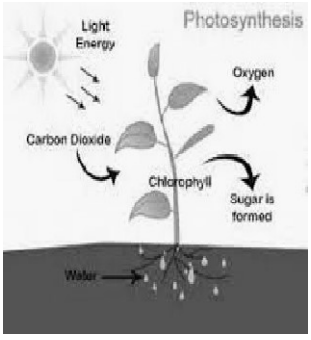
FACTORS INFLUENCING ECOLOGY

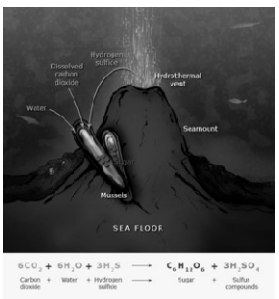


Biotic factors

Autotrophs

- Produces organic compounds on its own
- Food - ***chemical energy***
- Production needs
  - **Carbon source**
  - **Energy**





- Organisms using light – ***Photolithoautotrophs*** (plants, algae etc.,)
- Autotrophs transform sunlight to make food, we call the process - **Photosynthesis**
- Light energy (Free) – converted into Chemical energy (Potential energy)
- Use oxidation of inorganic compounds - ***Chemolithoautotrophs*** (some bacteria)
- Using inorganic compounds **- Chemosynthesis**

Heterotrophs

- An organism that obtain carbon for its growth and development from other organic substrates
  Eg: *Fungi, Some bacteria, Animals*
  (Herbivorous, Carnivorous, Omnivorous)

Decomposers

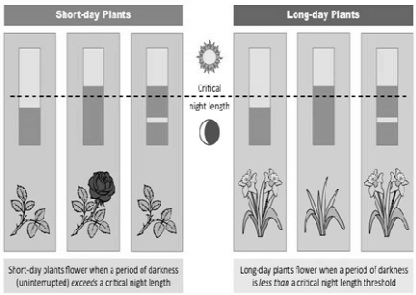
- Organisms that break down organic materials to gain nutrition and energy
- They release raw nutrients into the environment after breaking down Eg: Bacterias, Fungi (***not virus!!!***)

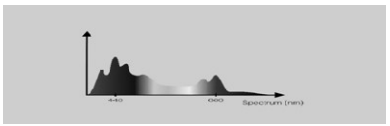
Abiotic factors

Light

- Light energy (Sunlight) – primary source of energy to all ecosystems
- Used by green plants during photosynthesis
- Factors playing important role
  - *Quality of light*
  - *Intensity of light*
  - *Length of light period*

- ***Quality of light*** (blue and red)
- ***Light intensity*** (latitude and season)
- ***Day length***
  - Long day
  - Short day
  - Day neutral





Temperature

- Contributes to erosion & creation of soil
- Different organisms have different cellular tolerances for cold and heat

Water

- Important component in erosion & generation of soils
- Terrestrial and freshwater environments require animals and plants to conserve water and evolve ways to maintain water/salt balance.

- Plants can be categorized by their adaptations to conserve water:
- ***Xerophyte*** –evolutionary adaptations for dry (xeric) environments
- ***Hydrophyte*** –evolutionary adaptations for wet (hydric) environments
- ***Mesophyte*** –evolutionary adaptations for moderate conditions



Atmospheric gases

- Most important gases used by plants and animals
  - ***Oxygen*** (respiration)
  - ***CO_2*** (Photosynthesis – plants)
  - ***Nitrogen*** (Lightning and Bacteria – plant nutrition)

Soil

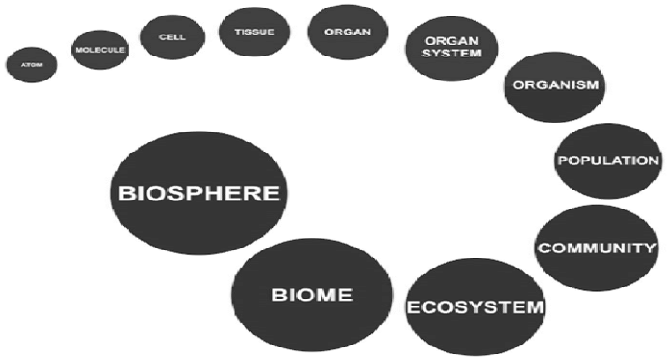
- Physical, Chemical and Biological properties

Physiographic factors

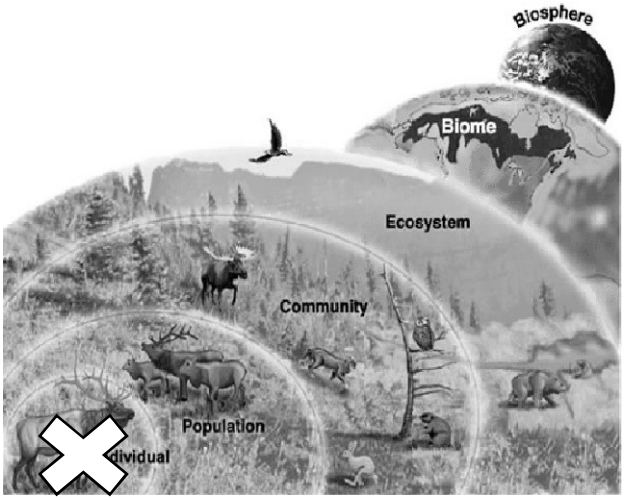
- Altitude, Latitude, Slope, Aspect etc.,

Ecology concepts

Hierarchy of life



Levels of ecological studies



POPULATION ECOLOGY

Population Ecology

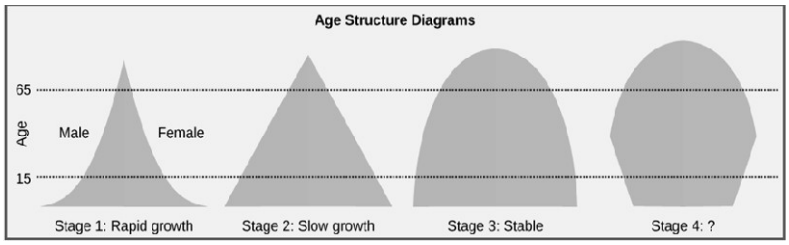
- *Branch of ecology that studies the structure and dynamics of population*
- **Population** – ***smallest unit of ecological analysis***
- Population – "***a group of interbreeding and interactive individuals of the same species inhabiting the same area at a given point of time***"

Age distribution in population

There are 3 age groups

- **Pre reproductive**
  - No reproduction
- **Reproductive stage**
  - Sexually mature, actively reproducing
- **Post reproductive**
  - Beyond reproduction; ageing group

Pattern in age distribution

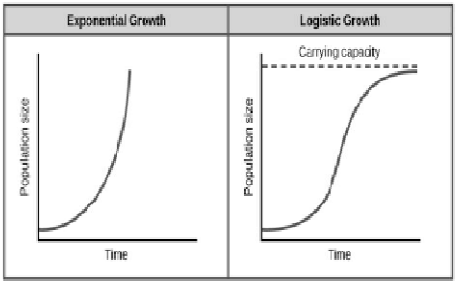


Population growth

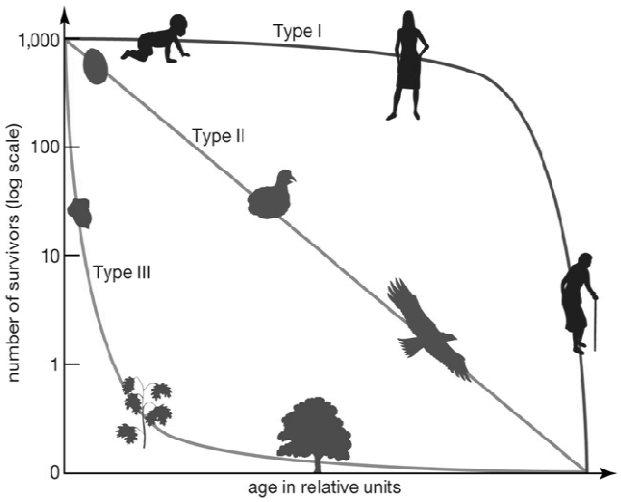
Depends on 4 factors

1. Fecundity and Natality (Absolute and Realized)
2. Death
3. Immigration
4. Emigration

Patterns of population growth



Survivalship curve



Population stabilization

Regulated by 2 factors

- ***Density independent factors***
  - Food, Space, Shelter, Weather
- ***Density dependent factors***
  - Competition, Predation, Emigration, Reproduction, Diseases etc.,

Population stabilization

Density Dependent Factors
Predators
Availability of resources (e.g. shelter, water)
Nutrient supply (..e. food source)
Disease / pathogenic spread
Accumulation of wastes

Density Independent Factors
Phenomena (e.g. natural disasters)
Abiotic factors (e.g. temperature, CO_2 levels)
Weather conditions (e.g. floods, storms, etc.)

Mnemonic: PANDA PAW

Density Dependent Factors:

Competition | Parasitism | Disease | Predation

COMMUNITY ECOLOGY

Introduction

Ecological community

- *Assemblage of species populations that has potential of interaction*

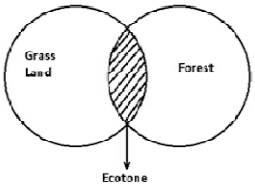
Definition (***Putman 1994***).

- *"interactive assemblage of species occurring together within a particular geographical area, a set of species whose ecological function and dynamics are in some way interdependent"*

Inter-specific associations in a community

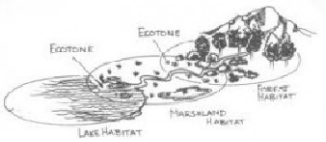
Species A	Species B	Name of Interaction
+	+	*Mutualism*
-	-	*Competition*
+	-	*Predation*
+	-	*Parasitism*
+	0	*Commensalism*
-	0	*Amensalism*

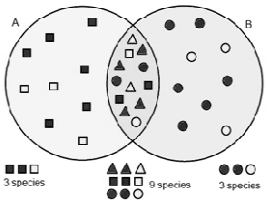
Ecotones



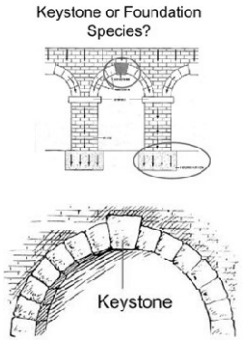
- An *area* or *zone of transition* between two or more diverse communities is known as an ***Ecotone***.
- In gradually blended interface area, species from each community will be found together as well as unique local species.

Edge effect





- Often, both the number of spp and population density of some of the species – greater in ecotone than in the communities flanking it.
- This tendency for increased variety and density of species of a community is known as ***Edge effect***
- Species using edges **– *Edge species***



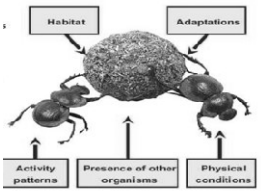
Keystone Species

- A keystone species is a species that has a disproportionate effect on its environment relative to its abundance.
- Such an organism plays a role in its ecosystem that is analogous to the role of **a keystone** in an arch.
- A small impact on keystone species could cause major ***disruption for the whole ecosystem***.

Example

Blue jays in oak forest

- Birds called Blue Jays (*Cyanocitta cristata*), disperse seeds that give rise to oak forests.
- Without Blue Jays, oak forests are not naturally replenished and without the forests, all other species in the ecosystem cannot survive.



Ecological Niche

- It is the ***multi-dimensional ecological profile*** of a species in a community covering all the measurable aspects of its ecological activities
- It is a term describing the relational position of a species or population in an ecosystem.
- Includes how a population responds to the abundance of its resources and enemies and how it affects those same factors.

Principle of competitive exclusion

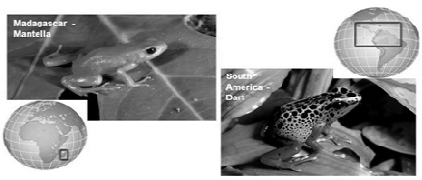
- Two different species can have partially overlapping niche in the same community
- But never totally overlapping
- In case of total overlap one species will be eliminated from the community
- This is called the ***principle of competitive exclusion***

Ecological guild

- A group of species in the same community which utilize the same resource in the same manner
- *Eg: Grazing animals in a community (cow and buffalo)*

Ecological equivalent

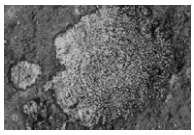
- Two different species in different communities but playing largely similar or same role
- They occupy similar niche in separate geographical areas



Ecological succession

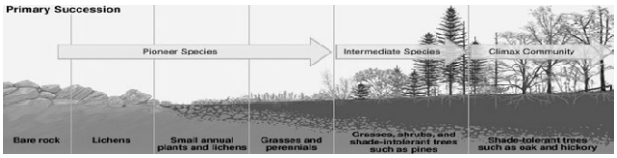
- Continued presence of plant community in that site - changes the factors of locality - the conditions become unsuitable for the original plant community
- Site is gradually invaded by the members of other plant community which gradually replaces the former.

Kinds of succession



Primary succession

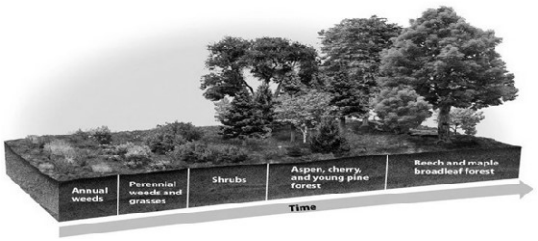
- The succession which takes place on sites which have previously not borne vegetation.
- Primary succession - autogenic succession
- First species to appear – ***Pioneer***
- ***Eg: Lichens =fungi (physical) + algae (photosynthesis)***

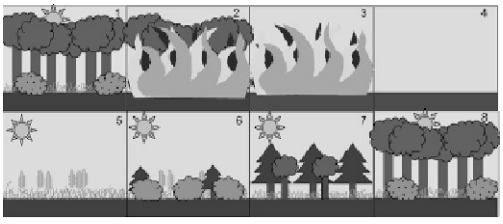


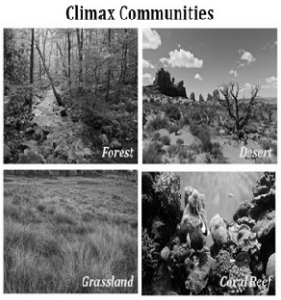
Secondary succession

- The succession which takes place on site after the destruction of the whole or part of the original vegetation.
- Allogenic succession (clearing, burning, grazing, storm, erosion, deposition, landslide)
- The plant communities – before climax - **seres**.
- **Sere** -the series of plant communities resulting from processes of succession or any recognizable stage in plant succession.

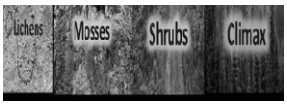
Secondary succession







Climax



- If the succession is allowed to progress without disturbance, a stage is reached when no more improvement is possible in the soil and the vegetation.
- At that stage the vegetation is in equilibrium with the environment and stays unchanged indefinitely by reproducing itself.
- Thus, ***climax is the culmination stage in plant succession for a given environment.***