Biodiversity Pattern and Global Biodiversity Hotspots:

(A) Biodiversity Pattern:

Ecologists studied biodiversity in the environment and they observed a regular pattern in which diversity was distributed over the entire area of the planet. This is the well defined and well-known **pattern** of **biodiversity** studies till date. According to this **pattern**, the species diversity follows a regular **pattern** as we move from the equator to the Polar Regions. Ecologists discovered two broad kinds of diversity patterns, namely: ***Latitudinal gradient*** and ***Species-area relationships.***

(i) Latitudinal Gradient:

This is the most well-defined and well-known pattern of biodiversity studies till date. The plant and animal diversity observed maximum at the equator and generally it decreases as we move towards the poles.

We find species richness in plants and animals at the equator. India, located in the tropical regions, shows high species richness. However, the great Amazon rainforests show maximum biological diversity in terms of the number of species residing in that region. It is believed that in spite of being the region with the highest biodiversity, many species in Amazon are yet to be discovered and identified. The reason for this increased level of biodiversity at the tropics is thought by ecologists to be as follows:

- *Tropical areas have a more stable climate compared to that of the temperate areas. As a result, the tropics succeed in supporting a higher number of species as the species do not have to keep adapting to a changing season.*
- *Temperate regions have suffered a lot of glaciations in the recent past as a result of which they have had a very unstable environment. Whereas, the tropics have been comparatively stable. Thus, speciation has been more favoured in the tropics compared to that of the temperate lands.*
- *The tropical regions are comparatively more susceptible to solar energy. As a result, the plants in this region receive more energy during photosynthesis. This, in turn, transfers more energy to the successive tropic levels in the food chain. Thus, more energy supports more diversity.*

(ii) Species-Area Relationships:

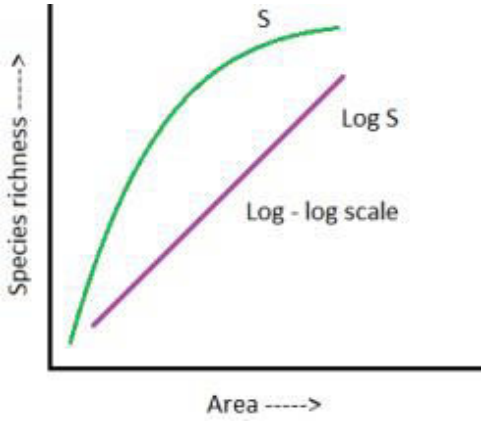
The great geographer and naturalist, Alexander von Humboldt (German) observed the relation between an area and the species richness found in it. He found that the plant and animal diversity increases with increase in explored area of observation up to a certain level. This relationship can be explained by the equation:

$$S = CA^Z$$

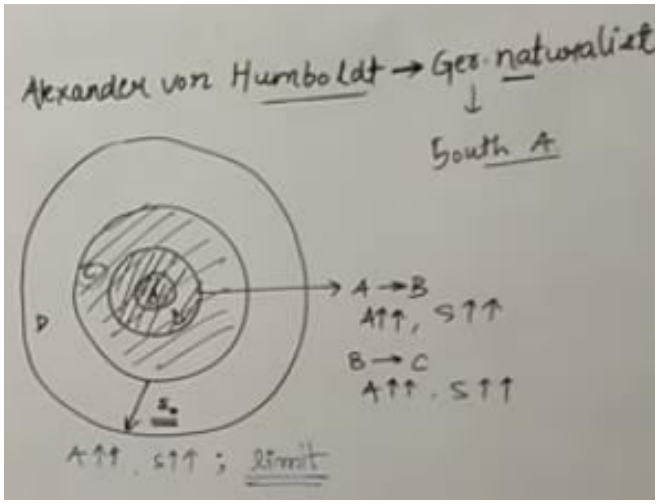
Here **C** is a constant which depends on the unit used for area measurement, and equals the number of species that would exist if the habitat area was confined to one square unit. The graph looks like a straight line on log-log axes and can be linearized as:

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

Where, S = richness of species, C = Y-intercept, Z = regression coefficient and A = Area. The value of Z is found to lie in the range of 0.1 to 0.2 for comparatively smaller area such as countries while for very large area such as entire continents, the slope of the line is much steeper with Z value lying from 0.6 to 1.2. The equation can be represented by the following diagram:



(B) Global Biodiversity Hotspots:



Hot spots are the areas with high density of **biodiversity** or **mega diversity** which are most threatened at present. The concept **hotspot** was suggested by a **British** ecologist, ***Norman Meyer* (1988).** He selected 25 **hotspots.** In 1990 Myers added a further some hotspots and now there are **35 hot spots** in the world which is only 15.7% of the earth land surface. In India there are two **hotspots** namely ***North-East Himalayas*** and ***Western Ghats***. The 86% of **hotspots** have been already destroyed. **Conservation International** adopted Myers' hotspots as its institutional blueprint in 1989. The biodiversity hotspots hold especially high numbers of endemic species.

The hot spots are determined considering following factors:

- *Total species (Species richness)*
- *Unique species (Degrees of endemism)*
- *Number of species at risk (Threat of extinction)*

There are two specific criteria for hotspot diversity:

(i) It must contain a minimum of 1,500 species of vascular plants, equalling to more than 0.5% of the total plant species of the world as endemics. Vascular plants are a category of high plant that assures the circulation of nutrients such as water, mineral and photosynthetic product. They have vascular tissues that conduct the water and nutrients from bottom to top and end up in transpiration, absorption or conduction. In this way, vascular plants assure great productivity to the ecosystem.

(ii) It has to have lost at least 70 percent of its original habitat. The lost of species comes frequently from overconsumption and from the destruction of natural forest for agriculture. The isolated situation makes it very vulnerable, since there is no possibility of reproduction in case of extinction. Overall, the hotpots gather the most important population that faces extinction on the planet.

The world's 35 biodiversity hotspots are given as:

World's 35 Biodiversity Hotspots:

S. No.	Continents	Hotspots
1	**Africa (Total 8)**	Cape Floristic Region, Coastal Forests of Eastern Africa, Eastern Afromontane, Guinean Forests of West Africa, Horn of Africa, Madagascar and the Indian Ocean Islands, Maputaland-Pondoland-Albany and Succulent Karoo
2	**Asia-Pacific (Total 14)**	East Melanesian Islands, Himalaya, Indo-Burma, Japan, Mountains of Southwest China, New Caledonia, New Zealand, Philippines, Polynesia-Micronesia, Southwest Australia, Forests of Eastern Australia (new), Sundaland, Wallacea and Western Ghats and Sri Lanka
3	**Europe and Central Asia (Total 04)**	Caucasus, Irano-Anatolian, Mediterranean Basin and Mountains of Central Asia
4	**North and Central America (Total 04)**	California Floristic Province, Caribbean Islands, Madrean Pine-Oak Woodlands and Mesoamerica
5	**South America (Total 05)**	Atlantic Forest, Cerrado, Chilean Winter Rainfall-Valdivian Forests, Tumbes-Chocó Magdalena and Tropical Andes

India as a Mega Bio-Diversity Nation:

India has different climate and topography in different parts and hence is termed as a *mega diversity Nation.* Geological events in the landmass of India have provided conditions have high levels of biodiversity. There are about 93 major wetlands, coral reefs and mangroves. Indian forests cover 64.01 million hectares having a rich biodiversity of plants in the Trans-Himalayan, North-West, West, Central and Eastern Himalayan forests, Western Ghats, Coasts, Deserts, Gangetic plains, Deccan Plateau and the Adman, Nicobar and Lakshadweep islands. Among the biologically rich nations, India stands among the top 10 or 15 countries for its great variety of plants and animals, many of which are not found elsewhere. India has 350 different mammals (rated eight highest in the world), 1,200 species of birds (eighth in the world), and 453 species of reptiles (fifth in the world) and 45,000 plant species, of which most are angiosperms, (fifteenth in the world).

These include especially high species diversity of ferns (1022 species) and orchids (1082 species). India has 50,000 known species of insects, including 13,000 butterflies and moths. It is estimated that the number of unknown species could be several times higher. It is estimated that 18% of Indian plants are endemic to the country and found nowhere else in the world. **The eastern Himalayas** from a humid region having high monsoon rain fall milder temperature and less snowfall. The mighty mountains with their snow-pick and extremely rich forest exert a tremendous influence on the flora and fauna of the region.