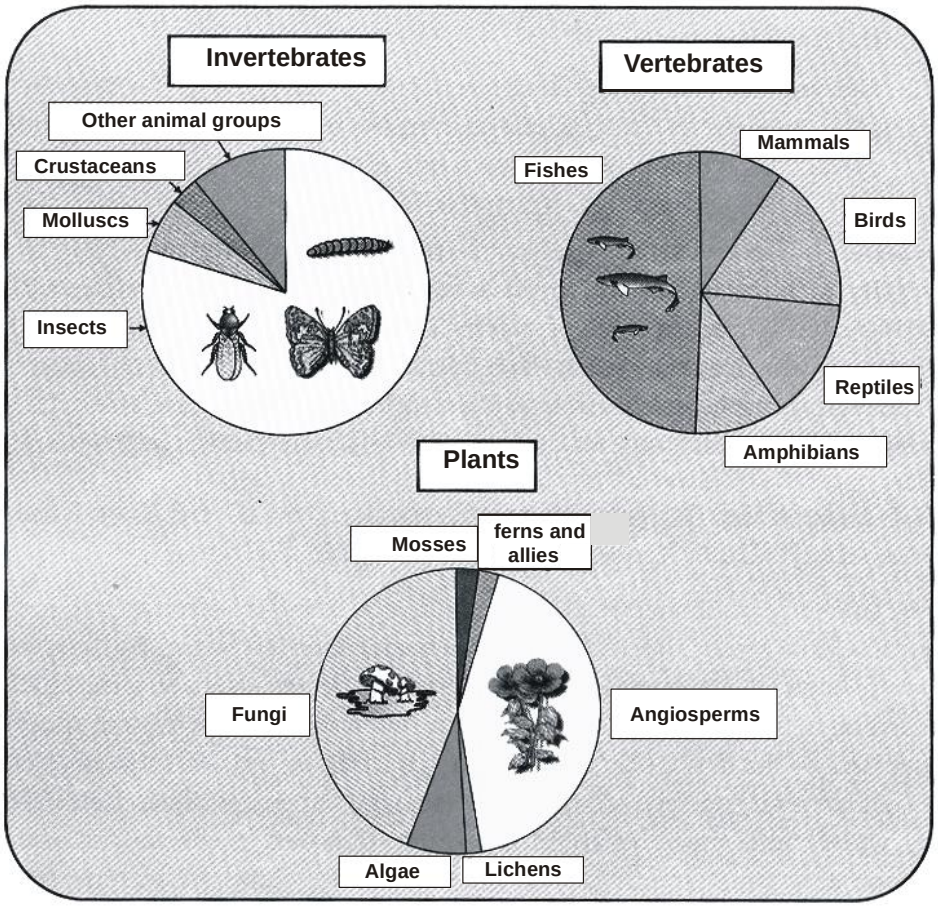
BIODIVERSITY AND CONSERVATION

Introduction:

- It is the occurrence of different types of ecosystems, different species of organisms with their biotypes and genes adapted to different climates, environments alongwith their interactions and processes.
- The term **"Biodiversity"** coined by **W.G. Rosen. Biodiversity** is the term popularised by the sociobiologist **Edward Wilson** to describe the combined diversity at all the levels of biological organisation.

Magnitude of Biodiversity in the world & India:

- According to **Robert may** global species diversity is about 7 million. But we are able to describe and identify only 1.5 million species (However, Taxonomists estimate the number of species between 1.7-1.8 million).
- Total **1.75 million species** have been reported at present time including **12 lac animals (more than 70% of all the species) and 5 lac (22% of total species) plants**.



- In India the number of species is **142000 or roughly 8.1%** of the total species that occur in **2.4% land area.**
- Out of these recorded species from India, **33% flowering plants, 10% mammals, 36% reptiles, 60% amphibians and 53% fresh water fish are endemic and exclusive to India.**
- India with about **45000 species** of plants and twice as many species of animals is one of the **12 megadiversity** countries of the world.

- 15000 new species are being discovered per year

Number of Identified species in the World		
1	Higher Plants	2,70,000
2	Algae	40,000
3	Fungi	72,000
4	Bacteria/Cyanobacteria	4,000
5	Viruses	1,550
6	Mammals	4,650
7	Birds	9,700
8	Reptiles	7,150
9	Fish	26,959
10	Amphibians	4,780
11	Insects	10,25,000
12	Crustaceans	43,000
13	Molluscs	70,000
14	Nematodes and Worms	25,000
15	Protozoa	40,000
16	Others	1,10,000

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Levels of biodiversity:

It involves three types

(a) Genetic Diversity (b) Species Diversity (c) Ecosystem or Community Diversity

(a) Genetic Diversity:

- It involves diversity in the number and types of genes as well as chromosomes present in different species and the variations in the genes and their alleles in the same species. **e.g. Bacteriophage - 100 genes, *E.coli*-4000 genes, *Drosophila melanogaster* 13000 genes, *Oryza sativa* 32000-50000 genes, *Homo sapiens*: 30000 genes.**
- **India has more then 50,000 genetically different strains of rice and 1,000 varieties of mango.**
- ***Rauwolfia vomitoria* - Its different species are found in different parto of Himalayan region & have different concentration potency of chemical reserpine due to genetic diversity.**
- It helps in the formation of **Ecotype**.
- It is useful in adaptation to changes in environmental conditions.
- It helps in **speciation**.

(b) Species Diversity:

- It is the variety in the number and richness of the species of a region.
- Number of individuals of different species represent **species evenness**.
- Number of species per unit area is called **species richness**.
- Species diversity is product of both species richness or evenness.
- A community having three different birds species having 4,1 and 1 individuals is less diverse than the community represented by 3 bird species with 2 individuals of each species.

(c) Ecosystem or Community Diversity :

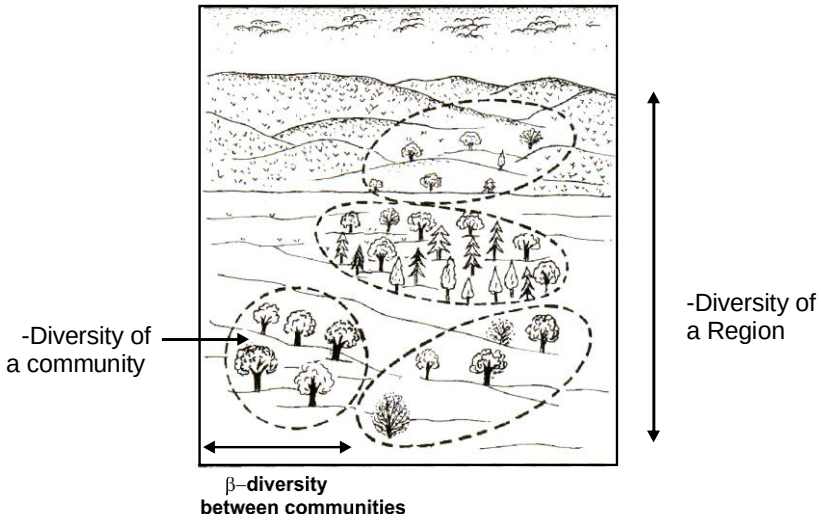

Fig: Three types of Ecosystem Diversity

- According to **Whittaker (1965)** it is of three types
  - **(1) Alpha Diversity (α-diversity) :** It is found with in community and depends upon species richness and evenness.
  - **(2) Beta Diversity (β-diversity) :** It appears between two communities.
  - **(3) Gamma Diversity (γ-diversity) :** It is regional diversity that shows total richness of species in all the habitats found within a region, geographical area or landscape.

Patterns of Biodiversity:

- Biodiversity shows a latitudinal and altitudinal gradients.
- Biodiversity increases from poles to the equator and decreases with the increase in altitude.
- It is maximum in tropical forests, moderate in temperate areas and minimum at the poles.
- In general, species diversity decreases as we move away from the equator towards the poles. With very few exceptions, tropics (latitudinal range of 23.5° N to 23.5° S) harbour more species than temperate or polar areas. Colombia located near the equator has nearly 1,400 species of birds while New York at 41° N has 105 species and Greenland at 71° N only 56 species. India, with much of its land area in the tropical latitudes, has more than 1,200 species of birds. A forest in a tropical region like Equador has up to 10 times as many species of vascular plants as a forest of equal area in a temperate region like the Midwest of the USA.
- Maximum diversity occurs in **Amazon rain forest of south America** with 40,000 species of plants, 3000 species of fish, 1300 birds, 427 mammals, 427 amphibians, 378 reptiles and more than 1,25,000 invertebrates.
- The reasons of higher diversity in tropical areas are as follows.
  - **(i)** Frequent glaciation was quite common in temperate region in the past. This type of disturbance was absent in tropical latitudes therefore species continued to flourish and evolve undisturbed for millions of years and thus had a long evolutionary time for species diversification.
  - **(ii)** There are no unfavourable seasons in tropics. Tropical environments are less seasonal, more constant and predictable.

    It helps to gain more niche specialisation for tropical organisms and greater species diversity
  - **(iii)** Environmental stability.

(iv) Species-Area relationaships : Alexander von Humboldt exploring the wilderness of south american jungles and observed that species rich ness increased with increasing explored area but upto a certain limit. The relationship between species richness and area turned out to be rectangular hyperbola for a wide variety of taxa including birds, bats, fresh water fishes or flowering plants.

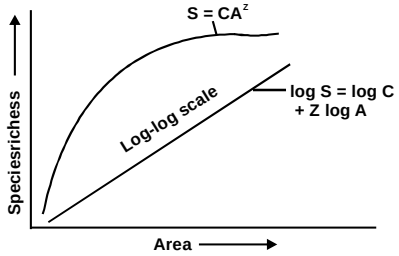

Fig :- Species-Area relationship Which becomes linear on a log-log scale.

This relationship is linear on a logarithmic scale.

log S = log C + Z log A

S = species richness
Z = Slope of line or regression coefficient
C = y intercept
A = area.

The value of Regression coefficient or Z is about 0.1-0.2 regardless of taxonomic group or region. When we discuss species-area relationship for a very large area like the entire continent, Z, slope of the line will be much steeper (The Z value is 0.6-1.2) **e.g. For frugivorous birds and mammals of tropical forests of different continents, the slope of line is steeper with a Z value of 1.15.**

The importance of Species Diversity to the Ecosystem

The number of species in a community really matter to the functioning of the ecosystem. For many decades, ecologists believed that communities with more species, generally, tend to be more stable than those with less species.

What exactly is stability for a biological community?

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. [We don't know how these attributes are linked to species richness in a community, but David Tilman's long-term ecosystem experiments using outdoor plots provide some tentative answers. 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.] Although, we may not understand completely how species richness contributes to the well-being of an ecosystem, we know enough to realise that rich biodiversity is not only essential for ecosystem health but imperative for the very survival of the human race on this planet.

At a time when we are losing species at an alarming pace, one might ask– **Does it really matter to us if a few species become extinct?** Would Western Ghats ecosystems be less functional if one of its tree frog species is lost forever? How is our quality of life affected if, say, instead of 20,000 we have only 15,000 species of ants on earth?

There are no direct answers to such näive questions but we can develop a proper perspective through an analogy (the 'rivet popper hypothesis') used by Stanford ecologist Paul Ehrlich. In an airplane (ecosystem) all parts are joined together using thousands of rivets (species). If every passenger travelling in it starts popping a rivet to take home (causing a species to become extinct), it may not affect flight safety (proper functioning of the ecosystem) initially, but as more and more rivets are removed, the plane becomes dangerously weak over a period of time. Furthermore, which rivet is removed may also be critical. Loss of rivets on the wings (key species that drive major ecosystem functions) is obviously a more serious threat to flight safety than loss of a few rivets on the seats or windows inside the plane.

Loss of Biodiversity:

- It is due to extinction (It is the total elimination or dying out of species from the earth) of species.
- According to **IUCN red data book**, earth has lost some 784 species during the last 500 years, including 338 vertebrates, 359 invertebrates and 87 plants.
- In the last two decades, 27 species have become extinct.
- The important recent extinctions are **Dodo of mauritius, thylacine or Tasmania Wolf of Australia, Quagga of Africa or south african Zebra , Steller's Sea Cow of Russia and three subspecies of Tiger (Bali, javan and Caspian).**
- At present time about **15,500 species** worldwide are facing the threat of extinction in which **31% gymnosperms, 32% amphibians, 23% mammal species and 12% bird species** involve. The current rate of extinction is 100–1000 times faster than pre-human times. It is considered as sixth extinction due to human activities.
- Loss of biodiversity is responsible for.
  (i) Drastic changes in ecosystem processes like water use, pest and disease cycles.
  (ii) Reducing ecosystem productivity.
  (iii) Reduced resistance to environmental perturbations like drought.

Causes of Biodiversity Losses:

- The major causes of loss of biodiversity are
  (i) Habitat loss and habitat fragmentation.
  (ii) Over exploitation.
  (iii) Exotic species invasions.
  (iv) Coextinctions.
  Some other factors like disturbance and degradation, pollution, intensive agriculture and forestry are also intensifying extinctions of species.
- **Destruction of habitat** due to expanding population, development of more industrial areas, urbanization, more area for agriculture, new roads, canals, dams is the primary cause of extinction of species. **Tropical rain forests** once occupied **14% of earth**. Today they occur on only **6% of land area**.
- **Habitat fragmentation** decreases the core area and increases the edge area. **e.g. All natural grasslands of U.S.A have been lost due to agriculture and human settlements.**
- **Over exploitation** reduces the size of population of any particular species as a result it becomes endangered or vulnerable or facing the threat of extinction **e.g. hunting of animals, collection of medicinal plants. Excessive tree felling in the forest, overgrazing.**
- **Exotic species** may cause disappearance of native species. **e.g. Water hyacinth (Eichhornia crassipes). Lantana camara, Eupatorium odoratum, Parthenium hysterophorus (carrot or congress grass), Nile perch, African Catfish - Clarius gariepinus threat to native cat fish - Clarius baterachus**
- **Coextinctions :** Certain obligatory mutualistic relationships exist in nature, **Extinction of one will automatically cause extinction of the other. e.g. Pronuba yuccasella and Yucca.**

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Red Data Book of IUCN :

- **IUCN (International union for conservation of Nature and Natural Resources) or WCU (World conservation Union)** maintains this book including a catalogue of threatened plants and animals facing risk of extinction.
- **Threatened species (T):** They become extinct if they are not provided with proper habitat, food, protection.

- The IUCN 2000 Red list perform assessment of 18,000 species out of which 11096 species (5485 animals and 5611 plants) are on the threatened list world-wide. Out of these 925 animal species and 1014 plant species are critically endangered.
- On the basis of distribution, decline in number of population, habitat and value of the species, Red list involves following 8 catagories.
  - **(i) Extinct (E or EX) :** A species / taxon is called extinct it is completely disappeared from all the parts of earth. **e.g. Dodo, passenger pigeon**.
  - **(ii) Extinct in Wild (EW) :** The species / taxon is disappeared from its natural habitats **e.g. Ginkgo biloba.** A number of domesticated animals and plant have become extinct in the wild.
  - **(iii) Critically Endangered (CR) :** It is facing very high risk of extinction in the wild and can become extinct any moment in the immediate future. **e.g. Berberis nilghiriensis, Sus salvanius**, **Podopohyllum.**
  - **(iv) Endangered (EN or E) :** Species / taxon is facing a high risk of extinction in the wild in the near future due to decrease in its habitat, excessive predation or poaching. **e.g. Red Panda (Ailurus fulgens), Bentinckia nicobarica, Indian Aconite, Lion Tailed macaque, lemur idri idri of madagascar, Asiatic Wild Ass (Asinus hemionus khur now restricted to Rann of Kutch and Pakistan),Great Indian Bustard, Nepenthes.**
  - **(v) Vulnerable (VU OR V) :** A Species / taxon bear sufficient population but is undergoing depletion due to some factors so that it is facing risk of extinction in medium term future. **e.g. Anitlope cervicapra (Black Buck, Indian Gazelle), Cupressus cashmeriana**.
  - **(vi) Lower Risk (LR) :** Near Threatened.
  - **(vii) Data deficient (DD) :**
  - **(viii) Not Evaluated (NE) :** Out of them, four categories of species (CR, E, V and LR) are included under threatened species (T).

Test your Resonance with concept

1. Decrease in species diversity in tropical countries is mainly due to
(1) Urbanisation (2) Pollution (3) Deforestation (4) Soil erosion

2. In India, we find mangoes with different flavours, colours, fibre contents, sugar contents and shelf life. The large variation is due to
(1) Genetic divesity (2) Species diversity
(3) Induced mutation (4) Hybridization

3. As we move from the poles to equator, the biolgical diversity
(1) Increases (2) Decreases
(3) First increases then decreases (4) First increases then again increases

4. Introduction of Nile Perch in Lake Victoria of South Africa resulted in:
(1) Excessive growth of water weeds (2) Elimination of water weeds
(3) Elimination of many species of Cichlid fish (4) Excessive growth of chichlid fish

5. Lungs of planet is another name of
(1) Silent valley (2) Australian coral reef
(3) Himalayan region (4) Amazon Tropical rain forest

Answers

1. (3) **2.** (1) **3.** (1) **4.** (3) **5.** (4)

Conservation of Biodiversity:

It involves two types of strategies

(1) In situ Conservation **(2) Ex situ Conservation**

(1) In situ (on site) Conservation:

- This type of conservation performs inside the natural habitat or man made ecosystems.
- Two alternate methods are being used to save biodiversity

(i) Protected areas **(ii) Hot spots**

(i) Protected areas: These areas are legally conserved for the protection & maintenance of biodiversity.

- World Conservation Monitoring Centre has recognised 37,000 protected areas world-wide.
- In 2005, **(90) National parks (AIPMT-2015), (448) Wildlife sanctuaries, 14 Biosphere reserves** were established in India and many sacred groves covering 4.7% land surface.

(a) National parks: These are larger areas maintained for scientific, educational and recreational use, They are not usually used for commercial extraction of resources. There are 100 national parks in India occupying nearly 1.1% of geographical area.

(b) Wildlife sanctuaries: These are tracts of land with or without lake where wild animals/fauna can take refuge without being hunted. Other activities like collection of forest products, harvesting of timber, private ownership of land, etc. are allowed. India has 551 sanctuaries occupying over 3.6% of geographical area (India 2005).

(c) Biosphere reserves: Under **MAB (Man and Biosphere programme) of UNESCO, Biosphere reserves** established in1975 **(408 biosphere reserves established till may 2002)**.

- Biosphere Reserves (BR)are multipurpose protected areas of land / coastal environments which are meant for preserving genetic diversity in representative ecosystems of various natural biomes and unique biological communities by protecting wild populations, traditional life style of tribals and domesticated plant/animal genetic resources. **In India, 18 biosphere reserves have been set up by now.**
- Each biosphere reserve has three zones

(a) Core zone : No human activity is allowed.

(b) Buffer zone : Limited human activity is allowed like resource use strategies, research and education.

(c) Transition zone : Activities like settlements, cropping, grazing, foresty and tourism are allowed in this zone.

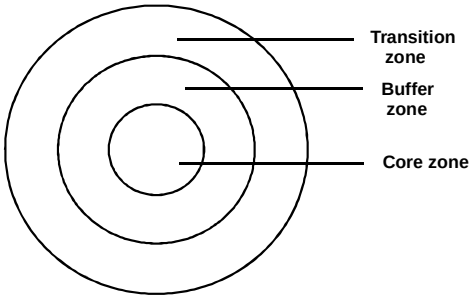

Fig: Zonation in terrestrial biosphere.

(ii) Hot spots :

- Hot spots are areas with high density of biodiversity or megadiversity which are also the most threatened ones.

- It is also defined as geographical zone or ecological niche with a large number of endemic plants.
- Ecologoically hot spots are determined by four factors as.
  (a) Number of species / species diversity.
  (b) Degree of endemism.
  (c) Degree of threat to habitat due to its degradation and fragmentation.
  (d) Degree of exploitation.

- **Myers** initially identified **12 hot spots** with 14% of plant species in a area of only 0.2%. Four more hotspots were added by Myers. Today the number of hotspots identified by ecologists is **34** covering an area less than 2% of land surface with about 20% of human population living there.
- **India** is even otherwise a country of **megadiversity with 2.4% of land area** and having **8.1% of global diversity.** Major centres of biodiversity are Agasthymalai hills, silent valley and Amambalam Reserve.
- **India has three hotspots - Indo : Burma, Himalayas and Western Ghats - Sri lanka.**
- There is **high degree of endemism** as well as richness of species of flowering plants, amphibians, reptiles, some mammals and butterflies.
- Valleys of this region are rich in endemic species. It has been an active centre of evolution of flowering plants, being rich in primitive angiosperm genera **(e.g. members of family Magnoliaceae, Winteraceae)**.

(2) Ex situ (on situ) Conservation :

- It is conservation of selected rare threatened plants/animals outside their natural homes. It involves **offsite collections and gene banks.**
  (i) Offsite collections : These are live collections of wild and domesticated species in man made **botanical gardens (AIPMT-2015), zoological parks, wildlife safari parks, arboreta (= arboretums), aquaria, etc.**
  (ii) Gene banks: These are institutes that maintain stocks of viable seeds (seed banks), live growing plants (orchards), tissue culture and frozen germplasm with the whole range of genetic variability.

- Seeds are of two types
  (a) Recalcitrant seeds **(b) Orthodox seeds**

  (a) Recalcitrant seeds: They are those seeds which get killed on reduction of moisture and exposure to low temperature, **e.g. tea, cocoa, jackfruit, and coconut.** They can be stored for shorter duration after treatment with fungicides in rooms having humid air and normal oxygen.

  (b) Orthodox seeds: They are those seeds which can tolerate reduction in moisture content (upto 5%), anaerobic conditions and low temperature (–10º to –20ºC or even lower for prolonged periods) **e.g. Cereals, Legumes.** At intervals the seeds are allowed to germinate, form plants and develop fresh seeds for storage.

Tissue culture :

- It is carried out through callus formation, embryoids, pollen grain culture and shoot tip culture for those plants which are either seedless, have recalcitrant seeds, variable seed progeny or where clone is to be maintained.
- The method is useful in maintaining a large number of genotypes in small area, prepaid multiplication of even endangered species and for hybrid rescue.
- Shoot tip culture produces virus free plants. It is used for international exchange of germplasm in vegetatively multiplied cultivars, **e.g. banana, potato.**

Cryopreservation :

- **It is preservation in liquid nitrogen at –196ºC**. It can maintain tissue culture, embryos**,** animal cells/tissues, spermatozoa indefinitely.

Resonate the Concept

- **Bioprospecting :** Exploring molecular genetic and species-level diversity for products of economic importance.

International Efforts for conserving biodiversity:

- **Earth Summit at Rio de janerio (1992), Brazil**, promoted Convention on biological Diversity (CBD) which was signed by **152 nations**. Its recommendations came into effect on 29th Dec. 1993. India became a party to this Convention on Biological Diversity in May, 1994. **Agenda 21, a product of Earth Summit, is a blue print for encouraging sustainable development of diversity through social, economic and environmental measures in the 21 st century.**
  The various commitments were.
  (i) Adaption of ways and means to conserve biodiversity.
  (ii) Managing biodiversity for sustainable use.
  (iii) Ensuring equitable sharing of benefits from biological diversity including utilisation of genetic resources.
- A **second World Summit** was held in **2002** in **Johannesberg, South Africa,** 190 countries attending the Summit pledged to significantly **reduce the current rate of biodiversity loss at global, regional and local levels by 2010.**
- Some nongovernmental organisations (NGO's) like **green peace** provide international support for conservation.
- **World Consevation union (former IUCN)** is an international independent organisation which provides leadership, common approach and expertise in area of conservation.
- Another similar organisation is **World Wild fund for Nature (WWF)**.
- **Covention in International Trade in Endangered species (CITES) helps in restricting poaching and loss of rare species.** Restriction on trading in animal products is believed to have saved the elephant from extinction.

Biodiversity Conservation In India:

- India is **centre of origin** and natural home of **167 cultivated species.** It is home land of some 320 wild relatives of crop plant. The latter include **rice, sugarcane, millets (crop plants), banana, mango (fruit plants), jackfruit, cucurbits, Dioscorea, Alocasia, Colocasia (Vegetables), Cardamom, black pepper, ginger, turmeric (spices), Brassica (oil and vegetables).**
- India is centre of biodiversity for some animal species like zebu (Boss indicus), water buffalo (Bubalus arnee = B. bubalus), mithum (Bos frontalis, Gayal), chicken (Gallus domesticus) and camel (Camelus dromidarius).
- **Bomboss** and **tree cotton** also **originated in India**.
- India is **secondary home** of some animals **e.g. sheep, goat, horse, yak, donkey and plants e.g. Maize, potato, tobacco.**
- Conservation is being conducted by Ministry of Environment and Forests with help of local people. **Joint forest Management (JFM)** is practised in 10.25 million hectares of degraded forests through 36075 village forest protection committees, It is useful to local and tribal people as they become partner in non-wood forests products.

- **Major e.g. Situ conservation of biodiversity is being managed by National Bureau of Plant, Animal and Fish Genetic Resources.**
- **There is an International Crop Research Institute for Semi-Arid Tropics (ICRISAT) in Hyderabad for conserving germplasm of groundnut, pigeon pea, chick pea, pearl millet and sorghum.** A number of other centres in India are maintaining hundred and thousands of present and past varieties of crop plants.

Read and Digest

1. **Green Data Book:** It is a catalogue giving information on rare plants growing in protected areas/botanical gardens only.
2. **In India:** Tropical rain forests are found in Western Ghats, Andman and Nicobar Island and North Eastern India.
3. Mammals have highest number of endangerd species.
4. **Silent valley of kerala** is **natural tropical rain forest** with **rich** and **unexplored biodiversity.** It was declared as national Reserve forest. it is called silent because of absence of chipring cicadas in this valley.
5. **Shahtoosh (Chiru or Tibetan–Antilope):** The hairs from its neck are the source of expensive wool -shahtoosh. It is banned in India except jammu and kashmir under endangered category.
6. kaziranga national Park (Assam), Keoladeo national Park (Bharatpur, Rajasthan) Manas wildlife sancturary (Assam), Nandadevi national park (Uttrakhand) and Sunderban national Park (West Bengal) are **5 UNESCO'** World heritage sites of India.
7. **22nd May : International Day for Biological Diversity.**
8. Ist National park of world was **yellow stone national Park, USA**.
9. First national park of India established in **1935** which was Hailey's national Park now it is called **Jim Corbett National Park**, located in **Uttaranchal**.
10. **Dodo bird (Didus ineptus) of Mauritius and pink headed duck (Rhodonessa caryophyllacea) and cheetah (Acinonyx jubatus) of India have extinct.**
11. **The first biosphere reserve in India was Nilgiri.**
12. **World Summit on Sustainable Developement – 2002 Johannesberg :** 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.
13. National chambal sanctuary famous for Gharial.
14. Guru jambheshwarji has given 29 principles (Bish + no (20 + 9), hence his followers are called Bishnio (An Indian religious sect) which has commandment prohibiting felling of green trees and killing animals. They donot kill black buck. They are responsible for preserving Khejri tree (Prosopis cineraria) in Rajasthan.
15. **Biodiversity Act 2002 :** It is useful for the protection of India's rich biodiversity and associated knowledge against their use by foreign individuals and organisations.
16. There are about 3000 species of food plants, out of them only 150 species are commercialised, **85% of the foddoutput is produced by less than 20 species.**
17. **Two third of food of world is being produced by three carbohydrates rich crops – Wheat, Maize and Rice.**

18. **Social Forestry :** It is the raising of quick growing trees with multiple uses on all types of vacant lands (Village common lands) for use of rural community to meet the requirement.
19. **Sacred forests and lakes :** Sacred forests and lakes (sacred grooves) are forest patches around places of worship which are held in high esteem by tribal communities. They are the most undisturbed forest patches (island of pristine forests) which are often surrounded by highly degraded landscapes. They are found in several parts of india E.g, Karnataka, Maharashtra, Rajasthan. Not a single branch is allowed to be cut from these forests. As a result many endemic species which are rare or have become extinct elsewhere can be seen to flourish here.
20. **Important Days**
    (i) World Environment Day– 5th june.
    (ii) Wild life Week – First week of October (Monday)
    (iii) World Forestry Day – 21st March.
    (iv) World Ozone Day – 16 September
    (v) World Earth Day – 22 April
    (vi) World Population Day – 11 july
21. **National forest policy was framed in 1952.**
22. **(i) CAZRI :** Central Arid Zone Research Institute, Jodhpur (Raj.)
    (ii) UNEP : United nations Environment programme.
    (iii) MAB : Man and biosphere programme.
23. **Agroforestry : I**t is the plantation of grasses, horticultural and multipurpose trees and shrubs alongwith crops so as to stabilise the soil and meet the fodder, fruit, timber and grain requirements of the community.

Some special projects for endangered animal species

S. No.	Name of Project	Characters
1	Tiger project	There are now 25 tiger reserves (Mainly Sunderban, Corbett, Periyer and Ranthambore NP) to save tigers. It was launched on 1 st April, 1973.
2	Lion project (Gir Lion Project)	Asian lion is found only in Gir forest of Gujarat. It was started in 1972.
3	Rhino Conservation project	It was started in Assam in 1987. Dudhwa national Park (Lakhimpur Kheri UP was selected for the rhino reintroduction project)
4	Crocodile breeding project	It was initially started in Orissa to save crocodiles in 1975. There are three species of crocodiles in India. (i) saltwater (Crocodylus porosus) (ii) fresh water muggar (Crocodylus palustris)(iii) Gharial (Gavialis gangeticus)
5	Snow leopard project	There are 12 snow-leopard reserves throughout the Himalayas.
6	hangul project	It was started in 1970 Dachigam Sanctuary, Sri nagar (kashmir) to protect hangul or kashmiri stag (Cervus elephus hanglu)
7	Brow-antler deer project	It was started in manipur since 1977 to protect brow-antler deer (Cervus eldieldi)

8	Musk deer project	It was started at Kedarnath Sanctuary Uttrakhand to protect musk-deer (Moschus moschiferus). Shikari Devi Sanctuary in Himachal pradesh is also carrying this project.
9	Elephant project	It has been recently started (1991) to protect elephants.
10	Yak project Research Centre	It is in Arunachal Pradesh
11	River Dolphin Project	Vikramashila (Bihar)
12	Lion Tailed macaque Project	Silent valley national Park, Kerala
13	Great Indian Bustard Project	Desert national Park (Raj) and Great Indian Bustard sanctuary (Maharashtra)

S. No.	Wild animals	Protected places in India
1	Tiger (Panthera tigris)	Corbett national park (Uttrakhand), Sunderban Tiger Reserve (West Bengal) Ranthambor national park, savai Madhopur (Raj.)
2	Red Panda (Ailurus fulgens)	Khanghende Zonga national Park, (Sikkim)
3	One horned Rhinos (Rhinoceros unicorius)	Kaziranga National park (Assam) , Manas sanctuary (Assam)
4	Great indian Bustard (Choriotis nigriceps)	Desert national park, jaiselmer (Raj.) Great Inidan Bustard sanctuary (Maharashtra)
5	Asiatic Wild Ass (Asinus hemionus Khur)	Wild Ass sanctuary Surender Nager (Distt. Kachchh), Gujarat
6	Kashmiri stag (Hangul)–(Cervus elaphus hanglu)	Dachigam National park, Sri nagar (Jammu and Kashmir.)
7	Elephants (Elephas maximus)	Periyar sanctuary (kerala), Similipal sanctuary (Orissa), Manas sanctuary (Assam)
8	Gharial (Gavialis gangeticus)	National chambal sanctuary kota (Raj.)
9	Asiatic Lion (Panthera leo persica)	Gir national park (Gujarat)
10	Black Buck (Antelope cervicapra)	Kanha national park (M.P.), Desert National park Jaiselmer (Raj.)

Test your Resonance with concept

1. In a biosphere various zones are designated as
(a) No human activity is permitted
(b) Limited human acitivity is permitted
(c) Large number of human activity is permitted
These zones are called respectively as
(1) Core, manipulation and buffer (2) Core, buffer and consolidation
(3) Buffer, core and manipulation (4) Core, buffer and manipulation.

2. Biosphere reserves differ from national parks and wild life sanctuaries in
(1) Absence of human entry
(2) People are integral part of the system
(3) Plants being paid more attention than animals
(4) Living organisms are brought from other places for the preservation and proseperity

3. A biosphere reserve preserves
(1) Willd populations (2) Traditional life styles of tribals
(3) Genetic resources of organisms (4) All of above

4. Hot spots of biodiversity are areas with
(1) Little biodiversity (2) Maximum biodiversity
(3) Maximum conservation (4) Both (1) and (3)

5. Bandipur (Karnataka) National Park runs a project for
(1) Peacock (2) Deer (3) Elephant (4) Tiger

Answers

1. (4) **2.** (2) **3.** (4) **4.** (2) **5.** (4)