



CHAPTER – 15

BIODIVERSITY AND CONSERVATION

Earth has an enormous diversity of life that we encounter, for humans the rich variety of living organism never ceases to astonish and fascinate them, there are more than 20,000 species of ant, 3,00,000 species of beetles, 28,000 species of fishes and nearly 20,000 species of orchids on a planet.

Biodiversity: The occurrence of different types of ecosystems, different species of organisms, and their variants such as biotypes, ecotypes, and genes adapted to different climates and environments of different regions, as well as their interactions and processes, is referred to as biodiversity or biological diversity.

Edward Wilson was the first person to use this term.

Various microorganisms like algae, fungi, plants, and animals found on Earth, whether in terrestrial or aquatic places and

ecological systems of which they are a part, is referred to as biodiversity. Different types of biodiversity's are:

- (i) Genetic biodiversity: a single species may show high level of diversity at the genetic level over its distributional range. E.g. *Rauwolfia serpentine*, rice (more than 50,000 stains) and mango (1000 different varieties.)
- (ii) Species diversity: diversity at species level. E.g. number of amphibian species in the Western Ghats are more than the Eastern Ghats.
- (iii) Ecological diversity: individual ecosystems have great level of biodiversity within them. Examples of ecological diversity are deserts, rain forests, mangroves, coral reefs, wetlands, estuaries, alpine meadows etc.

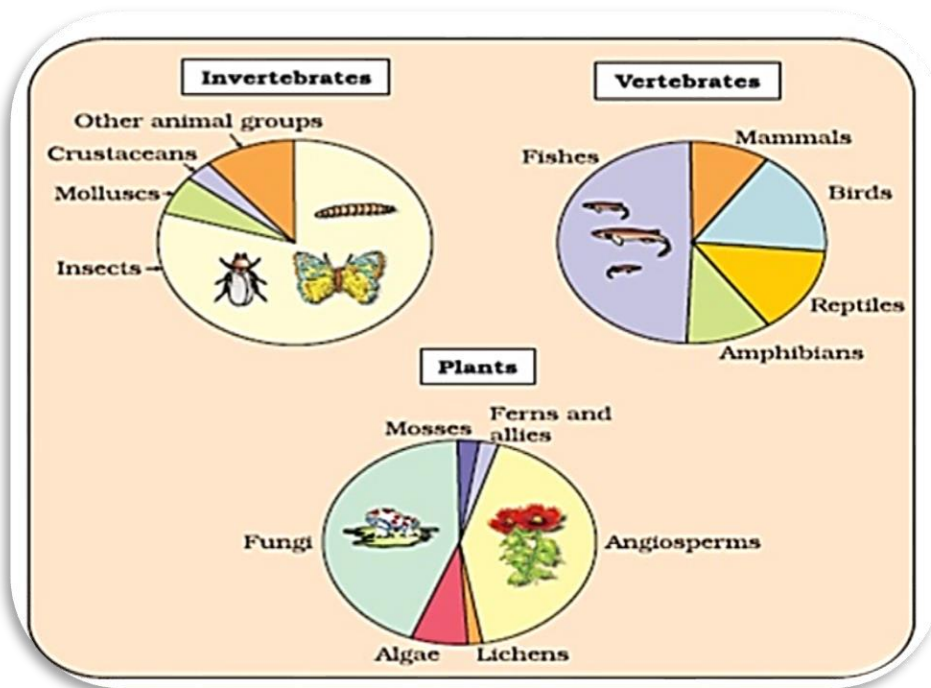
One of the most important environmental concerns of worldwide significance is biodiversity and how we can conserve it. The concern is growing day by day as more people throughout the world recognise the fundamental relevance of biodiversity for the sustainment of life and well-being on this planet.

Some extreme estimates range from 20 to 50 million, but a more conservative and scientifically sound estimate made by Robert May places the global species diversity at about 7 million.

According to the IUCN, the total number of plant and animal species described thus far is around 1.5 million, although many species have yet to be discovered and described.

Animals constitute 70% species of the world, with the remainder being planted such as algae, fungi, bryophytes, gymnosperms, and angiosperms and insects account for 70% of all animals.

Fungal species on earth exceed the number of fish, amphibians, reptiles, and mammals combined.



Representation of global diversity: proportionate number of species of major taxa of plants, invertebrates and vertebrates

Brush Up Your Understanding

- Q1.** *Rouwolfia vomitoria* shows.
 (a) Ecosystem diversity (b) Species diversity
 (c) Genetic diversity (d) All of the above
- S1.** (c)
- Q2.** Who of the following gave the term Biodiversity?
 (a) Darwin (b) Edward Wilson
 (c) Lamarck (d) None of the above

S2. (b)

Biodiversity of India

One of the twelve Mega diversities countries of the world is India which has only 2.4 % of the land area of the world, it has 8.1 % of global species biodiversity, research has shown that there are about 45,000 species of plants and 90,000 to 1 lakh species of animals that are yet to be discovered till now. As per Robert May, 22% of the total species have been recorded. 1,00,000 plant species and 3,0,0000 animal species are yet to be discovered.

Patterns of Biodiversity

- Longitudinal Gradients:** The variety of plants and animals is not consistent throughout the earth and is distributed unevenly. In terms of diversity, this distribution pattern follows the latitudinal gradient. As we travel farther from the equator and toward the poles, the variety of species declines. Tropics are home to more species than temperate or polar regions. The Amazonian Rainforest hosts the most biodiversity on the planet. It includes about 40,000 plant species, 1,25,000 insect species, 300 fish species, 427 amphibian and 378 reptile

species, 1300 bird species, and 427 mammals. Why is that so? Let's have a look at some hypotheses:

- o **Speciation:** it is generally a function of time like temperate regions subjected to frequent glaciations in the past tropical latitudes have remained relatively undisturbed from millions of years and the had a long evolutionary time for species diversification.
- o **Tropical environment:** unlike temperate ones are less seasonal relatively more constant and predictable such constant environment promotes niche specialisation and lead to a better species diversity.
- o **Solar energy:** solar energy in the Tropic contributes to higher productivity that contribute to Greater diversity.
- o **Species area Relationship:** German naturalist and geographer Alexander Von Humboldt while his excavations in the South American jungles found that species richness increases with increasing explored area but only up to a certain limit, the relationship between species richness and area for a wide variety of taxa is a rectangular hyperbola while on a logarithmic scale the relationship is a straight line and is represented by the equation:

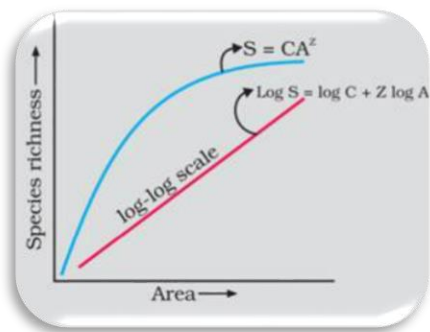
$$\log S = \log C + Z \log A$$

Where: S: species richness

A: area

Z: slope of the line (regression coefficient)

C: Y-intercept



Graph showing species area relationship

The value of Z lies in the range of 0.1 to 0.2 regardless of the taxonomic group of the region, for continents the value of Z is 0.6 to 1.2. For frugivorous (fruit-eating) birds and mammals in the tropical forests of different continents, the slope is found to be 1.15.

Brush Up Your Understanding

- Q1.** As we move away from the equator towards the poles, the species diversity.
- (a) Increases (b) Decreases
(c) Remains unaffected (d) None of the above
- S1.** (b)
- Q2.** Alexander Von Humboldt was a.
- (a) German naturalist (b) Australian naturalist
(c) American naturalist (d) Indian naturalist
- S2.** (a)

Importance of Species Diversity to the Ecosystem

A community with more species is more stable. A stable community should not show too much variation in productivity from year to year; it must be either resistant or resilient to occasional disturbances (natural or man-made), and it must also be resistant to invasions by alien species. Tilman found that plots with more species showed less year-to-year variation in total biomass. He also showed that in his experiments, increased diversity contributed to higher productivity.

Loss in Biodiversity: Our planet's biological richness is fast dwindling owing to three factors:

- Population
- Urbanisation, and
- Industrialisation.

The IUCN Red List (2004) records the extinction of 784 species in the previous 500 years (containing 338 vertebrates, 359 invertebrates, and 87 plants). Extinct species include the dodo (Mauritius), Quagga (Africa), thylacine (Australia), Steller's Sea Cow (Russia), and three tiger subspecies (Bali, Javan, and Caspian). 27 species have become extinct in the previous 20 years. If a region continuously loses its biodiversity then it may cause:

- ✓ Less plant production.

- ✓ Impact of environmental perturbances like drought and flood will be more.
- ✓ Increased variability in certain ecosystem processes like plant productivity, water use and pest and disease cycles.

Causes of loss in Biodiversity: loss in Biodiversity occurs due to:

- (i)** Habitat loss and fragmentation: it is the leading cause of animal and plant extinction. Our planet's lungs that is the Amazon rain forest which contains millions of species, is being chopped and cleared for soya bean cultivation or conversion to grasslands. When broad ecosystems are fragmented into small bits as a result of numerous human activities, animals and birds that require large territories move and are negatively impacted.
- (ii)** Over-exploitation: Man's overexploitation of biological systems for natural resources results in deterioration and extinction of resources, such as Steller's sea cows and passenger pigeons. Many marine fish populations are overfished, threatening the survival of certain key species.
- (iii)** Invasion of alien species: When alien species enter the environment, whether purposefully or inadvertently, some of them become invasive and cause the decrease or extinction of indigenous species. The introduction of Nile perch into Lake Victoria in east Africa finally led to the demise of an ecologically unique assemblage of over 200 species of cichlid fish in the lake. Invasive weeds such as carrot grass (*parthenium*), *Lantana*, and water hyacinth pose a danger to native species.
- (iv)** Co-extinctions: When a species becomes extinct, the plant and animal species that are dependent on it also vanish.

Brush Up Your Understanding

- Q1.** Which of the following is an alien species?
- (a) *Parthenium* (b) *Lantana*
(c) *Eichhornia* (d) All of the above
- S1.** (d)
- Q2.** An important cause leading to extinction of plant and animals is.
- (a) Invasion of alien species
(b) Co-extinction
(c) Habitat loss and fragmentation
(d) Over-exploitation
- S2.** (c)

Conservation of Biodiversity

We should conserve biodiversity because:

- (i)** Narrow utilitarian: Nature provides humans with several direct economic advantages such as food, fuel, fibres, building materials, medicinal plants, and industrial goods. Nations endowed with high

biodiversity should expect to gain significant benefits as resources are poured into 'bio-prospecting' (exploring molecular, genetic and species level diversity for products of economic importance).

- (ii) Broadly utilitarian: argument says that biodiversity plays a major role in many ecosystem services that nature provides. Biodiversity is important in the ecological services that nature delivers. Oxygen production during photosynthesis, pollination without a natural pollinator, and enjoyment from nature are all priceless.
- (iii) Ethical: Conservation of biodiversity refers to what we possess in relation to the millions of plant, animal, and microbial species with whom we share our world. Every species has intrinsic worth, even if it has little immediate or economic benefit to humans. It is our moral obligation to look for their well-being and to leave our biological heritage in excellent condition for future generations.

How can we conserve our Biodiversity?

We can conserve our biodiversity in two ways:

- (i) *In-situ* conservation: when we conserve and protect the whole ecosystem, its biodiversity at all levels is protected, for example, we save the entire forest so as to save the tiger, this approach is called ***in-situ* or on-site conservation**. There are 34 biodiversity hot spots in the world. These hotspots are also regions of accelerated habitat loss. These hotspots are also regions of accelerated habitat loss. **Three of these hotspots – Western Ghats and Sri Lanka, Indo-Burma and Himalaya – cover our country's exceptionally high biodiversity regions.** Although all the biodiversity hotspots put together cover less than 2 per cent of the earth's land area, the number of species they collectively harbour is extremely high and strict protection of these hotspots could reduce the ongoing mass extinctions by almost 30 per cent. **India has 14 biosphere reserves, 90 national parks and 448 wildlife sanctuaries. India has also a history of religious and cultural traditions that emphasised protection of nature.** In many cultures, tracts of forest were set aside, and all the trees and wildlife within were venerated and given total protection. Such **sacred groves** are found in **Khasi and Jaintia Hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghat regions of Karnataka and Maharashtra and**

the Sarguja, Chanda and Bastar areas of Madhya Pradesh. In Meghalaya, the sacred groves are the last refuges for a large number of rare and threatened plants

- (ii) *Ex-situ* conservation: however, there are situations where an animal or plant is endangered or threatened and need urgent measures to save it from extinction, this approach is called ***ex-situ* or off-site conservation**. In such cases, threatened animals and plants are kept in zoological parks, and botanical gardens. In recent years *ex-situ* conservation has advanced beyond keeping threatened species in enclosures. Now gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques, eggs can be fertilised in vitro, and plants can be propagated using tissue culture methods. Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks.

Brush Up Your Understanding

- Q1. Zoological Park is.
 - (a) *In-situ* conservation
 - (b) *Ex-situ* conservation
 - (c) Both (a) and (b)
 - (d) None of the above
 - S1. (b)
 - Q2. Total number of biodiversity hotspots in the worlds are.
 - (a) 31
 - (b) 32
 - (c) 33
 - (d) 34
 - S2. (d)
- The conservation of biodiversity is a collective responsibility of all Nations, the historic convention on biological diversity '**the Earth Summit**' held in **Rio de Janeiro in 1992** called upon all Nations to take up appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits, **in a follow-up the world summit on sustainable development held in 2002 in Johannesburg South Africa, 190 countries** pledged their commitment to achieve by 2020 a significant reduction in the current rate of biodiversity loss at Global regional and local level.

SUMMARY

Biodiversity or biological diversity can be defined as the vast diversity of species and varieties of all the life forms existing on earth. They include the species of micro-organisms, algae, fungi, plants, animals, occurring on the earth in various habitats and the ecological complexes and niches of which they are a part. India has approximately 45,000 species of plants and nearly twice as many species of animals. India, therefore, is one of the 12 mega diversity countries of the world. Numerous species that are yet to be identified are believed inhabit tropics and coral reefs.

Various levels of biodiversity include genetic diversity (It is the diversity in the number and type of genes as well as chromosomes present in different species and the variations in the genes and their alleles in the same species), species diversity (It is the diversity and variety in the number and richness of the species of a region) and ecological diversity (it is diversity at the ecosystem level).

India has attained a unique distinction as it has been assigned the status of mega diversity nation. Our country has 10 biogeographical regions. They are: Trans Himalaya, Himalaya, Desert, Semi-arid, Western Ghats, Deccan peninsula, Gangetic Plain, Coasts, North-East and Islands.

There is little biodiversity at the poles. Biodiversity is more in temperate areas but is maximum in tropical rain forests. This is because the tropical rain forests have more favourable conditions for more varieties of organisms and with less or no catastrophes.

A decrease in species diversity occurs as we ascend high mountains due to drop in temperature and greater seasonal variability.

German geographer and naturalist Alexander von Humboldt observed that species richness within a region increases with increasing area but only up to a certain limit.

Biodiversity is very important to human race, it provides us with food, it is a source of fat and oils, fibres, new varieties, drugs and medicines, it is of aesthetic value and of cultural significance.

The world is facing accelerated rate of species extinction, largely due to human interference. There are four major causes (the evil quartet) of biodiversity loss, they are habitat loss and fragmentation, over-exploitation, invasion of alien species and co-extinction.

Conservation of biodiversity is considered under three categories and they are narrow utilitarian, broadly utilitarian and ethical.

Biodiversity can be conserved in-situ as well as ex-situ.

MIND MAP

Biodiversity is the term popularised by the sociobiologist Edward Wilson.

Rauwolfia vomitoria growing in different Himalayan ranges shows species diversity.

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

Deserts, rain forests, mangroves, coral reefs, wetlands, estuaries, and alpine meadows has a greater ecosystem diversity.

More than 70 per cent of all the species recorded are animals, while plants.

Among animals, insects are the most species-rich taxonomic group, making up more than 70 per cent of the total.

Species diversity decreases as we move away from the equator towards the poles.

The largely tropical Amazonian rain forest in South America has the greatest biodiversity on earth.

The IUCN Red List (2004) documents the extinction of 784 species (including 338 vertebrates, 359 invertebrates and 87 plants) in the last 500 years.

Dodo (Mauritius), quagga (Africa), thylacine (Australia), Steller's Sea Cow (Russia) and three subspecies (Bali, Javan, Caspian) of tiger are some of the recent extinctions.

India now has 14 biosphere reserves, 90 national parks and 448 wildlife sanctuaries (*in-situ conservation*).

Zoological parks, botanical gardens and wildlife safari parks are *ex-situ* conservation techniques.

MULTIPLE CHOICE QUESTIONS

- Q1.** Who among the following popularised the term biodiversity?
 (a) Paul Ehrlich
 (b) Alexander von Humboldt
 (c) Edward Wilson
 (d) Ernest Heckel
- Q2.** How many genetically different strains of rice is produced by India?
 (a) 20,000 (b) 30,000
 (c) 40,000 (d) 50,000
- Q3.** Which of the following place shows greater amphibian species diversity?
 (a) The Eastern Ghats (b) The Western Ghats
 (c) Both (a) and (b) (d) None of the above
- Q4.** Which of the following harbours more species among the following?
 (a) The tropic areas
 (b) The temperate areas
 (c) The polar areas
 (d) All of the above
- Q5.** What is the number of plant species in the Amazonian rainforest?
 (a) 3,000 (b) 40,000
 (c) 1,300 (d) 1,25,000
- Q6.** The observation that within a region, species richness increases with increasing explored area but only up to a certain limit was given by.
 (a) Paul Ehrlich
 (b) Alexander von Humboldt
 (c) Edward Wilson
 (d) None of the above
- Q7.** Which of the following organisms have got extinct due to human activities?
 (a) Dodo (b) Quagga
 (c) Thylacine (d) All of the above
- Q8.** What is the percentage of gymnosperm species that is facing the threat of extinction?
 (a) 12% (b) 23%
 (c) 31% (d) 32%
- Q9.** Which of the following is also called as “Lungs of the planet”?
 (a) The Amazon rain forest
 (b) Kinabalu National PARK
 (c) Congo rain forest
 (d) Daintree rain forest
- Q10.** Which of the following animal species got extinct due to over exploitation by humans?
 (a) Steller’s sea cow
 (b) Passenger pigeon
 (c) Parrot
 (d) Both (a) and (b)
- Q11.** What caused the extension of cichlid fish in East Africa?
 (a) Habitat loss
 (b) Overexploitation
 (c) Invasion of alien species
 (d) Co-extinction
- Q12.** Which of the following are invasive weed species that cause environmental damage?
 (a) Carrot grass (b) Lantana
 (c) Water Hyacinth (d) All of the above
- Q13.** How many plant species contribute to traditional medicines used by native people around the world?
 (a) 10,000 (b) 20,000
 (c) 25,000 (d) 30,000
- Q14.** What is bioprospecting?
 (a) it is exploring molecular level diversity for products of economic importance
 (b) it is exploring genetic level diversity for products of economic importance
 (c) it is exploring species-level diversity for products of economic importance
 (d) it is exploring molecular, genetic and species level diversity for products of economic importance
- Q15.** What percentage of total oxygen is produced by the Amazon rainforest?
 (a) 10% (b) 20%
 (c) 30% (d) 40%
- Q16.** Conserving and protecting the whole ecosystem is protecting biodiversity at all levels, this is called.
 (a) *Ex-situ* conservation
 (b) *In-situ* conservation
 (c) Both (a) and (b)
 (d) None of the above
- Q17.** Regions with very high levels of species richness are called.
 (a) Scared grooves
 (b) Biodiversity hotspots
 (c) Both (a) and (b)
 (d) None of the above
- Q18.** What are the total number of biodiversity hotspot in the world?
 (a) 21 (b) 31
 (c) 34 (d) 44
- Q19.** Which of the following covers our country’s exceptionally high by biodiversity regions?
 (a) Western Ghats and Srilanka
 (b) Indo-Burma
 (c) Himalaya
 (d) All of the above

- Q20.** What percentage of the earth's land area is covered by the biodiversity hotspots?
 (a) 1% (b) 2%
 (c) 3% (d) 4%
- Q21.** What are the number of biosphere reserves in India?
 (a) 90 (b) 14
 (c) 448 (d) None of the above
- Q22.** The number of national parks in India are.
 (a) 70 (b) 80
 (c) 90 (d) 100
- Q23.** Which of the following are a part of *ex-situ* conservation?
 (a) Zoological park (b) Botanical garden
 (c) Wildlife safari park (d) All of the above
- Q24.** Which of the following method gives a chance to preserve the gametes of threatened species in viable and fertile conditions for longer durations of time?
 (a) Centrifugation (b) Cryo-preservation
 (c) Sedimentation (d) All of the above
- Q25.** Where was 'The Earth Summit' held?
 (a) New York (b) Rio de Janerio
 (c) Paris (d) India
- Q26.** When and where was the world summit on Sustainable Development held?
 (a) 2002, India (b) 2002, America
 (c) 2002, South Africa (d) 2002, China
- Q27.** Which of the following active chemical is produced by the medicinal plant *Rauwolfia vomitoria*?
 (a) Smack (b) Coke
 (c) Reserpine (d) Hereoin.
- Q28.** Among the following, which of them make the most species-rich taxonomic group?
 (a) Plants (b) Insects
 (c) Birds (d) Fishes
- Q29.** What share does India contribute towards the global species diversity?
 (a) 6.1% (b) 7.1%
 (c) 8.1% (d) 9.1%
- Q30.** What happens to the species diversity as we move away from the equator towards the poles?
 (a) It remains constant
 (b) It decreases
 (c) It increases
 (d) First it decreases and then increases
- Q31.** What is the number of species of birds in the tropical latitudes of India?
 (a) 1,100 (b) 1,200
 (c) 1,300 (d) 1,400
- Q32.** Which of the following rainforest has the greatest biodiversity on earth?
 (a) Congo rain forest (b) Valdivian rainforest

(c) Daintree rainforest (d) Amazon rainforest

- Q33.** Who among the following performed long-term ecosystem experiments using outdoor plots?
 (a) Alexander von Humboldt
 (b) David Tilman
 (c) Gause
 (d) MacArthur
- Q34.** According to the IUCN red list, how many species have got extinct in the last 500 years?
 (a) 586 (b) 289
 (c) 784 (d) 864
- Q35.** What are the **CONS** of loss of biodiversity in a region?
 (a) Leads to decline in plant production
 (b) It leads to lowered resistance to environment perturbations
 (c) It leads to increased variability in some ecosystems
 (d) All of the above
- Q36.** Which of the following may be the cause of biodiversity loss?
 (a) Habitat loss and fragmentation
 (b) Over-exploitation
 (c) Co-extinctions
 (d) All of the above

ASSERTION AND REASON

Direction: in the following questions, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct option among a, b, c and d.

- Q1. Assertion (A):** Western Ghats are included among the hot spots of biodiversity.
Reason (R): Western ghats have greater amphibian diversity than eastern ghats.
 (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)
 (c) Assertion (A) is true but reason(R) is false
 (d) Assertion (A) is false but reason(R) is true
- Q2. Assertion (A):** Tropical regions are more diversity rich in comparison to temperate areas
Reasons (R): Availability of more solar energy directly affects the presence of more species in these areas.
 (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)
 (c) Assertion (A) is true but reason(R) is false
 (d) Assertion (A) is false but reason(R) is true

Q3. Assertion (A): The diversity of plants and animals is not uniform throughout the world but shows a rather uneven distribution.

Reason (R): For many group of animals or plants, there are interesting patterns in diversity, the most well-known being the latitudinal gradient in diversity.

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
- (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)
- (c) Assertion (A) is true but reason(R) is false
- (d) Assertion (A) is false but reason(R) is true

Q4. Assertion (A): The largely tropical Amazonian rain forest in South America has the greatest biodiversity on earth.

Reason (R): When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause decline or extinction of indigenous species

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)

(c) Assertion (A) is true but reason(R) is false

(d) Assertion (A) is false but reason(R) is true

TRUE AND FALSE

Q1. The relation between species richness and area for a wide variety of taxa as per Alexander von Humboldt's equation, the value of Z for frugivorous birds and mammals in the tropical forests of different continents is 0.6

Q2. More solar energy in the tropics contributes to higher productivity which in turn contributes indirectly to greater diversity.

Q3. Loss of biodiversity in a region may lead to decline in plant production and lowered resistance to environmental perturbations.

Q4. The narrowly utilitarian argument says that biodiversity plays a major role in many ecosystem services that nature provides.

PRACTICE QUESTIONS (MCQ)

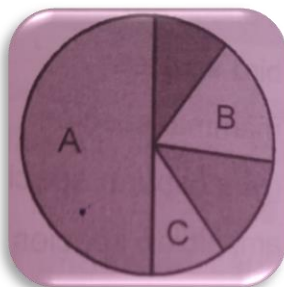
Q1. Choose the incorrect option with respect to species diversity of Amazon rain forest in South America.

- (a) Plants- 40,000
- (b) Birds - 3,000
- (c) Mammals - 427
- (d) Amphibians - 427

Q2. Greater biological diversity of tropics than the temperate regions is due to the.

- (a) Presence of more seasonal environment
- (b) Frequent glaciations in the past
- (c) Highly variable climate and availability of less solar energy in the past
- (d) Availability of more solar energy which contributes to higher productivity

Q3. In the following pie chart of global vertebrate's diversity, what does A, B, C represent?



- (a) Birds, fishes, amphibians
- (b) Mammals, reptiles, birds
- (c) Fishes, birds, amphibians
- (d) Amphibians, fishes, reptiles

Q4. The equation that correctly represents the species-area relationship is.

- (a) $\log C = \log S + Z \log A$
- (b) $\log A = \log C + Z \log S$
- (c) $\log A = \log S + Z \log C$
- (d) $\log S = \log C + Z \log A$

Q5. If we analyse the species-area relationships among very large areas like the entire continents, then the slope of line becomes much steeper in the range of.

- (a) 0.1 to 0.6
- (b) 0.1 to 0.2
- (c) 0.6 to 1.2
- (d) 0.2 to 0.6

Q6. A stable community shows which of the following feature?

- (a) Resistant to invasion of alien species
- (b) Resistant to occasional disturbances
- (c) Less variation in year to year productivity
- (d) All of the above

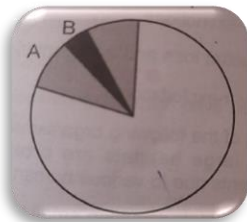
Q7. Most species rich taxonomic group among animals comprises.

- (a) More than 80% of total diversity
- (b) No more than 50% of total diversity
- (c) More than 70% of total diversity
- (d) No more than 60% of total diversity

Q8. An example of organism with recent extinction in Australia is.

- (a) Dodo
- (b) Quagga
- (c) Thylacine
- (d) Steller's cow

- Q9.** Choose the odd one out with respect to alien species invasion.
 (a) Nile perch (b) Water hyacinth
 (c) *Clarias pariepinus* (d) Cichlid fish
- Q10.** At present, the area covered by tropical rain forest is how much percentage of earth's land surface?
 (a) 20% (b) 14%
 (c) 6% (d) 12%
- Q11.** What percentage of oxygen does the Amazon rain forest contribute to the earth's atmosphere?
 (a) 10% (b) 20%
 (c) 15% (d) 25%
- Q12.** Choose the odd one out with respect to *ex-situ* conservation strategy.
 (a) Zoological park (b) Botanical gardens
 (c) Wild safari parks (d) Hot spots
- Q13.** The world summit on sustainable development was held in 2022 in.
 (a) South America (b) South Cannada
 (c) South Africa (d) South Asia
- Q14.** Which of the following is not under broadly utilitarian reasons for conserving biodiversity?
 (a) Pollination
 (b) Aesthetic pleasures
 (c) Controlling soil erosion
 (d) 25% drugs sold in market are plant based
- Q15.** Insects are the most numerous with estimate of.
 (a) 7 out of 10 invertebrates
 (b) 4 out of 10 invertebrates
 (c) 7 out of 10 animals
 (d) 4 out of 10 animals
- Q16.** Given below is a pie chart of global invertebrate diversity, what does A and B represent?



- (a) A- molluscs, B- Crustaceans
 (b) A- Insects, B- molluscs
 (c) A- Crustaceans, B- molluscs
 (d) A- Molluscs, B- Insects
- Q17.** Which of the following represents minimum species diversity among the vertebrates?
 (a) Birds (b) Mammals
 (c) Reptiles (d) Amphibians
- Q18.** Loss in biodiversity in a region may lead to all of the following except.
 (a) Decline in plant production
 (b) Lowered resistance to environment perturbations

- (c) Increased variability in certain ecosystem processes
 (d) Increased endemism
- Q19.** Which of the following organism are badly affected when large habitats are broken up into small fragments due to various human activities?
 (a) Mammals requiring small territories
 (b) Planktons showing diapause
 (c) Animals with migratory habits
 (d) Birds requiring small territories
- Q20.** Bioprospecting is exploring molecular, genetic and species level diversity for products of.
 (a) Ecosystem services (b) Economic benefits
 (c) Aesthetic pleasure (d) Both (a) and (c)
- Q21.** When we conserve and protect the whole ecosystem, its biodiversity at all levels is protected. This approach includes all of the following except.
 (a) Biosphere reserve (b) Seed bank
 (c) National parks (d) Sanctuaries
- Q22.** Gametes of threatened species can be preserved in viable and fertile condition for long periods using.
 (a) Wild life sanctuary parks
 (b) On-site conservation
 (c) Cryopreservation
 (d) Botanical gardens
- Q23.** How many countries pledged their commitment to achieve by 2010, a significant reduction in the current rate of biodiversity loss at global, regional and local levels in the World summit held in 2002?
 (a) 119 (b) 120
 (c) 180 (d) 190
- Q24.** Which of the following is not a reason of maximum diversity in the tropics?
 (a) High pest pressure
 (b) Evolutionary older zone
 (c) High rate of out crossing
 (d) Greater environmental conditions
- Q25.** Which among the following statement is wrong?
 (a) A stable community should show much variation in productivity from year to year
 (b) According to Tilman's long term ecosystem experiments increased diversity contributed to higher productivity
 (c) Stable community must be resistant to occasional disturbances
 (d) Rich biodiversity is essential for ecosystem health but imperative for the very survival of human race on this planet
- Q26.** Degree of biodiversity increases from.
 (a) Equator to poles
 (b) Poles to equator
 (c) Low latitude to high latitude
 (d) Low altitude to high altitude

- Q27.** Threats to biodiversity comes from.
 (a) Habitat loss (b) Over-exploitation
 (c) Intensive agriculture (d) All of the above
- Q28.** Alexander von Humboldt described for the first time.
 (a) Ecological biodiversity
 (b) Laws of limiting factor
 (c) Species area relationship
 (d) Population growth equation
- Q29.** In India, which of the following is a hotspot of biodiversity?
 (a) Sunderbans (b) Western ghats
 (c) Eastern ghats (d) Gnagetic plains
- Q30.** Sacred grooves are useful in.
 (a) Generating environmental awareness
 (b) Preventing soil erosion
 (c) Year round flow of water in the rivers
 (d) Conserving rare and threatened species

ASSERTION AND REASON

Direction: in the following questions, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct option among a, b, c and d.

- Q1. Assertion (A):** In *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
Reason (R): Zoological parks, botanical gardens and wildlife safari parks serve this purpose.
 (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)
 (c) Assertion (A) is true but reason(R) is false
 (d) Assertion (A) is false but reason(R) is true
- Q2. Assertion (A):** 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.

Reason (R): The broadly utilitarian argument says that biodiversity plays a major role in many ecosystem services that nature provides.

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)
 (c) Assertion (A) is true but reason(R) is false
 (d) Assertion (A) is false but reason(R) is true
- Q3. Assertion (A):** More than 25 per cent of the drugs currently sold in the market worldwide are derived from plants and 25,000 species of plants contribute to the traditional medicines used by native peoples around the world.
Reason (R): When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct.
 (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)
 (c) Assertion (A) is true but reason(R) is false
 (d) Assertion (A) is false but reason(R) is true
- Q4. Assertion (A):** When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause decline or extinction of indigenous species.
Reason (R): *Parthenium*, *Lantana* and water hyacinth are examples of alien species.
 (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
 (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)
 (c) Assertion (A) is true but reason(R) is false
 (d) Assertion (A) is false but reason(R) is true

SOLUTIONS MULTIPLE CHOICE

- S1. (c)** Edward Wilson was a socio-biologist who describe the term biodiversity. He used the term to describe the combined diversity at all levels of biological organization.
- S2. (d)** a single species might show very high diversity at the genetic level over its distributional range. Along with rice, many other plants like mango show genetically different strains in the country.
- S3. (b)** diversity at the species level is called species diversity.
- S4. (a)** species diversity generally decreases as we move away from the equator towards the poles, thus with very few exceptions the tropics harbour more species than the temperate or the polar areas.
- S5. (b)** the largely tropical Amazonian rainforest in South America has the greatest biodiversity on Earth, it is the home to more than 40,000 species of plants, 3,000 species of fish, 1,300 of birds, 427 of mammals, 427 of amphibians, 378 of reptiles and more than 1,25,000 invertebrates.

- S6. (b) if a graph is plotted between species richness and area for a wide variety of taxa then it will turn out to be a rectangular hyperbola.
- S7. (d) the biological wealth of our planet has been declining rapidly and the accusing finger is clearly pointing to human activities. The colonisation of tropical Pacific Islands by humans is said to have led to the extinction of more than 2000 species of native Birds.
- S8. (c) extinctions across taxa are not random. Recent studies have shown that 12% of all bird species, 23% of all mammal species, 32% of all amphibian species and 31% of all gymnosperms species in the world face the threat of extinction.
- S9. (a) they are called so because they are huge and cover a large area of land.
- S10. (d) humans have always been dependent on nature for food and shelter, which leads to overexploitation of natural resources, and due to this many animal species like Steller's sea cow and passenger's pigeon have been lost.
- S11. (c) introduction of Nile Perch in Lake Victoria in East Africa led to the extinction of 200 cichlid fish in the lake.
- S12. (d) All are invasive weeds that spread at a fast rate due to rapid reproduction are very difficult to be eradicated.
- S13. (c) we need to conserve biodiversity because the maximum things that are being used in our daily life are derived from the plants, cutting of trees is leading to extinction of some of the important species of plants and also animals.
- S14. (d) bioprospecting can lead nations endowed with rich biodiversity to reap enormous benefits.
- S15. (b) Amazon rainforest covers a very large area in South America and contributes maximum oxygen percentage in earth's atmosphere.
- S16. (b) *in-situ* conservation is just like saving the entire forest to save the tiger.
- S17. (b) biodiversity hotspot is a region that have significant levels of biodiversity but is also threatened by human activities.
- S18. (c) these 34 biodiversity hotspots are also the regions of accelerated habitat loss.
- S19. (d) Western Ghats, Sri Lanka, Indo-Burma and Himalaya are among the 34 biodiversity hotspots that cover our country's exceptionally high biodiversity regions.
- S20. (b) the biodiversity hotspots harbour extremely high species richness. Providing protection to these hotspots could reduce the ongoing mass extinction by almost 30%.
- S21. (b) all the ecologically unique and biodiversity rich regions are converted by the government into biosphere reserves, sanctuaries and national parks.
- S22. (c) national parks are also ecologically unique regions that has been converted and includes some of the most extinct species of the country under protection.
- S23. (d) the zoological parks, botanical gardens and wildlife safari park are a method of *ex-situ* conservation in which threatened animals and plants are taken out from the natural habitat and placed in special setting where they can be protected and given special care.
- S24. (b) in cryopreservation cells, tissues as well as gametes can be preserved at very low temperatures up till -80 degree centigrade.
- S25. (b) the historic convention on biological diversity 'The Earth Summit' was held in Rio de Janeiro in the year 1992 called upon all Nations to take appropriate measures for conservation of biodiversity and sustainable utilisation of its benefits.
- S26. (c) World summit on Sustainable Development was held in 2002 in Johannesburg, South Africa, it was a follow-up program in response to 'The Earth Summit' held in 1992. In this program, 190 countries pledged their commitment to achieve by 2010 a significant reduction in the current rate of biodiversity loss at global, regional and local levels.
- S27. (c) *Rauwolfia vomitoria* is also called **poison devil's-pepper**. It is a small tree and contains various chemical compounds that are used by the pharmaceutical industry and one of them is reserpine.
- S28. (b) more than 70% of all the species recorded are animal's with plants comprising more than 22 % of the total among animals. Insects are the most species rich taxonomic group making up more than 70% of the total.
- S29. (c) although India has only 2.4 % of the world's land area, its share of the Global species diversity is impressive and that is 8.1%
- S30. (b) In many group of animals and plants there are interesting patterns in diversity, in general species diversity decreases as we move away from the equator towards the poles.
- S31. (b) there are more than 1,200 species of birds in the tropical areas of India.

- S32. (d)** the tropical Amazonian rainforest in South America has the greatest biodiversity on earth, it is a home for more than 40,000 species of plants, 1,300 species of birds, 427 species of mammals and amphibians and 1,25,000 species of invertebrates.
- S33. (b)** Tilman found that plots with more species showed less year to year variation in total biomass, he also showed that in his experiments increased diversity contributed to higher productivity.
- S34. (c)** the biological wealth of our planet has been declining rapidly and the accusing finger are the human activities according to IUCN Red list, 2004 documentation there has been an extension of 784 species in the last 500 years.
- S35. (d)** in the last 20 years the earth has witnessed the disappearance of around 27 species, if we carefully analyse the records then it will show that extinctions across the taxa are not random, some groups like amphibians appeared to be more vulnerable to extinction while some are not.
- S36. (d)** the accelerated rate of species extinction that the world is facing is largely due to human activities

like over exploitation, co-extinction, besides habitat loss and fragmentation and invasion of alien species may also be one of the causes for loss in biodiversity.

ASSERTION AND REASON

- S1. (b)** **S2. (c)**
S3. (a) **S4. (b)**

TRUE AND FALSE

- S1. (False)** The relation between species richness and area for a wide variety of taxa as per Alexander von Humboldt's equation, the value of Z for frugivorous birds and mammals in the tropical forests of different continents is 1.15
- S2. (True)**
- S3. (True)**
- S4. (False)** The broadly utilitarian argument says that biodiversity plays a major role in many ecosystem services that nature provides.

PRACTICE SOLUTIONS

- S1. (b)** The largely tropical Amazonian rain forest in South America has the greatest biodiversity on earth- it is home to more than 40,000 species of plants, 3,000 of fishes, 1,300 of birds, 427 of mammals, 427 of amphibians, 378 of reptiles and of more than 1,25,000 invertebrates.
- S2. (d)** There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity
- S3. (c)**
- S4. (d)** where, S= Species richness A= Area Z = slope of the line (regression coefficient) C = Y-intercept.
- S5. (c)** if you analyse the species-area relationships among very large areas like the entire continents, you will find that the slope of the line to be much steeper (Z values in the range of 0.6 to 1.2).
- S6. (d)** A stable community should not show too much variation in productivity from year to year; it must be either resistant or resilient to occasional

disturbances (natural or man-made), and it must also be resistant to invasions by alien species.

- S7. (c)** More than 70 per cent of all the species recorded are animals, while plants (including algae, fungi, bryophytes, gymnosperms and angiosperms) comprise no more than 22 per cent of the total. Among animals, insects are the most species-rich taxonomic group.
- S8. (c)**
- S9. (d)**
- S10. (c)** Once tropical rain forest covered more than 14 % of the earth's land surface, these rain forests now cover no more than 6%.
- S11. (b)** Amazon forest is estimated to produce, through photosynthesis, 20 per cent of the total oxygen in the earth's atmosphere.
- S12. (d)** Zoological parks, botanical gardens and wildlife safari parks are methods of ex-situ conservation strategy.
- S13. (c)** the World Summit on Sustainable Development was held in 2002 in Johannesburg, South Africa.
- S14. (d)**

- S15. (c)** out of every 10 animals on this planet, 7 are insects.
- S16. (a)**
- S17. (b)**
- S18. (d)** Biodiversity loss is defined as the extinction of species worldwide, as well as the local reduction or loss of species in a certain habitat, resulting in a loss of biological diversity.
- S19. (c)** When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories and animals with migratory habits are badly affected. This results in the decline in their population.
- S20. (b)** bioprospecting is exploring molecular, genetic and species-level diversity for products of economic importance.
- S21. (b)** biosphere reserve, national parks and sanctuaries are methods of *in-situ* (on-site) conservation and seed bank is an example of *ex-situ* conservation in which plants and animals are taken out of their natural habitat and conserved.
- S22. (c)** gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques.
- S23. (d)**

- S24. (d)** Environmental variations are least in the tropics. and they have the most stable climate conditions.
- S25. (a)** A stable community should not show too much variation in productivity from year to year; it must be either resistant or resilient to occasional disturbances (natural or man-made), and it must also be resistant to invasions by alien species.
- S26. (b)** species diversity decreases as we move away from the equator towards the poles.
- S27. (d)**
- S28. (c)** the great German naturalist and geographer Alexander von Humboldt observed that within a region species richness increased with increasing explored area, but only up to a limit.
- S29. (b)** Western Ghats and Sri Lanka, Indo-Burma and Himalaya – cover our country's exceptionally high biodiversity regions.
- S30. (d)**

ASSERTION AND REASON

- | | |
|----------------|----------------|
| S1. (a) | S2. (b) |
| S3. (b) | S4. (a) |