

BACKGROUND



More than 1200 species of birds are found in India, including some spectacular species such as the Bar-headed Goose *Anser indicus*.

INDIA: GENERAL INFORMATION

India is situated north of the equator between 8° 4' and 37° latitude and 68° 7' and 97° 25' longitude, and is bounded on the southwest by the Arabian Sea and on the southeast by the Bay of Bengal. To the north and northeast lies the mighty Himalayan range. To the west lies Pakistan and to the east, Bangladesh and Myanmar. In the north, China (Tibet), Nepal and Bhutan share the international boundary with India. To the south Sri Lanka shares the maritime boundary and is separated from India by a narrow channel of the Bay of Bengal formed by the Palk Strait and the Gulf of Mannar (Mathew 2003).

India is one of the largest countries of the world and covers an area of about 3,287,263 sq. km. It measures 3,214 km from north to south and 2,933 km from east to west and has a land frontier of 15,200 km and a coastline of 7,516 km. The mountain ranges such as the Himalayas in the north, the Aravallis in the west, the central highlands of the Vindhyas and Satpuras and the Eastern and Western Ghats in the east and west, comprise several sub-mountain tracts of varied lengths and heights that support diverse flora and fauna.

India is a vast country with varied climatic conditions. It has three climatic seasons in a year - monsoons (June-September: southwest monsoon; October-November: northeast monsoon), summer (April-July) and winter (October - March). However, in south India, the winter is not as cold as in north India. The 'winter' is marked by clear skies, hot days and cool nights. This kind of weather prevails from September to March. The southwest monsoon sets in over Kerala in June and it progresses towards the north and envelops the entire country by the end of July. The eastern coastal regions - the coasts of Andhra Pradesh and Tamil Nadu - experience the northeast monsoon between October and November. Along the east coast, this period is marked by cyclones due to severe atmospheric depression in the Bay of Bengal and the Indian Ocean that moves towards the mainland at a high speed, which causes widespread destruction to life and property. The west coast rarely experiences such cyclonic effects. The annual average rainfall in India varies from a low of 50 mm in the extreme western parts of Jaisalmer bordering Pakistan, to a high of 11,000 mm in the Cherrapunjee region of Meghalaya. Similarly, the temperature also shows high variability - more than 50 °C in the Thar desert to minus 50 °C at Siachen in Jammu and Kashmir.

The first census of human population in India was conducted in 1872. Since then, 1881 onwards, this exercise has been carried out once in 10 years. At the time of India's Independence in 1947, the population was 340 million. By 1981, it rose to 685 million and by 1990, to 844 million. Compared to 1971, the population has increased by 25%. In 1971, the human density was 216 per sq. km, with a high of 655 in Kerala and a low of 8 in Arunachal Pradesh. As per the 1991 census, the average human density has further risen to 273 persons per sq. km. By 2001, India's population has crossed the one billion mark! The population has trebled in the 54 years of India's Independence, with an annual rise of about 18 million people. The projected human population growth by 2050 is between 1.4 and 1.5 billion.

Biodiversity

India, a mega-diversity country, is among the top ten nations endowed with the world's richest biodiversity. Its immense biological diversity represents about 7% of the world's flora and 6.5% of the world's fauna. There are about 614 species of amphibians and reptiles, 1,225 species of birds and 350 species of mammals in India. Among the larger animals, 173 species of mammals, 78 species of birds and 15 species of reptiles are considered threatened. A large range of species inhabits the country's various habitats, from its crowded and colourful coral reefs to the icy alpine grasslands. We have very little information on the biology of the vast majority of these organisms. There are many species that have not even been named by science. Their value to India's human population, as sources of useful genes, as food or medicine, or as essential parts of ecological systems, has hardly been studied.

VEGETATION CHARACTERISTICS WITHIN VARIOUS BIOGEOGRAPHIC ZONES OF INDIA

By Dr. G. S. Rawat

The Indian region exhibits an enormous variation in climate, geomorphology, and surface topography. On the basis of physiography it is divisible into three zones, namely the Himalayan region, the Indo-Gangetic Plains and the Indian Peninsula. Each of these zones can be further classified based on the relief features and patterns of soil and water regimes. This has manifested in a great deal of floral and faunal diversity and interesting patterns of vegetation formations. Champion and Seth (1968) have classified India's vegetation into seven major groups, 16 sub-groups and over 150 sub-types and seral stages. This classification takes physiognomy, floristics as well as local edaphic and biotic factors into consideration hence it is used widely by foresters as well as ecologists. The description of wildlife habitats including the characterization of major biomes and Important Bird Areas (IBAs) can best be done using Champion and Seth's categories.

This chapter deals with a general description of the vegetation within various biogeographic zones of India. Although Rodgers and Panwar (1988) and Rodgers *et al.* (2000), have given broad characteristics of various regions, major biomes and habitats within these zones need further characterization in terms of vegetation types and community composition. It has been noted that at least 24 distinct physiognomic units (including Champion and Seth's categories) are required to broadly describe the major biomes and biogeographic regions of India. These types along with the characteristic floral elements are shown in the Table. In addition, a large number of herbaceous formations and associations at the local level characterize the habitats for various faunal groups including birds.

i The Indian Trans-Himalayas

The Indian Trans-Himalayas, also known as the Indian cold desert, support very sparse vegetation. Based on the physiognomy, three categories of natural vegetation are clearly discernible namely, Alpine Arid Scrub (AAS) or Steppe formations, Alpine Arid Pastures (AAP), and Marsh Meadows (MM). The AAS vegetation is dominated by the *Artemisia-Caragana*, *Hippophae-Myricaria*, and *Ephedra gerardiana* communities. The AAPs are largely dominated by graminoids while the MMs have a preponderance of sedges. The plant community structure and composition are strongly influenced by the microtopography and soil moisture. Accordingly, various habitats such as moist slopes, riverine areas, sandy plains, field borders, valley bottoms, rubble slopes, scree slopes, and marsh meadows exhibit distinct formations and communities. The characteristic species in the Trans-Himalayas are the species of *Saussurea*, *Potentilla*, *Corydalis*, *Astragalus* and *Oxytropis*. In general, the Indian Trans-Himalayas is poorer in floral diversity as compared to the moist alpine meadows of the Greater Himalayas. A small portion of the Indian Trans-Himalayas is represented in the Central Himalayas (Sikkim) which is relatively higher in terms of species diversity compared to the northwestern region. This region is characterized by low primary productivity, harsh climatic conditions, and specialized growth forms (Kachroo *et al.* 1977).



Photo: Asad R. Rahmani

ii The Himalayan Region

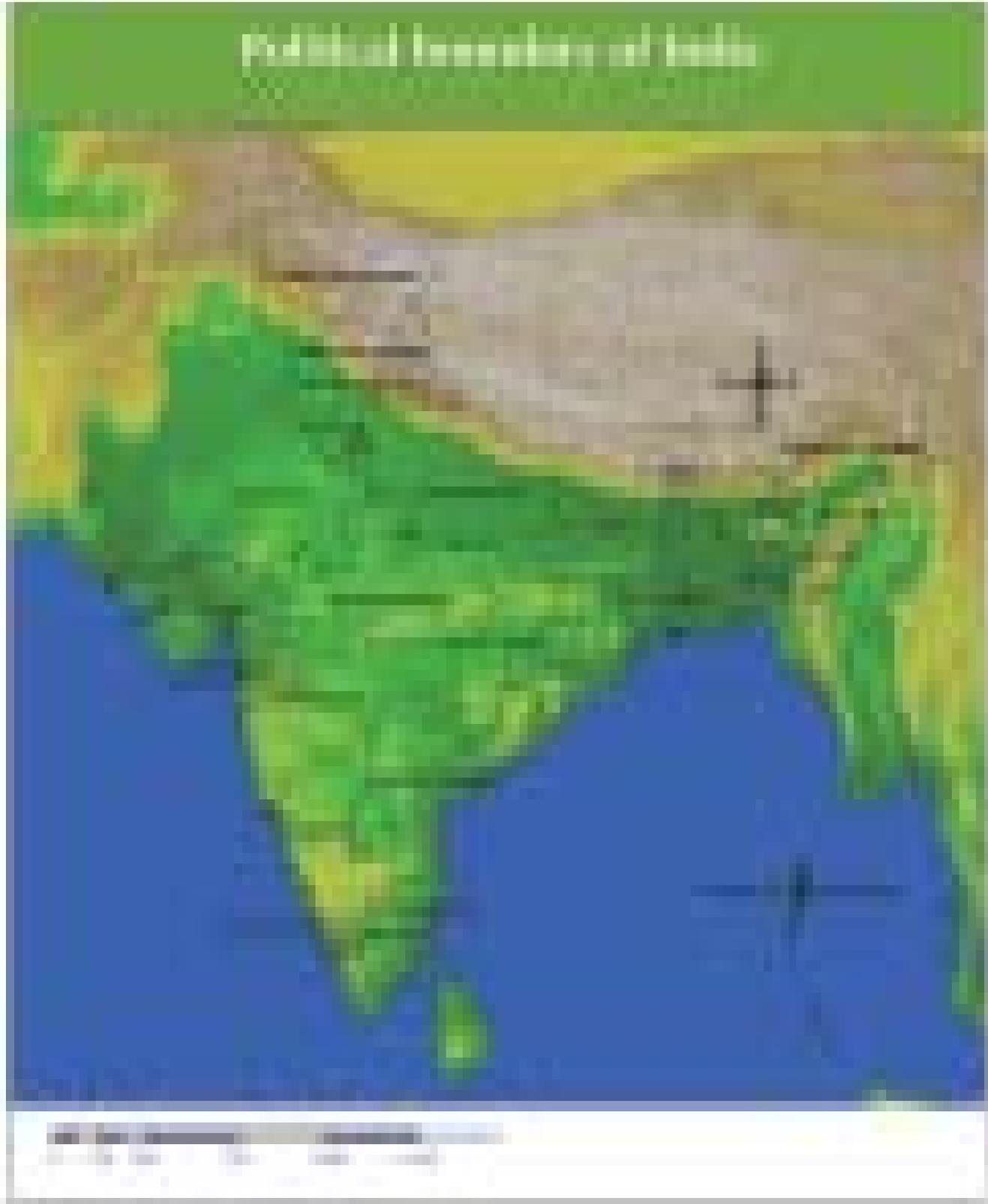


Photo: Asad R. Rahmani

The Himalayan region is spread over an area of approximately 2,10,626 sq. km within India. This region as a whole is regarded as an important biodiversity hotspot. The region supports a wide range of vegetation types ranging from the Tropical to the Alpine types. It is home to over 8,000 species of flowering plants and nearly 10,000 species of lower plants. The zone above the natural treeline (c. 3,300 – 3,600 m asl in the Western Himalayas and c. 3,800 – 4,000 m in the East) in the Himalayas supports the alpine vegetation, which is characterized by alpine scrub, meadows, moss-lichen laden rocky slopes, and matted shrubs. Of all the categories, the meadows are of considerable ecological interest due to the adaptability of the plant forms and the great profusion of herbaceous species. The meadows are the repository of valuable fodder species as well as medicinal and aromatic plants. The alpine zone is generally separated by a distinct treeline characterized by birch-rhododendron (*Betula utilis* - *Rhododendron campanulatum*), fir (*Abies pindrow*) or brown oak (*Quercus semecarpifolia*) forests.

At a lower elevation (1,500-3,300 m asl), the major vegetation types in the Northwest and Western Himalayas include Himalayan Dry Temperate (Coniferous), Himalayan Moist Temperate (Broadleaf), Temperate Grassy Slopes (secondary formations), and secondary scrub. These habitats provide breeding grounds for a large number of birds and mammals. To the south facing, frequently burnt and exposed slopes there are temperate grasslands throughout the Western Himalayas. Dachigam NP (an IBA) in Kashmir represents one such grassland habitat that supports a highly threatened subspecies of the Red Deer called Hangul *Cervus elaphus hanglu* and several grassland birds. The Montane region of Sikkim and Arunachal Pradesh bears Temperate Broadleaf Forests, Temperate Coniferous Forests, Sub-alpine Forests and scrub.

Important Bird Areas in India - Background



The geographical designations employed do not imply the expression of any opinion whatsoever on the part of IBCN: Bombay Natural History Society concerning the legal status of any state/country, territory or area, or concerning the delimitation of its frontiers or boundaries.

The Shivaliks or the sub-Himalayan zone falls under the Indo-Gangetic Plains according to Rodgers and Panwar (1988). Subtropical climate, varied topography, rich alluvial soils and intermingling of taxa from the Indo-Malayan and Palaeartic regions have given rise to very high biodiversity. The major forest types according to Champion and Seth (1968) from the west to the east along the increasing rainfall gradient include *Dodonaea* scrub, Subtropical Dry Evergreen Forests of *Olea cuspidata*, Subtropical Pine Forests, Northern Dry Mixed Deciduous Forest, Dry Shivalik Sal Forest, Moist Mixed Deciduous Forest, Subtropical Broadleaf Wet Hill Forest, Northern Tropical Semi-Evergreen Forest, and Northern Tropical Wet-Evergreen Forest. The Shivalik hills are best represented between the Ganges and Yamuna rivers in Uttaranchal. The entire belt covers an area of c. 40,000 sq. km of which only <2100 sq. km falls under the protected area network. Ecologically, the entire Shivalik belt can be considered as a highly sensitive zone.

iii. The Indian Desert

The Indian Desert covers nearly 12% of the land, most (90%) of which is located in western India. Biogeographically, the Thar desert is the eastward extension of the Sahara-Arabian desert system which spreads through Iran, Afghanistan and Baluchistan (Rodgers and Panwar 1988). It is estimated that the Indian Desert supports c. 500 species of vascular plants. Such a low species diversity compared to the other biogeographic zones is due to harsh climatic factors coupled with intense biotic pressure (anthropogenic factors). Despite uniformly adverse climatic conditions, the deserts exhibit distinctive microtopographic variations and highly specialized plant communities. For example, *Calligonum polygonoides* and *Lasiurus* spp. stands are found in typical sand dunes. Other associations are *Prosopis-Zizyphus-Capparis*, *Euphorbia-Salvadora-Acacia*, *Capparis-Prosopis-Salvadora*, and *Tamarix-Salvadora-Suaeda* in sandy plains, stony and hilly areas, gravel and compact areas and saline soils respectively (Bhandari 1990). The growth forms of extreme arid environments include leafless perennials (6% taxa), spiny and thorny species (10% taxa), hairy or with trichomes (20% taxa), and with characteristic thick cuticles and sunken stomata (c. 60% taxa).

The Thar desert has more than 500 species of plants.

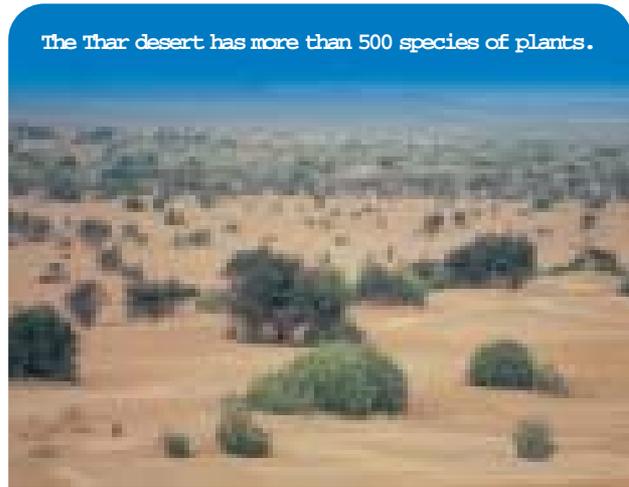


Photo: M. Zafar-ul Islam

ix. The Semi-Arid Zone

Probably less than 1% of the original semi-arid dry grasslands survive.



Photo: Asad R. Rahmani

The Semi-Arid Zone (c. 5,45,850 sq. km) lies between the isohyets 400-1000 mm (annual) and represents a characteristic Savannah Woodland, Dry Deciduous and Tropical Thorn Forest zone in Western India. These vegetation types have been classified as Tropical Dry Deciduous and Tropical Thorn Forests by Champion and Seth (1968). The open and stunted vegetation (less than 6 m in height) is dominated by *Acacia* spp., *Balanites roxburghii*, *Cordia myxa*, *Phoenix sylvestris*, *Anogeissus pendula*, *Capparis aphylla*, *Crotalaria* spp., and *Salvadora* spp. *Euphorbia* and several other xerophytic species are common in the rocky habitats. The soil is usually bare, although some grassy growth may appear during the short monsoon (Puri *et al.* 1989). The Kathiawar region encompassing the Gir forest in Gujarat and the Aravalli hill ranges in eastern Rajasthan are also dominated by Tropical Dry Deciduous and Tropical Thorn Forests, the latter indicating the semi-arid conditions. The flora of this zone is dominated by grasses and associated forbs, including legumes of African affinity.

v. The Western Ghats

The Western Ghats, a chain of ancient mountains parallel to the west coast of the Indian Peninsula occupies only c. 5% of India's land area (about 1,32,606 sq. km), yet it harbours nearly 27% of its total flora. The Western Ghats, with a latitudinal range of more than 10 degrees, lies more or less parallel to the west coast of India. Its forests are one of the best representatives of Non-Equatorial Tropical Forests in the world (Pascal 1982).

Wet Evergreen Forests are mostly confined to the windward side of the Western Ghats where the rainfall exceeds 2,000 mm. By taking into account the distribution pattern of certain characteristic species, which reflect the climatic variations, the forests are further subdivided into several floristic types. All these types are classified according to low (0-800 m), medium (800-1,450 m) and high (> 1,400m) elevation types. Most of the Evergreen Forests are dominated by the members of Lauraceae,

The Western Ghats, comprising only 5% of India's area, harbour 27% of its total flora.



Photo: Isaac Kehimkar

Myrtaceae, Ebenaceae and Annonaceae. In the Nilgiri hills, which are slightly drier compared to the western slopes, the forest formations are dominated by the *Diospyros ovalifolia*-*Memecylon lushingtonii*-*Olea glandulifera* communities. Other floristic elements in the region include *Eurya japonica*, *Gaultheria fragrantissima*, *Ilex wightiana*, *Mahonia leschenaultii*, *Photinia notoniana*, *Rapanea* spp., *Rhododendron nilagiricum*, *Rhodomyrtus tomentosa*, *Symplocos* spp., and *Turpinia cochinchinensis*. Moist Deciduous forests are found mainly in the rainfall zone of 1,500 mm to 1,800 mm. These forests are largely found between the Wet Evergreen and Dry Deciduous types. The typical elements of such forests are *Dillenia pentagyna*, *Tabernaemontana heyneana*, *Lagerstroemia microcarpa* and *Tectona grandis*. Dry Deciduous Forests are confined to the rain shadow areas of the Western Ghats, especially towards the northern parts of the Nilgiris, Palnis and areas bordering the Mysore and Karnataka plateau. The typical floristic elements in these forests are *Albizzia amara*, *Acacia* spp., *Gyrocarpus jacquini*, *Tectona grandis*, *Anogeissus latifolia*, *Pterocarpus marsupium*, *Terminalia alata* and a large number of grasses.

Areas above 1,800 m asl in the Western Ghats are dominated by natural grasslands and adjacent pockets of Montane Evergreen Forests frequently termed as Shola-Grassland Complex. The common herbaceous elements among the grasses include *Anaphalis* spp., *Campanula fulgens*, *Cassia* spp., *Crotalaria notonii*, *Cyanotis* spp., *Impatiens* spp., *Indigofera pedicillata*, *Justisia simplex*, *Knoxia mollis*, *Leucas suffruticosa*, *Lilium neilgherrense*, *Oldenlandia articularis*, *Polygala sibirica*, *Striga asiatica*, *Viola patrinii*, and *Wahlenbergia gracilllis*. In the swampy pockets *Commelina* spp., *Centella asiatica*, *Drosera peltata*, *Fimbristylis uliginosa*, *Andropogon fouldsii*, *Anthistiria ciliata*, *Arundinella* spp., *Arundinaria villosa*, *Bothriochloa pertusa*, *Chrysopogon orientalis*, *Cymbopogon* spp., *Eragrostis nigra*, *Eulalia* spp., *Heteropogon contortus*, *Isachne* spp., *Themeda* spp., *Tripogon bromoides* and *Zenkeria elegans* are found.

vi. The Deccan Peninsula

The Deccan Peninsula, the largest biogeographic zone of India, according to the classification of Rodgers and Panwar (1988), has extensive forested tracts. The zone is relatively homogenous and supports various vegetation types ranging from Tropical Thorn Forest to Tropical Dry and Moist Deciduous. There are five biogeographic provinces within this zone: Central Highlands comprising the Vindhya and Satpura hill ranges, Chota Nagpur Plateau, Eastern Ghats, Tamil Nadu Plains, and Karnataka Plateau. Phytogeographically, these areas are quite similar and do not exhibit high level of endemism, yet the assemblages within the sub-zones represent very characteristic ecological conditions, relict vegetation patches, biotic formations, and edaphic formations. Much of the area falls under the Southern Moist Deciduous and Southern Dry Deciduous Forest categories of Champion and Seth (1968). These include sal and teak bearing forests, Moist Mixed Deciduous Forest without teak, and Secondary Moist Mixed Deciduous Forests of Madhya Pradesh, Andhra Pradesh, Maharashtra and Karnataka. The thorn scrub vegetation has been described by Puri *et al.* (1989).

Typical species of the region, besides sal and teak, are species of *Acacia* (*A. caesia*, *A. catechu*, *A. leucophloea*, *A. pennata*, *A. racemosa*), *Aegle marmelos*, *Anogeissus acuminata*, *Bridelia retusa*, *Buchanania lanzan*, *Cochlospermum religiosum*, *Dalbergia paniculata*, *Elaeodendron glaucum*, *Embllica officinalis*, *Madhuca indica*, *Manilkara hexandra*, *Pterocarpus marsupium*, *Terminalia bellerica*, *Terminalia chebula*, and *Butea superba*. A few pockets in the Eastern Ghats support Evergreen Forests with characteristic species such as *Barringtonia acutangula*, *Syzygium cumini*, *Ficus hispida*, *Melastoma malabathricum*, *Homonoia riparia*, *Terminalia arjuna*, *Mangifera indica*, a tree fern (*Cyathula spinulosa*) and a Gymnosperm (*Gnetum ula*) (Rawat 1997).

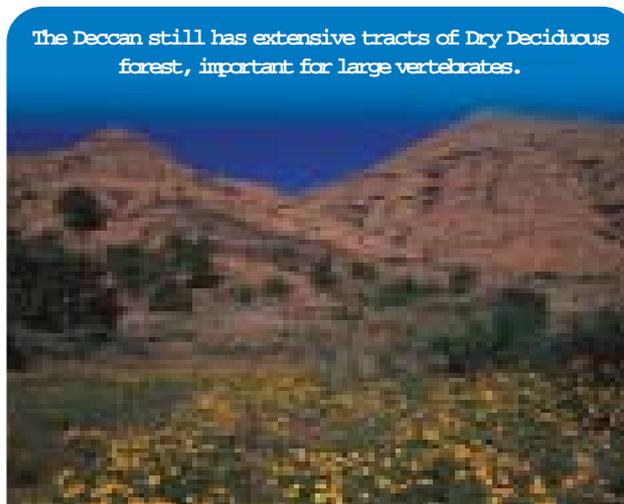


Photo: Nayan Khanolkar

vii. The Gangetic Plains



Photo: M. Zafar-ul-Iskhan

The Gangetic Plains (c. 3,54,782 sq. km) include the areas adjacent to the Terai-Bhabar tracts in Uttar Pradesh, Bihar and West Bengal. The alluvial formations are divisible into drier Pleistocene alluvium (*Bhangar*), more recent wet silt (*Khadar*), limestone predominated pebbly grounds (*Kankar*) and elevated alluvial formations (*Duar*) of West Bengal. This area is dominated by hygrophilous grasslands and savannah woodlands. This area is strongly influenced by frequent fires and floods, which deposit silt from the Himalayan foothills. Much of the area was settled by man during the past two centuries, especially after the large-scale eradication of a deadly strain of malaria during the late 1950s. The prominent species of grasses in the region include *Saccharum spontaneum*, *S. arundinaceum*, *Imperata cylindrica*, *Cymbopogon flexuosus*, and *Vetiveria zizanioides*. Some of the communities within these grasslands e.g., *Imperata cylindrica*-*Cymbopogon flexuosus*, are also reported to be the habitat for the threatened Bengal Florican *Houbaropsis bengalensis*. Most of these grasslands are seral in nature which ultimately give rise to climax sal *Shorea robusta*

forest through the seral stages of *Dalbergia sissoo-Acacia catechu*, *Zizyphus mauritiana-Butea monosperma* and *Lagerstroemia parviflora* among others. These forests have been categorized under the Northern Moist Deciduous Forests by Champion and Seth (1968).

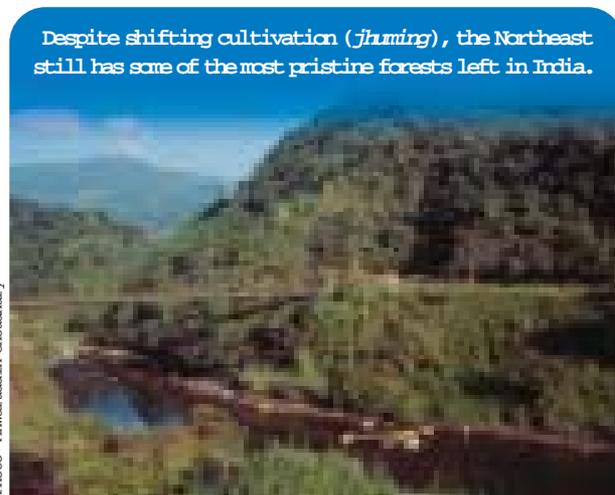
viii. The Coasts

The Indian coastline (from Gujarat to Sunderbans) is c. 7,500 km long. The typical coastal ecosystem covers an area of c. 82,813 sq. km. The area has mainly two types of vegetation, namely mangrove forests and dry sand dunes. However, on the Coromandel coast there is a typical Dry-Evergreen formation close to the coast. The mangroves are essentially semi-aquatic/wetland ecosystems, located along the estuaries of major rivers characterized by salt tolerant species such as *Rhizophora mucronata*, *Bruguiera gymnorhiza*, *Ceriops tagal*, *Lumnitzera littorea*, *Avicennia officinalis*, *Heritiera littoralis*, *Acanthus ilicifolius* and *Acrostichum aureum*. Today most of India's mangrove vegetation is confined to certain protected areas such as Sunderbans, Bhitarkanika, Coringa, Nelapattu, Point Calimere and Pirotan (Marine) National Park (all IBAs).

The coastal sand dune vegetation is typically xerophytic with species such as *Anthrocnemum indicum*, *Salvadora oleoides* and *Spinifex littoreus*. Major problems in these areas include extraction of sand, developmental projects, and plantation of exotic species such as *Casurina equisetifolia* and *Eucalyptus* spp.



ix. The Northeast India

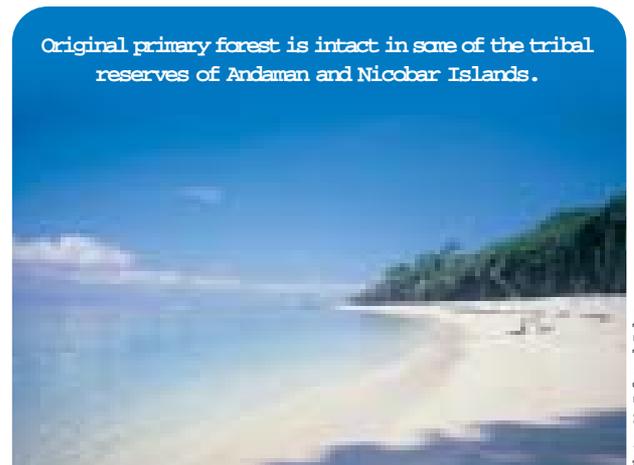


Northeast India, including Assam Valley and the adjacent hill ranges exhibits a complex mosaic of vegetation types ranging from Northern Tropical Wet Evergreen to Montane and Wet Temperate types. The major categories of forests according to Champion and Seth (1968) include the Assam Valley Tropical Wet Evergreen Forest, Cachar Tropical Semi-Evergreen Forest, Cachar Tropical Evergreen Forest, Upper Assam Valley Tropical Evergreen Forest, Cane Brakes, Subtropical Broadleaf Wet Hill Forest, Assam Subtropical Pine Forest, Moist Bamboo Brakes, Naga Hills Wet Temperate Forest, and Eastern Hollock Forest (*Terminalia myriocarpa*). The characteristic species in the evergreen forests are *Dipterocarpus macrocarpus*, *Michelia doltsopa*, *Dipterocarpus turbinatus*, *Acer laevigatum*, *Terminalia chebula*, *Schima wallichii*, *Garcinia pedunculata*, *Alseodaphne owdenii*, *Dillenia indica*, *Casatanopsis tribuloides*, *Aglaia hiernii*, *Xenosperme muricatum*, *Artocarpus heterophyllus*, *Phrynium capitatum*, *Amomum lingueforme*, *Costus speciosus*, *Hedychium bracteatum* and *Aeginetia indica*. Towards the higher elevations the characteristic

species include *Lithocarpus pachyphylla*, *Engelhardtia spicata*, *Castanopsis tribuloides*, *Erythrina arborescens*, *Eurya simplicina*, *Gmelina oblongifolia*, *Mahonia borialis*, *Melocanna bambusoides*, *Dendrocalamus hamiltonii* and a large number of other bamboos. Owing to extensive shifting cultivation (*jhumming*) and invasion by exotic species, many of the original categories described by Champion and Seth (1968) are hardly discernible in the field at present.

x. The Islands

The total area under 'Islands' within the Indian territory is approximately 8,358 sq. km, of which the Andaman and Nicobar Islands occupy about 8,249 sq. km and the Lakshadweep islands cover an area of 109 sq. km. These islands have about 2,200 species of higher plants including about 200 strict endemics. Approximately 1,300 species are not found elsewhere in India but are found in Myanmar, Malaysia, Indonesia and Polynesia (Rodgers and Panwar 1988). Phytogeographically, the Andaman and Nicobar islands exhibit different affinities. While the Andamans are closely related to Myanmar and Northeast India, the Nicobar Islands have closer affinities with Indonesia. The latter group of islands have no Dipterocarps but a higher diversity of tree ferns and palms. Champion and Seth (1968) have classified the Andaman and Nicobar forests into six types. Of these, three are of the evergreen type (Giant Andaman Evergreen Forest, Andaman Tropical Evergreens, and Andaman Hilltop



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Evergreen Forest) and the others are the Andaman Moist Deciduous Forest, Littoral Forest and Mangrove Forest. Bamboo and Cane Brakes form local variations.

The tall Gurjan (*Dipterocarpus alatus*) forests of Andaman have almost vanished due to large-scale clearance of flat terrain for agriculture. The Andaman Tropical Evergreens are multi-storeyed, closed canopy forests which grow on hilly terrain. They are less luxuriant than the Giant Evergreen with lesser height and lesser density. Mangroves in the Andaman and Nicobar islands are estimated to occupy 1,15,000 ha of which 50,000 ha are in the Andaman group. The coast line of the Andaman Islands is irregular and deeply indented thereby giving rise to a number of tidal creeks.

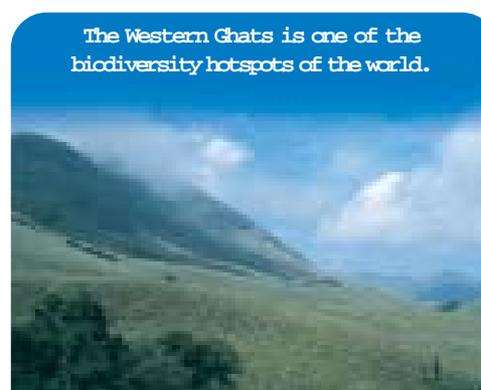


Photo: Asad R. Rehmani

Major vegetation types of India and characteristic floral elements

| Sr. No. | Vegetation Type and Geographical Location | Characteristic / Dominant Species |
|---------|--|---|
| 1. | TWE Andaman and Nicobar Islands | <i>Dipterocarpus</i> spp., <i>Calophyllum soulattri</i> , <i>Mangifera sylvatica</i> , <i>Myristica</i> sp., <i>Calamus palustris</i> |
| 2. | TWE (Western Ghats) | <i>Dipterocarpus indicus</i> , <i>Humboldtia brunonis</i> , <i>Cullenia exarillata</i> , <i>Ficus</i> spp., <i>Palaquium ellipticum</i> , <i>Myristica malabarica</i> |
| 3. | TWE (Northeast India) | <i>Dipterocarpus macrocarpus</i> , <i>Artocarpus chaplasi</i> <i>Livistonia jenkinsiana</i> , <i>Ficus</i> spp., <i>Alpinia</i> spp., <i>Phrynium</i> sp. |
| 4. | TSE (Transitional) | <i>Ficus</i> spp., <i>Dillenia pentagyna</i> , <i>Garuga pinnata</i> , <i>Toona ciliata</i> |
| 5. | TMD (Moist Teak) Indian Peninsula | <i>Tectona grandis</i> , <i>Xylia xylocarpa</i> , <i>Terminalia crenulata</i> |
| 6. | TMD (Moist Sal) Upper Gangetic Plains | <i>Shorea robusta</i> , <i>Terminalia alata</i> , <i>Dalbergia sissoo</i> , <i>Acacia catechu</i> |
| 7. | TMD (Peninsular Sal) Deccan Plateau | <i>Shorea robusta</i> , <i>Madhuca indica</i> , <i>Syzygium operculatum</i> , <i>Symplocos</i> sp. |
| 8. | Mangroves Coastal region | <i>Heriteria fomes</i> , <i>Avicinnia marina</i> , <i>Nypa fruticans</i> |
| 9. | TDD (Dry Teak) Deccan Plateau | <i>Tectona grandis</i> , <i>Terminalia alata</i> , <i>Anogeissus latifolia</i> |
| 10. | TDD (Southern) Semi-arid | <i>Albizia amara</i> , <i>Hardwickia binata</i> |
| 11. | TDD (Savannah) Semi-arid | <i>Prosopis cineraria</i> , <i>Zizyphus mauritiana</i> , <i>Butea monosperma</i> |
| 12. | TDD (Northern) Semi-arid | <i>Acacia senegal</i> , <i>Anogeissus pendula</i> , <i>Zizyphus mauritiana</i> |
| 13. | TTF (Southern) Deccan | <i>Acacia</i> spp., <i>Carissa opaca</i> , <i>Ixora</i> sp. |
| 14. | TTF (Northern) Semi-arid | <i>Zizyphus nummularia</i> , <i>Salvadora oleoides</i> |
| 15. | TDE East Coast | <i>Manilkara hexandra</i> , <i>Chloroxylon swietenia</i> , <i>Strychnos nux-vomica</i> |
| 16. | MWT (Shola) Western Ghats | <i>Gordonia obtusa</i> , <i>Meliosma arnottiana</i> , <i>Schefflera</i> spp. |
| 17. | SBH (Eastern Himalayan Foothills and NE Hills) | <i>Lauraceae</i> , <i>Meliaceae</i> , <i>Annonaceae</i> , <i>Dendrobium</i> spp., Tree ferns |
| 18. | SPF Himalayan region | <i>Pinus roxburghii</i> , <i>Themeda anathera</i> |
| 19. | HWT Eastern Himalayas | <i>Magnolia griffithii</i> , <i>Altingia exelsa</i> , <i>Lauraceae</i> , <i>Meliaceae</i> , <i>Begonia</i> spp. |
| 20. | HMT (Broadleaf) Eastern Himalayas | <i>Quercus</i> spp., <i>Acer</i> , <i>Ilex</i> , Mosses and Lichens |
| 21. | HDT (Conifer) Western Himalayas | <i>Pinus wallichiana</i> , <i>P. gerardiana</i> , <i>Juniperus macropoda</i> |
| 22. | SAF Western Himalayas | <i>Betula utilis</i> , <i>Rhododendron campanulatum</i> , <i>Quercus semecarpifolia</i> |
| 23. | AMS Western Himalayas | <i>Juniperus pseudosabina</i> , <i>Rhododendron anthopogon</i> , <i>Lonicera</i> spp., <i>Salix</i> spp. |
| 24. | ADS Trans-Himalayas | <i>Caragana versicolor</i> , <i>Ephedra gerardiana</i> , <i>Tanacetum</i> spp. |

TWE = Tropical Wet-Evergreen Forests, TSE = Tropical Semi-Evergreen, TMD = Tropical Moist Deciduous, L/S = Littoral / Swamp Forest, TDD = Tropical Dry Deciduous, TTF = Tropical Thorn Forest, TDE = Tropical Dry Evergreen, MWT = Montane Wet Temperate, SBH = Subtropical Broadleaf Hill, SPF = Subtropical Pine Forest, HWT = Himalayan Wet Temperate, HMT = Himalayan Moist Temperate, HDT = Himalayan Dry Temperate (Coniferous), SAF = Sub-Alpine Forests, AMS = Alpine Moist Scrub, ADS = Alpine Dry Scrub