

Present scenario of Wildlife & its Conservation in India



Detailed Course outline

Biodiversity Conservation

- 1. Concepts of biodiversity:** Gene to ecosystem level diversity; global bio geographic classification; hotspots of biodiversity; endemism; concept of umbrella, flagship, keystone and Indicator species.
- 2. Bio geographic classification of India:** Zones, provinces and biomes level, representative faunal associations.
- 3. Introduction to animal kingdom:** classification and essential features.
- 4. Conservation of biodiversity:** IUCN categories of protected areas; history of wildlife management in India; protected areas system in India-national parks, wildlife sanctuaries, conservation reserves and community reserves; special category areas; biosphere reserves , natural World heritage sites, project tiger, project elephant, project snow leopard etc., wildlife management in other countries.
- 5. Ecotourism- concept,** fundamental principles, visitor impacts, tools for addressing impacts, few case studies; interpretive planning.
- 6. Wildlife health management:-** Introduction to wildlife health management, determinants of disease (EIDs) of zoonotic importance, disease of migratory birds, concept of one health, disease investigations and field procedures, disease management, planning prevention and control of disease in wildlife, human health risks from global environment changes, biowarfare , bioterrorism and animal diseases as weapons.
- 7. Ex-situ conservations:** Ex-situ management of wild animals: theory and practices of Ex-situ conservation, element of zoo management: planning and management of animal facilities; world zoo conservation strategy; zoo policy; central zoo, authority, recognition of zoo rules etc.
- 8. People & protected areas:** Biodiversity conservation and community participation-issues, concept of eco development for wildlife conservation, communities and community participation, biodiversity register, local traditional knowledge and practices in conservation, institutions and institution building process, planning eco development; relocation and rehabilitation of villages from inviolate areas, existing policy and legal framework, case studies for eco development and resettlement; role of extension for local villages and schools, media management and public relations.

Wildlife Management

- **Habitat Ecology:** Introduction to the concept of plant and animals succession; concept of habitat, different types of habitats i.e. forests, grassland, deserts, freshwater, marine estuarine, wetland, animal habitat use patterns; concept of habitat preference & critical habitats; edge effect, niche, limiting factors, role of fire, grazing and other natural calamities like foods, cyclones, tsunami etc. in habitat modification invasive species and their control, mapping of wildlife resources, Protected Area (PA) network; Island biogeography & protected area design.
- **Population Ecology & Conservation Biology:** Life history traits; patterns of population growth, density dependent and independent mechanisms; concept of population viability analysis (PVA), carrying capacity, met a-population and evolutionary significant units (ESU), monitoring and estimation of wild animals: case study of tiger, endangered species management – principles & practices of reintroduction, restocking, preparation of recovery Plans.
- **Illegal trade in wildlife species and products:** Wild animals and animal product in illegal trade and methods (involvement of local people, instruments used, trade routes, trans-boundary issues in illegal trade (inter division, interstate, international), control measures (intelligence gathering, data base of criminals, crime charts, crime mapping, deceptions used, electronic surveillance device, study of crime scenes, forensics, collection and preservation of evidence, arrest, interrogation, investigation, preparation of case records, court procedures etc.) Case studies on successful prosecutions.
- **Human wildlife conflict & mitigation:** Nature, cause and mitigation of depredation by wild animals: case studies from India and abroad, wild animal barriers, role of communities in management of conflict situations, crowd control, role of district administration.
- **Management of animal in distress and their rehabilitation:** Introduction to physiology of stress, shock and trauma, safe capture of wild animals- equipments and techniques, basis pharmacology of immobilization drug, drug classification, legal aspects, immobilization of ungulates, carnivores and mega herbivores, management of elephants in musths, transport of wild animals, design of transport cages, rehabilitation and monitoring.

Outline

- Part I : Introduction
- Part II : Glimpse of Indian Wilderness
- Part II : Threats & Conservation

- Discussion







Concepts of Biodiversity

- ❖ Biological Diversity
- ❖ Global Bio-geographic Classification
- ❖ Hotspots of biodiversity
- ❖ Endemism
- ❖ Concept of Umbrella, Flagship, Keystone and Indicator species

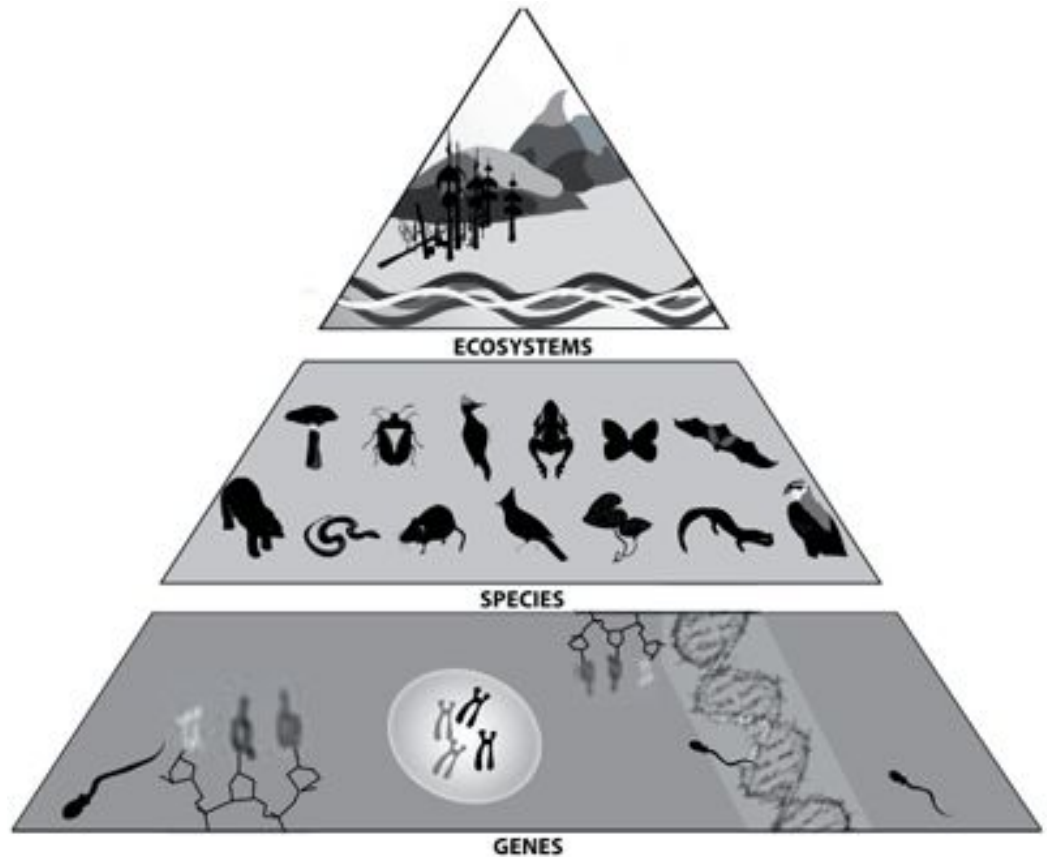
Biological Diversity

- Biological Diversity means the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part this includes diversity within species, between species and of ecosystems

Source: Article 2 Use of terms: Convention on Biological Diversity 1992

Levels of Biodiversity

- Ecosystem Diversity
- Species Diversity
- Genetic Diversity



Ecosystem Diversity

- Diversity of a place at the level of ecosystems
- Alpha Diversity – Diversity within a ecosystem or particular area; diversity of organisms sharing a particular community/habitat
- Beta Diversity – Diversity between ecosystems;
- Gamma Diversity – Overall diversity within a large area

Species Diversity

- Diversity of species within a region
- Index about the number of species in an area

India is one of the seventeen mega-biodiversity countries of the world

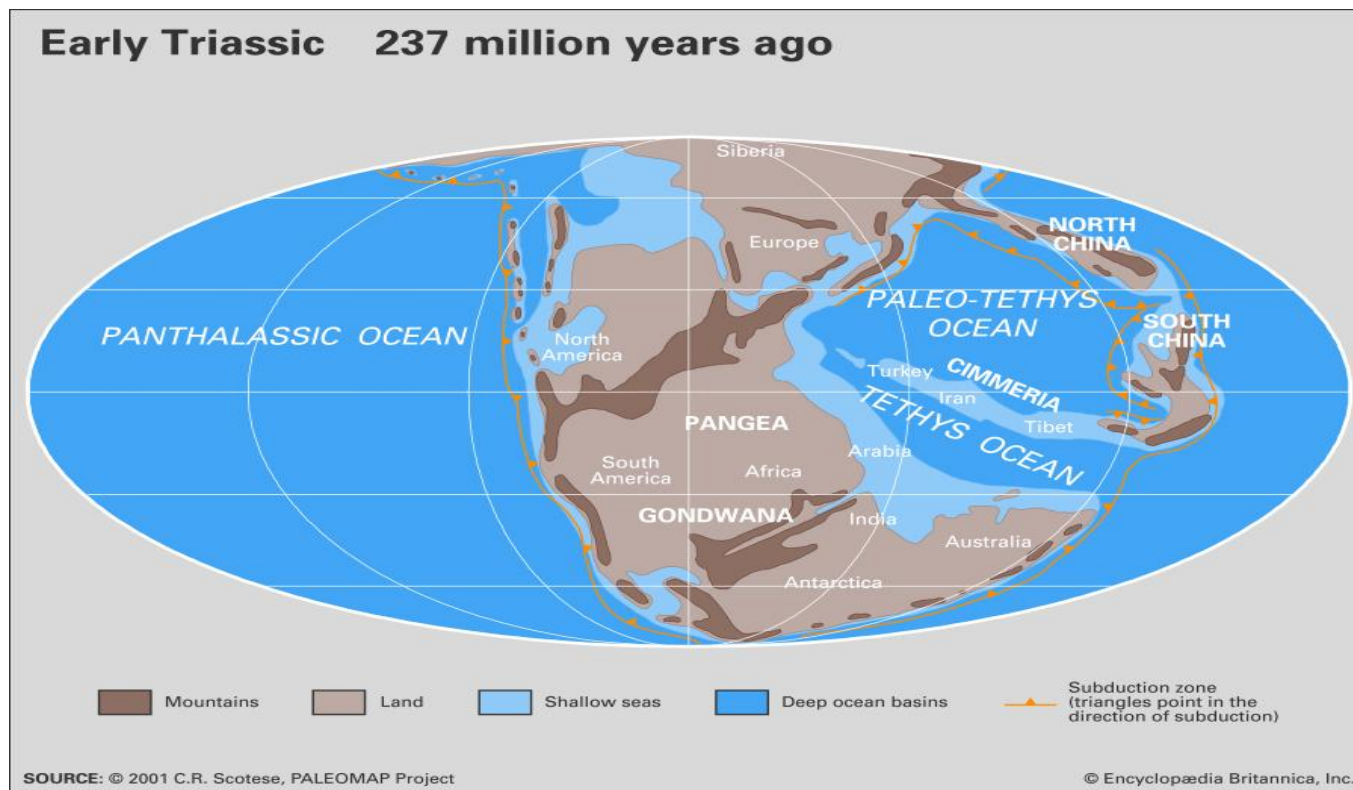
Mexico, Colombia, Ecuador, Peru, Venezuela, Brazil, USA, Congo, South Africa, Madagascar, China, India, Malaysia, Indonesia, Philippines, Papua New Guinea, and Australia.

One of the five mega diversity countries in Asia
(India, Philippines, Malaysia, Indonesia, China)

Mega diverse countries are that contain as much as 7-8% per cent of the world's species.

Distribution of Flora and Fauna

The dramatic geological history of the Indian subcontinent has had profound effects on regional climates and biota.



All the present land masses formed one huge super continent- **Pangea** in the past,

(Source: Chatterjee and Scotese, 1999)

The Indian plate separated from Africa along with Madagascar in the Middle Jurassic *ca.* 160 Ma, then from Madagascar in the mid-Cretaceous *ca.* 90 Ma, moving at the remarkable rate of 15–25 cm/y before colliding into Asia in the early Cenozoic, uplifting the Himalayas.

Middle Jurassic 180 Ma

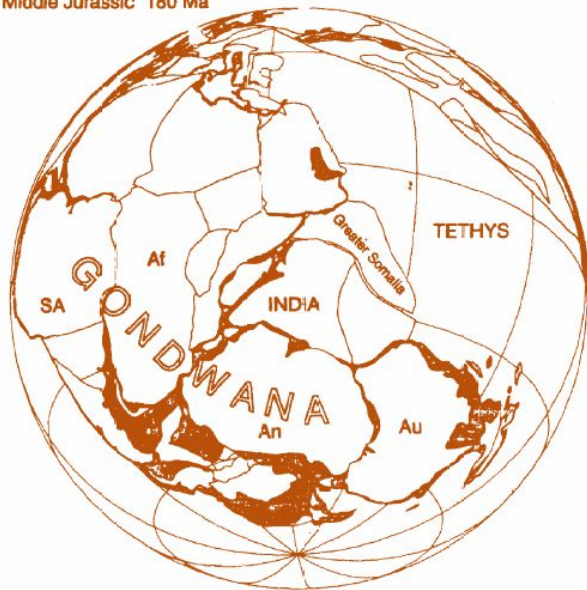


Fig. 6 Palaeogeographic reconstruction of Gondwana showing the India's position during the Middle Jurassic (180 Ma) period.

Late Jurassic 160 Ma

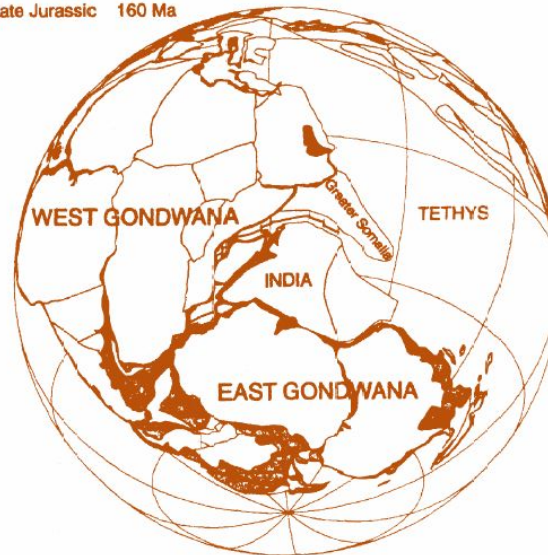


Fig. 7 Palaeogeographic reconstruction showing the initial breakup of Gondwana into western and eastern components during the Late Jurassic (160 Ma) period. Indo-Madagascar-Seychelles became part of the eastern Gondwana. New Mid-ocean rifts occur between Antarctica and Mozambique, between Madagascar and Tanzania, and between northwest India and Madagascar. Migration routes remain open between all parts of Gondwana.

Cretaceous-Tertiary Boundary 65 Ma

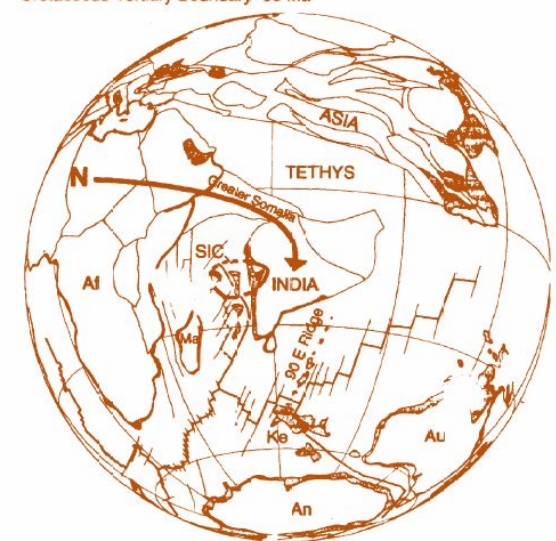


Fig. 14 Palaeogeographic reconstruction showing the positions of Gondwana continents during the Cretaceous-Tertiary (KT) boundary when dinosaurs and two-thirds of marine organisms were wiped out. The Shiva crater at the India-Seychelles rift margin and the Chicxulub crater in Mexico have emerged as prime candidates for the KT impact sites.

Present-day

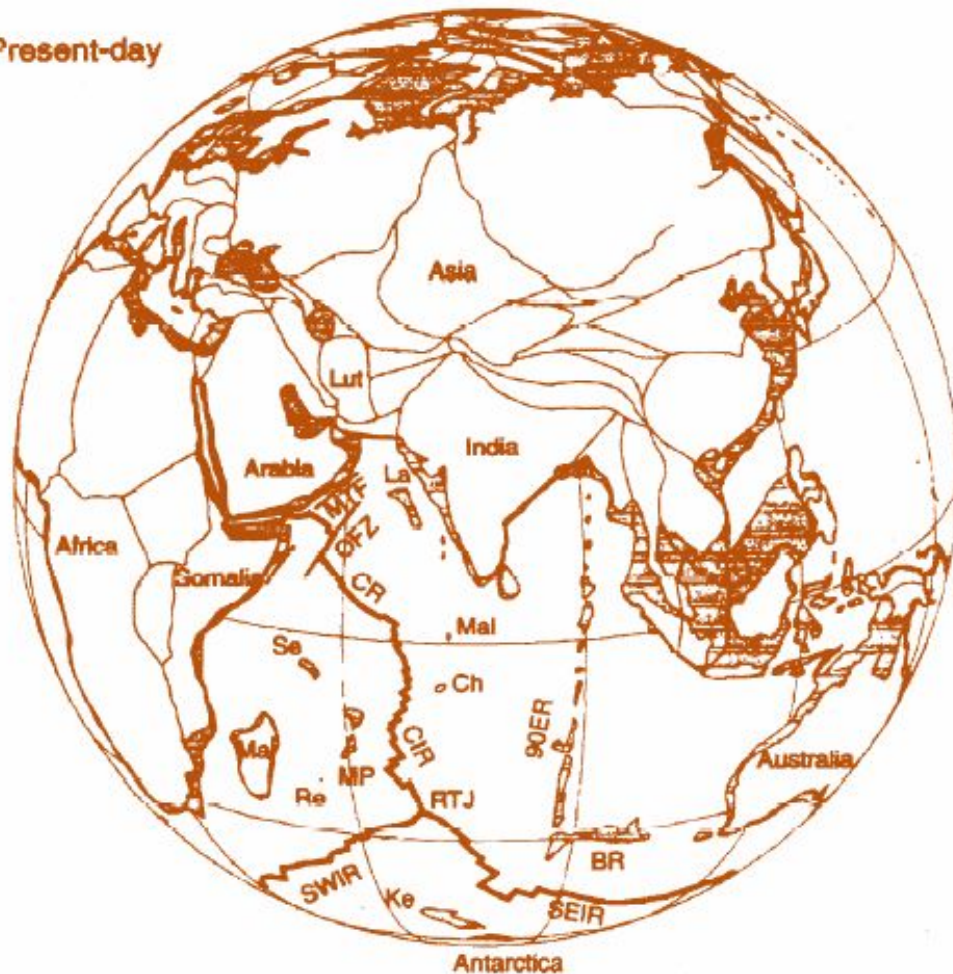


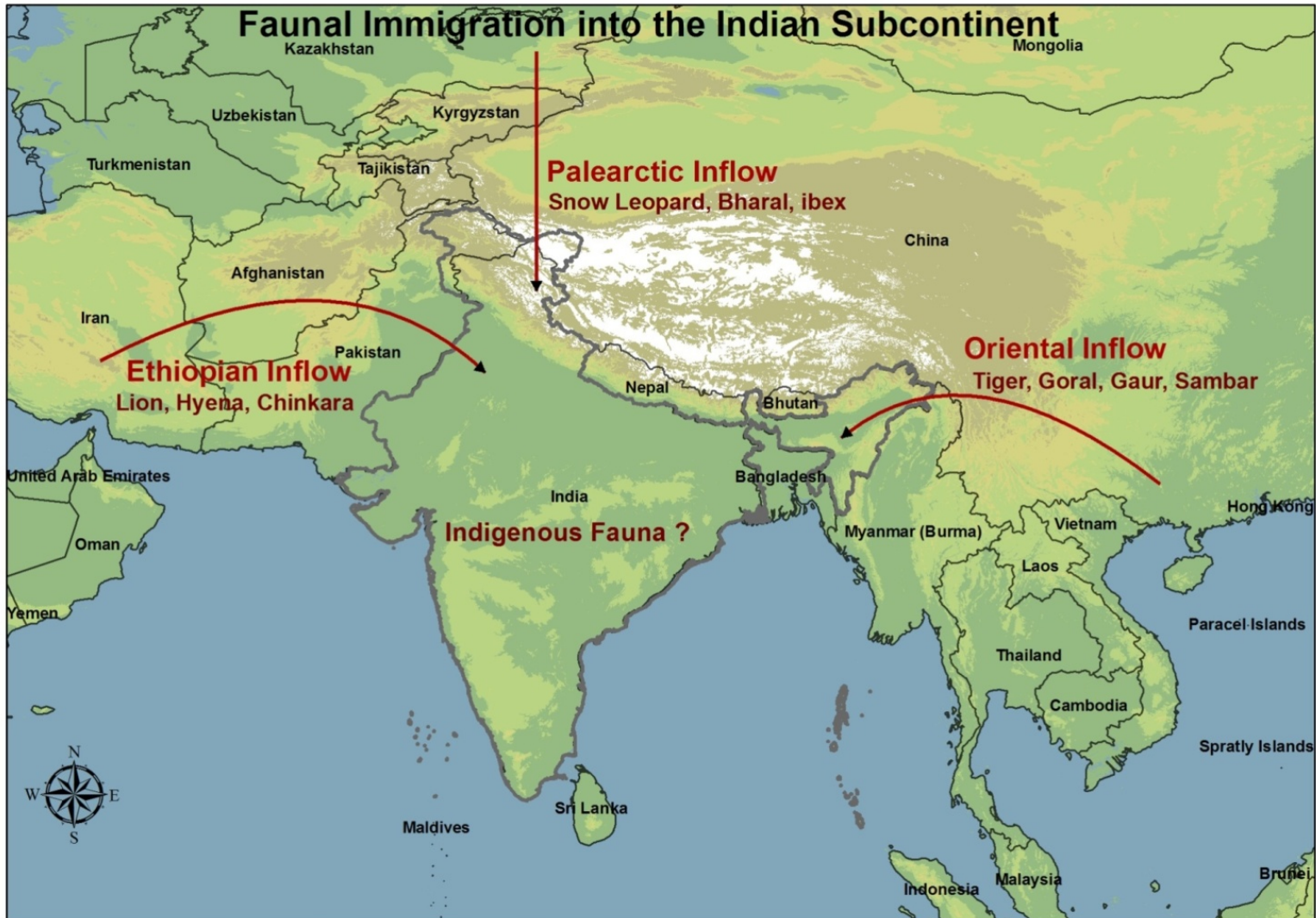
Fig. 1 Present-day plate Map of the Indian Ocean illustrating the location of mid-ocean rifts (heavy black line) and submarine plateaus. Abbreviations: BR, Broken Ridge; CH, Chagos; CIR, Central Indian Ridge; CR, Carlsberg Ridge; KE, Kerguelen Plateau; LA, Laccadive; MA, Madagascar; MAL, Maldives; MTF, Masirah Transform Fault; 90ER, Ninetyeast Ridge; SE, Seychelles.

The present biota of India, have elements from Africa, Madagascar, and often the Seychelles (eg: animal ,snakes, fishes)

Plant taxa include two genera of trees related to figs as well as the family Dipterocarpaceae.

(Source: Chatterjee and Scotese, 1999)

- India lies at the confluence of three regions
- Its fauna and flora includes African, European, Eurasian and Mediterranean elements



Species that have reached Sri Lanka.....

Rhododendron arboreum



Mesua ferrea : National tree of Sri Lanka



Elephant, mouse deer, chital, sambar, rusty-spotted cat, jungle cat, leopard

Factors contributing to India's biodiversity richness

- Variations in elevation (from sea level to nival zone).
- Physiography, climate and geography of India.
- The protection of wildlife -tradition in Indian history.
- Protected Area (PA) network .
- Cultural and religious sentiments of the people.
- Conservation movements.
- Enabling laws and policies.
- Vegetarianism (largely).



Angiosperms: 15000-16000

Butterflies: 1500

Fishes: 2546

Amphibians: 271

Reptiles: 447

Birds: 1302

Mammals: 425

- *26 recognized endemic centres for flowering plants*
- *30% world's flora*
- *7.31% global fauna*

Notable wildlife values of India

- India harbours more than half the tiger (ca. 1700) and Asian elephant (ca. 25,000) population.
- Nearly 80 % of the one horned rhino population (ca. 2200).
- Only subcontinent to have wild buffaloes, swamp deer, Asiatic wild ass.
- Exceptional mountain ungulate diversity : 19 species.

Many sub-species occur as single populations

Lion (*Panthera leo persica*),

Hangul or Kashmir stag (*Cervus elaphus hanglu*),

Manipur brow-antlered deer (*Cervus eldii eldii*),

Hard ground Barasingha (*Rucervus duvaceli branderi*)



Protected Area Network of India

Protected Areas (771) represent (162099.47 km²) or 4.93% geographical area of India

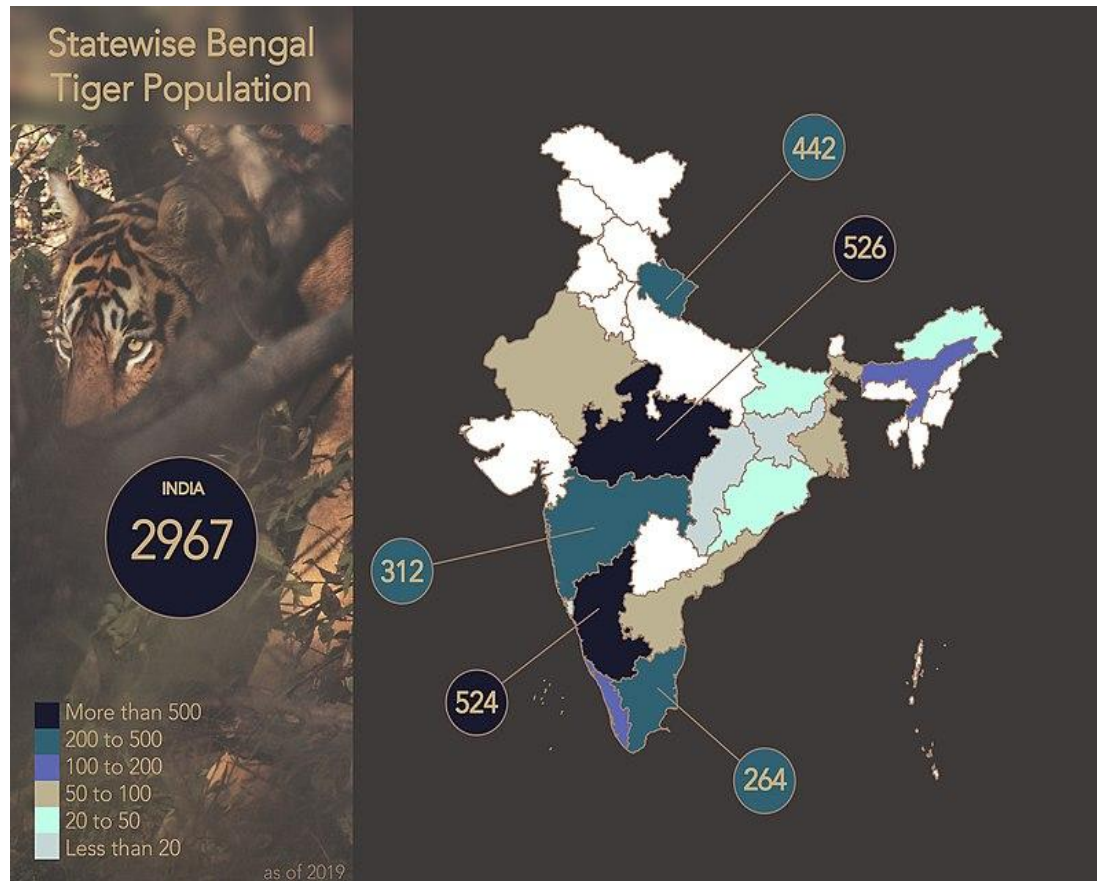
National Parks: 104

Wildlife Sanctuaries: 544

Conservation Reserves: 77

Community Reserves: 46

Tiger Reserves



Project Tiger was launched in the year 1973. Starting from nine (9) reserves in 1973-2016 the number is grown up to fifty (50), covering an area of 71027.10 sq.km in 18 states.

Elephant Reserves



- ❑ PROJECT ELEPHANT was launched by the Government of India in the year 1992 as a Centrally Sponsored Scheme being mainly implemented in 16 States / UTs , viz. Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Jharkhand, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Orissa, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, West Bengal.
- ❑ 32 ERs in 10 landscapes covering an area of 69,582.80 sq.km.

RAMSAR Wetland sites



26 RAMSAR Wetland sites covering an area of 12,119 sq.km

Important Coastal and Marine Biodiversity Areas (ICMBAs)



106 sites (62 in WC and 44 in EC) have been identified and prioritized as Important Coastal and Marine Areas (ICMBAs) by the Wildlife Institute of India. 22 ICMBAs have been prioritized for immediate conservation action by upgradation to Protected Areas under categories such as Conservation or Communities Reserve to increase participation of the local communities in governance.

Natural World Heritage Sites



7 Natural World Heritage Sites (GHNP, Nanda Devi and Valley of Flowers, Bharatpur, Kaziranga, Manas, Sunderbans, W.Ghats) and 1 Mixed site (Khangchendzonga National Park)

Important Bird Areas (IBAs) in India



The IBA programme of Birdlife International aims to identify, monitor and protect a global network of IBAs for conservation of the world's birds and associated biodiversity. The Bombay Natural History Society (BNHS; www.bnhs.org) and Birdlife International have identified 467 IBAs in India (Islam and Rahmani, 2004). Forty percent of these IBAs fall outside the PA network and thus form an important tool for landscape-level conservation planning.

Key Biodiversity Areas

- ❑ Key Biodiversity Areas (KBAs) is an umbrella term commonly used to include areas that contribute to the global persistence of biodiversity, including vital habitat for threatened plant and animal species in terrestrial, freshwater and marine ecosystems.
- ❑ Globally KBAs are designated based on 11 criteria defined under five broad categories of threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability.
- ❑ The criteria for designating a site as KBA have been described in the document "The Global Standard for the Identification of Key Biodiversity Areas (2016)" by International Union for Conservation of Nature (IUCN).
- ❑ IUCN identifies 531 KBA sites in India as on July

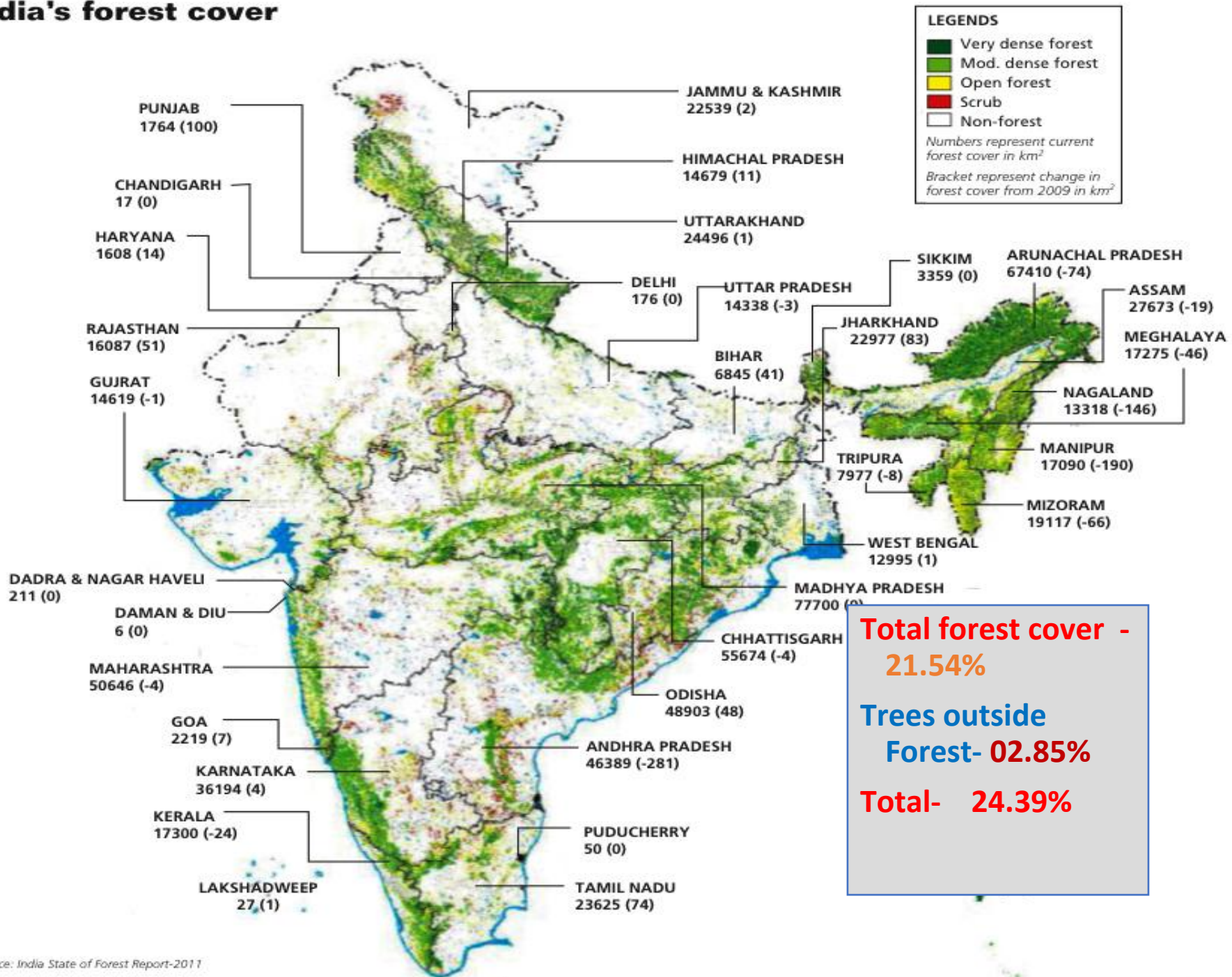
Biodiversity Heritage Sites

- “Biodiversity Heritage Sites” (BHS) are well defined areas that are unique, ecologically fragile ecosystems - terrestrial, coastal and inland waters and, marine having rich biodiversity comprising of any one or more of the following components: richness of wild as well as domesticated species or intra-specific categories, high endemism, presence of rare and threatened species, keystone species, species of evolutionary significance, wild ancestors of domestic/ cultivated species or their varieties, past pre-eminence of biological components represented by fossil beds and having significant cultural, ethical or aesthetic values and are important for the maintenance of cultural diversity, with or without a long history of human association with them. (Source: NBA, India)
- 12 BHS have been notified till April 2018

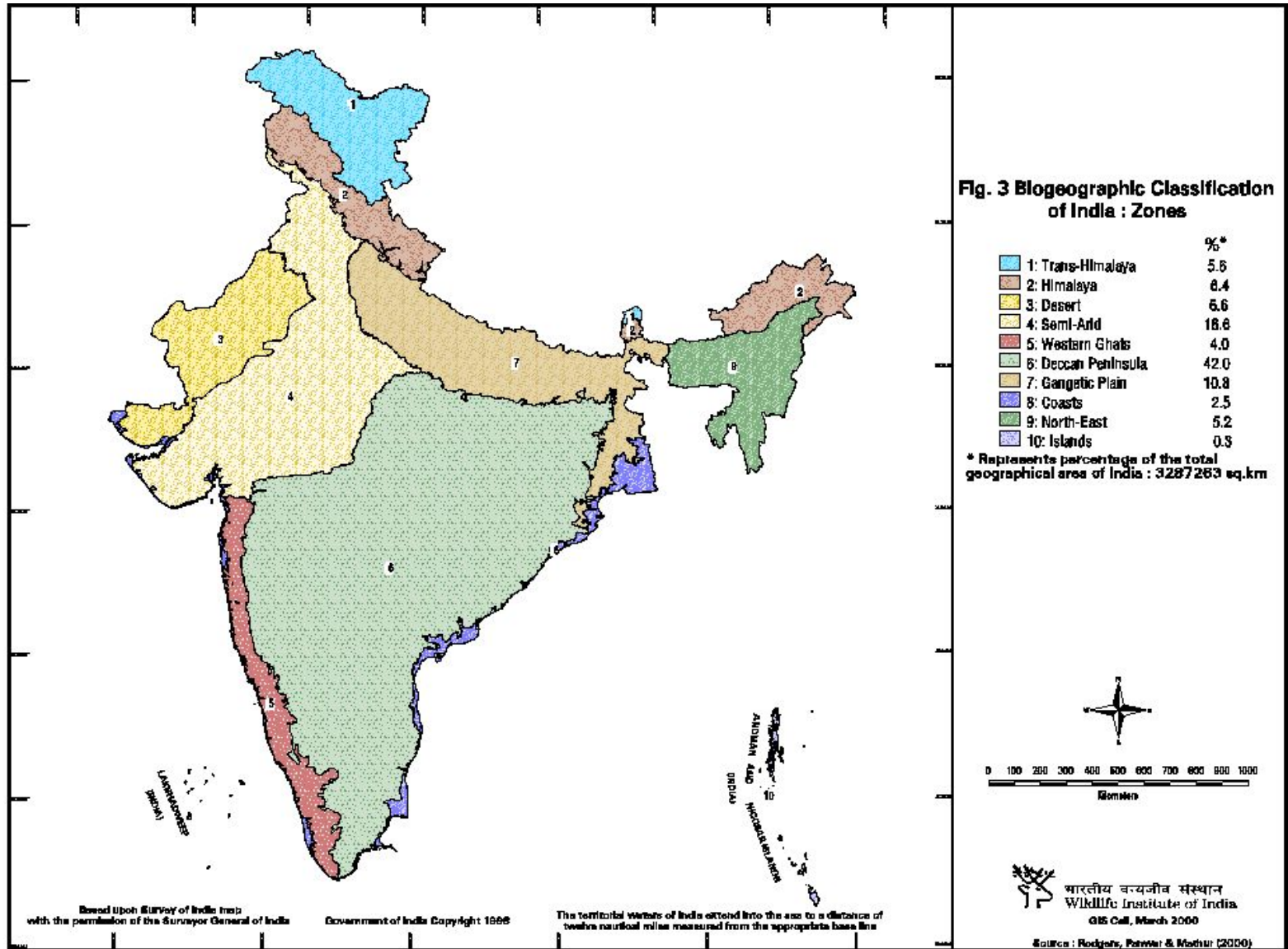
Part II

Biogeographic Zones

India's forest cover



Biogeographic Zones of India



Biogeographic Zone: *Trans Himalayas*

Cloud Leopard



Comprise of the Tibetan plateau and Tibetan marginal mountains covering 2.5 million sq. km with altitude range 4500 - 6000 m asl

Characterized by dry alpine steppe formed by grasses, sedges, forbs and shrubs adapted to cold-arid environment

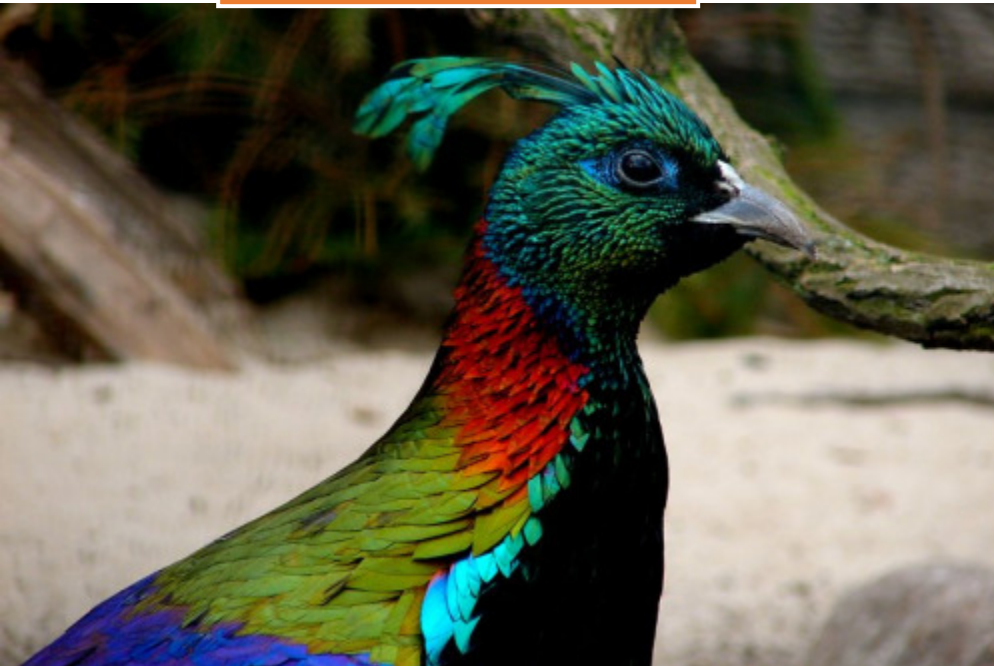
Himalayan Blue Sheep



Biogeographic Zone: *Himalayas*



Himalayan Monal



Himalayan Musk deer



Iconic PAs

- J&K: Hemis NP & Changtang Cold Desert WLS
- Himachal: Kibber WLS



Entrance to Kibber Wildlife Sanctuary



Himalaya (West, Central and East)



Three major geographical entities- Himadri (greater Himalaya), Himachal (lesser Himalaya) and Shiwaliks (outer Himalaya)

Characterized by tropical rainforests, dense subtropical and alpine forests and rich temperate flora, evergreen tall trees- oak, chestnut, pine, deodar;



Iconic PAs

- J&K: Dachigam NP
- Himachal: GHNP
- Uttarakhand: Nanda Devi, Valley of Flowers
- Sikkim: Khanchendzonga
- Arunachal Pradesh:





Desert



Represented by parts of Rajasthan, Kutch, Haryana and parts of Gujarat spanning over 320,000 sq km

Characterized by tropical thorn forests and tropical dry deciduous forests, sandy deserts, seasonal salt marshes and mangroves near estuaries



Arpit Deomurari /Conservation



Iconic PAs

Rajasthan:

✓ Desert NP

Gujarat:

✓ Kachchh Desert Wildlife
Sanctuary





Rachit Shah

Semi Arid



Transitional zone between desert and denser forests of Western Ghats

Characterized by thorn forests with grasses and bamboo in some regions, xerophytic and ephemeral herbs; few trees such as *Acacia* and *Prosopis*, *Calotropis*.



Iconic PAs

Gujarat:

✓ Gir NP

Rajasthan:

✓ Sariska, Ranthambore





©Karthik Ak

Western Ghats



<http://sports365blog.com/tag/kedharnath/>



Iconic PAs

Maharashtra:

✓ Radhanagari WLS

Goa:

✓ Cotigao WLS

Karnataka:

✓ Kudremukh

Tamil Nadu:

✓ Kalakkad-Mundanthurai

Kerala:

✓ Periyar NP, Eravikulam NP





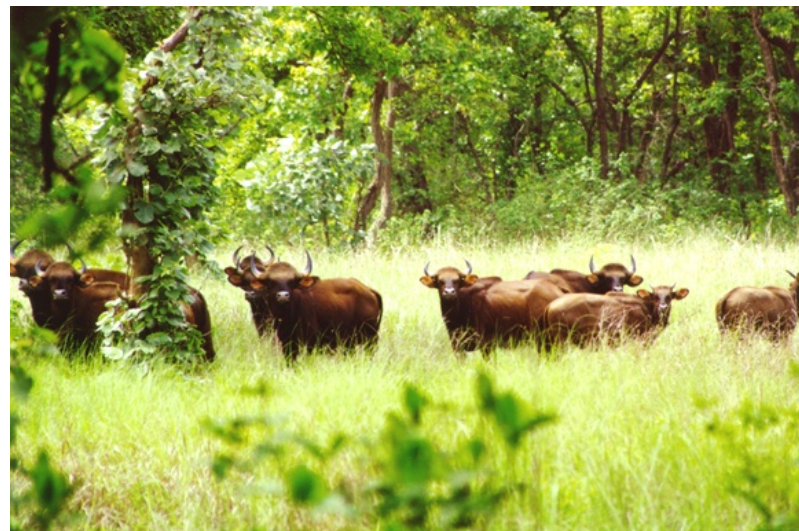
Deccan Peninsula

Semi-arid region lying in the rain shadow of the Western Ghats covering about 43% of India's land surface

Bound by Satpuras on the north, Western Ghats on the west and Eastern Ghats on the east



Photo credit: Ameen Ahmed/WWF-India



Iconic PAs

MP:

Kanha, Bandhavgarh

Chattisgarh:

Indravati

Maharashtra:

Melghat, Tadoba

Odisha:

Similipal

Andhra Pradesh:

NSTR

Telengana:

Kawal TR

Karnataka:

Daroji

Tamil Nadu:

Satyamangalam





Gangetic Plains



Cover an area of 72.4 mha in the drainage of the Ganga and Brahmaputra

Represent arid, semi-arid to humid landscapes; geomorphologically classified as bhabar, terai, bhangar, khadar

Fauna include Asian elephant, blackbuck, one-horned rhinoceros, freshwater turtles, waterfowl in riverine ecosystems, gharial



Iconic PAs

UP:

✓ Dudhwa, Katarniaghat

Bihar:

✓ Valmiki







Coasts



Photo: K Sivakumar



Extends over 7517 km in the west and east covering nine coastal states and two union territories

Characterized by mangrove forests in estuarine tracts on both east and west coasts

Fauna: Olive Ridley turtles, dugong, dolphin, crocodiles, avifauna



Iconic PAs

West Coast:

Gujarat:

Gulf of Kutch

East Coast:

West Bengal:

Sunderbans

Odisha:

Bhitarkanika, Gahirmatha

Andhra:

Coringa, Pulicat

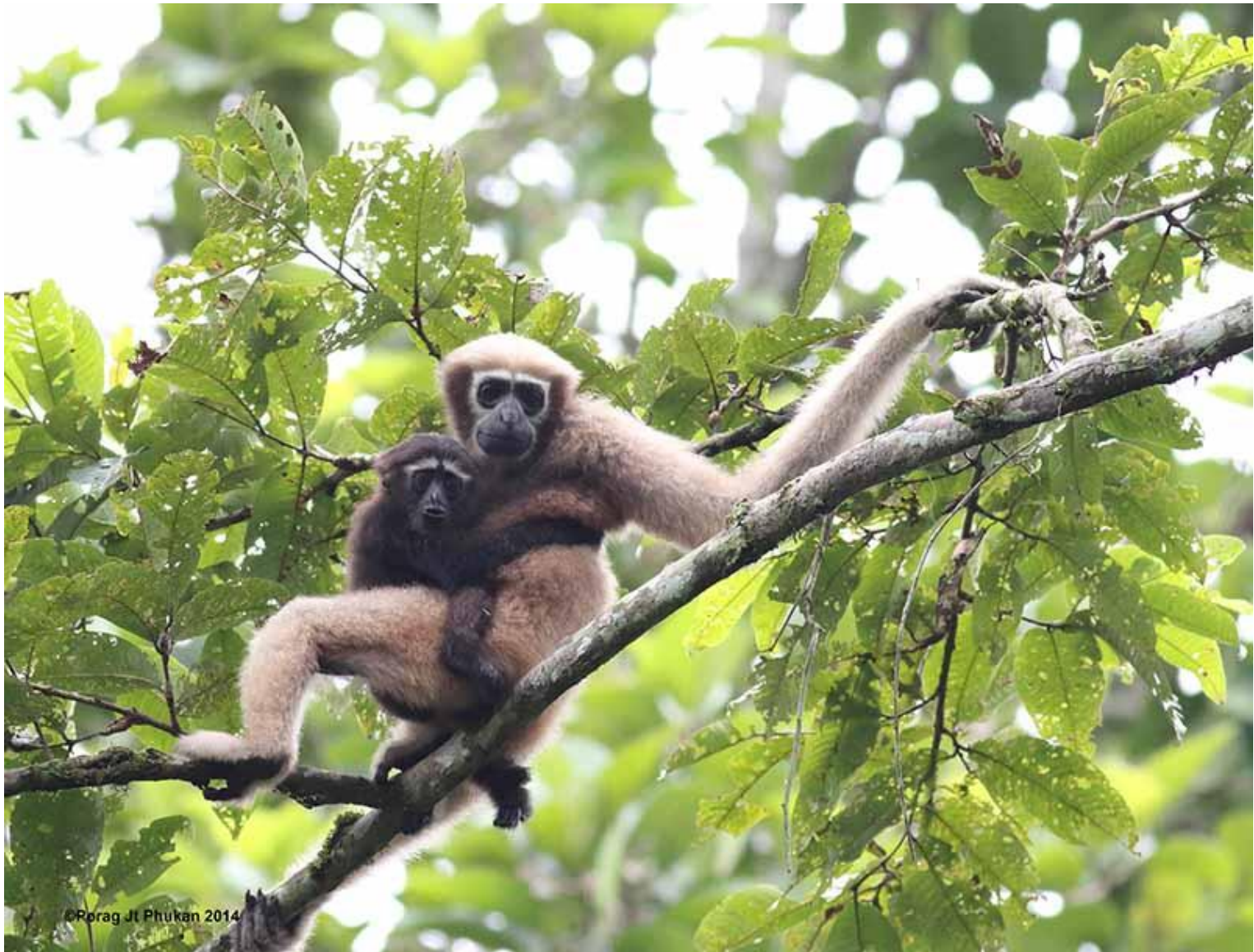
Tamil Nadu:

Point Calimere





Srikant h Chandrasekharan



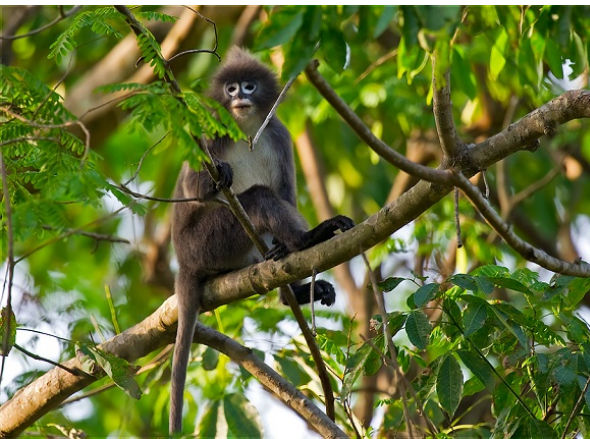
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North East

Spread across 7 north eastern states

Characterised by the tropical vegetation evergreen and semi-evergreen rain forests, moist deciduous monsoon forests, swamps and grasslands

Harbour many endemic species of orchids, bamboo, ferns



Iconic PAs

Sikkim:

Khangchendzonga NP

Assam:

Kaziranga TR

Arunachal:

Namdapha TR

Manipur:

Keibul Lamjao NP

Tripura:

Sepajijhala NP

Mizoram:

Dampa TR

Nagaland:

Intanki NP



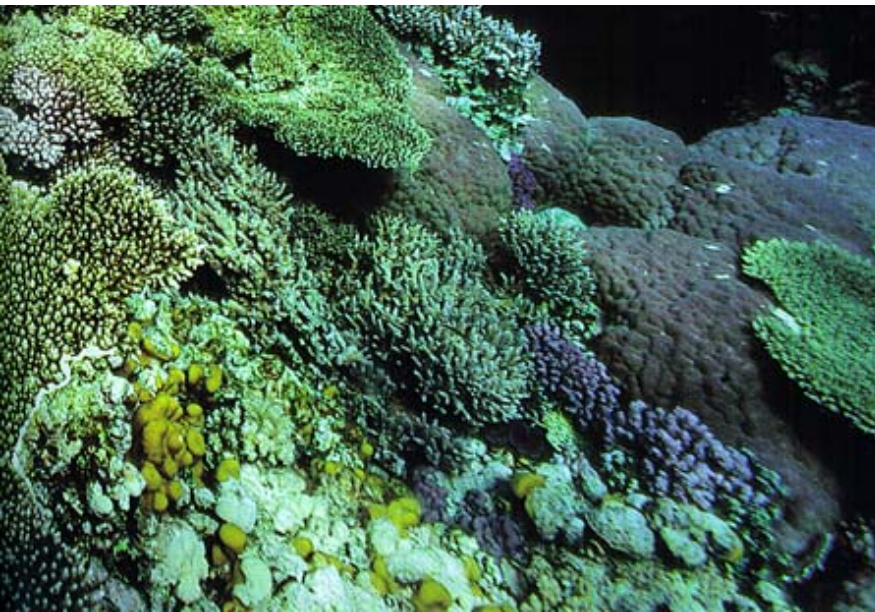


Islands



Include two main groups of islands: the Lakshadweep (36 islands) and Andaman and Nicobar islands (572 islands), in addition to smaller islands that dot the coastline of mainland India

Contribute at least 200 endemic species



Iconic PAs

- Andamans
- ✓ Mahatma Gandhi Marine NP
- ✓ Mount Harriet NP
- ✓ Narcondam Island NP



- Nicobars
- ✓ Galathea NP
- ✓ Campbell Bay NP



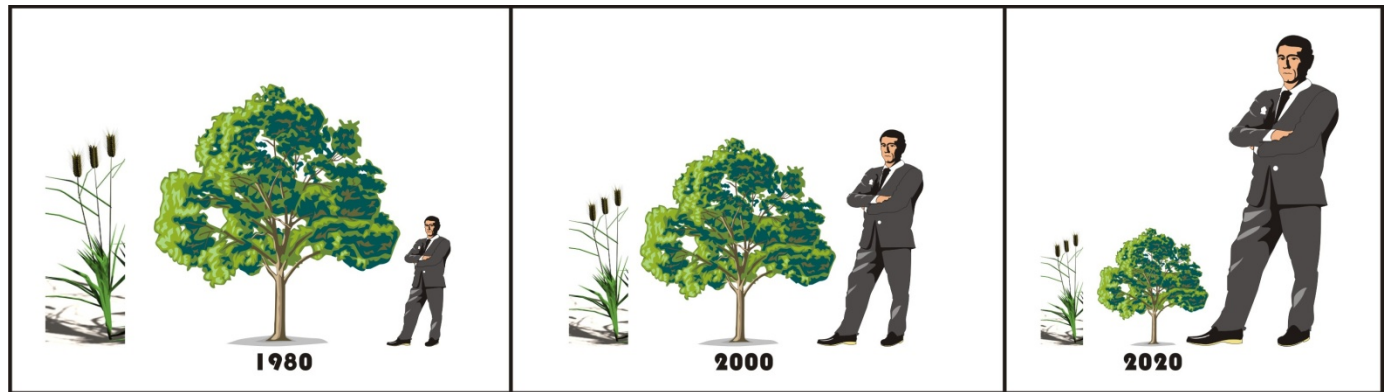
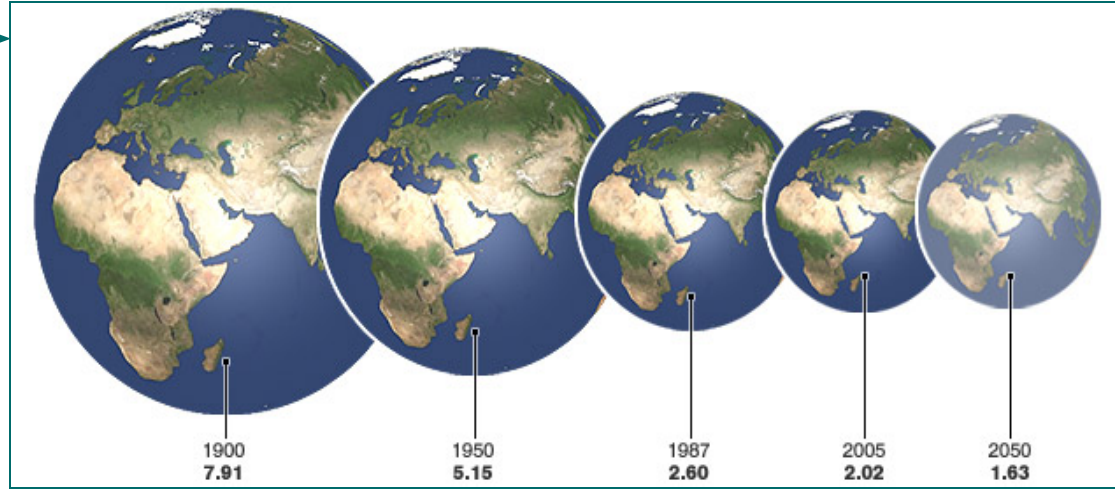
- Lakshadweep
- ✓ Pitti Bird Sanctuary



Part III

Threats to biodiversity

Rising population



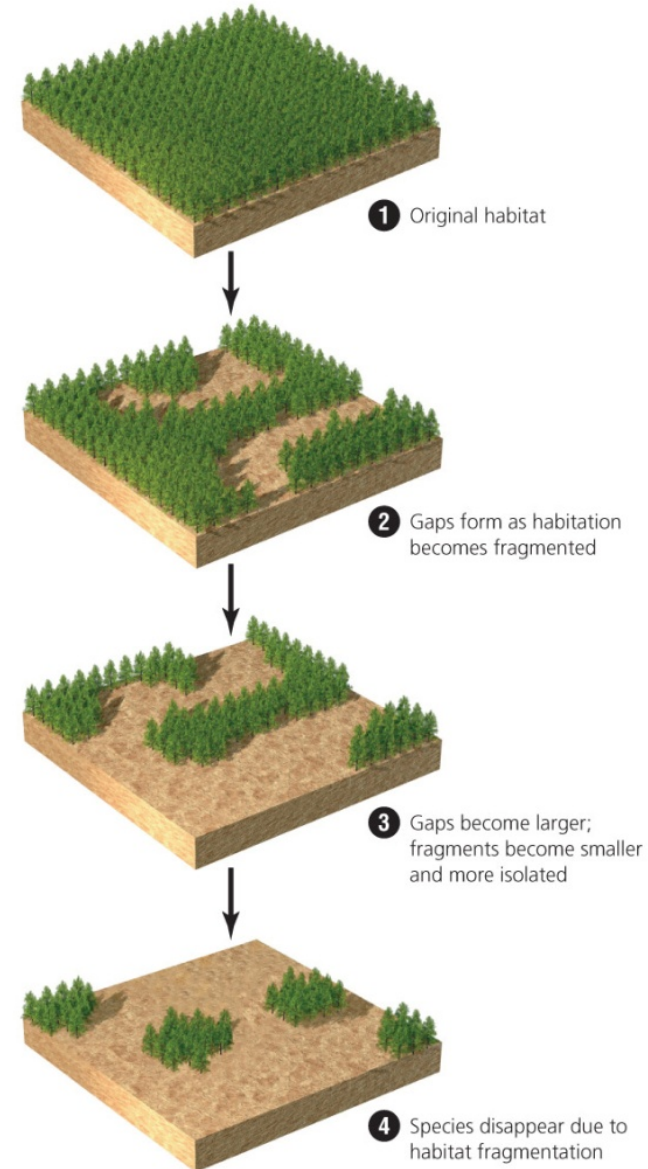
(Source: Anon, 2000)

Ecological Disasters



Habitat fragmentation: biggest threat

*Smaller fragments
hold fewer species*



Linear infrastructure development



Land degradation and mining



s-energy/2008/coal-cost/

Hydropower

Endangerment of habitat
of many threatened
species



Invasive species



Ipomoea carnea,

Shifting cultivation, north-eastern India

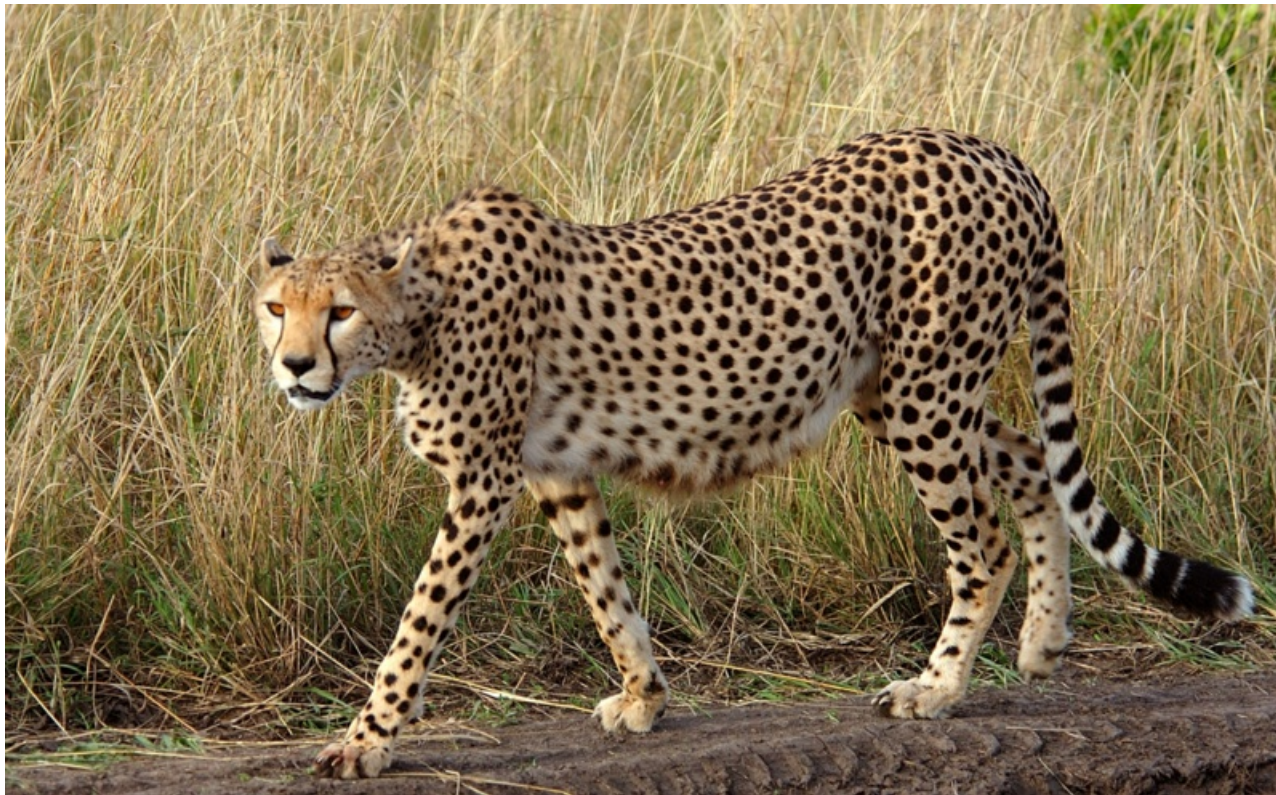


Human interference leads to resource conflict



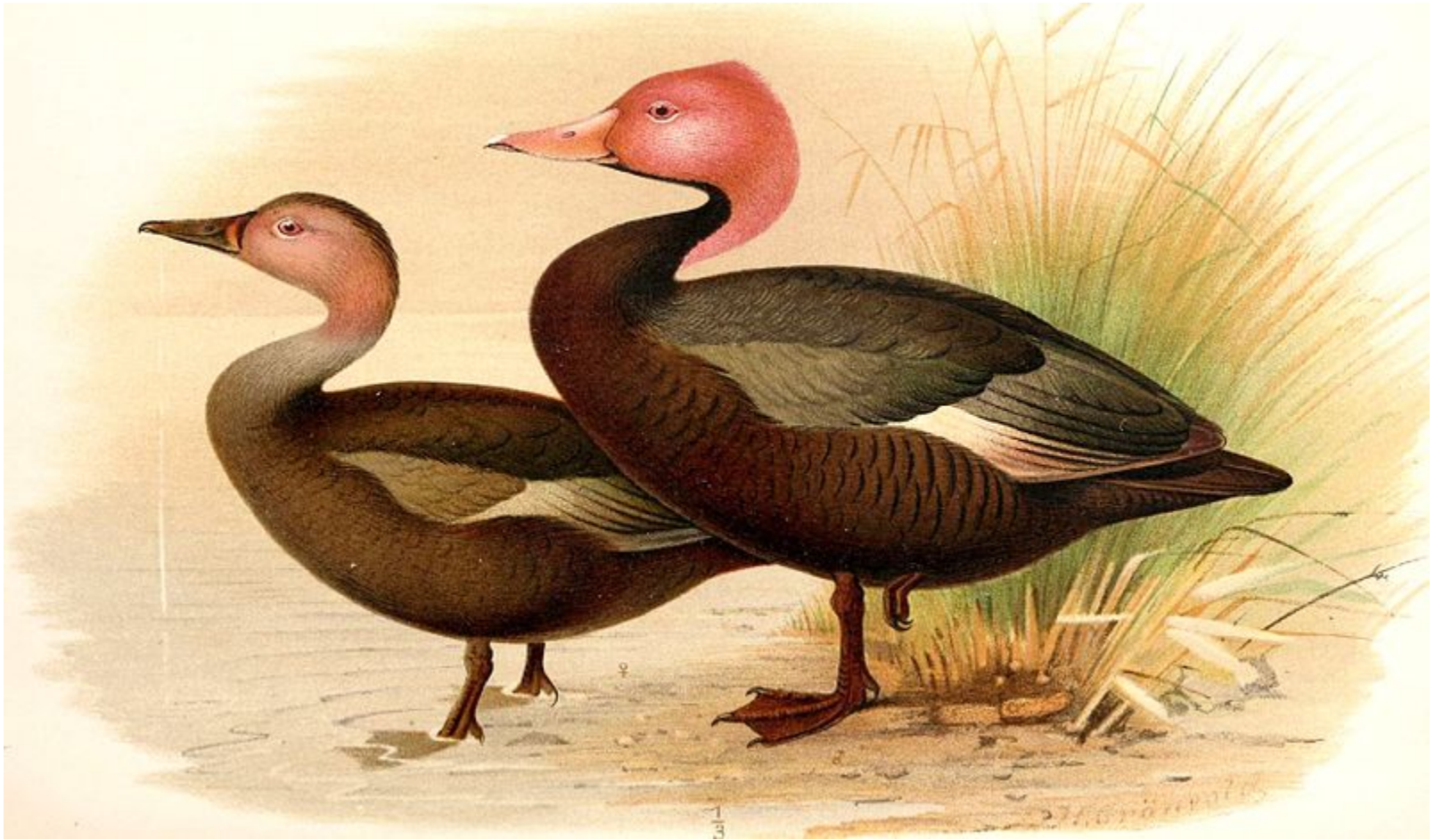
As a result we have lost some splendid species...

Cheetah *Acionyx jubatus*



200 years ago cheetah was a problem species in Tirunelveli district, Tamil Nadu

The Pink-headed Duck *Rhodonessa caryophyllacea* used to be found in eastern India, Bangladesh and northern Myanmar. They became extinct during 1960s,



Species lost and found

Jerdon's Courser *Rhinoptilus bitorquatus* was rediscovered in 1986 in Andhra Pradesh



The Forest Owlet *Athene blewitti* was last collected in 1884 and rediscovered in 1997 in Bhandara near Melghat Tiger Reserve



The Mishmi (rusty-throated) Wren Babbler was rediscovered from Arunachal Pradesh in 2005, after its last recorded in 1947



Discovery of animal and plant species new to science

Arunachal macaque (*Macaca munzala*),



White-tailed Monal, (*Bugun liocichla*)



Fourteen new species of tiny “dancing frogs” have been discovered in the jungles of western India,



Castoe's Coral Snake *Calliophis castoe* was discovered recently in 2012 by researchers in the Anamalai hills



Ctenactis Triangularis recently found new coral species in the Andaman Sea.



The butterfly *Hypolycaena narada* also called the Banded Tit, was recently discovered in the Changlang District of Arunachal Pradesh in July this year



Species Extinct since 1500

- 43 Amphibians; 9 since 1980
- 134 birds; 5 since 1980
- 75 mammals; none since 1980

Thanks

Acknowledgements

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