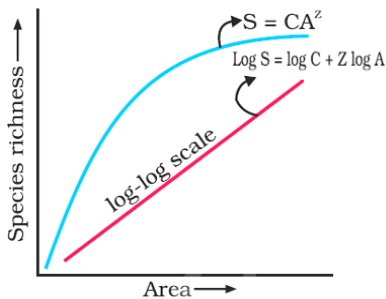


15. BIODIVERSITY AND CONSERVATION

Species- Area relationship

According to the study of **Alexander von Humboldt** in South American jungles, within a region, species richness increases with increasing explored area, but only up to a limit. Relation between species richness and area gives a **rectangular hyperbola**.



$$S = CA^Z$$

Where,
 S= Species richness
 A= Area
 C= Y-intercept
 Z= slope of the line
 (regression co-efficient)

- On a logarithmic scale, the relationship is a straight line described the equation **Log S = log C + Z log A**
- Generally, for small areas, the Z value is **0.1 to 0.2**.
- But for large areas (e.g. entire continents), slope of the line is steeper (**Z value: 0.6 to 1.2**).
- E.g. for frugivorous birds and mammals in the tropical forests of different continents, the Z value is **1.15**.

IMPORTANCE OF SPECIES DIVERSITY

- '**Rivet popper hypothesis**': It is an analogy used to understand the importance of biodiversity.

It is proposed by Stanford ecologist **Paul Ehrlich**.

In an airplane (**ecosystem**), all parts are joined with many rivets (**species**). If passengers pop a rivet (extinction of a species), it may not affect flight safety (**functioning of the ecosystem**). But as more and more rivets are removed, the plane becomes dangerously weak. Loss of rivets on the wings (**key species** that drive major ecosystem functions) is more dangerous than loss of a few rivets on the seats or windows.

LOSS OF BIODIVERSITY

Causes of Biodiversity losses ('The Evil Quartet')

- 1. Habitat loss and fragmentation:** Most important cause.
 - E.g. Tropical rain forests (loss from 14% to 6%).
 - Thousands of hectares of rain forests are being lost within hours.
 - **The Amazon rain forest** is being cut for cultivating soya beans or for conversion of grass lands for cattle.
 - Fragmentation badly affects animals requiring large territories and migratory animals.

- 2. Over-exploitation:** Stellar's sea cow, Passenger pigeon etc. extinct due to over exploitation.
- 3. Alien species invasions:** Alien species cause decline or extinction of **indigenous species**. E.g.
 - **Nile Perch** introduced in **Lake Victoria (East Africa)** caused extinction of more than 200 species of **cichlid fish**.
- 4. Co-extinction:** When a species becomes extinct, the species associated with it also extinct. E.g.
 - Extinction of the **parasites** when the **host** is extinct.
 - In co-evolved **plant-pollinator mutualism**, extinction of one causes the extinction of the other.

BIODIVERSITY CONSERVATION

2 types: **In situ** (on site) and **Ex situ** (off site).

a. In situ conservation (on site)

It is the conservation of genetic resources within natural or human-made ecosystems in which they occur. E.g. **National Parks, Sanctuaries, Biosphere reserves, cultural landscapes, natural monuments etc.**

- **National Park:** Strictly reserved for the welfare of the wildlife where private ownership, cultivation, grazing etc. are prohibited. E.g. **Eravikulam National Park in Kerala**.
- **Sanctuary:** Here, protection is given only to the animals. Collection of timbers, minor forest products and private ownership are allowed so long as they do not harm the animals. E.g. **Periyar wildlife sanctuary in Kerala**.
- **Biosphere Reserves:** Areas of land or coastal ecosystems for conservation and sustainable use.
- **Sacred forests (Sacred groves):** Forest fragments which are communally protected based on religious beliefs.

b. Ex situ conservation (off site)

It is the conservation of organisms outside their habitats. E.g. genetic resource centres, zoological parks, wildlife safari parks, botanical gardens, gene banks, cryopreservation etc.

Hotspots

- These are the regions with very high species richness, high degree of **endemism** (species confined only to a specific region) but most threatened.
- There are **34 hotspots** in the world.
- **3 hotspots** cover India's biodiversity regions- **Western Ghats & Sri Lanka, Indo-Burma and Himalaya**.
- All hotspots together cover only < 2% of the earth's land area. But the species richness is extremely high. Protection of hotspots reduced the ongoing extinctions by 30%.

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