Biodiversity

What does "Bio" mean?

Bio = *Life*

What does "Diversity" mean?

Diversity = Variety

- ✓ **A wide variety of living organisms including plants, animals and micro-organisms with whom we share this planet earth makes the world a beautiful place to live in.**
- ✓ **Living organisms exist almost everywhere from mountain peaks to the ocean depths; from deserts to the rainforests.**

- ✓ **They vary in their habit and behaviour, shapes, sizes and colour.**
- ✓ **The remarkable diversity of living organisms form an inseparable and significant parts of our planet**
- ✓ **however, the ever increasing human population is posing serious threats to bio-diversity.**

- **At the global level, an estimated 1.7 million species of living organisms have been described to date and many more are yet to be discovered.**

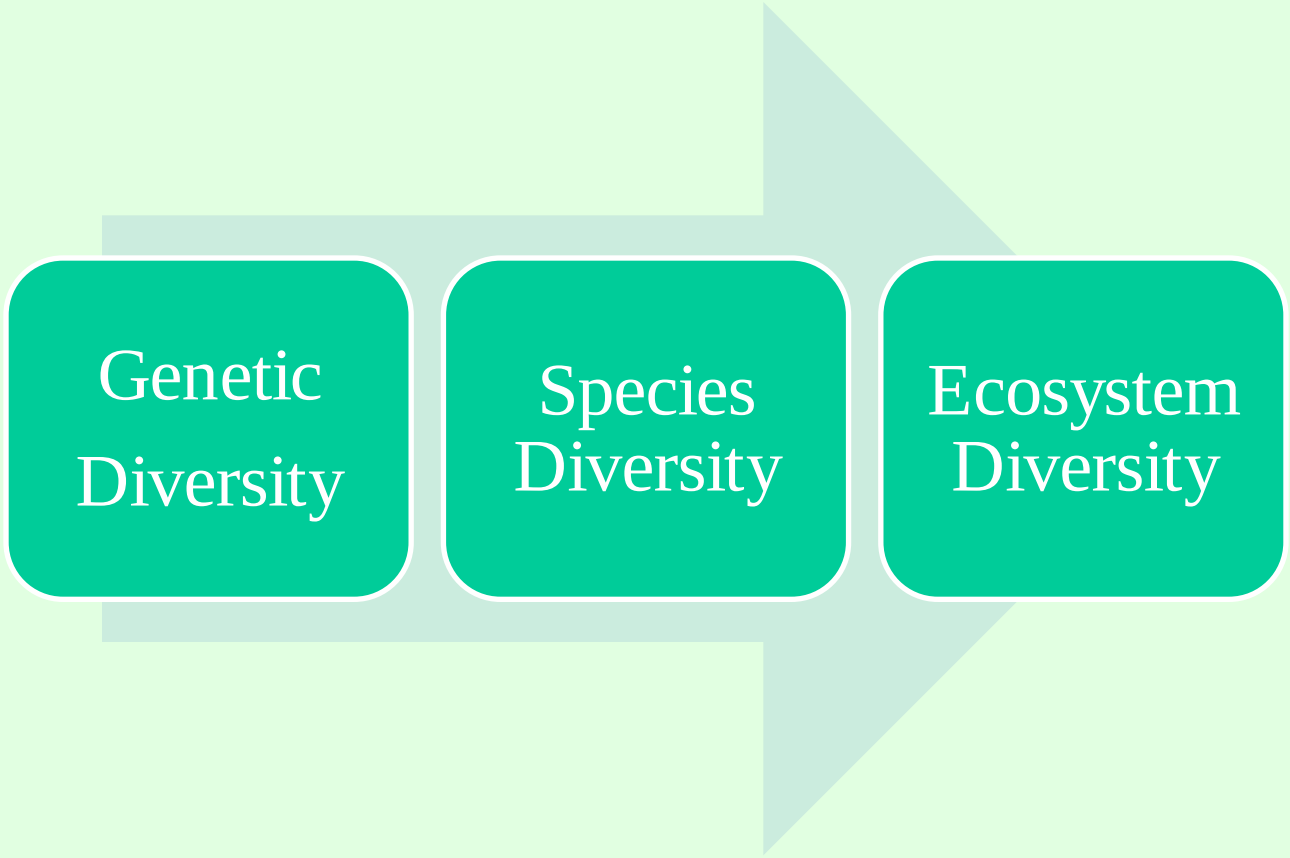
- **The overall richness of species is concentrated in equatorial regions and tends to decrease as one moves from equatorial to polar regions.**

- **In addition, biodiversity in land ecosystems generally decreases with increasing altitude.**

- **In marine ecosystems, species richness tends to be much higher in continental shelves.**

- **India is a country of vast diversity and it is among the 12 “mega-diversity” countries in the world.**

***There are 3 components of biodiversity:**



Genetic Diversity

1. *Genetic Diversity- the variety of genes or inheritable characteristics present in a population

Chihuahuas, beagles, and Rottweiler's are all dogs—but they're not the same because their genes are different.

Chihuahua

Beagle

Rottweilers

Genetic Diversity within the humans

diversity found in native chickens

Genetic diversity in the bambara groundnut

Species Diversity

2. *Species Diversity- the number of different species and the relative abundance of each species in a biological community. For example, monkeys, dragonflies, and meadow beauties are all different species in the same community.

Saki Monkey

Golden Skimmer

Meadow Beauty

3. Ecosystem Diversity

3. *Ecosystem Diversity- the variety of ecosystems that are present in the biosphere. Grass lands, deserts, mountains

⇒ It relates varieties of habitats, biotic communities ecological processes in biosphere.

Paines Prairie

Rain Forest

Sand hill Pond

According to Whittaker (1965), the community diversities are of three types:

Measuring biodiversity:

- At simplest level: biodiversity is the **species richness**
- Various levels of measuring the biodiversity are:

1. ***Alpha diversity***
2. ***Beta diversity***
3. ***Gamma diversity***

(i) α-Diversity:
It tells the species diversity in a given community.
It depends upon species richness and evenness.

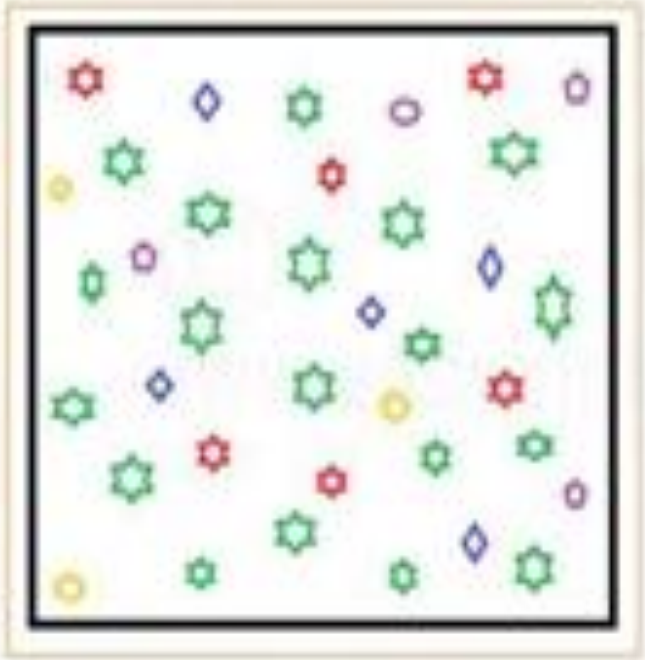
(ii) β-Diversity:
It describes a range of communities due to replacement of species which arises due to the presence of different microhabitats, niches and environmental conditions.

(iii) γ -Diversity:
It describes diversity of habitat over a total land escape or geographical area.

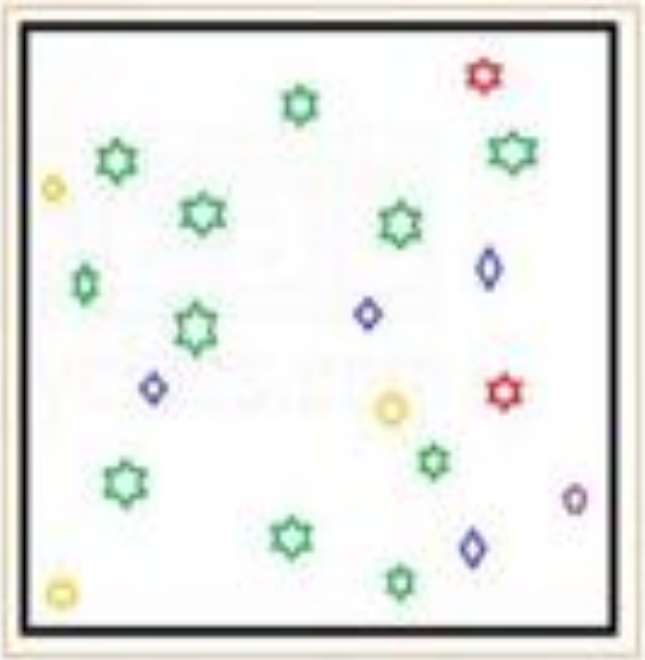
Measuring biodiversity:

1. Alpha diversity:

- Refers to **number of species** in a single community
- It is better called as species richness
- Used to **compare number** of **species** in different communities



Community I



Community II

Measuring biodiversity:

2. Beta diversity:

- Degree of **change in species composition** along an environmental gradient
- *Example:* Beta diversity is high, if the species composition of moss communities changes successively at higher elevations on a mountain slope
- Beta diversity is low if same species of moss occupy the whole mountain side

Measuring biodiversity:

3. Gamma diversity:

- Gamma diversity applies to large geographic scale
- "The rate at which additional species are encountered as geographical replacements within a habitat type in different localities"
- "Gamma diversity is a species turnover rate with distance between sites of similar habitat or with expanding geographic areas"

Uses of biodiversity:

1. Productive use:

- Products commercially harvested for exchange in market
- This value of biodiversity is concerned with national income
- Biodiversity provides: fuel, timber, fish, fodder, fruits, cereals, medicinal plants etc.
- In India, income from biodiversity is nearly 30% (736.88 billion rupees, 1994-95)

- They provide timber for house-building, ship-building, bridges, railway carriages, furniture's etc.
- They supply fire wood and charcoal for fuel in homes and in industries.
- They provide wood pulp for the paper and rayon industries.
- They provide honey for food and medicines.

Uses of biodiversity:

2. Consumptive use:

- Deals with natural products that are consumed directly
- They are goods which do not come under normal circulation of trade
- Example: non timber forest products, Honey collected from forests

Spices

Rubber

Fruits

Several types of oils

Vegetables

Leather industry

Milk products

Dye industry

Textile Industry

Natural Beehive

At least 40 per cent of the world's economy and 80 per cent of the needs of the poor are derived from biological resources.

MEDICINAL HERBS

- Plant produce a primary metabolites and secondary metabolites.
- Primary metabolites include carbohydrate, lipids, proteins.
- Secondary metabolites is a natural products derived from primary metabolites.
- Secondary metabolites is the major source for pharmaceuticals, food additives, and pesticides.

- Alkaloids found mainly in plants. ALKALOID BASED DRUGS are as follows:
- Atropine
- Scopalamine
- Morphine

Uses of biodiversity:

3. Indirect use:

- Most significant
- This value is related primarily with **functions of ecosystem**
- Biodiversity is very essential for:
  - Ecological balance
  - Constancy of climatic features
  - Soil maintenance

- Biodiversity also provides critical indirect benefits to humans that are difficult to quantify because we have never had to put a price tag on them.
- These benefits encompass ecosystem services , such as air and water purification, climate regulation, and the generation of moisture and oxygen.
- the world cannot afford to replace these services, therefore we must work to protect our ecosystems.

- Tropical regions are rich in biodiversity than temperate region

Should we be concerned about loss of biodiversity?

What we know:

The Earth is losing species at an alarming rate

In the past 500 years, we know of approximately 1,000 species that have gone extinct

THREATS TO BIODIVERSITY

Natural causes:

- Narrow geographical area
- Low population
- Low breeding rate
- Natural disasters

Anthropogenic causes:

- Habitat loss
- Overexploitation of selected species
- Innovation by exotic species
- Pollution
- Hunting
- Global warming and climate change
- Agriculture
- Domino effect

Habitat destruction is currently ranked as the primary causes of species extinction world wide...!!!

Causes of Threat

Over exploitation of selected species

Poaching :Targeting of certain selected species takes place even after legal protection , products from endangered species are traded within and between the nations.

Animals are killed for their skin, teeth, horn bones, medicinal use, research and educational purpose etc.

Man – Wildlife Conflicts

Causes of Man-Animal Conflicts:

i. Habitat fragmentation and shrinking of habitat give rise to shrinking of space, food etc in the forest result in animals stray out of habitat in search of *food, water or shelter*.

Animals cannot pass these canals and roads easily and they are localized and their natural balance is disturbed.

ii. *Encroachment in the forest lands by local people* has resulted in shrinkage of wildlife habitats especially on the fringes which has increased the pressure on the limited natural resources in the forest areas.

iii. Most incidences of man-animal conflicts are noticed *during summer when water becomes scarce. The livestock and wild animals have to share the limited water sources on the fringes or inside forest*

No need to memorize line by line, it is just for your information

No need to memorize line by line neither the data

- In India, wild elephants probably kill far more people than tiger, leopard or lion.
- Damage to agricultural crops and property, killing of livestock and human beings are some of the worst forms of man-animal conflict.
- Farmers sometimes poison and shoot wild animals as they damage their crops, but this can be prevented by taking certain measures

After 250 nilgai or blue bulls were shot in Bihar on 9th June, 2016 because acres of crops were being destroyed in areas where they exist in large numbers and regularly stray onto farms growing crops like wheat and pulses. is found in small patches around the villages

Endangered Species

- An Endangered Species- is a plant or animal that is in danger of becoming extinct.
- A Threatened Species- plants or animals that may become endangered in the near future

CONSERVATION OF BIODIVERSITY

- Biodiversity inventories
- Conserving Biodiversity in protected Habitats-
- *In situ* conservation
- *Ex situ* conservation
- Seed Bank, Gene Bank, Pollen Bank, DNA Bank

Conservation measures of biodiversity

Ex-situ conservation:

- Refers to conservation of components of biodiversity outside their natural habitats, e.g. zoos, museums, gene banks, botanic gardens/arboretums;
- Used for threatened and endangered species to avoid their extinction; also known as captive conservation.

In-situ conservation:

- Refers to conservation of ecosystems and natural habitats including maintenance and recovery of viable populations of species in their natural habitats.

National parks and game reserves - *These are different from zoological gardens and are established on* terrestrial and aquatic ecosystems with the objective to preserve wildlife that cannot co-exist with human beings and human activities. National parks are under the jurisdiction of central government while game reserves are managed by the local county council.

(a) In-situ conservation:

In these areas, hunting, firewood collection, timber harvesting etc. are prohibited so that the wild plants and animals can grow and multiply freely without any hindrance.

Some protected areas are:

Cold desert (Ladakh and Spiti),

Hot desert (Thar),

Saline Swampy area (Sunderban and Rann of Kutch),

Tropical moist deciduous forest (Western Ghats and north East) etc.

Protected areas include national parks, sanctuaries and biosphere reserves.

Remember ONLY 2-3 names

Many National Parks and Sancturies have been established to preserve wildlife in their natural environment.

There are about 89 national parks in India.

Some of them are given below along with important species found there.

- Kaziranga sanctuary (Assam) –
- Manas sanctuary (Assam) –
- Gir forest (Gujarat) –
- Kelameru bird sanctuary (Andhra Pradesh) –
- Dachigam sanctuary (Jammu and Kashmir) –
- Bandipur sanctuary (Karnataka) –
- Periyar sanctuary (Kerala) –
- Kanha National Park (Madhya Pradesh) –
- Simipal National Park (Orissa) –
- Bharatpur bird sanctuary (Rajasthan) –
- Corbett National Park (Uttaranchal) –
- Jaladpara sanctuary (West Bengal) –

Remember ONLY 2-3 names of sanctuaries/parks

Sanctuaries:

These are the areas where only wild animals (fauna) are present.

(i) Nandankanan Zoological Park

(ii) Chandaka Elephant reserve

(iii) Simlipal Tiger Reserve

(iv) Bhitarkanika Wild life Sanctuary

(v) Gharial project at Tikarpada

(vi) Chilika (Nalaban) Sanctuary

Remember ONLY 2-3 names of sanctuaries/parks

Hot Spots:

Norman Myers, a British Ecologist, developed the concept of hot spots in 1988 to designate priority areas for *in situ conservation. According to him, the hot spots are the richest and* the most threatened reservoirs of biodiversity on the earth.

Twenty-five biodiversity hot spots have been identified in the world. These hot spots are characterized by posing exceptionally high biodiversity.

For example the total area of these 25 hot spots cover 1.4% of the total land area, support 44% of plant and 35% terrestrial vertebrates.

- ***Hot spots are the areas with high density of biodiversity or mega diversity which are most threatened at present.***
- **OF ALL THE HOT SPOTS IN THE WORLD , MOST OF THEM ARE LOCATED IN TROPICAL AREAS**
- ***Out of 25 hot spots in world, two are located in India namely North-East Himalayas and Western Ghats.***

(b) Ex-situ conservation:

Ex-situ conservation involves maintenance and breeding of endangered plants and animals under partially or wholly controlled conditions in specific areas like zoo, gardens, nurseries etc. That is, the conservation of selected plants and animals in selected areas outside their natural habitat is known as ex-situ conservation.

The stresses on living organisms due to competition for food, water, space etc. can be avoided by ex-situ conservation there by providing conditions necessary for a secure life and breeding.

Some important areas under these conservation are:

(i) Seed gene bank,

(ii) Field gene bank;

(iii) Botanical gardens;

(iv) Zoos.