

Biodiversity, Conservation and Environmental Issues

three levels of variety, four ways it's being lost, and the pollution problem sitting alongside it

Biodiversity: Levels

- term coined by Walter Rosen (1982), popularised by Edward Wilson
- per IUCN/UNEP/WRI: biodiversity is the totality of genes, species and ecosystems in a region
- the outcome of 3.5 billion years of evolutionary history
- genetic diversity**: intraspecific, variation in genes and alleles within and between populations of one species
- underlies evolution and adaptability, e.g. ~1000 mango varieties, ~50,000 rice varieties in India
- species diversity**: interspecific, species richness (how many) and species evenness (how individuals distribute)
- India is one of 12 megadiversity nations
- ecological (ecosystem) diversity**: variety of ecosystem types within a region
- e.g. India: desert, rain forest, deciduous forest, wetland, estuary, grassland, vs much lower diversity in Norway

Levels of biodiversity



the three levels biodiversity is sorted into: variation within one species' gene pool, up to the variety of whole ecosystem types in a region

Patterns of Biodiversity

- latitudinal gradient**: species richness is highest near the equator, declines toward the poles
- true for most plants and animals
- tropical rain forests are richest: Amazon ~40,000 plants, 1,300 birds, 427 mammals, 3,000 fish
- reasons proposed: long-term climatic stability, less migration between isolated populations (less gene flow)
- abundant sunlight, warmth and rainfall favouring speciation
- altitudinal gradient**: diversity is higher at lower altitudes, falls as climate turns harsher and more seasonal

Species-Area Relationship *

- Alexander von Humboldt: species richness rises with area, but only up to a limit
- the relationship is close to a rectangular hyperbola
- $\log S = \log C + Z \log A$
- S is species richness, A is area, C the Y-intercept, Z the slope
- for smaller areas, Z typically runs 0.1 to 0.2, regardless of species or region
- for entire continents, the slope steepens toward vertical
- meaning species count rises faster than area explored, at that scale



on a log-log scale the species-area relationship straightens into a line; its slope is Z, the exponent in $S = CA^Z$

