

**BIODIVERSITY****How Many Species are there on Earth and How Many in India?**

- Robert May believes there are about 7 million species worldwide, but we have only managed to describe and identify around 1.5 million of them. Taxonomists think the actual number might be between 1.7 to 1.8 million.
- Currently, there have been reports of approximately 1.75 million species, including over 1.2 million animals (more than 70% of all species) and 500,000 plants (22% of total species).
- In India, there are about 142,000 species, which is roughly 8.1% of the global total, despite covering only 2.4% of the world's land area.
- Of the species found in India, 33% of flowering plants, 10% of mammals, 36% of reptiles, 60% of amphibians, and 53% of freshwater fish are unique to India.
- India is one of the 12 countries in the world known for its mega biodiversity, with about 45,000 species of plants and twice as many species of animals. Approximately 15,000 new species are discovered each year.

Number of Identified species in the World		
1	Higher Plants	2,70,000
2	Algae	40,000
3	Fungi	72,000
4	Bacteria/Cyanobacteria	4,000
5	Viruses	1,550
6	Mammals	4,650
7	Birds	9,700
8	Reptiles	7,150
9	Fish	26,959
10	Amphibians	4,780
11	Insects	10,25,000
12	Crustaceans	43,000
13	Molluscs	70,000
14	Nematodes and Worms	25,000
15	Protozoa	40,000
16	Others	1,10,000

**Patterns of Biodiversity****(i) Latitudinal gradients -**

- Plant and animal diversity varies across the world, with more species found near the equator and fewer towards the poles. Generally, there are more species in tropical areas (between 23.5° N and 23.5° S) than in temperate or Polar Regions. For example, Colombia, near the equator, has nearly 1,400 bird species, while New York at 41° N has 105 species, and Greenland at 71° N has only 56 species. India, with much of its land in tropical zones, has over 1,200 bird species. Tropical forests like those in

Ecuador have up to ten times more plant species than temperate forests like those in the American Midwest.

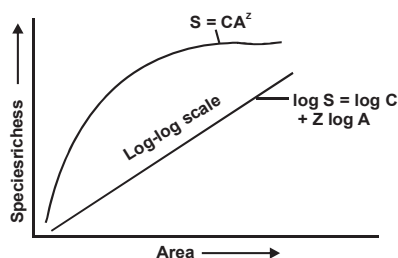
- The Amazon rainforest in South America has the highest diversity, with approximately 40,000 plant species, 3,000 fish species, 1,300 bird species, 427 mammal species, 427 amphibian species, 378 reptile species, and over 125,000 invertebrate species.

**The reasons of higher diversity in tropical areas are as follows.**

- In the past, temperate regions often experienced frequent glaciation, a type of disturbance absent in tropical areas. This allowed species in the tropics to thrive and evolve without interruption for millions of years, leading to a longer period for species to diversify.
- Unlike temperate regions, the tropics do not have harsh seasons. Tropical environments are more stable and predictable, which allows organisms to specialize in specific habitats and leads to greater diversity of species.
- Stability in the environment.

**Species-Area relationships:**

- Alexander von Humboldt explored the wild jungles of South America and noticed that as he explored more area, he found more species, but only up to a certain point. He found that this pattern, called a rectangular hyperbola, held true for many different groups of animals and plants, such as birds, bats, freshwater fish, and flowering plants.



**Fig :- Species-Area relationship**  
Which becomes linear on a log-log scale.

This relationship is linear on a logarithmic scale.

$$\log S = \log C + Z \log A$$

$S$  = species richness

$Z$  = Slope of line or regression coefficient

$C$  = y intercept

$A$  = area.

- The value of the regression coefficient, also known as  $Z$ , is typically around 0.1 to 0.2, regardless of the type of species or where they are found. However, when we look at the relationship between species and the size of an area as large as a whole continent, the slope of the line becomes much steeper. In these cases, the  $Z$  value ranges from 0.6 to 1.2. For instance, when studying frugivorous birds and mammals in tropical forests across different continents, the slope of the line is steeper, with a  $Z$  value of 1.15.

**The importance of Species Diversity to the Ecosystem**

- The quantity of species in a community significantly impacts how well the ecosystem works. For a long time, ecologists thought that communities with a higher number of species are usually more stable compared to those with fewer species.

**Loss of Biodiversity**

- According to the IUCN Red List, the Earth has lost around 784 species in the last 500 years, including 338 vertebrates, 359 invertebrates, and 87 plants.
- Over the past two decades, 27 species have become extinct.

- Notable recent extinctions include the Dodo of Mauritius, the Thylacinus or Tasmania Wolf of Australia, the Quagga of Africa, Steller's Sea Cow of Russia, and three subspecies of Tiger (Bali, Javan, and Caspian).
- Currently, approximately 15,500 species worldwide are threatened with extinction, including 31% of gymnosperms, 32% of amphibians, 23% of mammal species, and 12% of bird species. The current rate of extinction is estimated to be 100–1000 times faster than before human activities, leading to what is known as the sixth extinction.
- Biodiversity loss in a region may lead to:
- Decreased plant production.
- Reduced resistance to environmental changes like drought.
- Alterations in ecosystem processes such as plant productivity, water use, and pest and disease cycles.

### **Cause of biodiversity loss**

- i. Habitat loss and Fragmentation.
- ii. Over exploitation
- iii. Introduction of exotic species/ Alien species.
- iv. Co-extinction

#### **(i) Habitat loss and Fragmentation:**

- This is the main reason why animals and plants are disappearing forever. A striking example of this is seen in tropical rainforests. Once covering more than 14 percent of the earth's land, these rainforests now cover less than 6 percent. They are disappearing rapidly. By the time you finish reading this chapter, another 1000 hectares of rainforest will have vanished.
- The Amazon rainforest, often referred to as the 'Lungs of the planet' because of its vast size, is home to possibly millions of species. However, it's being cut down and cleared to grow soybeans or converted into grasslands for raising beef cattle.
- Apart from complete loss, pollution is also degrading many habitats, threatening the survival of numerous species. When large habitats are broken into smaller fragments due to human activities, animals like mammals and birds that need large territories, as well as those with migratory habits, are severely affected, leading to declines in their populations.

#### **(ii) Over-exploitation:**

Humans have always relied on nature for food and shelter, but when our desire for more becomes excessive, we start overusing natural resources. Many species, like the Steller's sea cow and passenger pigeon, have disappeared in the last 500 years because humans took too much from nature. Currently, many marine fish populations worldwide are being caught too much, putting some important commercially valuable species at risk of disappearing forever.

#### **(iii) Alien species invasions :**

- When species from other places are brought in, either accidentally or on purpose, some of them become invasive and harm or wipe out native species.
- For example, the Nile perch was introduced into Lake Victoria in East Africa, leading to the extinction of more than 200 species of cichlid fish in the lake, which were ecologically unique.
- You might know about the environmental damage and threat to our native species caused by invasive weeds like Parthenium (carrot grass), Lantana, and water hyacinth.
- Recently, the illegal introduction of the African Catfish *Clarias gariepinus* for fish farming is putting our native catfish in rivers at risk.

**(iv) Co-extinctions:**

When a species disappears, other plants and animals that rely on it also vanish, including the parasites that depend on them. Another example is when a plant and its pollinator, which have evolved together, both die out if one of them goes extinct.