

Chapter - 15

Biodiversity and conservation.

CamlinExam

PAGE:

DATE:

Biodiversity:

Biodiversity term given by the sociobiologist Edward Wilson to describe the combined diversity at all the levels of biological organisation.

i) Genetic diversity -

A single species might show high diversity at the genetic level over its distributional range.

eg: medicinal plant Rauwolfia vomitoria growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical that the plant produce.

rice - more than 50,000 genetically different strains

mango - more than 1000 varieties.

ii) species diversity -

Diversity at species level.

eg: Western ghats have a greater amphibian species diversity than the Eastern Ghats.

iii) Ecological diversity -

At ecosystem level. India has more ecological diversity than Norway (deserts, rain forest, mangroves, coral reef)

How many species are there on Earth and How many in India?

• According to the International Union for Conservation of Nature and Natural Resources (IUCN) (2004) the plant and animal species are slightly more than 1.5 million but we have no idea of how many species are yet to be discovered and described.

- Total number of species on earth - 20 to 50 million.

• More than 70% species recorded are animals, less than 22% are plants.

- In animals - 70% are insects

- 1 • Biologists are not sure about how many prokaryotic species are there might be.
- India has 2.4% of world's land area but share 8.1% global species diversity.
- 5 • Hence India is one of the 12 mega diversity country in world.
- In India, 45,000- plant species, 90,000 animals have been recorded.
- But globally only 22% of total species have been recorded.
- 10 • Applying this proportion to India's diversity figures, we estimate that there are probably more than 1,00,000 plants species and more than 3,00,000 animal species yet to be discovered & described.

Pattern of Biodiversity:

15 i) Latitudinal gradients -

In general species diversity decreases as we move away from the equator towards the pole.

tropics harbour more species than temperate or polar areas.

- 20 • Colombia located near equator - 1,400 species of bird.
- New York - 41°N - 105 species.

• Greenland - 71°N - 56 species.

- The largely tropical amazonian rain forest in South America has the greatest biodiversity on earth. (more than 40,000 plants species, 3000 of fishes species, 13000 birds species, 427 of mammals, 427 of amphibians, 378 reptiles and more than 1,25,000 invertebrates, 2 million insect species).
- 25 • tropical latitudes have remained relatively undisturbed for millions of years and thus had a long evolutionary time for species diversification.
- 30 • tropical environment are less seasonal, relatively more constant and predictable. Such constant environment promote niche

1. Specialisation and lead to greater species diversity.
- There is more solar energy available in the tropic region which contributes to high productivity.

5. ii) species-area relationship -

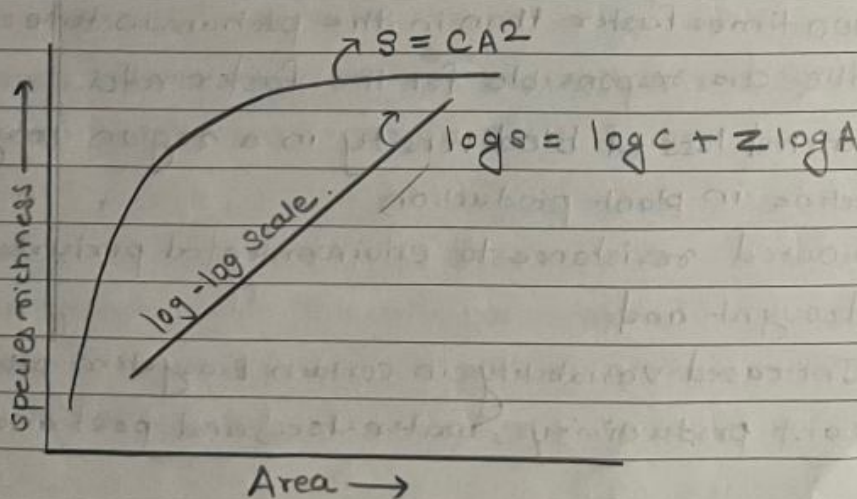
- German naturalist and geographer Alexander von Humboldt observed that within a region species richness increased with increasing explored area but only upto a limit.
- 10. relation between species richness and area - rectangular hyperbola
- on a logarithmic scale, the relationship is a straight line described by the equation.

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

where

- 15.
- S = Species richness
 - A = Area
 - z = slope of the line (regression coefficient)
 - C = y -intercept.

20. Value of z lies in range of 0.1 to 0.2



Species Area relationship.

1 The importance of Species diversity to the Ecosystem?

- A stable community should not show too much variation in productivity from year to year. it must be resistant to invasion by alien species.
- David Tilman - Showed that in his experiment increased diversity contribute to higher productivity.
- rich biodiversity is not only essential for ecosystem health but imperative for the very survival of the human race on this planet.

Loss of Biodiversity -

- The IUCN red list (2004) documents the extinction of 784 species in the last 500 years.
- recent extinction include the dodo (Mauritius), quagga (Africa), thylacine (Australia), steller's sea cow (Russia) and three subspecies (Bali, Javan, Caspian) of tigers.
- presently 12% of all bird species, 23% of all mammal species, 32% of all amphibian species and 31% of all gymnosperm species in the world face the threat of extinction.
- The current species extinction rates are estimated to be 100 to 1000 times faster than in the prehuman times and our activities are responsible for the faster rate.
- In general loss of biodiversity in a region may lead to a
 - i) Decline in plant production
 - ii) lowered resistance to environmental perturbations such as drought and
 - iii) Increased variability in certain Ecosystem processes such as plant productivity, water use, and pest and disease cycle.

Causes of biodiversity losses:

i) Habitat loss and fragmentation-

e.g: habitat loss come from tropical rain forest. once covering more than 14% of the earth's land surface, this rain forests now cover no more than 6%. They are being destroyed fast.

Amazon rain forest harbouring probably millions of species is being cut and cleared for cultivating soya beans or for ~~more~~ conversion to grasslands for raising beef cattle.

When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories and certain animal with migratory habits are badly affected, leading to population decline.

ii) over-exploitation-

Humans have always depend on nature for food and shelter. it leads to over-exploitation of natural resources.

Many species extinctions in the last 500 years were due to overexploitation by humans.

iii) Alien species invasions:

Sometimes alien species turns invasive and cause decline or extinction of indigenous species.

e.g: carrot grass (parthenium) Lantana, water hyacinth, ~~elanus gariepinus~~, Nile perch.

illegal introduction of the african catfish ~~elanus gariepinus~~ for aquaculture purposes is posing a threat to the indigenous catfish in our rivers.

iv) Coexistence -

When a species become extinct, the plant and animal species associated with it in an obligatory way also becomes extinct.
 e.g: co-evolved plant pollinator mutualism where extinction of one invariably leads to the extinction of the other.

Biodiversity Conservation -

Why should we conserve biodiversity?

- The narrowly utilitarian arguments for conserving biodiversity are obvious. human derive natural food, firewood, fibre, construction material, industrial products, and medicinal products:
 more than 25% drugs are derived from plants.
- The broadly utilitarian argument says biodiversity plays a major role in many ecosystem services that nature provides.
 Amazon forest produce 20% of the atmospheric oxygen by photosynthesis, pollination is another service.
- The ethical argument for conserving biodiversity relates to what we owe to millions of plant, animal and microbe species with whom we share this planet. every species has an intrinsic value.

How do we conserve biodiversity?

i) In situ conservation -

- The conservation of a species in its natural habitat and the maintenance and recovery of viable population of species in their original place.
- In india ecologically unique and biodiversity rich region are

1. legally protected as biosphere reserves, national parks and sanctuaries.
- India now has 14 biosphere reserves, 90 national parks, & 448 wildlife sanctuaries.
5. India has also a history of religious and cultural tradition that emphasised protection of nature.
- In many cultures, tract of forest were set aside, and all the trees and wildlife within were venerated and given total protection such as Sacred groves are found in Khasi and Jaintia Hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghats region of Karnataka and Maharashtra.
- 10.

ii) Ex-situ conservation;

threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care.

eg: zoological park, botanical garden, wildlife safari

Now gametes of threatened species can be preserved in viable and fertile condition for long period using cryopreservation technique, eggs can be fertilised in vitro and plants can be propagated using tissue culture method.

Seeds of different genetic strain can be kept for long periods in Seed bank.

25

30