



**Study Material *for Classroom*
Students only**

GENERAL STUDIES GENERAL SCIENCE

BIODIVERSITY & CONSERVATION

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Biodiversity & Conservation

Biodiversity refers to the variety of life. It is seen in the number of species in an ecosystem or on the entire Earth. Biodiversity gets used as a measure of the health of biological systems, and to see if there is a danger that too many species become extinct. The United Nations designated 2011–2020 as the “United Nations Decade on Biodiversity”.

The term biological diversity was used first by wildlife scientist and conservationist **Raymond F. Dasmann** in 1968, where he advocated conservation. It was widely adopted only in the 1980s.

The term biodiversity first appeared in a publication in 1988 when entomologist **E. O. Wilson** used it as a title.

LEVELS OF BIODIVERSITY

Biological diversity is usually considered at three different levels – a) genetic diversity i.e. at genetic level, b) species diversity i.e. at the level of species, and c) ecosystem diversity i.e. at the level of ecosystem.

GENETIC DIVERSITY

Genetic diversity is all the different genes contained in all individual plants, animals, fungi, and microorganisms. **Genetic diversity** is the total number of genetic characteristics in the genetic makeup of a species. It is distinguished from genetic variability, which describes the tendency of genetic characteristics to vary.

Genetic diversity serves as a way for populations to adapt to changing environments. With more variation, it is more likely that some individuals in a population will possess variations of alleles that are suited for the environment. Those individuals are more likely to survive to produce offspring bearing that allele. The population will continue for more generations because of the success of these individuals.

SPECIES DIVERSITY

Species diversity is all the differences within and between populations of species, as well as between different species. **Species diversity** is the number of different species that are represented in a given community. Species diversity consists of two components: species richness and species evenness. Species richness is a simple count of species, whereas species evenness quantifies how equal the abundances of the species are.

***Keystone species** is a species that has a disproportionately large effect on its environment relative to its abundance. Such species are described as playing a critical role in maintaining the structure of an ecological community, affecting many other organisms in an ecosystem and helping to determine the types and numbers of various other species in the community. A classic keystone species is a small predator that prevents a particular herbivorous species from eliminating dominant plant species.*

Ecosystem diversity It is the variation in the ecosystems found in a region or the variation in ecosystems over the whole planet. Ecological diversity includes the variation in both terrestrial and aquatic ecosystems. Ecological diversity can also take into account the variation in the complexity of a biological community, including the number of different niches, the number of trophic levels and other ecological processes. An example of ecological diversity on a global scale would be the variation in ecosystems, such as deserts, forests, grasslands, wetlands and oceans.

DISTRIBUTION OF BIODIVERSITY

Biodiversity is not evenly distributed, rather it varies greatly across the globe as well as within regions. Among other factors, the diversity of all living things (biota) depends on temperature, precipitation, altitude, soils, geography and the presence of other species.

Diversity consistently measures higher in the tropics and in other localized regions and lower in polar regions generally. Rain forests that have had wet climates for a long time, have particularly high biodiversity. Terrestrial biodiversity is thought to be up to 25 times greater than ocean biodiversity.

LATITUDINAL GRADIENTS

Generally, there is an increase in biodiversity from the poles to the tropics. Thus localities at lower latitudes have more species than localities at higher latitudes. This is often referred to as the latitudinal gradient in species diversity. Several ecological mechanisms may contribute to the gradient, but the ultimate factor behind many of them is the greater mean temperature at the equator compared to that of the poles.

Even though terrestrial biodiversity declines from the equator to the poles, some studies claim that this characteristic is unverified in aquatic ecosystems, especially in marine ecosystems. The latitudinal distribution of parasites does not appear to follow this rule.

HOTSPOTS

A biodiversity hotspot is a region with a high level of endemic species that is under threat from humans. The term hotspot was introduced in 1988 by Norman Myers. While hotspots are spread all over the world, the majority are forest areas and most are located in the tropics.

MEASUREMENT OF BIODIVERSITY

Diversity may be measured at different scales. These are three indices used by ecologists:

- **Alpha diversity** refers to diversity within a particular area, community or ecosystem, and is measured by counting the number of taxa within the ecosystem (usually species)
- **Beta diversity** is species diversity between ecosystems; this involves comparing the number of taxa that are unique to each of the ecosystems.
- **Gamma diversity** is a measurement of the overall diversity for different ecosystems within a region.

IMPORTANCE OF BIODIVERSITY

Humans depend for their sustenance, health, wellbeing and cultural growth on nature. Biotic resources provide food, fruit, seed, fodder, medicines and a host of other goods and services. The enormous diversity of life is of immense value, imparting resilience to ecosystems and natural processes. Biodiversity also has enormous social and cultural importance.

The value of biological diversity:

The various benefits of biological diversity can be grouped under three categories: a) ecosystem services, b) biological resources, and c) social benefits.

ECOSYSTEM SERVICES

Responsible for maintaining ecosystem health. Thus biodiversity is essential for the maintenance and

sustainable utilization of goods and services from ecological system as well as from individual species.

- (i) **Protection of water resources:** Natural vegetation cover helps in maintaining hydrological cycles, regulating and stabilizing water run-off and acting as a buffer against extreme events such as floods and droughts. Wetlands and forests act as water purifying systems, while mangroves trap silt thereby reducing impacts on marine ecosystems.
- (ii) **Soil protection:** Biological diversity helps in the conservation of soil, clearing large areas of vegetation cover has been often seen to accelerate soil erosion, reduce its productivity and often result in flash floods. Root systems allows penetration of water to the sub soil layer. and brings mineral nutrients to the surface by nutrient uptake.
- (iii) **Nutrient storage and cycling:** Ecosystem perform the vital function of recycling nutrients found in the atmosphere as well as in the soil. Plants are able to take up nutrients, and these nutrients then can form the basis of food chains. Nutrients in the soil, in turn, is replenished by dead or waste matter which is transformed by micro-organisms and earthworms
- (iv) **Pollution reduction:** Ecosystems and ecological processes play an important role in maintenance of gaseous composition of the atmosphere, breakdown of wastes and removal of pollutants. Wetlands have the ability to breaking down and absorb pollutants. Heavy metals, suspended solids; reduce the BOD (Biological Oxygen Demand) and destroy harmful micro-organisms.
- (v) **Climate stability:** Vegetation influences climate at macro as well as micro levels. Growing evidence suggests that undisturbed forests help to maintain the rainfall in the vicinity by recycling water vapor at a steady rate back into the atmosphere. Vegetation also exerts moderating influence on micro climate.
- (vi) **Maintenance of ecological processes:** Different species of birds and predators help to control insect pests. Birds and nectar-loving insects act as important pollinating agents of

crop and wild plants. Some habitats act as spawning areas in mangroves and wetlands. Biological resources of economic importance

- (i) **Food, fibre, medicines, fuel wood and ornamental plants:** Five thousand plant species are known to have been used as food by humans. Presently about 20 species feed the majority of the world's population and just 3 or 4 only are the major staple crops to majority of population in the world. A large number of plants and animals materials are used for the treatment of various ailments.
- (ii) **Breeding material for crop improvement:** Wild relatives of cultivated crop plants contain valuable genes that are of immense genetic value in crop improvement programmes. Genetic material or genes of wild crop plants are used to develop new varieties of cultivated crop plants for restructuring of the existing ones for improving yield or resistance of crops plants. For example: rice grown in Asia is protected from four main diseases by genes contributed by a single wild rice variety.
- (iii) **Future resources:** There is a clear relationship between the conservation of biological diversity and the discovery of new biological resources. The relatively few developed plant species currently cultivated have had a large amount of research and selective breeding applied to them. Many presently under-utilised food crops have the potential to become important crops in the future. Knowledge of the uses of wild plants by the local people is often a source for ideas on developing new plant products.

SOCIAL BENEFITS

- (i) **Recreation:** Forests, wildlife, national parks and sanctuaries, garden and aquaria have high entertainment and recreation value. Ecotourism, photography, painting, film making and literary activities are closely related.

Cultural values: Plants and animals are important part of the cultural life of humans. Human cultures have co-evolved with their environment and biological diversity can be

impart a distinct cultural identity to different communities.

CAUSES OF BIODIVERSITY LOSSES

The accelerated rates of species extinctions that the world is facing now are largely due to human activities. There are **four major causes** ('The Evil Quartet' is the sobriquet used to describe them).

- (a) **Habitat loss and fragmentation**- When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories and certain animals with migratory habits are badly affected, leading to population declines.
- (b) **Over-exploitation**- Many species extinctions in the last 500 years (Steller's sea cow, passenger pigeon) were due to overexploitation by humans.
- (c) **Alien species invasions**- When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive,

and cause decline or extinction of indigenous species.

- (d) **Co-extinctions**- When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct

MAJOR THREATS

Biodiversity is under serious threat as a result of human activities. The main dangers worldwide are population growth and resource consumption, climate change and global warming, habitat conversion and urbanisation, invasive alien species, over-exploitation of natural resources and environmental degradation

Species often become threatened or disappear when several of these factors are combined. The fragmentation of habitats decreases the size of populations and make these more vulnerable to other factors. Once the population is weakened, small external perturbations such as disease can wipe out the remaining individuals entirely.

Major threats

Main threats	Some underlying causes
Threats in terrestrial areas	
Degradation, destruction and fragmentation of natural habitats	Spread of the urbanised areas, road network and industrial areas and associated problems (noise, pollution); abandon of former agricultural practices that were favourable to biodiversity
Decrease in the capacity of the agricultural areas to host wildlife	Intensification of agricultural practices (yielding pollution and disturbance) and disappearance of landscape elements that provide food and shelter that are exploitable by wildlife (such as hedges, trees, ponds, etc.)
Pollution of soils, air and water	Excess of heavy metals (industry, roads), manure and pesticides (agriculture) and other pollutants
Invasions by alien species	International trade and transport (roads, railways, rivers), gardening practices, exotic trees in forestry, exotic pests released in the wild, climate change, etc.
Epidemics affecting wildlife	Arrivals of pathogens that are favoured by the introduction of exotic species, pollution and the destruction of habitats
Climate change	Carbon emissions, deforestation and other land use changes due to human activities
Dessication of soils and wetlands	Excess pumping of underground water tables
Recreation and leisure	Overuse of green open spaces and wild areas, little respect for nature, mountain biking and motor sports in fragile areas, dogs not on leash

Threats in marine areas

Overfishing and decline of species	Industrial fishing, overexploitation of target species, by-catch species
Pollution and eutrophication	Land-based activities (river run-off), atmospheric deposition, maritime traffic
Degradation and destruction of the sea floor	Beam trawling, dredging, sand and gravel extraction
Alien species introductions	Maritime trade (ballast waters, fouling), leisure navigation, Mariculture, climate change
Leisure and tourism	Coastal development, water quality in summer (high population), mechanical beach cleaning, noise and other perturbations due to the high population

RICHNESS OF BIODIVERSITY OF INDIA

1. The geographical location of India provides a wide range of latitudes and longitudes along with a spectrum of climate regimes culminate into a wide range of biophysical environments, supporting a variety of habitats and ecosystems. The topographical diversity marked by mountainous regions encompassing an area of about 100 million hectares, arid and semi-arid zones consist of over 30 million hectare and the long coast line over 7000 kms, coupled with varied precipitation constitute a rich landscape diversity.
2. India is located at the confluence of three Vavilovian centers (global centers of origin of life or biogeographic realms), viz., Indo-Malayan, Eurasian and Afro-tropical and because of the edge effect, India has very rich biodiversity in terms of flora and fauna.
3. India has a heritage of co-existence of humans and nature coupled with conservation which is also responsible for the rich biodiversity of India.

India consists of:

1. Two realms
 - (i) The Himalayan region represented by Palearctic Realm and
 - (ii) The rest of the sub-continent represented by Malayan Realm
2. Five biomes
 - (i) Tropical humid forests
 - (ii) Tropical dry or deciduous forests (including Monsoon Forests)
 - (iii) Warm deserts and semi-deserts
 - (iv) Coniferous forests and
 - (v) Alpine meadows.
3. **Bio-geographic zones:** In India, there are 10 bio-geographic zones, each with characteristic climate, soil, topography and biodiversity.
4. **Bio-geographic provinces:** The bio-geographic province is a sub-unit of bio-geographic zone. with distinct characteristic climate, thus culminating into biodiversity accordingly. It is this ecological diversity that makes India as one of the mega diversity regions in the world. At least, one biosphere reserve is designated in each of the bio-geographic provinces.

List of Bio-geographic Zones and Bio-geographic Provinces

S.No	Bio-geographic Zone	Bio-geographic Province
1	Trans-Himalaya	Ladakh Mountains Tibetan Plateau Himalaya Sikkim
2	The Himalaya	North West Himalaya West Himalaya Central Himalaya East Himalaya

S.No	Bio-geographic Zone	Bio-geographic Province
3	The Indian Desert	Thar Katchchh
4	The Semi-Arid	Punjab Plains Gujarat Rajputana
5.	The western Ghats	Malabar Plains Western Ghats Mountains
6.	The Deccan Peninsula	Central Highlands Chotta Nagpur Eastern Highlands Central Plateau Deccan South
7.	The Gangetic Plains	Upper Gangetic Plains Lower Gangetic Plains
8.	The Coasts	West Coast East Coast Lakshadweep
9.	North-East India	East - Brahmaputra Valley East - North East Hills
10.	Islands	Andamans Nicobars

BIODIVERSITY CONSERVATION

- **In situ conservation- Conserving biodiversity in natural habitat conservation areas** as biosphere reserves, national parks and sanctuaries
- **Ex situ Conservation-** In this approach, 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. Zoological parks, botanical gardens and wildlife safari parks serve this purpose.

EX-SITU CONSERVATION

Ex-situ conservation of plants and animals preserve/protect them away from their natural habitat. The

Government of India at national level after independence took up a lot of such methods, which can be listed, are as follows.

(A) BOTANICAL GARDENS:

There are several botanical gardens developed in India as a part of ex-situ conservation in order to protect, preserve, promote the rare and threatened species, and these gardens may serve as potential sanatorium as well as research ground for the species under reference. Nowadays, through the Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Health and Department of Science and Technology, there are provisions for the development of botanical gardens in the country

Largest Botanical Garden of India: Indian Botanical Garden located in Shibpur, Howrah near Kolkata is the largest botanical garden in India.

(B) ZOOS AND ZOOLOGICAL PARKS

1. Under section 38H of Wildlife Protection Act, 1972, there is a provision for developing of the zoological parks under Central Zoo Authority of India.
2. Zoos are primarily the centers of facilities, where animals are confined within enclosures and displayed to the public, and in which they may also be bred. Such facilities include zoos, safari parks, animal theme parks, aviaries, butterfly zoos, and reptile centers, as well as wildlife sanctuaries and nature reserves where visitors are allowed.

(C) REINTRODUCTION

The reintroduction is a process in which if a species has dwindled substantially in its natural habitat, then those species are rescued through ex-situ conservation in any zoo or some other place, where captive breeding is done and after the increase in the population of the species under reference, then those species are reintroduced into the natural habitat. At the national level, several efforts are made in this direction.

Example, Gangetic Gharials were reintroduced in the rivers of Uttar Pradesh and Madhya Pradesh, where it became extinct.

PROTECTED AREA NETWORK IN INDIA

A network of 668 Protected Areas (PAs) has been established, extending over 1,61,221.57 sq. kms. (4.90% of total geographic area), comprising 102 National Parks, 515 Wildlife Sanctuaries, 47 Conservation Reserves and 4 Community Reserves. There are 4 categories of the Protected Areas viz, National Parks, Sanctuaries, Conservation Reserves and Community Reserves. The PAs are constituted and governed under the provisions of the **Wild Life (Protection) Act, 1972**. Implementation of this Act is further **complemented by other Acts** viz. **Indian Forest Act, 1927, Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986** and **Biological Diversity Act, 2002** and the **Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006**.

(A) SANCTUARY

It is an area which is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance. The Sanctuary is **declared for the purpose of protecting, propagating or developing wildlife or its environment. Certain rights of people** living inside the Sanctuary **could be permitted**.

Major wildlife Sanctuaries of India

Name	Information
1. Pakhal Wild Life Sanctuary	Established in 1952 is located in AP 50km away from Warangal city.
2. Pabitora Wild Life Sanctuary	A WLS located about 60km east of Guwahati in Assam, in the Morigaon district Declared sanctuary in 1971 to protect one-horned Rhinoceros
3. Bhagwan Mahawir Wild Life Sanctuary	Bhagwan Mahaveer Sanctuary and Mollem NP is located in the Western Ghats in Goa, 57km east of Panaji
4. Wild Ass Wild Life Sanctuary	Located in the Rann of Kutch Gujarat Only home to Wild Ass in India Located in the northeastern Goa

Name	Information
5. Neyyar Wild Life Sanctuary	Located in Kerala around the Agasthyamalai Peak
6. Parambikulam Wild Life Sanctuary	Located in the Coimbatore district of TN
7. Bhitarkanika Wild Life Sanctuary	Located in the Kendrapada district of Orissa, in the coastal region
8. Gahirmatha Turtle Wild Life Sanctuary	Located at the coast of Kendrapada district of Orissa Nesting ground of the Giant Olive Ridley Turtle A World Heritage Site
9. Calimere Wild Life Sanctuary	Situated near the Point Calimere (Kaveri Delta) in the Nagapattinam district of TN
10. Jaldapara Wild Life Sanctuary	Located at the foothills of Eastern Himalayas in the Jalpaiguri district of WB Main attraction Asiatic one- horned rhinoceros
11. Chandraprabha Wild Life Sanctuary	Located at the Varanasi, UP
12. Balpakram Wild Life Sanctuary	Located at the Garo Hills, Meghalaya

(B) NATIONAL PARK

It is an area having adequate ecological, faunal, floral, geomorphological, natural or zoological significance. The National Park is declared for the purpose of protecting, propagating or developing wildlife or its environment, like that of a Sanctuary.

*The **difference between a Sanctuary and a National Park** mainly lies in the vesting of rights of people living inside. **Unlike a Sanctuary,***

where certain rights can be allowed, in a National Park, no rights are allowed. No grazing of any livestock shall also be permitted inside a National Park while in a Sanctuary, the Chief Wildlife Warden may regulate, control or prohibit it. In addition, while any removal or exploitation of wildlife or forest produce from a Sanctuary requires the recommendation of the State Board for Wildlife, removal etc., from a National Park requires recommendation of the National Board for Wildlife.

Major National Parks of India	
Name	Information
1. Coringa National Park	<ul style="list-style-type: none"> It is located in the East Godavari district of AP near Kakinada Port The habitat is suitable for saltwater crocodile
2. Kanger Ghati National Park	<ul style="list-style-type: none"> Located in the Bastar district of Chhattisgarh Home to rare mouse deer
3. Gir National Park	<ul style="list-style-type: none"> Located in the southern part of Kathiawad Peninsula in the Gir and Girnar Hills region Famous for the Asiatic Lions

Name	Information
4. Marine National Park	<ul style="list-style-type: none"> Located in the Jamnagar district Declared as the first marine park of the country in 1982
5. Sultanpur National Park	<ul style="list-style-type: none"> Located in the Gurgaon district of Haryana , near to Delhi Known for migratory and local birds
6. Great Himalayan National Park	<ul style="list-style-type: none"> In the Kullu district of HP Main faunas : Musk- deer, leopard, flying squirrel, scrow, bharal
7. Salim Ali National Park	<ul style="list-style-type: none"> Located in the Valley of Kashmir, formerly known as the City Forest National Park
8. Bannerghatta National Park	<ul style="list-style-type: none"> Located in Karnataka near Bengaluru (22 km south) Famous for butterflies
9. Dachigam National Park	<ul style="list-style-type: none"> Located about 20 km to the east of Srinagar
10. Ranganthittu National Park	<ul style="list-style-type: none"> Habitat of musk deer, leopard, wild cat, numerous birds Located in the Mandya district of Karnataka, on the bank of the Kaveri
11. Eravikulam National Park	<ul style="list-style-type: none"> Established to protect the Nilgiri Tahr, an endangered species of the wild goat Located in the Idukki district of Kerala
12. Silent Valley National Park	<ul style="list-style-type: none"> Located in the Kundali hills of the Nilgiri Hills in the Palakkad district of Kerala
13. Fossil National Park	<ul style="list-style-type: none"> Located in the southeastern part of MP in the Mandla district
14. Madhav National Park	<ul style="list-style-type: none"> Located in the northern part of MP in the Shivpuri district
15. VanVihar National Park	<ul style="list-style-type: none"> Located at the heart of Bhopal city in MP
16. Keibul LamJao National Park	<ul style="list-style-type: none"> Located in the south – eastern region of the Loktak Lake, Manipur Home of the endangered Bro Entlard dear This is worlds only floating park.
17. Nandan Kanan National Park	<ul style="list-style-type: none"> Located near Bhubneshwar in Orissa Known for the rare white tigers
18. Desert National Park	<ul style="list-style-type: none"> Located in the Jaisalmer district of Rajasthan Funa- Chinkara, blackbuok, Great Indian Bustard
19. MG Marine National Park	<ul style="list-style-type: none"> Located at Wandoor on the Andaman Islands
20. Button Island National Park	<ul style="list-style-type: none"> There are North, Middle and South Button Island National Parks in the vicinity of Port Blair

(C) CONSERVATION RESERVES

It can be declared by the State Governments in any **area by the Government, particularly the areas adjacent to National Parks and Sanctuaries and those areas which link one Protected Area with another.** Such declaration should be made after having consultations with the local communities. Conservation Reserves are declared for the purpose of protecting landscapes, seascapes, flora and fauna and their habitat. **The rights of people living inside a Conservation Reserve are not affected.**

(D) COMMUNITY RESERVES

Community Reserves can be declared by the State Government **in any private or community land, not comprised within a National Park, Sanctuary or a Conservation Reserve, where an individual or a community has volunteered to conserve wildlife and its habitat.** Community Reserves are declared for the purpose of protecting fauna, flora and traditional or cultural conservation values and practices. As in the case of a Conservation Reserve, the rights of people living inside a Community Reserve are not affected.

(E) RESERVED FORESTS & PROTECTED FORESTS

- Declared by the state governments (unlike Wildlife Sanctuaries or National Parks)
- These are forested lands where human activity (like hunting, logging, grazing etc) may be permitted on a sustainable basis\
- The key difference between Reserved Forests and Protected Forests is that **in Reserved Forests explicit permission is required for such activities whereas in Protected Forests such activities are permitted unless explicitly prohibited.**

(F) BIOSPHERE RESERVE

BIOSPHERE RESERVE

Biosphere reserves are areas of terrestrial and coastal ecosystems promoting solutions to

reconcile the conservation of biodiversity with its sustainable use. They are internationally recognized, nominated by national governments and remain under sovereign jurisdiction of the states where they are located. Biosphere reserves serve in some ways as 'living laboratories' for testing out and demonstrating integrated management of land, water and biodiversity. Collectively, biosphere reserves form a world network: the World Network of Biosphere Reserves (WNBR). Within this network, exchanges of information, experience and personnel are facilitated. There are over 500 biosphere reserves in over 100 countries.

ORIGIN OF BIOSPHERE RESERVE CONCEPT

The origin of Biosphere Reserves goes back to the "Biosphere Conference" organized by UNESCO in 1968. This was the 1st intergovernmental conference examining how to reconcile the conservation and use of natural resources, thereby foreshadowing the presentday notion of sustainable development. This Conference resulted in the launching of the UNESCO "Man and the Biosphere" (MAB) Programme in 1970. One of the original MAB projects consisted in establishing a coordinated World Network of sites representing the main ecosystems of the planet in which genetic resources would be protected, and where research on ecosystems as well as monitoring and training work could be carried out. These sites were named as "Biosphere Reserves", in reference to the MAB programme itself.

FUNCTIONS OF BIOSPHERE RESERVES (BR)

Each biosphere reserve is intended to fulfil 3 basic functions, which are complementary and mutually reinforcing:

- **A conservation function** - to contribute to the conservation of landscapes, ecosystems, species and genetic variation;
- **A development function** - to foster economic and human development which is socioculturally and ecologically sustainable;

- **A logistic function-** to provide support for research, monitoring, education and information exchange related to local, national and global issues of conservation and development.

STRUCTURE OR ZONATION OF BR

Biosphere reserves are typically divided into three zones.

1. **Core areas (for conservation):** Dedicated to conservation, non-destructive research, low-impact uses like ecotourism and education.
2. **Buffer areas (for sustainable use):** These adjoin areas of core zone and are used for cooperative activities to protect core zone, basic and applied research, and education.
3. **Transition area or areas of cooperation (equitable sharing of benefits):** These are outer zones of buffer areas and have no boundaries. They include settlement agriculture fields and other activities of economic uses and are meant for equitable sharing of benefits.

The objective of dividing biosphere reserves into zones is to enable in-situ and ex-situ conservation, incentives for conservation and sustainable use, research and training, awareness and education, impact assessment, regulating access to genetic resources, access and transfer of technology, and provisions of financial resources.)

SIGNIFICANCE OF BR

1. Biosphere reserves aim to achieve integrated management of land, fresh and marine waters and living resources, by adopting bioregional planning schemes, based on integrating conservation of biological diversity into sustainable development; hence it reflects our commitment to work together as

good overseers and to pass on to future generations)

2. The zonation of BRs includes strictly protected core areas, typically surrounded by buffer zones where conservation is emphasized, but where people also live and work, and the whole is surrounded by a transition area, or area of cooperation, which promotes sustainable development.
3. Biosphere reserves serve as “**living laboratories**” for testing out and demonstrating integrated management of land, water and biodiversity)

BENEFITS OF BIOSPHERE RESERVES

The biosphere reserve concept can be used as a framework to guide and reinforce projects to enhance people's livelihoods and ensure environmental sustainability. UNESCO's recognition can serve to highlight and reward such individual efforts. The designation of a site as a biosphere reserve can raise awareness among local people, citizens and government authorities on environmental and development issues. It can help to attract additional funding from different sources. At the national level, biosphere reserves can serve as pilot sites or 'learning places' to explore and demonstrate approaches to conservation and sustainable development, providing lessons which can be applied elsewhere. In addition, they are a concrete means for countries to implement Agenda 21, the Convention on Biological Diversity (for example the Ecosystem Approach), many Millennium Development Goals (for example on environmental sustainability), and the UN Decade of Education for Sustainable Development. In the case of large natural areas which straddle national boundaries, transboundary biosphere reserves can be established jointly by the countries concerned, testifying to long-term cooperative efforts.

Biosphere Reserves of India

S.No	Name of the Biosphere Reserves and area in Km² given in parenthesis	Location of the Biosphere Reserve site in the State (s)/Union Territory
1	Nilgiri (5520)	Part of Wynad, Nagarhole, Bandipur and Madumalai, Nilambur, Silent Valley and Siruvani hills in Tamil Nadu, Kerala and Karnataka.
2	Nanda Devi (5860.69)	Part of Chamoli, Pithoragarh and Almora districts in Uttarakhand.
3	Nokrek (820)	Part of East, West and South Garo Hill districts in Meghalaya.
4	Manas (2837)	Part of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamrup and Darang districts in Assam.
5	Sunderbans (9630)	Part of delta of Ganges & Brahmaputra river system in West Bengal.
6	Gulf of Mannar (10500)	India part of Gulf of Mannar extending from Rameswaram island in the North to Kanyakumari in the South of Tamil Nadu.
7	Great Nicobar (885)	Southern most island of Andaman and Nicobar Islands.
8	Similipal (4374)	Part of Mayurbhanj district in Orissa.
9	Dibru-Saikhova (765)	Part of Dibrugarh and Tinsukia districts in Assam.
10	Dehang-Dibang (5111.5)	Part of Upper Siang, West Siang and Dibang Valley districts in Arunachal Pradesh.
11	Pachmarhi (4981.72) (Area extended on 30.7.2009)	Part of Betul, Hoshangabad and Chhindwara districts in Madhya Pradesh.
12	Khangchendzonga (2619.92)	Part of North and West districts in Sikkim.
13	Agasthyamalai (3500.36)	Part of Thirunelveli and Kanyakumari districts in Tamil Nadu and Thiruvanthapuram, Kollam and Pathanamthitta districts in Kerala.
14	Achanakmar- Amarkantak (3,835.51)	Part of Anuppur and Dindori districts of Madhya Pradesh and Bilaspur district of Chattisgarh.
15	Kachchh (12,454)	Part of Kachchh, Rajkot, Surendranagar and Patan districts in Gujarat.
16	Cold Desert (7,770)	Pin Valley National Park and surroundings; Chandratal & Sarchu; and Kibber Wildlife sanctuary in Himachal Pradesh.
17	Seshachalam (4755.997)	Seshachalam hill ranges in Eastern Ghats encompassing part of Chittoor and Kadapa districts in Andhra Pradesh.
18	Panna (2998.98)	Part of Panna and Chhattarpur districts in Madhya Pradesh

MAN AND THE BIOSPHERE PROGRAMME (MAB)

Launched in 1971, UNESCO's **Man and the Biosphere Programme (MAB)** is an Intergovernmental Scientific Programme that aims to establish a scientific basis for the improvement of relationships between people and their environments.

MAB's work engages fully with the international development agenda –specially with the Sustainable Development Goals and the Post 2015 Development Agenda– and addresses challenges linked to scientific, environmental, societal and development issues in diverse ecosystems; from mountain regions to marine, coastal and island areas; from tropical forests to drylands and urban areas. MAB combines

the natural and social sciences, economics and education to improve human livelihoods and the equitable sharing of benefits, and to safeguard natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate, and environmentally sustainable.

The MAB programme provides a unique platform for cooperation on research and development, capacity-building and networking to share information, knowledge and experience on three interlinked issues biodiversity loss, climate change and sustainable development. It contributes not only to better understanding of the environment, but also promotes greater involvement of science and scientists in policy development concerning the wise use of biological diversity.

To date, 651 biosphere reserves in 120 countries, including 15 transboundary sites, have been included in the World Network of Biosphere Reserves.

- Out of total 18 Biosphere reserves in India, 9 are part of the World Network of Biosphere Reserves
 - o Gulf of Mannar Biosphere Reserve
 - o Nanda Devi Biosphere Reserve
 - o Nilgiri Biosphere Reserve
 - o Nokrek National Park
 - o Pachmarhi Biosphere Reserve
 - o Simlipal National Park
 - o Sundarbans Biosphere Reserve
 - o Achanakmar-Amarkantak Biosphere Reserve
 - o Nicobar Islands

WORLD HERITAGE SITE

A **World Heritage Site** is a place (such as a building, city, complex, desert, forest, island, lake, monument, or mountain) that is listed by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as being of special cultural or physical significance.^[1] The list is maintained by the international World Heritage Programme administered by the UNESCO World Heritage Committee, composed of 21 UNESCO member states which are elected by the General Assembly.

The programme catalogues, names, and conserves sites of outstanding cultural or natural importance to the common heritage of humanity.

Until the end of 2004, there were six criteria for cultural heritage and four criteria for natural heritage. In 2005, this was modified so that there is only one set of ten criteria. Nominated sites must be of "outstanding universal value" and meet at least one of the ten criteria.

CULTURAL CRITERIA

- I. "represents a masterpiece of human creative genius and cultural significance"

- II. "exhibits an important interchange of human values, over a span of time, or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning, or landscape design"
- III. "to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared"
- IV. "is an outstanding example of a type of building, architectural, or technological ensemble or landscape which illustrates a significant stage in human history"
- V. "is an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture, or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change"
- VI. "is directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance"

NATURAL CRITERIA

- VII. "contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance"
- VIII. "is an outstanding example representing major stages of Earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features"
- IX. "is an outstanding example representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems, and communities of plants and animals"
- X. "contains the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation"

UNESCO RECOGNISES THE FOLLOWING BIOSPHERE RESERVES AS WORLD NATURAL HERITAGE SITES

- o Kaziranga National Park (1985)
- o Keoladeo National Park (1985)
- o Manas Wildlife Sanctuary (1985)
- o Nanda Devi and Valley of Flowers National Parks (1988)
- o Sundarbans National Park (1987)
- o Western Ghats (2012)
- o Great Himalayan National Park Conservation Area (2014)

What is the difference between a biosphere reserve and a natural World Heritage site?

A biosphere reserve is a representative ecological area with 3 mutually reinforcing functions: conservation, sustainable development and logistic support for scientific research and education. Collectively, all biosphere reserves form a World Network linked by exchanges of experience and knowledge. They are part of a UNESCO scientific programme, governed by a "soft law", the Statutory Framework. Natural World Heritage sites must be of outstanding universal value in accordance with the UNESCO Convention on the Protection of the World Cultural and Natural Heritage (1972). Efforts to enhance local development and to promote scientific understanding are means to ensure the protection of the natural World Heritage values. In some instances, a core area of a biosphere reserve can meet World Heritage criteria: the usually larger biosphere reserve can therefore serve as a complementary means to protect the integrity of the World Heritage site.

BIODIVERSITY HOTSPOTS

The concept of biodiversity hotspots was developed by the British ecologist Norman Mayers. The term 'hotspot' is used to define regions of high conservation priority with their biodiversity richness and high endemism and a higher threat. Biodiversity hotspots are the area with a large percentage of endemic species. *The biodiversity hotspots are*

demarcated on the basis of the following two criteria:

1. Contains least 0.5 per cent or 15000 of the world's 300,000 species of plants.
2. The region has lost 70 or more than 70 per cent of its primary vegetation.
3. In the case of marine hotspots, corals reefs, snails, lobsters and fish are taken into consideration.

Most of the hotspots are found in the tropical and subtropical areas where the temperature and humidity remain high throughout the year. Species and ecosystems diversity also varies with altitudes above the sea level and depth of oceans.

THE HOTTEST OF HOTSPOTS

Among the 35 hotspots of the world, some hotspots have relatively more endemism and are more threatened. To address these areas, the British environmentalist Norman Myers and others have posited a theory in the year 2000 that determines the status of the hottest of hotspots.

The key criteria of the hottest of hotspots are:

1. Number of endemic species of plants and vertebrates.
2. Area ratios for both endemic plants and vertebrates (species for 100 Sq.kms)
3. Habitat loss: The extent of primary vegetation as compared to the original spread.

List of the Hottest Spot

- | | |
|---|-------------------------------|
| (i) Madagascar | (ii) Philippines |
| (iii) Sunderland | (iv) Brazil's Atlantic forest |
| (v) Caribbean | (vi) Indo Burma |
| (vii) Western Ghats/Sri Lanka | |
| (viii) Eastern Arc Coastal Forest of Tanzania | |

Western Ghats of India is one of the 8 hottest hotspots of the world

Four regions that satisfy these criteria exist in India and are described below.

THE WESTERN GHATS AND SRI LANKA

About the region: The Western Ghats are a chain of hills that run along the western edge of peninsular

India. Their proximity to the ocean and throughorographic effect, they receive high rainfall. These regions have moist deciduous forest and rain forest. The region shows high species diversity as well as high levels of endemism. Nearly 77% of the amphibians and 62% of the reptile species found here are found nowhere else. Sri Lanka, which lies to the south of India, is also a country rich in species diversity. It has been connected with India through several past glaciation events by a land bridge almost 140km wide.

Biogeographical quirks exist with some taxa of Malayan origin occurring in Sri Lanka but absent in the Western Ghats. These include insects groups such as the zoraptera and plants such as those of the genus *Nepenthes*.

Biodiversity: There are over 6000 vascular plants belonging to over 2500 genera in this hotspot, of which over 3000 are endemic. Much of the world's spices such as black pepper and cardamom have their origins in the Western Ghats. The highest concentration of species in the Western Ghats is believed to be the Agasthyamalai Hills in the extreme south. The region also harbors over 450 bird species, about 140 mammalian species, 260 reptiles and 175 amphibians. Over 60% of the reptiles and amphibians are completely endemic to the hotspot. Remarkable as this diversity is, it is severely threatened today. The vegetation in this hotspot originally extended over 190,000 square kms. Today, its been reduced to just 43,000 sq. km. In Sri Lanka, only 1.5% of the original forest cover still remains.



The Lion tailed macaque is a flagship species of the Western Ghats

THE EASTERN HIMALAYAS

About the region: The Eastern Himalayas is the region encompassing Bhutan, northeastern India, and southern, central, and eastern Nepal. The region is geologically young and shows high altitudinal variation. Together, the Himalayan mountain system is the world's highest, and home to the world's highest peaks, which include Mount Everest and K2. To comprehend the enormous scale of this mountain range, consider that Aconcagua, in the Andes, at 6962 metres is the highest peak outside Asia, whereas the Himalayan system includes over 100 mountains exceeding 7200 metres. Some of the world's major river systems arise in the Himalayas, and their combined drainage basin is home to some 3 billion people (almost half of Earth's population) in 18 countries. The Himalayas have profoundly shaped the cultures of South Asia; many Himalayan peaks are sacred in Hinduism, Buddhism and Sikhism.

Geologically, the origin of the Himalayas is the impact of the Indian tectonic plate traveling northward at 15cm per year to impact the Eurasian continent, about 40-50 million years ago. The formation of the Himalayan arc resulted since the lighter rock of the seabeds of that time were easily uplifted into mountains. An often-cited fact used to illustrate this process is that the summit of Mount Everest is made of marine limestone.

Biodiversity: The Eastern Himalayan hotspot has nearly 163 globally threatened species including the One-horned Rhinoceros (*Rhinoceros unicornis*), the Wild Asian Water buffalo (*Bubalus bubalis* (Arnee)) and in all 45 mammals, 50 birds, 17 reptiles, 12 amphibians, 3 invertebrate and 36 plant species. The Relict Dragonfly (*Epiophlebia lailai*) is an endangered species found here with the only other species in the genus being found in Japan. The region is also home to the Himalayan Newt (*Tylototriton verrucosus*), the only salamander species found within Indian limits.^[26]

There are an estimated 10,000 species of plants in the Himalayas, of which one-third are endemic and found nowhere else in the world. Five families - Tetracentraceae, Hamamelidaceae, Circaesteraceae, Butomaceae and Stachyuraceae - are completely

endemic to this region. Many plant species are found even in the highest reaches of the Himalayan mountains. For example, a plant species *Ermaniahimalayensis* was found at an altitude of 6300 metres in northwestern Himalayas! A few threatened endemic bird species such as the Himalayan Quail, Cheer pheasant, Western tragopan are found here, along with some of Asia's largest and most endangered birds such as the Himalayan vulture and White-bellied heron.

The Saola, a bovine, is one of the world's rarest mammals. It was discovered in Vietnam only in 1992

The Himalayas are home to over 300 species of mammals, a dozen of which are endemic. Mammals like the Golden langur, The Himalayan tahr, the pygmy hog, Langurs, Asiatic wild dogs, sloth bears, Gaurs, Muntjac, Sambar, Snow leopard, Black bear, Blue sheep, Takin, the Gangetic dolphin, wild water buffalo, swamp deer call the Himalayan ranged their home. The only endemic genus in the hotspot is the Namadapha flying squirrel which is critically endangered and is described only from a single specimen from Namdapha National Park



The Indian Rhinoceros is one of the 45 species of globally threatened mammals found in the Eastern Himalayas.

INDO-BURMA

About the region: The Indo-Burma region encompasses several countries. It is spread out from Eastern Bangladesh to Malaysia and includes North-Eastern India south of Brahmaputra river, Myanmar, the southern part of China's Yunnan province, Lao People's Democratic Republic, Cambodia, Vietnam and Thailand. The Indo-Burma region is spread over 2 million sq. km of tropical Asia. Since this hotspot

is spread over such a large area and across several major landforms, there is a wide diversity of climate and habitat patterns in this region.

Biodiversity: Much of this region is still a wilderness, but has been deteriorating rapidly in the past few decades. In recent times, six species of large mammals have been discovered here: Large-antlered muntjac, Annamitemuntjac, Grey-shanked douc, Annamite striped rabbit, Leaf deer, and the Saola. This region is home to several primate species such as monkeys, langurs and gibbons with populations numbering only in the hundreds. Many of the species, especially some freshwater turtle species, are endemic. Almost 1,300 bird species exist in this region including the threatened white-eared night-heron, the grey-crowned crocias, and the orange-necked partridge. It is estimated that there are about 13,500 plant species in this hotspot, with over half of them endemic. Ginger, for example, is native to this region.

SUNDALAND

Sundaland is a region in South-East Asia that covers the western part of the Indo-Malayan archipelago. It includes Thailand, Malaysia, Singapore, Brunei and Indonesia. India is represented by the Nicobar Islands. The United Nations declared the islands a World Biosphere Reserve in 2013. The islands have a rich terrestrial and marine ecosystem that includes mangroves, coral reefs and sea grass beds. The marine biodiversity includes several species such as whales, dolphins, dugong, turtles, crocodiles, fishes, prawns, lobsters, corals and sea shells [29]. The primary threat to this biodiversity comes from over exploitation of marine resources. In addition, the forests on the island also need to be protected.

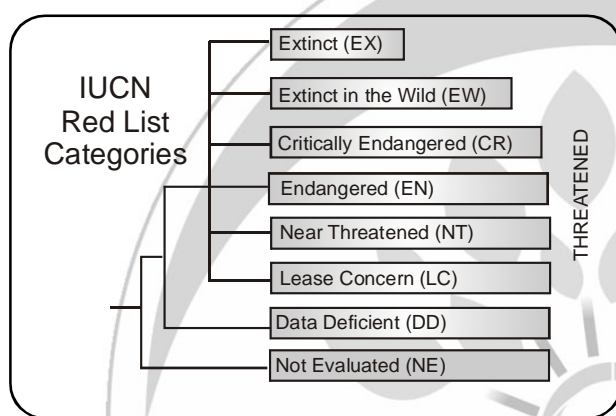
IUCN

IUCN, **International Union for Conservation of Nature**, helps the world find pragmatic solutions to our most pressing environment and development challenges. IUCN works on biodiversity, climate change, energy, human livelihoods and greening the world economy by supporting scientific research, managing field projects all over the world, and **bringing**

governments, NGOs, the UN and companies together to develop policy, laws and best practice. The IUCN is the “umbrella” organization to address the most pressing environmental and development challenges facing biodiversity and species.

IUCN RED LIST

The organisation publishes the **IUCN Red List**, compiling information from a network of conservation organizations to rate which species are most endangered.



THE CATEGORIES

- EXTINCT (EX)** : A taxon is Extinct when there is no reasonable doubt that the **last individual has died**. A taxon is presumed Extinct when exhaustive surveys have failed to record an individual.
- EXTINCT IN THE WILD (EW)** : A taxon is Extinct in the Wild when it is known **only to survive in cultivation**, in captivity or as a **naturalized population** (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and / or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
- CRITICALLY ENDANGERED (CR)**- A taxon is Critically Endangered when the best available evidence indicates that **it is facing an extremely high risk of extinction** in the wild.

- ENDANGERED (EN)** : A taxon is Endangered when the best available evidence indicates that **it is facing a very high risk of extinction in the wild**.
- VULNERABLE (VU)** : A taxon is Vulnerable when the best available evidence indicates that it is considerable to be **facing a high risk of extinction in the wild**.
- NEAR THREATENED (NT)** : A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but it is close to qualifying for or is likely to qualify for a threatened category in the near future.
- LEAST CONCERN (LC)** : A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

SOME IMPORTANT ENDANGERED SPECIES OF ANIMALS IN INDIA

- | | |
|------------------------------|---------------------|
| 1. Hangul/ Kashmir stag | 2. Red Panda |
| 3. Sloth Bear | |
| 4. Himalayan Brown Bear | 5. Indian Wild Dog |
| 6. Great Indian Bustard | 7. Wild Buffalo |
| 8. Asiatic Wild Ass | 9. One Horned Rhino |
| 10. Asian Elephant | 11. Wolf |
| 12. Golden Cat | 13. Clouded Leopard |
| 14. Snow Leopard | 15. Hoolock Gibbon |
| 16. Nilgiri Langur | |
| 17. Lion Tailed Macaque | 18. Musk Deer |
| 19. Black Necked Crane | |
| 20. Jerdon's Courser/ Civet | 21. Nilgiri Tahr |
| 22. Indian Rock Python | |
| 23. Common Indian Monitor | |
| 24. Tortoise Shell Turtle | |
| 25. Himalayan Monal Pheasant | |
| 26. Western Tragopan | 27. Likh Florican |
| 28. Great Pied Hornbill | 29. Mouse Deer |
| 30. Four Horned Antelope | |

EXTINCTION OF WILDLIFE

Evolution not only creates new species, but also eliminates some old ones. Extinction or elimination implies complete disappearance of a species from the Earth. Complete disappearance means when the last surviving member of a species dies. Of all the species existing on Earth, man is considered to be the most powerful.

TYPES OF EXTINCTION

There are three types of extinction of species: (a) Natural extinction, includes glaciation, climate change, volcanic eruption, diseases, epidemics, increase of competition, predators, shortage of food supply, and invasion of species. (b) Mass extinction which occurs in million of years, e.g. dinosaurs, mammoth, etc. (c) Anthropogenic extinction such as hunting, or capture and persecution. This is due to unlimited needs of man which deplete biodiversity severely in short period of time.

The main characteristics of species susceptible to extinction are:

- (i) Large body size viz. Bengal-tiger, lion and Indian elephant.
- (ii) Small size of population and low reproductive rate, blue-whale, giant-panda.
- (iii) Feeding at high trophic levels in food-chain, Bengal-tiger, White-bellied-eagle, etc.
- (iv) Fixed migratory routes and habitat: blue-whale, whooping-crane.
- (v) Localised and narrow range of distribution e.g., woodland-caribou and many island species.

The extinction may be caused by numerous

factors which may include: (i) destruction of natural habitat; (ii) hunting of wild animals for food, sport or recreation; (iii) forest fire; (iv) introduction of exotic species; (v) ignorance or lack of education, and (vi) apathy of the law enforcing agencies.

RED DATA BOOK

Red Data Book contains the list of the threatened species. It is a loose leaf volume of information on the status of many kinds of species. It is issued and continuously updated by the International Union for Conservation of Nature (IUCN) located at Morges, along the coast of Geneva Lake in the south-western part of Switzerland.

The Red Data Book was first issued in 1966 by IUCN. In this Book, information about endangered mammals and birds are more extensive than for other groups of animals and plants. Coverage is also given to less prominent organisms facing extinction.

The pink pages of the book include the critically endangered species. As the status of species changes, new pages are sent to the subscribers. With the passage of time, the number of pink pages continue to increase. Green pages are used for those species that were formerly endangered, but have now recovered to a point where they are no longer threatened.

According to the Red Data Book, about 20,000 species are endangered all over the world. About 11050 species of plants and animals are facing high risk of extinction, while 20,000 to 25,000 species are threatened. In India, about 195 species of flora are in the category of threatened.

Endangered Species	Region/State/Union Territory
1. (i) Andamane and Nicobari Shrew, (ii) Asian Elephant	(i) South Andaman and Nicobar (ii) Peninsular India
2. Bara-Singha (swamp-deer)	Marshy lands and swamps
3. Black-Baza (ii) Brown Bear	(i) Kerala, (ii) Himalayas: Himachal Pradesh, Jammu and Kashmir, Sikkim and Uttarakhand

4. Clouded leopard	Himalayan Foot-hills, Arunachal Pradesh, Assam, Manipur, Megha-laya, Mizoram, Nagaland, Sikkim, Tripura
5. Dhole (Asiatic/Indian Wild-Dog)	Different parts of India
6. ELd's Deer	Keibul-Lamjo (Manipur)
7. Ginges River Dolphin	Ganga River (India)
8. (i) Golden Langur, (ii)Great Teal	(i) Assam, North Eastern States of Indian (ii) Andaman Islands
9. Hangal (Kashmiri-Stag)	Jammu & Kashmir
10. Himalyan-Wolf	Jammu & Kashmir, Himachal Pradesh, Uttarakhand and Sikkim
11. Hog Deer	Northern India
12. Indian-wolf	South of Himalayas, Tarai Region of Northern Plains of India
13. Kondana Rat	Sinhagarh Plateau near Pune (Maharashtra)
14. Large Rock Rat (Elvira Rat)	Eastern Ghats (Tamil Nadu)
15. Lion-Tailed Macaque (Wondru)	Western Ghats (Karnataka and Kerala)
16. Malabar Civet	Kerala
17. Marbled Cat	Northern India
18. (i) Markhor, (ii) Marsh Mongoose	(i) Jammu & Kashmir (ii) Peninsular India, Rann of Kachchh
19. Namdhapa Flying Squirrel	Arunachal Pradesh
20. Nilgiri Langur	Kerala and Karnataka
21. Nilgiri Martin	Western Ghats (Karnataka and Kerala)
22. Oriental Small Clawed Otter	Karnataka, Kerala, Tamil Nadu
23. Pygmy-Hog	Terai Region
24. Red-Panda	Sikkim, Darjeeling, Eastern Himalayas
25. Rhinoceros	Assam
26. Swamp Deer	Rann of Kachchh (Gujarat), Sundarban (W.Bengal)
27. Wild-Ass (Khur)	Rann of Kachchh (Gujarat)
28. Wild Buffalo	Assam
29. White Bellied Musk-Deer	Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim
Endangered Birds	
30. Bengal Florican	West Bengal
31. Forest Owlet	Southern Madhya Pradesh and Maharashtra
32. Himalayan quail	Jammu & Kashmir, Himachal Pradesh and Uttarakhand
33. Jerdon's Courser	Northern parts of Andhra Pradesh

34. Pink Headed Duck	States of North East India
35. Siberian Crane (Winter migrant to India)	Keoladeo (Bharatpur-Rajasthan)
36. Sociable Lapwing (Winter migrant to India)	North-West India
37. Tiger	Peninsular India and the Great Plains of India
37. (i) White Bellied Heron,	(i) Assam'Andhra Pradesh, West Bengal (ii) Assam
(ii) Wild Buffalo	
Critically Endangered Reptiles	
38. Four Toed River Terrapin turtle or River Terrapin turtle	Fresh water rivers and lakes
39. Gharial	Clean rivers with sand banks
40. Hawkbill-turtle	Andaman and Nicobar Islands, Odisha and Tamil Nadu
41. Red Crowned Roofed Turtle or Bengal Roofed Turtle	Ganga River Basin
42. Sispara Day Gecko	Western Ghats, Nilgiri, and Kavali Sispara, Cochin
Critically Endangered Fish	
43. Ganges Shark	Ganga River
44. Knife -tooth Sawfish	Coastal Indian Ocean
45. Large -tooth Sawfish	Western Parts of the Arabian Sea
46. Long-comb Sawfish	Indo-Pacific Ocean

Vulnerable Species of India

Species	Region/State/Union Territory
1. Asian Black Bear (white- chested bear)	Himalayas
2. Barasingha (Swamp Deer)	Northern and Central India
3. Black-Buck	Thar Desert
4. Clouded Leopard	Himalayan Foot-Hills
5. Chiru (Tibetan Antelope)	Cold Desert (Himachal Pradesh and Ladakh)
6. Four Horned Antelope (Chausingha)	Swampy areas
7. Gaur/Mithun (Indian Bison)	Assam, States of North East India
8. Himalayan Tahr	Himalayas
9. Indian Wolf	Foot-Hills of Himalayas- extends to the south of the Himalayas

10. Marbled Cat	Northern India and North-East India
11. Nilgiri Marten	Western Ghats (Kerala and Karnataka)
12. Red Panda	Temperate Forests of the Himalayas
Marine Mammals	
13. Dugong (Sea Cow)	Indian Ocean
14. Fresh Water Dolphin (River Dolphin)	Ganga and its tributaries
15. Ganga River Dolphin	Ganga and Brahmaputra
List of Marsupials (pouched mammals)	Bandicoot, Dasyure, Kangaroo, Koala, Marsupial of Australia)
Tasmanian Devils,	Mole, Opossum, Phalangers, Tasmanian Wolf, Wallaby, Wombats
Extinct Marsupials (Australia)	Marsupial Wolf and Quagga

MIGRATION OF BIRDS

Migration of birds takes place throughout the year all over the world. Migration refers to the regular, recurrent and cyclical seasonal movement of birds from one place to another. The distance of migration ranged from short distance to thousands of kilometers. But at the end of the period, birds eventually return to the original place.

CAUSES AND CLASSIFICATION OF MIGRATION

The main causes of migration are: (i) to avoid extreme climate, (ii) in search of food and water, (iii) to have a better breeding condition, (iv) to avoid competition for food and to find safe nesting place.

The migratory birds of India may be classified under the following two categories:

Winter Birds

Black-Tailed Godwit, Blue-Throat, Common-Teal, Greater Eurasian Pigeon, Flamingo, Long Billed Pipit, Northern Shoveler, Rosy Pelican, Siberian Cranes, Spotted Redshank, Starling, Wood Sandpiper, Yellow Wagtail.

Summer Birds

Asian Koel, Black-Crowned Night Heron, Blue Cheeked Bee-Eater, Comb Duck, Cuckoos, Eurasian! Golden Oriole.

THREAT TO WILD ANIMALS

The rapid growth of human population, industrialization and urbanization have put great stress on habitat of wild animals. The changing patterns of land and agrarian practices are significantly reduce the habitats and corridors of wildlife. The habitat of wild animals in fact, is shrinking at a faster pace. Tourism and eco-tourism as well as forest fires have damaged and reduced the habitat of wild animals. These changes in land use are causing damage to life and property, injuries to wildlife, animals and injuries to people. In order to overcome these problems the following steps may be effective:

- (i) Create artificial barriers (physical and biological),
- (ii) guarding,
- (iii) relocation of human settlements, and
- (iv) waste management system that restrict wild animals access to refuse and garbage.

Major National Parks of India and their Endangered Species

National Park	State	Endangered Species
Annamalai	Tamil Nadu	Porcupine
Bandavgarh	Madhya Pradesh	White Tiger
Bandipur	Karnataka	Asian elephant
Bannerghata	Karnataka	Sambhar
Bhitarkanika	Odisha	Olive Ridley Turtle
Cimere	Tamil Nadu	Flamingo
Dachigam	Jammu & Kashmir	Hangul
Desert	Rajasthan	Black-Buck
Dudhwa	Uttar Pradesh	Tiger
Hemis	Jammu & Kashmir	Snow Leopard
Kaziranga	Assam	One-horned Rhino
Keibul Lam Jao	Manipur	Brown-antlered Deer
Keoladeo-Ghana	Rajasthan	Siberian Crane
Namdapha	Arunachal Pradesh	Clouded leopard
Nelaputta	Andhra Pradesh	Pelican
Neyyar	Kerala	Crocodile
Rajmala	Kerala	Nilgiri Tahr
Rann of Kachchh	Gujarat	Wild Ass
Silent Valley	Kerala	Lion-Tailed Macaque
Wayanad	Kerala	Indian Muntjac

ENDEMIC SPECIES

These are the species which are found only in some specific areas, usually isolated by natural or graphical barriers. Examples of such species are the Andaman-Teal, Nicobari-Pigeon, and Mithun of Arunachal Pradesh.

Endemism is the occurrence of a certain plant or animal species in a particular area alone, meaning they are confined only to a particular region or locality. It is an isolated distribution of a species. The idea of endemic distribution of plant was first enunciated by **de Candolle**.

Examples

- (a) Hard-ground Barasingha (a deer) found only in Kanha National Park of Madhya Pradesh in

central India is a good example of endemic species.

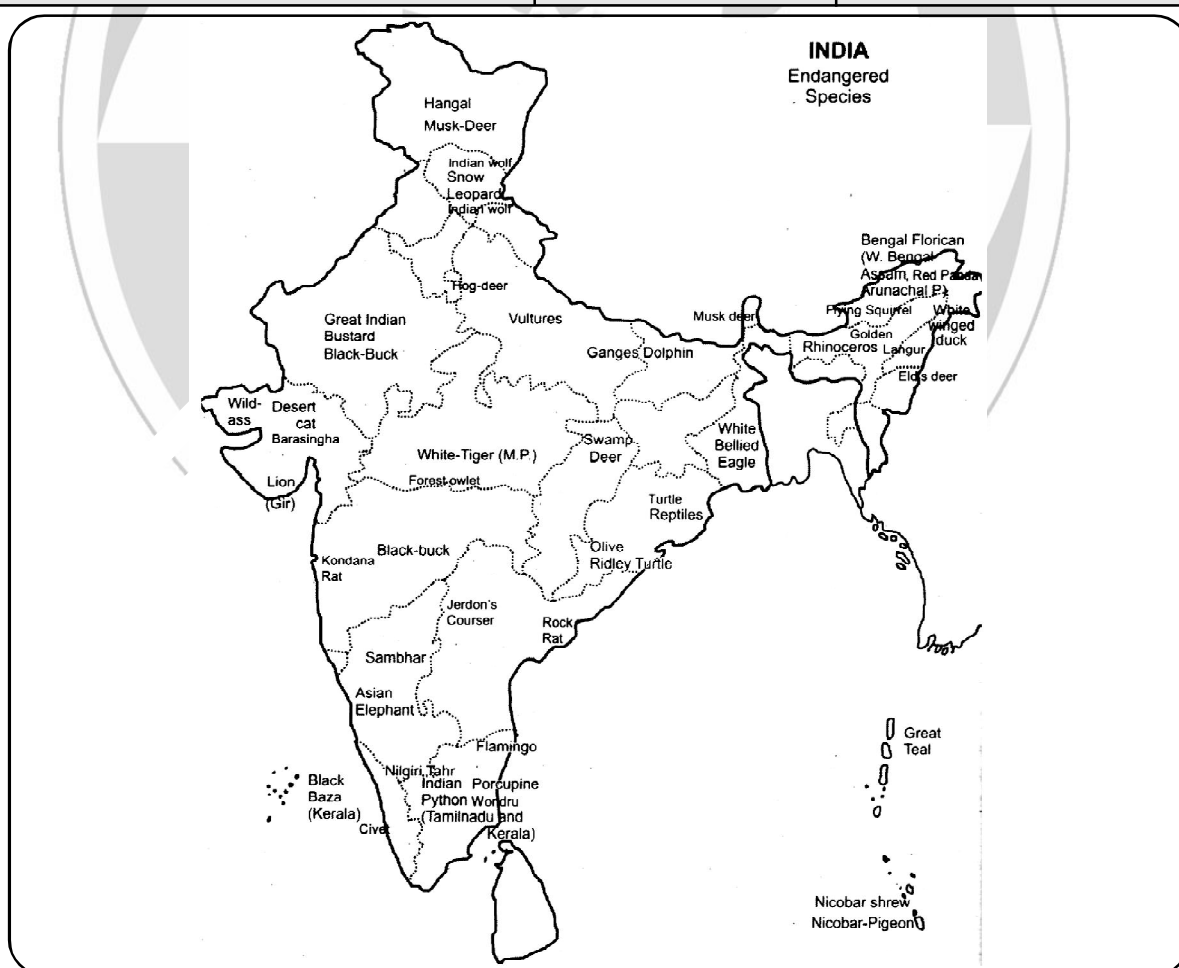
- (b) Lion-tailed macaque, Niligiri langur, Brown palm civet and Niligiri tahr are endemic fauna of importance in the Western Ghats.
- (c) Red Sanders (*Pterocarpus santalinus*) is endemic to the region of Andhra Pradesh and Tamil Nadu.

IUCN Red list of Indian Bird Species

(critically endangered category)

- (a) According to IUCN Red list of birds 15 species of birds are critically endangered as per the IUCN Red list version 2013.2.

S.No.	Category	Common Name	Scientific Name
1.	Migratory Wetland Species	Baer's Pochard	<i>Aythya baeri</i>
2.		Siberian Crane	<i>Grus leucogeanus</i>
3.		Spoon-billed Sandpiper	<i>Eurynorhynchus pygmeus</i>
4.	Non-migratory Wetland Species	White-bellied Heron	<i>Ardea insignis</i>
5.		Bengal Florican	<i>Houbaropsis bengalensis</i>
6.		Great Indian Bustard	<i>Ardeotis nigriceps</i>
7.		Jerdon's Courser	<i>Rhinoptilus bitorquatus</i>
8.		Social Lapwing	<i>Vanellus gregarious</i>
9.	Forest Species	Forest Owlet	<i>Heteroglaux blewitti</i>
10.		Indian Vulture	<i>Gyps indicus</i>
11.		Re-headed Vulture	<i>Sarcogyps calvus</i>
12.		Slender-billed Vulture	<i>Gyps tenuirostris</i>
13.		White-backed Vulture	<i>Gyps bengalensis</i>
14.	Parctically extinct	Himalyan Quil	<i>Ophrysia superciliosa</i>
15.		Pink-headed Duck	<i>Rhodonessa caryophyllacea</i>



Difference between National Park, Sanctuary and Biosphere reserve

National Park	Sanctuary	Biosphere reserve
Hitched to the habitat for particular wild animal species like tiger, lion, hangul, rhino etc.	Generally species-oriented as citrus, pitcher plant, Great Indian Bustard.	Not hitched to anyone, two or more species, but to the whole ecosystem i.e. totality of all forms of life i.e. ecosystem-oriented.
Boundaries circumscribed by legislation	Boundaries sacrosanct	Boundaries circumscribed by legislation
Except the buffer zone, no biotic interference	Limited biotic interference	Except the buffer zone, no biotic interference.
Tourism permissible	Tourism permissible	Tourism normally not permissible
Research and scientific management lacking	Research and scientific management lacking	Managed
So far no attention to gene pools and conservation	So far no attention	Attention given

ZOOLOGICAL SURVEY OF INDIA

The Zoological Survey of India, the only taxonomic organization in the country involved in the study of all kinds of animals from Protozoa to Mammalia, occurring in all possible habitats from deepest depth of the ocean to the peaks of Himalaya, was established on 1st July, 1916 to promote survey, exploration and research leading to the advancement in our knowledge of the various aspects of the exceptionally rich animal life.

- Once widespread in India, the species is now restricted to four general areas: northeastern India, central India, northwestern India, and southern India.

- In central India, highly fragmented elephant populations are found in the States of **Orissa, Jharkhan**, and the southern part of West Bengal, with some animals wandering into Chattisgarh.

- In north-western India, the species occurs in six fragmented populations at the foot of the Himalayas in Uttaranchal and Uttar Pradesh, ranging from **Katerniaghat Wildlife Sanctuary** in Bahraich Forest Division in the east, to the Yamuna River in the west.

- In southern India, elephants occur in the hilly terrain of the Western Ghats and in parts of the Eastern Ghats in the states of Karnataka, Kerala, Tamil Nadu, and, relatively recently, Andhra Pradesh.

- There are **eight main populations** in southern India, each fragmented from the others: northern Karnataka; the crestline of Karnataka – Western Ghats; Bhadra – Malnad : Brahmagiri–Nilgiris–Eastern Ghats; Nilambur–Silent Valley–Coimbatore; Anamalais–Parambikulam; Periyar–Srivillipur; and Agasthyamalais.

ANIMALS UNDER THREAT (WITH REFERENCE TO IUCN RED LIST)

INDIAN ELEPHANT

- Listed as **Endangered (EN)** in **IUCN Red list** because of a population size reduction inferred to be at least 50% over the last three generations, based on a reduction in its area of occupancy and the quality of its habitat.
- Trends in habitat loss/degradation and other threats including poaching, an overall population decline of at least 50% over the last three generations (estimated to be 60-75 years, based on a generation time estimated to be 20-25 years) seems realistic.

ASIATIC LION (VULNERABLE)

- A species population reduction of **approximately 30%** is suspected over the past two decades (approximately three Lion generations). The causes of this reduction (primarily indiscriminate killing in defense of lie and livestock, coupled with prey base depletion), are unlikely to have ceased.
- This suspected reduction is based on direct observation, appropriate indices of abundance; a decline in area of occupation, extent of occupation and habitat quality; and actual and potential levels of exploitation.

LION TAILED MACAQUE

- Listed as **Endangered** as the total number of mature individuals is less than 2500 with no subpopulation having more than 250 mature individuals.
- There are estimates of a continued decline of over 20% of the populations in the next approximately 25 years, along with hunting and continued loss of habitat.
- **The species is currently confined to fewer than ten sites**, with a total extent of occurrence of less than 20,000 km². There is a continuing decline in the quality of habitat, projected to continue into the future, which, if not addressed, will affect the long-term survival of some of the smaller populations, and could jeopardize the further recovery of the species.
- **Sport hunting** became common in the late 1800s and early 1900s. A reversal of government policies shortly thereafter protected many of the remaining populations.
- However, **poaching**, mainly for the **use of the horn in Traditional Chinese Medicine** has remained a constant and the success is precarious without continued and increased support for conservation efforts in India and Nepal.
- Poaching has led to decreases in several important populations, especially those in Chitwan, Manas, Laokhowa, and the Babai Valley area of Bardia.

LEOPARD (NEAR THREATENED)

- Leopards have a wide range and are locally common in some parts of India. However, they are

declining in large parts of their range **due to habitat loss and fragmentation, and hunting for trade and pest control.**

- These threats may be significant enough that the species could soon qualify for Vulnerable under criterion A.

NEELGAI (LEAST CONCERN)

- Numbers in India are estimated to **exceed 100,000** and their distribution covers a large part of the subcontinent. No decline has been reported and the species adapts well to agricultural areas.
- **Occur in arid areas, scrubs, dry deciduous forests and agricultural areas, but avoid dense forest and deserts.** They are both browsers and grazers.
- Considered an agricultural pest in parts of India and, although **legally protected** in India, legislation has been amended to **permit hunting when crop damage becomes excessive.**
- Hunting and habitat destruction have had an adverse effect in Pakistan and Bangladesh.

ROYAL BENGAL TIGER

- Listed as **Endangered**. Tiger range appears to have declined **by over 50% over the last three generations (21-27 years).**
- Comparing present Tiger population estimates (approximately 3,000) to those in the 1990s (5,000–7,000), despite the imprecision of the earlier estimate, also suggest a decline of at least 50% over this time period. The declining trend is likely to persist in the near future. The causes of population reduction may not be reversible in some areas.
- Asia is a densely populated and rapidly developing region, bringing huge pressures to bear on the large wild areas required for viable Tiger populations.
- **Conversion of forest land to agriculture and silviculture**, commercial logging, and human settlement are the main drivers of Tiger habitat loss. With their substantial dietary requirements, **Tigers require a healthy large ungulate prey base**, but these species are also under heavy human subsistence hunting pressure and competition from domestic livestock

- Tiger attacks on livestock and people can lead to intolerance of Tigers by neighbouring communities and presents an ongoing challenge to managers to build local support for Tiger conservation. In some areas there have been many human deaths.

WILD ASS

- Listed as **Endangered** as the **Asiatic Wild Ass** is estimated to have **declined by more than 50% over the past 16 years** based on direct observation and potential/actual levels of exploitation. The Asiatic Wild Ass is also estimated to continue declining by more than 50% over the next 10 to 21 years.
- Threats to the species include **loss of habitat as a result of** human settlement, cultivation, overgrazing, developmental activities, conflict with humans (crop depredation), competition for water, salt extraction, poaching for meat and competition with domestic livestock and, in certain parts of the range, war and civil unrest have had a detrimental effect on the species.
- Perhaps the greatest threat to the populations of Asiatic Wild Ass appears to be the potential for **catastrophic population declines due to poaching**.
- **Disease and/or drought are “stress events”** that are a constant threat to small, isolated Wild Ass populations, such as those in India, Iran, Israel, and Turkmenistan.
- Continued fragmentation and marginalisation of the smaller populations could result in similar extinctions.
- Small, isolated populations are demographically and genetically vulnerable. The Khur (*Equus hemionus khur*) in the **Little Rann of Kutch** is the subspecies subject to the most direct threat from increasing human activities.
- The ecology of the Wild Ass Sanctuary, for example, is threatened by a **canal building project– the Sardar Sarovar Project** of the Narmada Development Authority.
- There is growing competition for resources as an increasing number of livestock are grazed within the reserve during monsoon season.

- There is growing competition for resources as an increasing number of livestock are grazed within the reserve during monsoon season.

- At the same time, **salt mining**, the major economic industry for local people, has increased 140% since 1958. Such increased activity is particularly disruptive as the period for salt mining coincides with advanced stage of pregnancy in the Khur.

- The **increase in Khur population and its range expansion** into the human dominated landscapes has resulted in increased incidences of crop depredation. Agriculture has intensified with better irrigation facilities thus changing the land use patterns.

PANGOLIN OR SCALY ANTEATER

- The species is listed as **Near Threatened (NT)** because it is suspected to be in significant decline (though not at a rate of over 30% over the past and future ten years) primarily due to **hunting for food and medicine**.
- The future threats from hunting could increase even more, given the significant declines experienced by *Manis pentadactyla* and *Manis javanica*. Almost qualifies as **threatened under criterion A**.
- The species can adapt to modified habitats, although a large proportion of its range has high human population density. The principal factor affecting the species is exploitation, **largely for meat and for medicinal purposes**, with the scales thought to have aphrodisiac properties.
- Trade in *Manis crassicaudata* parts appears to be mostly at a subsistence or local level, with little international trade currently reported. Records of trade in this species outside of the confirmed range states are presumed to be misidentifications of other *Manis* species.

CHINKARALEAST CONCERN

- Although populations in Pakistan and Iran have been **greatly reduced by over hunting**, the Indian population was estimated at certainly > 100,000.

- Indiscriminate hunting has **adversely affected gazelles in Afghanistan, Iran and Pakistan** (hunted for meat and to a lesser degree for trophies)
- Habitat loss through overgrazing, conversion to agriculture and industrial development is also a factor.
- Listed as **Endangered** because its population size is estimated to number fewer than 2,500 mature individuals, there is **an observed continuing decline** in the number of mature individuals, and no subpopulations contains more than 250 mature individuals.
- Principal threats are habitat loss (mainly from domestic livestock and spread of invasive plants) and poaching.
- The general trends of decline even in the best managed. Tahr habits indicate that the total population of the species does not exceed 2000 at present and a conservative estimate would place the numbers within the 1,800-2,000 range.
- Currently, the only populations with more than 300 individuals are in **Eravikulam National Park and in the Grass Hills in Anamalai**.
- The most recent information from the **Nilgiri hills (Mukurti Wildlife Sanctuary)**, which previously had more than 300 tahr indicates that only between 75 and 100 individuals remain.
- Wattle (*Acacia mearnsii*) plantations and cattle apparently no longer threaten the Mukurti population, so their decline is probably due solely to illegal hunting. The status of the other smaller populations (many of which are less than 100 individuals), which are also subject to continued illegal hunting, can be considered precarious.
- Similar population decreases and threats to the species were reported in a survey in Kalakad Mundanthurai Tiger Reserve.

INDIAN FLYING FOX (LEAST CONCERN)

- Listed as **Least Concern** in view of its wide distribution, presumed large population, it occurs in a number of protected areas, has a tolerance of a degree of habitat modification, and because it is unlikely to be declining fast enough to qualify for listing in a more threatened category.
- There appear to be **no major threats** to this species as a whole. This species is assumed to

be locally threatened by cutting down of roosting trees because of road expansion or other purposes. The species is also hunted in several locations for meat and for medicine.

- New roosts have been observed, but the impact of roost disturbance and felling is not known, and the impact of hunting is also not understood.
- Surveys of local people at more than **30 roost sites** indicate a steady decline in roosting populations.
- In parts of its range, some deforestation seems to help this species as it has occupied areas of the **Western Ghats** once the vegetation was disturbed.

CRITICALLY ENDANGERED ANIMAL SPECIES OF INDIA

Critically endangered is the **highest risk category assigned by the IUCN (International Union for Conservation of Nature) Red List** to wild species. There are five quantitative criteria to determine whether a taxon is threatened. A taxon is critically endangered when the best available evidence indicates that it meets any of the following criteria.

1. Populations have declined or will decrease, by greater than 80% over the last 10 years or three generations.
2. Have a restricted geographical range.
3. Small population size of less than 250 individuals and continuing decline at 25% in 3 years or one generation.
4. Very small or restricted population of fewer than 50 mature individuals.
5. High probability of extinction in the wild.

BIRDS

1. **The Jerdon's Courser** (*Rhinoptilus bitorquatus*) is a nocturnal bird found only in the northern part of the state of Andhra Pradesh in peninsular India. It is a flagship species for the extremely threatened scrub jungle. The species was considered to be extinct until it was rediscovered in 1986 and the area of rediscovery was subsequently declared as the Sri Lankamalleswara Wildlife Sanctuary.

Habitat : Undisturbed scrub jungle with open areas.

Distribution : Jerdon's Courser is endemic to Andhra Pradesh. However, 19th century records do attribute its presence in the neighbouring areas of the state of Maharashtra.

2. **Forest Owlet (*Heteroglaux blewitti*)** had been lost for more than a century. It has an interesting history. When not sighted for decades, posters were printed and Salim Ali, the premier ornithologist of India made a public appeal to look for the bird. After 113 long years, the owlet was rediscovered in 1997 and reappeared on the list of Indian birds.

Habitat : Dry deciduous forest

Distribution : South Madhya Pradesh, in north-west Maharashtra and north-central Maharashtra.

3. **The White-bellied Heron (*Ardea insignis*)** is an extremely rare bird found in five or six sites in Assam and Arunachal Pradesh, one or two sites in Bhutan, and a few in Myanmar. It is inherently rare, and populations have never been known to be very high.

Habitat : Rivers with sand or gravel bars or inland lakes

Distribution : Bhutan and north-east India to the hills of Bangladesh and north Myanmar.

- 4-7. Out of nine species of vultures, the **population of three species – White-backed Vulture (*Gyps bengalensis*), Slender-billed vulture (*Gyps tenuirostris*) and Long-billed Vulture (*Gyps indicus*) has declined by 99%**. The Red-headed Vulture (*Sarcogyps calvus*) has also suffered a rapid decline in vulture populations has associated disease risks, including increased risk of spread of rabies and anthrax, besides adversely impacting the observance of last rites by the Parsis in the Towers of Silence.

Habitat : Forests, villages etc.

Distribution : Across India.

When vultures consume these carcasses, diclofenac enters their system, but they are

unable to metabolize. It Accumulation of diclofenac results in gout-like symptoms such as neck-dropping their territories by springing from the ground and flitting to and fro in the air.

Habitat : Grasslands occasionally interspersed with scrublands.

Distribution : Native to only 3 countries in the world – Cambodia, India and Nepal. In India, it occurs in 3 states, namely Uttar Pradesh, Assam and Arunachal Pradesh.

9. **The Himalayan Quail (*Ophrysia supercilliosa*)** is presumed to be extinct since no reliable records of sightings of this species exist after 1876. Intensive surveys are required as this species is hard to detect due to its reluctance to fly and its preference for dense grass habitats. Possible sighting of this species was reported in Nainital in 2003.

Habitat : Tall grass and scrub on steep hillsides.

Distribution : Western Himalayas

10. **The beautiful Pink-headed Duck (*Rhodonessa caryophyllacea*)** has not been conclusively recorded in India since 1949. Males have a deep pink head and neck from which the bird derives its name.

Habitat : Overgrown still-water pools, marshes and swamps in lowland forests and tall grasslands.

Distribution : Recorded in India, Bangladesh and Myanmar. Maximum records are from north-east India.

11. **The Sociable Lapwing (*Vanellus gregarious*)** is a winter migrant to India. This species has suffered a sudden and rapid population decline due to which it has been listed as critically endangered.

Habitat : Fallow fields and scrub desert.

Distribution : Kazakhstan, Russia, Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan, Afghanistan, Armenia, Georgia, Azerbaijan, Iran, Iraq, Saudi Arabia, Syria, Turkey, Egypt, India, Pakistan and Oman. In India, distribution is

restricted to the north and north-west of the country.

12. **The Spoon Billed Sandpiper (*Eurynorhynchus pygmeus*)** requires highly specialized breeding habitat, a constraint that has always kept its population scarce. India is home to some of the last existing wintering grounds of this species (estimated at only 150-320 breeding pairs worldwide).

Habitat : Coastal areas with sparse vegetation. No breeding records further inland than 7 km from the seashore.

Distribution : Has been recorded in West Bengal, Orissa, Kerala and Tamil Nadu.

13. **The Siberian Crane (*Grus leucogeranus*)** is a large, strikingly majestic migratory bird that breeds and winters in wetlands. They are known to winter at Keoladeo National Park, Rajasthan. However the last documented sighting of the bird was in 2002.

Habitat : Wetland areas

Distribution : Keoladeo National park in Rajasthan

MAMMALS

1. **The Pygmy Hog (*Porcula salania*)** is the world's smallest wild pig, with adults weighing only 8 kgs. This species constructs a nest throughout the year. It is one of the most useful indicators of the management status of grassland habitats. The grasslands where the pygmy hog resides are crucial for the survival of other endangered species such as Indian Rhinoceros (*Rhinoceros unicornis*), Swamp Deer (*Cervus duvacuceli*), Wild Buffalo (*Bubalus arnee*), Hispid hare (*Caprolagus hispidus*), Bengal Florican (*Eudpodotis bengalensis*) and Swamp Francolin (*Francolinus gularis*). In 1996, a captive-breeding programme of the species was initiated in Assam, and some hogs were reintroduced in Sonai Rupai area in 2009.

Pygmy hog-sucking Louse (*Haematopinus oliveri*), a parasite that feeds only on Pygmy

Hogs will also fall in the same risk category of critically endangered as its survival is linked to that of the host species.

Habitat : Relatively undisturbed, tall 'terai' grasslands.

Distribution : Formerly, the species was more widely distributed along the southern Himalayan foothills but now is restricted to only a single remnant population in Manas Wildlife Sanctuary and its buffer reserves.

- 2-4. **Andaman White toothed Shrew (*Crocidura andamanensis*)**, Jenkin's Andaman Spiny Shrew (*Crocidura jenkinsi*) and the Nicobar White-tailed Shrew (*Crocidura nicobarica*) are endemic to India. They are usually active by twilight or in the night and have specialized habitat requirements.

Habitat : Leaf litter and rock crevices.

Distribution : The Andaman White-toothed Shrew is found on Mount Harriet in the South Andaman Islands. The Jenkin's Andaman Spiny Shrew is found on Wright Myo and Mount Harriet in the South Andaman Islands. The Nicobar White-tailed Shrew (*Crocidura nicobarica*) is found in the southern tip of Greater Nicobar Island and is also recorded in the area extending from the Campbell Bay National Park to the Galathea River in the Andaman and Nicobar Islands.

5. **Kondana Rat (*Millardia kondana*)** is a nocturnal burrowing rodent that is found only in India. It is sometimes known to build nests.

Habitat : Tropical and subtropical dry deciduous forests and tropical scrub.

Distribution : Known only from the small Sinhagharh Plateau (about one km²), near Pune in Maharashtra. Reported from an elevation of about 1,270 m above mean sea level

6. **The Large Rock Rat or Elvira (*Cremnomys elvira*)** is a medium sized, nocturnal and burrowing rodent that is endemic to India.

Habitat : Tropical dry deciduous shrubland forest, seen in rocky areas.

Distribution : Known only from Eastern Ghats of Tamil Nadu. Recorded from an elevation of about 600 m above mean sea level.

7. **The Namdapha Flying Squirrel (*Biswamoyopterus biswasi*)** is a unique (the only one in its genus) flying squirrel that is restricted to a single valley in the Namdapha Tiger Reserve in Arunachal Pradesh.

Habitat : Tropical forest

Distribution : Western Ghats

Threats : Hunted for food.

8. **The Malbar Civet (*Viverra civettina*)** is considered to be one of the world's rarest mammals. It is endemic to India and was first reported from Travancore, Kerala. It is nocturnal in nature and found exclusively in the Western Ghats.

Habitat : Wooded plains and hill slopes of evergreen rainforests.

distribution : Western Ghats

- 9-10. **The Sumatran Rhinoceros (*Dicerorhinus sumatrensis*)** is the smallest and most endangered of the five rhinoceros species. It is now thought to be regionally extinct in India, though it once occurred in the foothills of the Himalayas and north-east India. The Javan Rhinoceros (*Rhinoceros sondaicus*) is also believed to be extinct in India and only a small number survive in Java and Vietnam.

Threats : The combined effect of dams, barrages, artificial embankments, change in river course, pollution, sand-mining, riparian agriculture and ingress of domestic and feral livestock caused irreversible loss of riverine habitat and consequently of the gharial.

2. **The Hawksbill Turtle (*Eretmochelys imbricata*)** is a heavily exploited species. The species is migratory in nature and nesting occurs in about 70 countries across the world. Maturation is slow and is estimated between 25-40 years.

Habitat : Nesting occurs on insular, sandy beaches.

distribution : In India they are found in the Andaman and Nicobar Islands, the coast of Tamil Nadu and Orissa.

Threats : Turtle shell trade, egg collection, slaughter for meat, oil pollution and destruction of nesting and foraging habitats.

3. **The Leatherback Turtle (*Dermochelys coriacea*)** is the largest of the living sea turtles, weighing as much as 900 kg. Adult leatherback turtles are excellent swimmers. They swim an average of 45-65 km a day, travel up to 15,000 km per year and can dive as deep as 1200 m. Jelly fish is their primary food. The population spikes of leatherbacks coincide with abundance of jellyfish, making them important top predators in marine environments.

Habitat : Tropical and subtropical oceans.

Distribution : Found in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans.

Threats : High Sea fishing operations, harvesting of eggs, destruction of nests by wild predators and causes them to migrate inland rather than towards the sea. Threats to habitat include construction, mining and plantation of exotics.

4. **Four-toed River Terrapin or River Terrapin (*Batagur baska*)** is a critically endangered turtle. The omnivorous diet of the river terrapin and other terrapin species makes them an essential part of the efficient clean-up systems of aquatic habitats.

Habitat : Freshwater rivers and lakes

Distribution : Bangladesh, Cambodia, India, Indonesia and Malaysia

REPTILES

1. **The Gharial (*Gavialis gangeticus*)** is the most uniquely evolved crocodilian in the world, a specialized, river-dwelling, fish-eater. The dire conditions of the gharial reflect the tragedy of our rivers, where we stand to not only lose other endangered taxa such as the Ganges River Dolphin (*Platanista gangetica*) but also the use of their waters for human consumption and other needs.

Habitat : Clean rivers with sand banks

Distribution : Only viable population in the National Chambai Sanctuary, spread across three states of Uttar Pradesh, Rajasthan and Madhya Pradesh in India. Small non-breeding populations exist in Son, Gandak, Hooghly and Ghagra rivers. Now extinct in Myanmar, Pakistan, Bhutan and Bangladesh.

Threats : Use of flesh for medicine purposes, demand for eggs, which are considered a delicacy.

5. **Red-crowned Roofed Turtle or the Bengal Roof Turtle (*Batagur Kachuga*)** is a critically endangered turtle mainly restcited to the Ganga bassin. Males have a bright red coloration during the breeding season.

Habitat : Deep, flowing rivers but with terrestrial nest sites.

Distribution : Found in India, Bangladesh and Nepal. In India it resides basically in the watershed of the Ganga.

Threats : Water development projects, water polluion, human disturbance and poaching for the illegal wildlife market.

6. **Sispara day gecko (*Cnemaspis sisparensis*)** is a large gecko which dwells ususally in forests; it is largely insectivorous and is active by night.

Distribution : Endemic to Western ghats, and foundin Sispara, Nigiris, Kavalai near Cochin.

Threats : Habitat conversion and modifications.

AMPHIBIANS

1. **The Animals Flying Frog (*Rhacophorus pseudomalabaricus*)**is confined to rainforest of southwestern Ghats and lives at elevations greater than 1000 m above mean sea level.

Distribution : It is found in Andiparai Shola, Pudothottam and the Anamalai Hills of Tamil Nadu and Kerala.

2. **The Gundia Indian Frog (*Indirana gundia*)** is found at an elevation of around 200 m above mean sea level.

Distribution : Known only to exist in Gundia, kemphoely in the Western Ghats region of Karnataka, South India.

3. **The Kerala Indian Frog (*Indirana phrynoderma*)** is found at elevations of around 500 m above mean sea level. Due to the presence of promient warts and tubercles of various sizes and glandular folds on its dorsal surface, it is commonl also known as the load-skineed frog.

Distribution : Anamalai Hills of Kerala and Tamil Nadu in the Western Ghats of south India.

4. **The Charles Darwin's Frog (*Ingerana charlesdarwini*)**is found at elevations below 500 m above mean sea level.

Distribution : This species is currently restricted to its type locality of Mount Harriet in South Andaman Island and Saddle Peak in the North Andaman Island, India.

5. **The Kottigehar Bubble-nest Frog (*Micrixalus kottigeharensis*)** is only known to occur in Kottigehar, Kadur in the Western Ghats of Karanataka state. Its distribution is restricted to elevation around 1000 m above mean sea level.

Distribution : This species is known to occur in Kottigehar, Kadur in the Hassan distrcit and Bhadra in Chikamangalur district, kamataka, India.

6. **The Amboli Bush Frog (*Pseudophilautus amboli*)** was discovered in 2009 in Amboli forest in the Western Ghats of Maharashtra. It is found at elevations ranging from 550 m to 940 m above mean sea level.

Distribution : this species has been recorded from its type locality of Amboli forest, Sawantwadi district; and Amba,m Kolhapur district of Maharashtra, Londa, Belgaum district, Jog Falls-Mavingundi, Shimoga district, Castle Rock, Uttara Kannada district, Kudremukh-Malleshwaram, Chikamangalur district of Karnataka.

7. **The Chalazodes Bubble-Nest Frog(*Raorchestes chalazodes*)** was described in 1876 based on single female specimen, from "Travancore", south India. There was no authentic report of this species since 1876 until its rediscovery in February 2011.

Distribution : All recorded specimens have been from the Western Ghats, India.

8. **The Small Bush Frog (*Raorchestes chotta*)** is the smallest bush frog found in India with a snout to vent legnth of 1.7 cm only. It was recently discovered in2009 in Ponmudi, Kerala inthe Western Ghats. It is found at elevation of 980 m above mean seal level.

Distribution : Known only to occur in abandoned plantations, its decline suggests that this species may not be tolerant to habitat changes or other unknown and less obvious threats.

9. **The Green-eyed Bush Frog (*Raorchestes chlorosomma*)** was discovered in 2009 from

Munnar in Idukki district of Kerala. This species has greyish green iris with irregular brown lines, bordered by a blue ring.

Distribution : Known only to occur in the type locality of Munnar, Idukki district, Kerala in the Western Ghats of South India.

10. **The Griet Bush Frog (*Raorchestes griet*)** is a small frog of snout to vent length ranging from 2-2.2 cm only. This species occurs at elevations between 600-1,800 m above mean sea level.

Distribution : Munnar, Devikulam and Vagaman in Idukki district of Kerala; and Anamalai Hills and Valparai in Coimbatore district of Tamil Nadu.

11. **The Kaikatti's Bush Frog (*Raorchestes kaikatti*)** was discovered in 2009 from Kaikatti Nelliampathi, in the Western Ghats of Kerala. This species occurs at an altitude of 1000 m above mean sea level.

Distribution : Known only to occur in the type locality Kaikatti-Nelliampathi in Palakkad district of Kerala, south India. It is believed to be endemic to the Nelliampathi Hills.

12. **The Mark's Bush Frog (*Raorchestes marki*)** was discovered in 2009 from Kaikatti-Nelliampathi, in the Western Ghats of Kerala. This species is found at an altitude of 1000 m above mean sea level. Mark's Bush frog is a small frog with snout to vent length ranging between 2.1-3 cm only.

Distribution : Currently known to occur only in Kaikatti-Nelliampathi in Palakkad district, Kerala, India.

13. **The Munnar Bush Frog (*Raorchestes munnarensis*)** was discovered in 2009 from Munnar in Idukki district of Kerala. It is found at an elevation of about 1,400 m above mean sea level.

Distribution : Currently known only to occur in two locations. Devikulam and Munnar, Idukki district, Kerala, south India.

14. **The Large Ponmudi Bush Frog (*Raorchestes ponmudi*)** is the largest bush frog of India with a snout to vent length up to 4 cm.

Distribution : Ponmudi and Agasthyamala Hills, Thiruvananthapuram district, Gavi, Pathanamthitta district, Vagaman, Idukki district, Wayanad Plateau, Kalpetta, Mananthavady and Sultan's

Battery, Wayanad district of Kerala; Anamalai Hills and Valparai, Coimbatore district, TN.

15. **The Resplendent Shrub Frog (*Raorchestes resplendens*)** was described in 2010 to occur in Anamudi Summit, Eravikulam National Park in the Western Ghats. The Resplendent Shrub Frog is a unique bush frog having brick red dorsal skin with black irregular furrows and prominent glands. This is the highest elevation bush frog reported from the Western Ghats from an altitude of 2,695 m above mean sea level.

Distribution : Currently known to occur in Anamudi Summit, Eravikulam National Park in the Idukki district Kerala.

16. **The Scared Grove Bush frog (*Raorchestes sanctisilvaticus*)** is known to occur only in the Kapildhara Falls, Madhya Pradesh.

Distribution : Known only to occur in Kapildhara Falls, Amarkantak, Jabalpur District, Madhya Pradesh.

17. **The Sushil's Bush Frog (*Raorchestes suhsili*)** was discovered in 2009 in Andiparai Shola, Valparai in the Western Ghats of Tamil Nadu. It is found at an altitude of around 600 m above mean sea level.

Distribution : Known only to occur in Valparai and its vicinity. Coimbatore district, Tamil Nadu

18. **The Shillong Bubble-nest Frog (*Raorchestes shillongensis*)** was discovered in Shillong, Meghalaya.

Distribution : Currently known to occur in the type locality of Malki Forest, Shillong, Meghalaya and in the habitat of this species.

19. **The Tiger toad (*Xanthophryne tigerinus*)** was discovered in 2009 from Amboli in the Western Ghats of Maharashtra state. It is found at an altitude of around 720 m above mean sea level.

Distribution : Found only in Amboli, Sindhudurg district, Maharashtra.

FISH

1. **The Pondicheery Shark (*Carcharhinus hemiodon*)** is a marine fish that occurs or occurred inshore on continental and insular shelves. This is a very rare and little-known species.

Distribution : Indian Ocean – from Gulf of Oman to Pakistan, India and possibly Sri Lanka. In scattered localities spanning India to New Guinea. Has also been recorded at the mouth of the Hoogly river.

2. **The Ganges Shark (*Glyphis gangeticus*)** is a uniquely adapted fish-eating shark that occurs in the turbid waters of the Ganga river and the Bay of Bengal. The small eye suggest that it is adapted to live in turbid water, while the slender teeth of the species suggest that it is primarily a fish-eater. It grows to a maximum length of 2.04 m.
3. **The Knife-tooth Sawfish (*Anoxypristis cuspidata*)** has a long narrow snout with balde-like teeth and a shark like body. It spends most of its time near the bottom of the sea sometimes going down to almost 40 m. It can grow up to 2.8 m in length and can withstand a range of salinity conditions. It is found in shallow coastal waters and estuaries.

Distribution : Widespread in western part of the Indo-Pacific region, including Red sea.

4. **Large-tooth Sawfish (*Pristis microdon*)** are heavy-bodied sawfish with a short but massive saw, and grow up to 3 m. in length It is seen seasonally and very occasionally caught along with the Bull Sharks and the Green Sawfish.

Distribution and habitat : Western part of the Indo-Pacific (East Africa to New Guinea, Phillippines and Vietnam to Australia). In India, it is known to enter the Mahanadi river, up to 64 km inland, and also is very common in the estuaries of the Ganga and Brahmaputra.

Threats : Same as that for the Knife-tooth Sawfish. There is also an increasing demand for sawfish in aquaria. Major habitat changes include construction of dams over rivers, siltation, pollution from industries and mining operations.

5. **Long-comb Sawfish or Narrow-snout Sawfish (*Pristis zijsron*)** grow up to 4.3 m in length and are heavily exploited by humans. This species was reported as frequently found in shallow water. It inhabits muddy bottoms and also enters estuaries. Its presence has been recorded inshore marine waters, and it goes down to depths of at least 40 m.

Distribution and Habitat : Indo-Pacific region including Australia, Cambodia, China, India, Indonesia and Malaysia.

SPIDERS

1. **The Rameshwaram Ornamented or Rameshwaram Parachute Spider (*Poecilotheria hanumavilasumica*)** was recently described in 2004, and is only found in India. It can give a nasty bite which usually is not fatal. The species is semi-social, which means they live partly in groups.

Habitat : Arboreal and tend to live in hiding. **Distribution :** Endemic to India. Spread along the coastal savannah, tropical lowland rain forests and montane forests upto an altitude of 2000 m above mean sea level.

2. **The Gooty Tarantula, Metallic Tarantula or Peacock Tarantula (*Poecilotheria metallica*)** is steel blue in colour with patches of intense orange-yellow, black and white. It was first found in Gooty (Ooty/Udagamandalam) in south India. In a burn pile during railway construction. Ever since the first picture of this spider was circulated globally, it has been in great demand in the illegal pet trade. A combination of small litter sizes and increased human pressure have made this species critically combination of small litter sizes and increased human pressure have made this species critically endangered.

Habitat : Wooden mountain area of south India. **Distribution :** Endemic to India.

CORALS

1. **Fire corals (*Millepora boschmai*)** are most closely related to jellyfish than corals. On contact, one usually feels a burning sensation similar to a sting from a jelly fish. The scientific name 'Millepora' is derived from the several small pores on the surfaces of these corals. They are usually yellowgreen or brown in colour.

Habitat : Millepora species are generally found in murky inshore waters and display a tolerance for siltation. They often are found in clear offshore sites. **Distribution :** Indonesia, Gulf of Chiriqui, Panama Pacific Province. Possibly extinct from Australia, India, Indonesia, Malaysia, Panama, Singapore and Thailand.

CONSERVATION OF IMPORTANT SPECIES OF ANIMALS IN INDIA

Name of Animal	Major Conservation Spot
Lion	Gir National Park, Gujrat
Tiger	Corbette National Park, Nanital Hazaribagh Sanctuary, Jharkhand Sunderbans Tiger Reserve, Bengal Nundathurai Sanctuary, Tamil Nadu Tandoba National Park, Maharashtra Ranthambore National Park, Rajasthan Kanha National Park, Madhya Pradesh Bandipur National Park, Mysore
Snow Leopard	Khangchendzonga National Park, Assam
Elephant	Manas Sanctuary, Assam
Rhino	Kaziranga National Park, Assam Corbette National Park, Nainital Palaman Sanctuary, Bihar Simlipal Sanctuary, Orissa Periyar Sanctuary, Kerala
Musk Deer	Kaziranga National Park, Assam
Black Buck	Manas Sanctuary, Assam Jaldapara Sanctuary, (Bengal)
Great Indian Bustard	Shikari Devi Sanctuary, Mandi, Himachal Pradesh
	Desert National Park, Rajasthan Kanha National Park, Madhya Pradesh
Kashmir Stag/Hangul	Desert National Park, Rajasthan
Indian Crocodile	Karera Sanctuary, Madhya Pradesh Great Indian Bustard Sanctuary, Maharashtra Dachgham Sanctuary, J and K
Wild Buffaloes	Bhitarkanika Sanctuary, Cuttack, Odissa
Pelican and Marine Bird	Nagarjun Sagar Sanctuary, Andhra Pradesh Srisailem/Ikshawaka Sanctuary, Andhra Pradesh Manas Sanctuary, Assam
Indian Bison	Sanctuary, Andhra Pradesh, Kolleru Bird sanctuary Calimere Sanctuary, Tamil Nadu
Lion Tailed Macaque	Bandipur Sanctuary, Karnataka Annamalai Sanctuary, Tamil Nadu
Wild Dog	Annamalai Sanctuary, Tamil Nadu
River Dolphin	Silent Valley National Park, Kerala Kanha National Park, Madhya Pradesh Vikramshila (Bihar) Another to be established in U.P. between Bijnaur and Narera

PROJECT ELEPHANT PROJECT ELEPHANT (PE)

Project Elephant: Project Elephant (PE) was launched by the Government of India in the year 1992 as a centrally sponsored scheme. It is implemented in 13 states where elephants are found in large numbers namely Andhra Pradesh, Arunachal Pradesh, Assam, Jharkhand, Karnataka, Kerala, Meghalaya, Nagaland, Odisha, Tamil Nadu, Uttaranchal, Uttar Pradesh and West Bengal. The project provides financial and technical support and works with objectives given below:

1. To protect elephants, their habitats and corridors
2. To address issues of human-animal conflict
3. Welfare of domesticated elephants

(Monitoring of Illegal Killing of Elephants (MIKE):

The programme or MIKE programme was started in 2003 in South Asia and was started in India in 2004 in 10 Elephant Reserves. It is a programme of CITES and was mandated by Cop. In India, the project elephant programme implements the MIKE Programme, with the idea of maintaining the elephant population, preventing illegal hunting, mapping the trends and checking the causes for changes by collection and monitoring of data obtained from the MIKE sites)

In India MIKE sites are:

1. Chirang Ripu (Assam)
2. Dhang Patki (Assam)
3. Eastern Dooars (WB)
4. Deomali (Arunachal Pradesh)
5. Garo Hills (Meghalaya)
6. Mayurbhanj (Odisha)
7. Mysore (Karnataka)
8. Nilgiri (TN)
9. Shivalik (Uttarakhand)
10. Wayanad (Kerala)

RHINO 2020

- (a) Systematic habitat destruction and persistent poaching and hunting has led to a drastic fall in

the numbers of the Great One-Horned India Rhino.

- (b) India- Rhino Vision (IRV) 2020 is an in-situ conservation programme launched in 2005, by the Assam Forest Department in collaboration with World Wildlife Fund, International Rhinoceros Foundation, Bodoland Territorial Council, and US Fish and Wildlife Service.
- (c) **Objective:** This programme is dedicated to saving the Great One-Horned Rhinoceros of India. IRV 2020 aims to increase the rhino population in Assam to 3000 by 2020.
- (d) **Present Status:** As of December 2012, there are only 3333 Great One-Horned Rhinos remaining in the world and seventy-five percent of these are found in Assam. Of these Kaziranga Park has 1700 rhinos.)

OPERATION BARASINGHA

Operation Barasingha Under the plan of operation Barasingha, the endangered and endemic hard-ground barasingha (*Rucervus duvauceli branderi*), was chosen for conservation, and under this programme, 16 deers were transported from the Kanha National Park to the Satpura Tiger Reserve, Madhya Pradesh, where the deer population is expected to grow and breed in a specially designed enclosure and increase in number and finally released into the natural forest.

CROCODILE PROJECT

- (i) Project Crocodile was initiated in in-situ conservation method with support from the United Nations Development Programme and Food and Agriculture Organization. The project included an intensive captive rearing and breeding programme intended to restock depleted Gharial habitats as the number of Gharials had come down to less than 200.
- (ii) Habitat alteration, prey depletion, direct mortality, pollution, siltation, and hunting are cited as main threats to survival.

NATIONAL GREEN TRIBUNAL (NGT)

This was set up on October 18, 2010 under the National Green Tribunal Act 2010 for effective and speedy

disposal of cases relating to environmental protection and conservation of forests and other natural resources

including enforcement of an) legal right relating to environment. It also provides relief and compensation for damages to persons and property arising out of environmental disputes and reduces the burden on higher courts.

BIODIVERSITY EXPRESS

It is also known as the Science Express Biodiversity Special (SEBS). This is a state-of-the-art mobile exhibition on a train with 16 AC coaches traveling across India. Started in 2007, this special train runs across the country, and creates awareness on biodiversity of India, climate change, pollution, energy conservation and other issues among students, teachers and common people. It is a journey of learning and spreads the message of biodiversity conservation. It is part of the Ministry of Environment and Forest Outreach Programme and involves the National Green Corps. The train halts at each station for 3-4 days for the convenience of the public.

GLOBAL ENVIRONMENT FACILITY (GEF)

The Global Environment Facility is a partnership for international cooperation where 183 countries work together with international institutions, civil society organizations and the private sector to address global environmental issues.

Since 1991, the CEF has provided \$12.5 billion in grants and leveraged \$58 billion in co-financing for 3690 projects in 165 developing countries. For 23 years, developed and developing countries alike have provided these funds to support activities related to biodiversity, climate change, international waters, land degradation, and chemicals and waste development projects and programs.

Through its Small Grants Programme (SGP) the GEF has made more than 20,000 grants to civil soc and community-base. organizations for a total of \$1 billion

BIOFIN

BIOFIN is a global multi Country project on Biodiversity Finance Initiative in a comprehensive manner. It provides tools and methodological framework in order to increase investments and generate finances for the management of ecosystems and biodiversity.

It is managed by U NDP Ecosystems and Biodiversity Programme, in partnership with the European Commission and the Government and Germany and the Switzerland,

Bhimli Geo-Heritage Site

The Geological Survey of India (GSI) has declared the red sand dunes in coastal Andhra Pradesh, near Kalinga of Bhimili beach road as a "Geo-Heritages sites of India")

New Tiger Reserve Parks

Rajaji National Park (48th Tiger Reserve) in Uttarakhand has been declared a Tiger Resent National Tiger Conservation Authority (NTCA) on April 21, 2015)

Objective Questions

1. Which of the following are correct regarding vultures in India?
 - (i) Maloxicam is a substitute for diclofenac
 - (ii) Diclofenac is an anti-inflammatory medicine
 - (iii) Vultures are endangered species in IUCN Red List
 - (iv) Vulture restaurants were started in maharashtra
 - (a) i, ii and iv are correct
 - (b) i, ii and iii are correct
 - (c) ii, iii and iv are correct
 - (d) i, ii, iii and iv are correct
2. Which of the following statements are correct pertaining to the Alien Invasive Species?
 - (i) Giant African snail is an invasive alien animal species damaging native ecosystem in Kerala.
 - (ii) Forest invasive species cell was established in Dehradun to control forest invasive species.
 - (iii) "Tilapia" introduced in Vaigai reservoir in Tamil Nadu effected the indigenous fish.
 - (iv) Lantana camera is a native weed plant of American tropics and is one of the worst invasive species.
 - (a) i, ii and iv are correct
 - (b) ii, iii and iv are correct
 - (c) ii, iii and iv are correct
 - (d) i, ii, iii and iv are correct
3. Which of the following statements are correct related to vultures in India?
 - (i) There are 4 vultures of India in the recent list of 15 critically endangered species list of Birds of IUCN.
 - (ii) Indian government banned diclofenac
 - (iii) Conservation Breeding Programme was taken up in Rajasthan and Gujarat for development of vultures.
 - (iv) There are nine species of vultures are there in India,
 - (a) i, iii and iv are correct
 - (b) i, ii and iii are correct
 - (c) i, ii and iv are correct
 - (d) All are correct
4. Which of the following are correct regarding Jelly fish lake found in Gujarat?
 - (i) A jelly fish lake was found recently in Arambada town.
 - (ii) It is called "upside down Jelly fish".
 - (iii) Bio-indicator of sulphates.
 - (iv) It is in symbiotic relation with the photosynthetic algae.
 - (a) i, ii, iii correct
 - (b) i, ii, iv correct
 - (c) i, iii, iv correct
 - (d) All are correct
5. Which of the following statements are correct related to B-Life?
 - (i) A major biodiversity initiative launched on international day for BD, 2014.
 - (ii) EU to fund for new initiatives to check BD loss.
 - (iii) Focus on least developed countries.
 - (iv) It include Wildlife Crisis Window (WCAX⁷) to control illegal trade of endangered species.
 - (a) i, ii, iii correct
 - (b) ii, iii, iv correct
 - (c) i, iii, iv correct
 - (d) All are correct
6. Find out the correct statement^(A) regarding Pashmina goat :
 - (i) The Changthangi or Pashmina goat (*Capra hircus*) is endemic only to the Ladakh region and is not found anywhere else.
 - (ii) "Noori" is the world's first cloned Pashmina goat.
 - (iii) Noori was developed in shere — Kashmir University of agricultural sciences and technology

- (iv) It is raised for meat and cashmere wool, which is known as Pashmina after weaving
- (a) i, ii and iii are correct
(b) ii, iii and iv are correct
(c) ii Only
(d) All are correct
7. Regarding Amur Falcons (*Falco amurensis*) the following statement(s) are correct:
- (i) The Amur Falcons migrate from Siberia to India for breeding.
(ii) Amur Falcons are capable of flying at very high speeds and change directions rapidly,
(iii) During the course of migration in Nagaland these birds were trapped earlier for food.
(iv) It is a small raptor
- (a) i, ii and iii are correct
(b) ii, iii and iv are correct
(c) i, ii and iv are correct
(d) All are correct
8. Which one of the following site is a Ramsar Wetland in India and also a UNESCO Heritage Site?
- (i) Keoladeo National Park
(ii) Hokera Wetland
(iii) Bhitarkanika
(iv) Kanjli Wetland
- (a) i Only
(b) ii and iii Only
(c) iii Only
(d) No one is correct
9. Which of the following have coral reefs?
(UPSC-2014)
- (i) Andaman and Nicobar Islands
(ii) Gulf of Kutch
(iii) Gulf of Mannar
(iv) Sunderbans
- Select the correct answer using the code given below :
- (a) i, ii and iii only
(b) ii and iv only
(c) i and iii only
(d) i, ii, iii and iv
- (a) Biosphere reserve
(b) Botanical gardens
(c) National parks
(d) Wildlife sanctuaries
11. Other than poaching, what are the possible reasons for the decline in the population of Ganges River Dolphins? (UPSC -2014)
- (i) Construction of dams and barrages on rivers
(ii) Increase in the population of crocodiles in rivers
(iii) Getting trapped in fishing nets accidentally
(iv) Use of synthetic fertilizers and other agricultural chemicals in crop-fields in the vicinity of rivers
- Select the correct answer using the code given below.
- (a) (i) and (ii) only
(b) (ii) and (iii) only
(c) (i),(iii) and (iv) only
(d) (i), (ii), (iii) and (iv)
12. With reference to 'Global Environment Facility', which of the following statements is/are correct? (UPSC-2014)
- (a) It serves as financial mechanism for 'conservation on Biological Diversity' and 'United Nations Framework Convention on Climate Change'.
(b) It undertakes scientific research on environmental issues at global level
(c) It is an agency under OECD to facilitate the transfer of technology and funds to underdeveloped countries with specific aim to protect their environment.
(d) Both (a) and (b)
13. Consider the following statements :
(UPSC-2014)
- (i) Animal Welfare Board of India is established under the Environment (Protection) Act, 1986.
(ii) National Tiger Conservation Authority is a statutory body.
(iii) National Ganga River Basin Authority is chaired by the Prime Minister.

Which of the statements given above is/are correct?

- (a) (i) only (b) (ii) and (iii) only
(c) (ii) only (d) (i), (ii) and (iii)

- 14.** If you walk through countryside, you are likely to see some birds walking alongside the cattle to see the insects, disturbed by their movement through grasses. Which of the following is/are such bird/ birds? (UPSC-2014)

- (i) Painted Stork (ii) Common Myna
(iii) Black-necked Crane

Select the correct answer using the code given below.

- (a) (i) and (ii) (b) (ii) only
(c) (ii) and (iii) (d) (iii) only

- 15.** In which of the following States is lion-tailed macaque found in its natural habitat? (UPSC-2014)

- (i) Tamil Nadu (ii) Kerala
(iii) Karnataka (iv) Andhra Pradesh

Select the correct answer using the codes given below.

- (a) (i), (ii) and (iii) only (b) (ii) only
(c) (i), (iii) and (iv) only (d) (i), (ii), (iii) and (iv)

- 16.** Consider the following : (UPSC-2013)

- (i) Star tortoise (ii) Monitor lizard
(iii) Pygmy hog (iv) Spider monkey

Which of the above are found in India?

- (a) (i), (ii) and (iii) only (b) (ii) and (iii) only
(c) (i) and (iv) only (d) (i), (ii), (iii) and (iv)

- 17.** Consider the following animals: (UPSC-2013)

- (i) Sea cow (ii) Sea horse
(iii) Sea lion

Which of the above is/are mammal/mammals?

- (a) (i) only (b) (i) and (iii) only
(c) (ii) and (iii) only (d) (i), (ii) and (iii)

- 18.** Consider the following fauna of India:

(UPSC-2013)

- (i) Gharial (ii) Leatherback turtle

(iii) Swamp deer

Which of the above is/are endangered?

- (a) (i) and (ii) only (b) (iii) only
(c) (i), (ii) and (iii) (d) None of these

- 19.** In which one among the following categories of protected areas in India are local people are allowed to collect and use the biomass? (UPSC-2012)

- (a) Biosphere Reserves
(b) National Parks
(c) Wetlands declared under Ramsar Convention
(d) Wildlife Sanctuary

- 20.** Which one of the following groups of animals belongs to the category of endangered species?

- (a) Great Indian Bustard, Musk Deer, Red Panda and Asiatic Wild Ass
(b) Kashmir Stag, Cheetai, Blue Bull and Great Indian Bustard
(c) Snow Leopard, Swamp Deer, Rhesus Monkey and Saras (Crane)
(d) Lion-tailed Macaque, Blue Bull, Hanuman Langur and Cheetal

- 21.** What is the difference between the antelopes Oryx and Chiru? (UPSC-2012)

- (a) Oryx is adapted to live in hot and arid areas whereas Chiru is adapted to live in steppes and semi desert areas of cold high mountains.
(b) Oryx is poached for its antlers whereas Chiru is poached for its musk
(c) Oryx exists in western India only whereas Chiru exists in north east India only
(d) None of the statements (a), (b) and (c) given above is correct

- 22.** Which of the following can be threats to the biodiversity of a geographical area? (UPSC-2012)

- (i) Global warming
(ii) Fragmentation of habitat

- (iii) Invasion of alien species
- (iv) Promotion of vegetarianism

Choose the correct answer :

- (a) i, ii & iii (b) ii & iii
- (c) i n& iv (d) i, ii, iii and iv

23. Consider the following :

- (i) Black-necked crane (ii) Cheetah
- (iii) Flying squirrel (iv) Snow leopard

Which of the above are naturally found in India?

- (a) i, ii, and iii only (b) i, iii and iv only
- (c) ii and iv only (d) i, ii, iii and iv

24. How does national Biodiversity Authority (NBA) help in protecting the Indian agriculture?

(UPSC-2012)

- (i) NBA checks the bio-piracy and protects the indigenous and traditional genetic resources.
- (ii) NBA directly monitors and supervises the scientific research on genetic modification of crop plants.
- (iii) Application for Intellectual Property Rights related to resources (genetic/biological) cannot be made without approval of NBA.

Which of the statements given a above is/are correct?

- (a) i only (b) ii and iii only
- (c) i and iii only (d) i, ii and iii

25. Which one of the following is not a site for in-situ method of conservation of flora?

(UPSC-2011)

- (a) Biosphere Reserve (b) Botanical Garden
- (c) National park (d) Wildlife Sanctuary

26. Which of the following is NOT responsible for increase in the biodiversity of an ecosystem?

(UPPSC 2015)

- (a) Productivity of ecosystem
- (b) Intermediate-disturbance
- (c) Age of ecosystem
- (d) Less number of tropic level

27. Which of the following has been identified as a 'biodiversity hot-spot' in India? (UPPSC 2015)

- (a) Sundarban (b) Western ghats
- (c) Manas (d) Cherapunji

28. Which one of the following has been recognized as a Megadiverse Country? (UPPSC 2015)

- (a) New Zealand (b) Australia
- (c) Nepal (d) Austria

29. Which is a biodiversity rich place in India? (UPPSC 2014)

- (a) Western Ghats (b) Eastern Ghats
- (c) Thar Desert (d) Bay of Bengal

30. Which of the following is not correctly matched (UPPSC 2014)

- (a) Rajaji National Park-Elephant
- (b) Periyar National Park-Hangul
- (c) Manas National Park-Elephant
- (d) Dudhwa National Park-Tiger

31. The Government of India enacted the Wild Life (Protection) Act 1972 with the objective of (HCS 2014)

- (a) Effectively protecting the protected wildlife of this country and to control smuggling and to legalize trade in wildlife and its derivatives
- (b) Effectively protecting the wildlife to move from one place to another into inhabited places
- (c) Effectively protecting the wildlife of this country and to control poaching, smuggling and illegal trade in wildlife and its derivatives
- (d) None of the above

32. Endangered species are listed in

- (a) Dead Stock Book (b) Red Data Book
- (c) Live Stock Book (d) None of the above

33. Which one of the following is an important strategy for conservation of biodiversity?

- (a) Biosphere Reserve (b) Botanical Garden
- (c) National Parks (d) Wildlife Sanctuaries

34. The maximum biodiversity is found in
 (a) Tropical rain forest (b) Temperate forests
 (c) Coniferous forests (d) Arctic forests
35. Flamingo City, which was recently in news, is located near which historical city?
 (a) Dholavira (b) Bhuj
 (c) Sriranga Patnam (d) Konark
36. Consider the following statements regarding the environment-related Awards :
 (i) Indira Gandhi Priyadarshini Award is given in the field of afforestation/wasteland development every year.
 (ii) Pitamber Pant Environmental Fellowship Award is given in the field of research related to environmental science.
 (iii) Amrita Devi Bishnoi Award is given in the field of protection of wildlife.
 Which of the above statement(s) is/are correct?
 (a) i and ii only (b) ii and iii only
 (c) i and iii only (d) All are correct
37. Which one among the following is an ape naturally found in India?
 (a) Chimpanzee (b) Hoolak Gibbon
 (c) Gorilla (d) Orangutan
38. Consider the following :
 1. Flying squirrel
 2. Porcupine
 3. Barking deer
 Which of the above is/are naturally found in India?
 (a) 1 and 2 only (b) 2 and 3 only
 (c) 3 only (d) 1, 2 and 3
39. In the context of ecology and environment, what does the Red Data Book pertain to?
 (a) Details of harmful levels of various pollutants
 (b) A complete list of all endangered plants and animals
 (c) A description of the consequences of nuclear holocaust
 (d) A description of the sociological and psychological consequence of genetically modified plants and animals
40. What is present expansion of WWF
 (a) World War Fund for nature
 (b) World Wide Forestry Fund
 (c) World Wide Fund for Nature
 (d) World Wild life Fund for Nature.
41. A hot spot in India is
 (a) Tropical Andes
 (b) Madagascar Himalayas
 (c) Western Himalayas
 (d) Mesoamerica.
42. All the following are included under in situ conservation except
 (a) Biosphere reserve (b) Sanctuary
 (c) National Park (d) Botanical Gardens
43. Largest tiger population occurs in
 (a) Kanha National Park
 (b) Corbett National Park
 (c) Sunderbans National Park
 (d) Ranthambor National Park
44. Which one of the following has maximum genetic diversity in India
 (a) Tea (b) Teak
 (c) Wheat (d) Mango.
45. A plant endemic to India is
 (a) Banyan (b) Ginkgo
 (c) Sequoia (d) Triticum
46. Establishment of National Parks and sanctuaries is a strategy for
 (a) Conservation of wildlife
 (b) Studying wildlife biology
 (c) Creating awareness about wildlife
 (d) Preventing wild animals entering villages.
47. Indian share in global species diversity is about
 (a) 8 % (b) 6%
 (c) 4% (d) 2%

48. Conservation of organisms in natural habitat is called
- Ex situ conservation
 - In situ conservation
 - Both (a) and (b)
 - None of the above.
49. Which one is famous for hosting thousands of migratory birds coming from Siberia every winter
- kanha National Park, Balaghat
 - Kaziranga National Park, Assam
 - Corbett National Park, Nainital, Uttarakhand
 - Keoladev National Park, Bharatpur, Rajasthan
50. Hot spots of biodiversity means
- Areas of Earth that contain many endemic species
 - Species serves as proxy for entire Community in particular areas
 - Species in particular niche/area
 - Species diversity at particular area.
51. Indian Rhinoceros is a natural inhabitant of which of the Indian states
- Himachal Pradesh
 - Uttar Pradesh
 - Assam
 - Uttarakhand
52. Which of the following is included in those species which are likely to become extinct
- Endangered species
 - Critically endangered species
 - Vulnerable species
 - All the above

ANSWERS

1. (a)	10. (a)	19. (b)	28. (b)	37. (b)	46. (a)
2. (d)	11. (c)	20. (a)	29. (a)	38. (d)	47. (a)
3. (d)	12. (a)	21. (a)	30. (b)	39. (b)	48. (b)
4. (b)	13. (b)	22. (a)	31. (c)	40. (c)	49. (d)
5. (d)	14. (b)	23. (b)	32. (b)	41. (c)	50. (a)
6. (b)	15. (a)	24. (c)	33. (c)	42. (d)	51. (c)
7. (c)	16. (a)	25. (b)	34. (a)	43. (c)	52. (d)
8. (a)	17. (b)	26. (b)	35. (b)	44. (d)	
9. (a)	18. (a)	27. (b)	36. (b)	45. (a)	

HINTS



1. (a) Vultures are critically endangered species—Maloxicam, a chemical substitute of Diclofenac with less harmful effects—There are 15 bird species included in the critically endangered list of IUCN and out of which 4 vulture species are there which are falling under scavenger birds category.
2. (d) Lantana camara is a shrub and survives under very hard conditions and spread very fast and it is a big problem in the country to eradicate and millions of rupees spent annually for its eradication—Indian council for Forest Research and Education (ICFRE) established Forest Invasive cell in Forest Research Institute (FRI), which is the apex institute for forest research.
4. (b) It is the indicator of phosphates.
6. (b) The Pashmina goat is a breed of goat from Tibet and neighbouring areas Ladakhi changthang areas and Nepal.
7. (c) The Amur Falcons migrate from Siberia to Southern Africa via India and over the Arabian Sea during winter.
9. (a) In India significant reef formations can be found in the Gulf of Mannar, Palk Bay, Gulf of Kutch, Andaman and Nicobar Islands and Lakshadweep. Among these, Andaman and Nicobar Island; and Gulf of Mannar are more conducive for the development of the corals than others.
10. (a) Biosphere reserves are established under UNESCO's Man and Biosphere (MAB) programme Biosphere Reserves are specially designated areas that enable sustainable use of biodiversity resources as well as biodiversity conservation along with human life. In national parks human activity is completely prohibited and wildlife sanctuaries the human activities partially allowed.
12. (a) Global Environment Facility (GEF) is the largest public funding agency aimed at improving the global environment. Its main functions include the financing the projects and publication of reports. It serves as financial operators for several conventions viz., Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), London Convention to Combat Desertification (UNCCD), Stockholm Convention on Persistent Organic Pollutants (POPs) and Minamata Convention on Mercury.
13. (b) **Animal Welfare Board** was established in 1962 under Section 4 of the Prevention of Cruelty to Animals Act, 1960. **NGRBA** (National Ganga River Basin Authority) is chaired by Prime Minister. The objective of the Authority is to ensure effective abatement of pollution and conservation of the river Ganga. **National Tiger Conservation Authority** is a constitutional body under Ministry of Environment and Forests set up for strengthening tiger conservation.
14. (b) **Painted stork** is a fish eating bird. **Common Myna** feeds on insects disturbed by garbage. **Black-necked crane** is mostly found in Trans-Himalayan region especially in Arunachal Pradesh and Ladakh.
15. (a) Western Ghats encompassing Kerala, Karnataka and Tamil Nadu form the natural habitat of Lion-tailed macaque. It is naturally located in Silent Valley National Park of Kerala, and is also found in Kalakkad Mundanthurai Tiger Reserve of Tamil Nadu.

and a small population is also found in Sirsi-Honnava, Karnataka. The Lion-Tailed Macaque was in news last year when IUCN took it off the list of World's 25 Most Endangered Primates' list.

16. (a) 1, 2 and 3 are found in India. Spider monkey lives in the forests of southern Mexico, Central, South America and Brazil.

17. (b) Mammals are animals in which the young are nourished with milk secreted from special glands, known as **mammary glands** of the mother. The sea cow and sea lion belong to the class of mammals. The sea horse, whose scientific name is *Hyppocampus* belongs to the class of fishes. The reproductive behavior of sea horse is noteworthy as the male carries the fertilized eggs in a pouch to hatch them. The young come out of the pouch and have to fend for themselves henceforth.

18. (a) **Gharial (*Gavialis gangeticus*)** is fresh water crocodile and is an exceptionally evolved crocodile species in the world, and it is critically endangered species. **Leatherback Turtles** are a kind of reptiles, and are Critically Endangered. **Swamp Deer** or the **Barasingha** is **vulnerable but not endangered**, and it is found in isolated localities in northern India and southwestern Nepal.

19. (b) In national parks the human activity is totally prohibited.

21. (a) All oryx species prefer desert like conditions and can survive without water for long

periods. Chiru is a Tibetan antelope and lives in cold high mountains.

23. (b) The Cheetahs are extinct in India in natural habitat. The Government has plans to reintroduce them from Iran.

31. (c) Wildlife protection Act was enacted with the sole aim of controlling poaching, smuggling and illegal trade in wildlife. Endangered flora and fauna in ecologically important areas were identified and brought under the ambit of the law.

32. (b) **Red data book** A Red Data Book contains lists of threatened species. Such species are categorized based on perceived risk to its existence. Each Red Data Book usually deals with a specific group of animals or plants (e. reptiles, insects, mosses). Different countries publish this document to provide information on the threat status of the species in that region.

33. (c) In the National Parks, no human activity is permitted.

34. (a) The climate of the tropical rain forests is most congenial for the biodiversity because of its high rain fall and humidity.

35. (b) **Flamingo City (Interior of Great Rann of Kutch)** is famous for the breeding colony of greater flamingoes (*Phoenicopterus rostratus*) near Khavda, which is located near Bhuj.

36. (b) This award is instituted by All India National Unity Conference and is awarded to individuals for promoting national unity, integration and brotherhood.