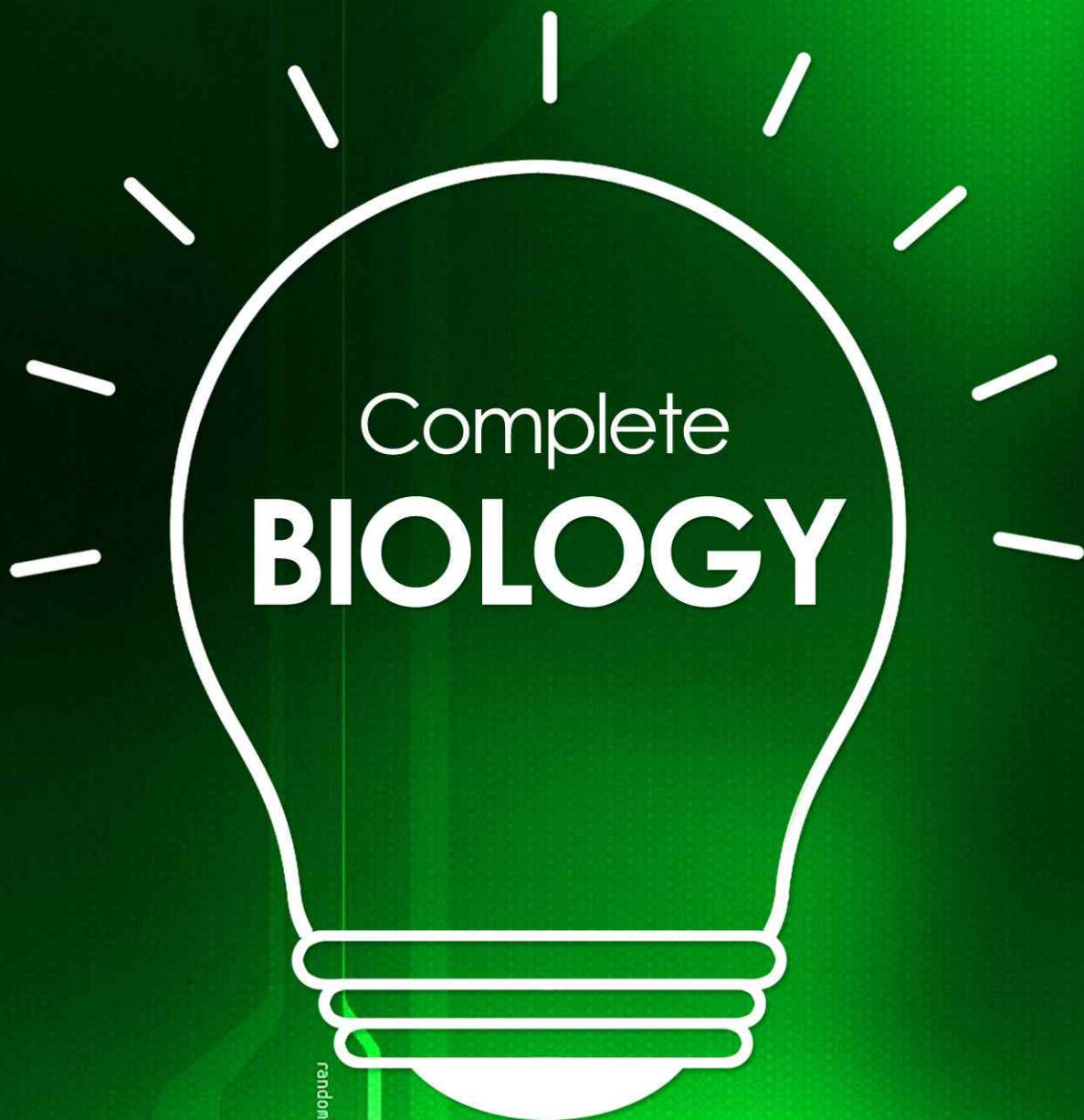




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Biodiversity and Conservation

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01. Biodiversity

The term biodiversity was popularised by sociobiologist **Edward Wilson** to describe the combined diversity (or heterogeneity) at all the levels of biological organisation right from macromolecules within the cells, genes, species, ecosystems and biomes.

There are three most important hierarchical levels of biodiversity.

- (i) **Genetic Diversity** : A single species might show high diversity at the genetic level over its distributional range. It means genetic diversity is a measure of variety in genetic information contained in the organisms. Within a species, genetic diversity occurs in the differences of alleles, entire genes and chromosomal structures. Genetic diversity enables a population to adapt to its environment and the changes occurring in the environment.
- (ii) **Species Diversity** : It refers to the variety of species within a region. For example, Western Ghats have greater amphibian species diversity as compared to Eastern Ghats.
 - (a) Species diversity is product of **species richness** and **species evenness**.
 - (b) Species richness is the number of species present within a unit area.
- (iii) **Ecological Diversity (Community Diversity)** : It is the variety of ecosystems which indicate diversity in the number of niches, trophic levels, food webs, nutrient cycles and ecological processes sustaining energy flow. For example, ecosystem diversity is high in India because of the occurrence of a large number of ecosystems like deserts, rain forests, mangroves, coral reefs, wetlands, estuaries, and alpine meadows. It is quite low in small countries e.g., Scandinavian country like Norway.

Biodiversity in India : India is divided into 10 bio-geographical regions. India with only 2.4% of the world's land area possesses 8.1% species diversity of the world due to varying physical conditions and species grouping. It is because India is one of the 12 mega diversity countries of the world. There are nearly 45,000 species of plants and **twice as many** animal species. If we accept May's global estimates, only 22% of the total species have been recorded so far. Applying this proportion to India's diversity figures, we estimate that there are probably more than 1,00,000 plant species and more than 3,00,000 animal species yet to be discovered and described. It will require a large trained manpower of taxonomists and lot of time to complete the inventory of the biological wealth of our country. However, a very large number of species that are yet to be discovered are facing the threat of becoming extinct even before we discover them.

02. Patterns of Biodiversity

- (i) **Latitudinal Gradients** : As we move from low to high latitude i.e. from the equator to the poles, the biodiversity decreases. In other words, the biodiversity is minimum in the region, moderate in temperate area and maximum in tropical regions (latitudinal range of 23.5° N to 23.5° S).

Examples of high diversity in tropical regions:

- (a) Colombia located near the equator (tropical region) has about 1,400 species of birds. New York (41° N) in temperate area has 105 species and Greenland (71° N) in arctic area possesses 56 species of birds.

- (b) India has more than 1,200 species of birds because most of the land area of our country lies in tropics.
- (c) A forest in a tropical region like Equador has 10 times more species of vascular plants as compared to a forest of equal area in a temperature region like the Midwest of the USA.
- (d) **Tropical Amazonian rain forest in South America has the greatest biodiversity on earth.**

Table : Biodiversity in Amazonian rain forest

Taxa	Number of Species
Plant species	More than 40,000
Mammals	427
Birds	1,300
Reptiles	378
Amphibians	427
Fishes	3,000
Invertebrates	More than 1,25,000

These are forests might have at least 2 million insect species yet to be discovered and named.

Why biodiversity is rich in tropics?

Ecologists and evolutionary biologist have proposed various hypothesis to explain the cause of high diversity in tropics. Some important ones are as follows:

- (a) Speciation is a function of time. Temperate areas have undergone frequent glaciations in the past. It killed most of the species. no such diversification occurred in tropics where species continued to flourish and evolve undisturbed for millions of years.
 - (b) Warm temperatures and high humidity in tropical areas provide favorable conditions throughout the year. Therefore, tropical environments unlike temperate ones, are **less seasonal, relatively more constant** and **predictable**. Such constant and favourable environment has helped tropical organisms to gain more niche specialisation and lead to a greater species diversity.
 - (c) Tropical areas receive more solar energy over the year as they are near to equator. Thus tropical communities are more productive that can support a wider range of species.
- (ii) **Species-Area relationships** : German naturalist and geographer **Alexander von Humboldt** while exploring the South American jungles, found that within a region, species richness increased with increasing explored area but only up to a limit. The relationship between species richness and area turned out to be a rectangular hyperbola for a wide variety of organisms like angiosperm plants, birds, bats and freshwater fishes. The relationship is a straight line on a logarithmic scale.