Biodiversity Hotspots in India

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Krishnamoorthy Venkataraman
and Chandrakasan Sivaperuman

Abstract

India is one of the 17 megadiverse countries in the world, and there are four biodiversity hotspots found in India. These are Indo-Burma, Himalaya, Western Ghats-Sri Lanka, and Sundaland. For biological diversity point of view, India is very rich in resources due to its diversified habitat and climatic conditions. India also supports 7.5% of the total animal species of the world. In this chapter, an effort made to compile and provide the detailed account on the vertebrate faunal diversity in the Indian biodiversity hotspots.

Keywords

Biodiversity · Faunal · Hotspots · India · Threatened

1.1 Introduction

Biodiversity is defined in the Convention on Biological Diversity as "the variability among living organisms from all sources including, inter alia, 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" (Article 2).

K. Venkataraman
National Centre for Sustainable Coastal Management, Anna University Campus, Chennai, Tamil Nadu, India

C. Sivaperuman (✉)
Zoological Survey of India, Andaman & Nicobar Regional Centre, Port Blair, Andaman & Nicobar Island, India
e-mail: c_sivaperuman1@rediffmail.com

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Myers (1988) defined "hotspots" as high concentrations of endemic species with high habitat loss. This hotspot approach can be applied at any geographical scale and both in terrestrial and marine environments. However, hotspots represent conservation priorities in terrestrial ecosystems but remain largely unexplored in marine habitats, where the amount of data is still poor (Mittermeier et al. 2011). A hotspot must contain at least 1500 species of vascular plants as endemics, and it has to have lost at least 70% of its original habitat (Myers et al. 2000). India is composed of a diversity of ecological habitats like forests, grasslands, wetlands, deserts, coastal, and marine ecosystems. India lies between 8° 04′ and 37° 06′ N latitude and 68° 07′ and 97° 25′ E longitude with a total geographical area of 329 million ha. India is one of the megadiverse countries due to its rich biological diversity, and there were 8.4 million species reported. According to the publication of Venkataraman (2006), India holds three major biological realms, namely, Indo-Malayan, Eurasian, and Afrotropical.

1.2 Biogeographic Zones of India

Biogeography is the study of distribution of plants and animals over their evolutionary history. The "biogeographic classification" for conservation planning divided the country into 10 zones and 26 provinces (WII 2009; Table 1.1). There are four levels of biogeographic classification.

Biogeographic zone is the large distinctive units of similar ecology, biome representation, community, and species (e.g., the Himalaya, the Western Ghats).

Biotic province is the secondary units within a zone, giving weight to particular communities separated by dispersal barriers or gradual change in environmental factors (e.g., North West and West Himalaya either side of the Sutlej River).

Land region is a tertiary set of units within a province, indicating different landforms (e.g., Aravalli Mountains and Malwa Plateau in Gujarat Rajwada Province).

Biome is an ecological unit, not a biogeographic unit. A biome such as swamp/wetland or temperate broad-leaved forests could be found in several biogeographic zones or provinces.

Table 1.1 List of biogeographic zone with provinces

Sl. no.	Name of the biogeographic zone	Number of provinces
1.	Trans-Himalaya	3
2.	Himalaya	4
3.	Indian desert	2
4.	Semiarid zone	2
5.	Western Ghats	2
6.	Deccan Peninsula	3
7.	Gangetic Peninsula	2
8.	Coasts	3
9.	North East India	2
10.	Islands	2

1.3 Biodiversity in India

India is very rich in terms of biological diversity due to its diversified habitat and climatic conditions. More than 50% of the world's plant diversity and 42% of terrestrial vertebrate diversity are endemic within the 35 biodiversity hotspots of the world. Overall, 7.5% of the total animal species of the world are found in India, though the Indian landmass is about 2%. India is known to have nearly 100,693 animal species, of which insect alone is 65,047 (Table 1.2). The inventories of reptiles, amphibians, fish, birds, and mammals are fairly complete. More than 5150 species of plants, 20,765 insect species, 46 mammal species, 176 bird species, 214 reptile species, 138 amphibian species, and 435 fish species are endemic in India (Ravindranath et al. 2006; Ramakrishna and Alfred 2007; ZSI 2016).

Table 1.2 Total number of animal species recorded in India

Kingdom	Phylum	Number of species			
		World (living and fossil)	World (living)	India	Percentage
Protista	Protozoa	36,400 (excluding fossil)	34,400	3510	9.64
Animalia	Mesozoa	122	122	10	8.02
	Porifera	11,055	8,838	545	6.16
	Cnidaria	17,702	11,522	1396	12.12
	Ctenophora	199	199	19	9.55
	Platyhelminthes	29,488	29,487	1738	5.89
	Rotifera	2049	2049	466	2.24
	Gastrotricha	828	828	162	19.56
	Kinorhyncha	196	196	10	5.10
	Nematoda	25,043	25,033	2914	11.63
	Acanthocephala	1461	1330	301	22.63
	Sipuncula	156	156	41	26.28
	Echiura	198	198	47	23.73
	Annelida	17,426	17,388	1024	5.89
	Onychophora	187	183	1	0.53
	Arthropoda	1,302,809	1,257,040	75,528	6.00
	Subphylum: Chelicerata	1,15,992	1,13,773	5945	5.23
	Class: Arachnida	1,14,275	1,12,442	5907	5.25
	Class: Merostomata	103	4	2	50.00
	Class: Pycnogonida	1346	1335	36	2.69
	Subphylum: Crustacea	73,141	67,735	3796	5.61
	Subphylum: Hexapoda	1,080,760	1,063,533	65,409	6.15
	Class: Collembola	8187	8162	324	3.97
	Class: Diplura	976	975	18	1.85
	Class: Protura	816	816	20	2.45
	Class: Insecta	1,070,781	1,053,578	65,047	6.17
	Subphylum: Myriapoda	12,010	11,999	378	3.15

(continued)

Table 1.2 (continued)

Kingdom	Phylum	Number of species			
		World (living and fossil)	World (living)	India	Percentage
	Class: Chilopoda	3118	3112	101	3.25
	Class: Diplopoda	7842	7837	270	3.45
	Class: Symphyla	204	204	7	3.43
	Phoronida	16	16	3	18.75
	Bryozoa (Ectoprocta)	11,652	6186	327	5.29
	Entoprocta	186	186	10	5.37
	Brachiopoda	7390	392	8	2.04
	Chaetognatha	186	170	44	25.88
	Tardigrada	1335	1167	30	2.57
	Mollusca	118,062	84,978	5189	6.11
	Nemertea	1368	1368	6	0.43
	Echinodermata	20,550	7550	777	10.29
	Hemichordata	162	139	14	10.07
	Chordata	89,955	71,526	6573	9.08
	Subphylum: Cephalochordata	33	33	6	18.18
	Subphylum: Urochordata	2804	2804	516	18.40
	Subphylum: Vertebrata	88,512	68,689	6051	6.85
	Class: Pisces	37,172	34,362	3324	9.70
	Class: Amphibia	8007	7667	388	5.06
	Class: Reptilia	16,123	10,357	527	5.47
	Class: Aves	11,241	10,357	1340	12.93
	Class: Mammalia	15,969	5853	427	7.29
	Total	**1,664,289**	**1,529,953**	**97,183**	
Grand total (Protista + Animalia		**1,700,689**	**1,566,353**	**100,693**	

Source: ZSI (2017)

The forest cover of the country constitutes about 692,027 km^2 (21.05%) of India's total geographical area (FSI 2011). Champion and Seth (1968) have classified the Indian forests into 16 major forest types and 221 subtypes. Wetland is another important habitat in India, and the extent of wetlands in India is about 4.1 million hectares, these excluding paddy fields and mangroves. The mangrove forest constitutes 7% of the world's mangroves with an extent of about 6700 km^2. The coral reef ecosystem is another important habitat in the marine environment; these are found in Andaman and Nicobar Islands, Lakshadweep Islands, Gulf of Kutch, and Gulf of Mannar. The Great Indian Desert covers about 2% of the total landmass which covers the states of Rajasthan, Gujarat, Punjab, and Haryana. The cold desert is also found in India, which generally lies in Ladakh, Jammu and Kashmir, and

Table 1.3 Total number of plant species recorded in India

Sl. no.	Type	Number of species		% in India	No. of endemic species	No. of threatened species
		World	India			
Flowering plants						
1.	Gymnosperms	1021	74	7.35	8	7
2.	Angiosperms	268,600	18,043	6.72	4036	1700
Non-flowering plants						
1.	Bryophytes	16,236	2523	15.54	629	ca. 80
2.	Pteridophytes	12,000	1267	10.57	47	414
Others						
1.	Virus and bacteria	11,813	986	8.77	NA	NA
2.	Algae	40,000	7284	18.21	1924	NA
3.	Fungi	98,998	14,883	15.09	4100	ca. 580
4.	Lichens	17,000	2401	14.12	520	NA
Total		**465,668**	**47,513**	**–**	**11,273**	**2781**

Source: Chapman (2009) and Singh and Dash (2014)
NA not available

Lahaul-Spiti in Himachal Pradesh covering an area of about 109,990 km^2. The India's landmass is only 2.4% of the world; however, it supports 47,513 species of plant (Singh and Dash 2014). Of the total recorded flora of the country, 28% are endemic. The detail comparative account of major plant species reported from India is provided in Table 1.3.

1.4 The Biodiversity Hotspots Concept

The first published biodiversity hotspot concept thesis was by the British Ecologist Norman Myers in the year 1988. Myers concept on biodiversity hotspots is the only relying sources, though he has used only qualitative criteria to assess the habitat loss and the presence of the highest number of plant endemism (Mittermeier et al. 2011). Later, eight more hotspots were analyzed and identified by Myers (1990), which includes four in Mediterranean regions. The Conservation International also adopted the Myers' hotspot concept and thereafter worked systematically to update the global biodiversity hotspots. Myers, Conservation International, and collaborators later revised estimates of the remaining primary habitat and defined the hotspots formally as biogeographic regions with more than 1500 endemic vascular plant species and ≤30% of original primary habitat (Myers et al. 2000). Based on this collaboration, an extensive global review has been made and the scientific publications on the hotspots also expand in greater number (Mittermeier et al. 1999; Myers et al.

2000). During the year 2004, a second major revision carried out and updated the biodiversity hotspots without changing the criteria; however they were redefining several hotspot boundaries. Based on the results, a total of 34 biodiversity hotspots were classified by Mittermeier et al. (2011). The Forests of East Australia is added as the 35th biodiversity hotspot by Williams et al. (2011). Overall the hotspots are maintaining the 77% of endemic plant species, 43% of vertebrates, and 80% of all threatened amphibians (Mittermeier et al. 2011; Williams et al. 2011).

1.5 Indian Biodiversity Hotspots

India is one of the world's most biodiverse countries. India's political boundaries encompass a wide range of ecozones, namely, the desert, the high mountains, the highlands, the tropical and temperate forests, the swamplands, the plains, the grasslands, and the islands. Four global biodiversity hotspots are found in India: the Western Ghats-Sri Lanka, the Himalaya, the Indo-Burma, and the Sundaland (Table 1.4). India is situated in the confluence of Oriental, Palaearctic, and Ethiopian biogeographical regions (Mani 1974). There are a total of 668 protected areas including 102 national parks, 515 wildlife sanctuaries, 47 conservation reserves, and 4 community reserves covering a total of 161,221.57 km^2 of the country. Also, there are 47 tiger reserves, 18 biosphere reserves, 25 elephant reserves, 5 natural world heritage sites, and 25 Ramsar sites designated in India (Anon. 2015).

Table 1.4 Biodiversity hotspots in India

Sl. no.	Name of the biodiversity hotspots	Province
1	Himalaya	These hotspots cover the Indian Himalayan region (and that falling in Pakistan, Tibet, Nepal, Bhutan, China, and Myanmar)
2	Indo-Burma	It covers the northeastern India, except Assam and Andaman group of Islands (and Myanmar, Thailand, Vietnam, Laos, Cambodia, and southern China)
3	Western Ghats-Sri Lanka	It includes the Western Ghats and Sri Lanka
4	Sundaland	Entire Nicobar group of islands is included in this hotspot (and Indonesia, Malaysia, Singapore, Brunei, and Philippines)

www.conservation.org

1.6 Hotspot: The Himalaya

The world's highest mountains and Mount Everest are found in the Indian Himalayan Biodiversity Hotspot. The forests of these mountains are subtropical broadleaf forest to alpine. Several vascular plants have also been reported at the height of 6000 m. This hotspot supports several important animals and bird species, which include vultures, tigers, elephants, rhinoceros, and buffalo. The Himalaya hotspot includes several of the world's deepest rivers. The mountain range of this hotspot covers about 750,000 km^2 and is divided into two major regions, i.e., the Eastern Himalaya (Nepal, Bhutan, the northeast Indian states of West Bengal, Sikkim, Assam, Arunachal Pradesh, southeast Tibet, and northern Myanmar) and the Western Himalaya (Kumaon-Garhwal, northwest Kashmir, and northern Pakistan) (Table 1.5).

1.7 Biodiversity

The Himalayan Biodiversity Hotspot supports about 163 globally threatened species which include one-horned rhinoceros *Rhinoceros unicornis*, wild Asian water buffalo *Bubalus bubalis*, and above 45 species of mammals, 50 species of birds, 17 species of reptiles, 12 species amphibians, 3 species invertebrates, and 36 species of plant (Table 1.6). The endangered species of the relict dragonfly *Epiophlebia*

Table 1.5 Details of the Himalayan Biodiversity Hotspot

Original extent (km^2)	741,706
Remaining vegetation (km^2)	185,427
Number of plant species are endemic	3160
Number of threatened and endemic birds	8
Number of endemic and threatened mammals	4
Number of endemic and threatened amphibians	4
Extent of protected area (km^2)	112,578

Source: www.conservation.org

Table 1.6 Biodiversity and endemic species

Group	Total number of species	Number of endemic species	Percentage of endemism
Plants	10,000	3160	31.6
Mammals	300	12	4.0
Birds	977	15	1.5
Reptiles	176	48	27.3
Amphibians	105	42	40.0
Freshwater fishes	269	33	12.3

Source: www.conservation.org

Table 1.7 Description of the Indo-Burma

Original extent (km^2)	2,373,057
Remaining vegetation (km^2)	118,653
Number of plant species are endemic	7000
Number of threatened and endemic birds	18
Number of endemic and threatened mammals	25
Number of endemic and threatened amphibians	35
Extent of protected area (km^2)	235,758

Source: www.conservation.org

laidlawi is also found in this hotspot. This region is also home to the salamander species Himalayan newts, *Tylototriton verrucosus*. More than 10,000 species of plants in the Himalayas were reported from here, of these one-third of the species are endemic. Five families, namely, Tetracentraceae, Hamamelidaceae, Circaesteraceae, Butomaceae, and Stachyuraceae, are completely endemic to this region. Many threatened and endemic bird species are also found in this hotspot, namely, the Himalayan quail, cheer pheasant, western tragopan Himalayan vulture, and white-bellied heron.

1.8 Hotspot: Indo-Burma

The Indo-Burma Biodiversity Hotspot is one of the top ten hotspots in the world, which is impossible to replace the original habitat and also under the threat is in the five. Only 5% of its natural habitat is remaining and with more human population than any other hotspots (Mittermeier et al. 2004). This hotspot encompasses several countries, which spread out from eastern Bangladesh to Malaysia, the south of Brahmaputra River of the northeastern India, the southern part of China's Yunnan province, Lao People's Democratic Republic, Cambodia, Vietnam, and Thailand. An extensive variety of diversities is represented in this hotspot, which includes mixed wet evergreen, dry evergreen, deciduous, and montane forests. Several patches of shrublands and woodlands on karst limestone outcrops and, in some coastal areas, scattered heath forests are also found here. Besides, a large variety of distinctive localized vegetation formations occur in Indo-Burma; these consist of lowland floodplain swamps, mangroves, and seasonally inundated grasslands (Table 1.7).

1.9 Biodiversity

A large amount of area in this hotspot, which is still untouched, however, has been declining rapidly in the past few decades. In recent years, about six species of mammals were discovered from this hotspot, namely, large-antlered muntjac, Annamite muntjac, gray-shanked douc, Annamite striped rabbit, leaf deer, and the Saola; this

Table 1.8 Biodiversity and endemism

Taxonomic group	Total number of species	Number of endemic species	Percentage of endemism
Plants	13,500	7000	51.9
Mammals	433	73	16.9
Birds	1266	64	5.1
Reptiles	522	204	39.1
Amphibians	286	154	53.8
Freshwater fishes	1262	553	43.8

Source: www.conservation.org

Table 1.9 Description of the Western Ghats and Sri Lanka hotspots

Original extent (km^2)	189,611
Remaining vegetation (km^2)	43,611
Number of plant species are endemic	3049
Number of threatened and endemic birds	10
Number of endemic and threatened mammals	14
Number of endemic and threatened amphibians	87
Number of extinct species	20
Extent of protected area (km^2)	26,130

Source: www.conservation.org
Recorded extinctions since 1500

is also home for many species of primates. Several species of freshwater turtle are endemic in this region. More than 1300 species of birds can be found, which include the threatened white-eared night heron, the gray-crowned crocias, and the orange-necked partridge. There is also an estimated 13,500 species of plants, of which more than 50%, are endemic (Table 1.8).

1.10 Hotspot: Western Ghats and Sri Lanka

The Western Ghats area chain of hills that run along the southwestern coast of India lies the Western Ghats Mountain Range (Table 1.9). This also known by the name "Sahyadri" constitutes a 1600-km-long mountain range, and this is originating from south of the Tapti River and extending up to Kanyakumari at Southern India. The Western Ghats Mountains are ranges recognized for their high biodiversity and natural heritage. The average elevation is 900–1500 m, and the highest mountain peak is having an altitude of 2969 m. The western slopes of Western Ghats receive very high rainfall ranging from 2000 to 6000 mm per year (Nair 1991). The hotspots support more species diversity and endemism. About 77% of amphibians and 62% of the reptile species found only in this hotspot which is not found anywhere.

1.11 Biodiversity

About 6000 species of vascular plant that belongs to 2500 genera were reported from this hotspot. Of these, 3000 species are endemic to this region. The world's spices, namely, the black pepper and cardamom, were originated from Western Ghats Mountain. The Agasthyamalai Hills support highest concentration of species in the Western Ghats. This hotspot is also home to special habitat of fresh water swamps known as Myristica swamps. The Western Ghats is home for more than 510 species of birds, 140 species of mammals, 260 species of reptiles, and 181 species of amphibians (Tables 1.10 and 1.11).

Table 1.10 Biodiversity and endemism

Taxonomic group	Total number of species	Number of endemic species	Percentage of endemism
Plants	5916	3049	51.5
Mammals	140	18	12.9
Birds	510	35	7.6
Reptiles	267	174	65.2
Amphibians	181	130	73.0
Freshwater fishes	191	139	72.8

Source: www.conservation.org

Table 1.11 Animal groups recorded from Western Ghats

Animal group	No. of species	Endemism%
Mammals	137	11.7
Birds	508	0.3
Reptiles	203	61.8
Amphibians	181	87.8
Fishes	290	65.0
Land snails	269	76.0
Freshwater snails	77	36.0
Butterflies	332	11.0
Odonata	174	39.6

1.12 Hotspot: Sundaland

The Sundaland Biodiversity Hotspot is located in Southeast Asia (Myers et al. 2000). This hotspot comprises the landmasses of the Malay Peninsula, Sumatra, Java, Bali, and Borneo besides several smaller islands. The Nicobar group of islands, which are jurisdictionally controlled by India, form part of this hotspot, and the fauna and flora have close affinities (Davis et al. 1995). The extent of the Sundaland hotspot is about 1.5 million km^2 and covering half of the Indo-Malayan archipelago. This hotspot also includes more than 17,000 islands, of which Borneo covers about 725,500 km^2 and Sumatra, 427,300 km^2. The dividing boundary between the Sundaland hotspot and the Mainland Southeast Asia hotspot to the northwest is here taken as the Kangar-Pattani Line, which lies near the Thailand-Malaysia border (van Steenis 1950; Whitmore 1984). Sundaland is rich in biodiversity on earth, supporting more than 25,000 species of vascular plants, of which 117 species are endemic. About 770 species of birds were reported from this region, which include 150 endemic species. High concentration of mammals was also reported; 380 mammal species are found in Sundaland, and 170 species are endemic (Tables 1.12, 1.13 and 1.14).

Table 1.12 Species diversity and endemism in Sundaland hotspots

Taxonomic group	Total number of species	Number of endemic species	Percentage of endemism
Plants	25,000	15,000	60.0
Mammals	380	172	45.3
Birds	769	142	18.5
Reptiles	452	243	53.8
Amphibians	244	196	80.3
Freshwater fishes	950	350	36.8

Source: Conservation International: www.conservation.org

Table 1.13 Description of the Sundaland

Original extent (km^2)	1,501,063
Remaining vegetation (km^2)	100,571
Number of plant species are endemic	15,000
Number of threatened and endemic birds	43
Number of endemic and threatened mammals	60
Number of endemic and threatened amphibians	59
Number of extinct species	4
Extent of protected area (km^2)	179,723

Source: www.conservation.org

Table 1.14 Biodiversity diversity and endemism

Taxonomic group	Total number of species	Number of endemic species	Percentage of endemism
Plants	25,000	15,000	60.0
Mammals	380	172	45.3
Birds	769	142	18.5
Reptiles	452	243	53.8
Amphibians	244	196	80.3
Freshwater fishes	950	350	36.8

Source: www.conservation.org

The Andaman and Nicobar archipelagos, also often referred to as the Emerald Islands, comprise 572 islands, islets, and rocky outcrops and extending over 800 km. The Andaman and Nicobar Islands running between 6° 45′ N and 13° 30′ N latitudes and 90° 20′ E and 93° 56′ E longitudes with extent of 8249 km^2 are broadly divided into two groups of islands, namely, the Andaman and the Nicobar. These two groups are separated by the Ten Degree Channel which is about 150-km-wide, 400 fathoms deep. The Andaman group consisting of 550 islands covers a land area of 6408 km^2, and the Nicobar group comprising 22 islands has an area of 1841 km^2. The Nicobar Islands are located in Southeast Asia, 150 km north of Aceh on Sumatra, and separated from Thailand to the east by the Andaman Sea. Located 1300 km southeast of the Indian subcontinent, across the Bay of Bengal, they form part of the Union Territory of Andaman and Nicobar Islands, India. The Nicobar groups of islands are further divided into three distinct subgroups, namely, Great Nicobar, Nancowry, and Car Nicobar. The protected areas in the Nicobar groups are Great Nicobar Biosphere Reserve, Campbell Bay National Park, Galathea National Park, Galathea Bay Wildlife Sanctuary, Megapode Island Wildlife Sanctuary, Tillangchong Island Wildlife Sanctuary, and Batimaliv Island Wildlife Sanctuary. The Tillangchong Island, Camorta Island, Katchal Island, Nancowry Island, and Trinkat Island are the important bird areas identified by the BirdLife International.

1.13 Important Major Fauna of Sundaland Hotspots (Nicobar Islands)

1.13.1 Coconut Crab, *Birgus latro* (Linnaeus, 1767)

The coconut crab, *Birgus latro* (Linnaeus), has wide distribution ranging from Eastern Africa, through the Indian Ocean islands, to the Pacific Ocean islands. This crab is the largest living terrestrial arthropod and weighs up to 4 kg and measures 200 mm in carapace width (Lavery et al. 1996a). *Birgus latro* is considered T4 terrestrial species, according to the dependence level it has on the aquatic environments. These species within the grade do not require immersion in standing water

but are dependent on water for the pelagic larvae (Powers and Bliss 1983; Hartnoll 1988; Greenaway 2003). During the larval phases, the *Birgus latro* spends 3–4 weeks in the sea before undertaking migration to terrestrial habitats. It is widely distributed in the tropical islands of the Indian and Pacific Oceans (Reyne 1939; Robertson 1991; Lavery et al. 1996b). The coconut crab is most commonly found on island habitats and generally within 4 km from the sea (Fletcher and Amos 1994). They mainly inhabit dense forest regions but can be abundant in sandy coconut groves (Grubb 1971). The populations of *Birgus latro* are declining throughout their range, with loss of habitat, and harvesting for human consumption is thought to be the key drivers of the declines. However, populations in general are poorly studied, and consequently the species is considered data deficient under the International Union for Conservation of Nature (IUCN) red list (Eldredge 1996). In India, the coconut crab occurs in Nicobar group of islands and North Sentinel Island in Andaman group (Hume 1874; Alcock 1905; Altevogt and Davis 1975; Bhaskar and Rao 1992). During the tsunami in 2004, the favored habitats of these animals have been severely affected (Ramachandran et al. 2005). After the tsunami, the sighting of the species is very less in most of the Nicobar group of islands.

1.13.2 Nicobar Megapode *Megapodius nicobariensis* (Blyth, 1846)

Megapodes are medium-sized to large terrestrial birds with large legs and feet with sharp claws, which are endemic to the Nicobar group of islands of India. They split into two subspecies, i.e., *Megapodius nicobariensis abbotti* and *Megapodius nicobariensis nicobariensis*. The *M. n. abbotti* is distributed in Great Nicobar, Little Nicobar, Kondul, Menchal, Treis, and Meroe, and *M. n. nicobariensis* is found in the islands of Camorta, Trinkat, Nancowry, Katchal, Teressa, Bompoka, and Tillangchong. It generally inhabits forests and secondary growth, with the greatest concentrations in coastal forests. It incubates its eggs in nest mounds close to the shore which are built from sand, loam, and humus. The species is primarily monogamous, although extra-pair copulations have been observed. In a pair, both the male and female contribute to the mound maintenance. The key threat is the loss of coastal forest through conversion to agriculture (coconut, banana, and cashew plantations, and rice-paddy cultivation), road development projects, which threaten to fragment habitat blocks, particularly on Great Nicobar, and settlement expansion. Megapode builds a large mound nest with soil and vegetation, with the eggs hatched by the heat produced by decomposition, and it is also called "thermometer birds."

1.13.3 Nicobar Tree Shrew *Tupaia nicobarica* (Zelebor, 1869)

Tree shrews are a group of tropical small mammals found in South and Southeast Asia. Tree shrews have been previously classified in different orders which include Primates and Insectivora. They are considered by some to resemble primitive mammals. Currently they are classified under the order Scandentia and belong to the

family Tupaiidae. Nineteen species of tree shrews were distributed under five genera (Anderson and Jones 1984). The Nicobar tree shrew is a small tupaiid and found only on two islands (Great Nicobar and Little Nicobar islands) in the Sundaland hotspots.

1.13.4 Nicobar Long-Tailed Macaque *Macaca fascicularis umbrosa* (Miller, 1902)

India is well known for its rich primate diversity with as many as 21 living primate species. The highest primate diversity in India is localized toward the northeastern states of India, where as many as ten species occur in sympatry. A critically endangered species of Nicobar long-tailed macaque *(Macaca fascicularis umbrosa)* inhabits the Nicobar Islands. Their preferred habitats are mangroves, coastal forests, and riverine; it is also found in inland forest at altitude of up to 600 m above sea level. The Nicobar long-tailed macaque is one of the endangered primates in India. This species has been listed in Schedule I of Wildlife Protection Act 1972. This species occurs only in Nicobar Islands. According to the IUCN, their status is *near threatened*, having been amended in 2004 from the taxon's previous status as *data deficient* following some basic surveys. This island faced maximum ecological damage during the December 2004 tsunami. The vegetation structure in this island except that one of two major food, *Pandanus*, has become rare due to flooding of coastal area and flushing of seawater in river beds. But the other fruits such as coconut, banana, etc. are available and abundant in unguarded agricultural fields. According to Velankar et al. (2016), the population of Nicobar long-tailed macaque has been recovered from the severe decline caused by tsunami 2004. The threats reported by Umapathy et al. (2003) still exist such as domestic dogs escape the tsunami disaster. The main causes of habitat destruction of long-tailed macaques were found to be the construction of new settlements for rehabilitation of local people and the new road alignment from Campbell Bay to India Point. In addition, if the proposed marine jetty at Galathea Bay is materialized, the existing population from Galathea Bay to India Point will face serious threats.

Nicobar long-tailed macaques also face pressure in Great Nicobar Islands, due to habitat loss and other anthropogenic pressure like other primates in the world. The local tribes and the settlers subsist on coconut, and they have converted coastal areas near their villages into coconut, banana, and tuber-bearing plants. *Pandanus* fruit is the staple diet of long-tailed macaques and most of the places this habitat has been destructed due to tsunami. In addition, the existing habitats were also converted for construction of new settlements, roads, and development of other infrastructures. In view of the fact, an intensive long-term research study is needed for quantitative information on the status, distribution, demographic, and habitat of this species to develop appropriate conservation and management plan.

1.13.5 Leatherback Turtle *Dermochelys coriacea*

Four species of marine turtles found in Andaman, namely, leatherback *Dermochelys coriacea*, hawksbill *Eretmochelys imbricata*, green *Chelonia mydas*, and olive ridley *Lepidochelys olivacea* turtles. The survey shows that the Andaman and Nicobar Islands have the largest nesting populations of leatherback, hawksbill, and green turtles (Andrews et al. 2006; Bhaskar 1979a, b, 1993; Kar and Bhaskar 1982; Fatima et al. 2011). The leatherback nesting population in the Nicobar Islands is the largest in South Asian region (Andrews and Shanker 2002; Fatima et al. 2011). Leatherback turtle is the largest turtle species, crossing both the Atlantic and Pacific Oceans during their migration. Pacific leatherbacks migrate from nesting beaches in the Coral Triangle to the California coast to feed on the abundant jellyfish every summer and fall. Also they are distributed in small group in British Columbia, Newfoundland, and the British Isles, and Australia, Cape of Good Hope, and Argentina. The leatherback turtle is known to have wide nesting distribution in the tropical Atlantic and Pacific oceans, especially in the mainland shores. In the Indian Ocean, they are nesting in South Africa, Andaman and Nicobar Islands, Sri Lanka, and Malaysia. The highest number of nesting was reported from Great Nicobar Island followed by Middle Andaman and South Andaman (Andrews and Shanker 2002; Bhaskar 1993; Andrews et al. 2006).

1.14 Major Threats to the Biodiversity

Like other ecosystems, the mountains obtain the major negative impact due to various unplanned developmental activities such as construction of roads and degradation which result in landslides and erosion. The mountain ecosystems in the Himalayas and Western Ghats have been considered fragile and have attracted special attention. The grassland ecosystem is one of the highly threatened ecosystems in India. This ecosystem is also under severe pressures from grazing, fire, pollution, development project, conversion for agriculture, and plantations. The other habitats like lakes, marshes, and river system are threatened due to pollution, sewage, and toxic effluents. The mangroves are also facing threats due to their reclamation for urban development, waste disposal, oil spillage, etc. Coral reef ecosystems are threatened because of mining, blasting, dredging, collection of reef biota, coastal clearance for development, sewage disposal, discharge of effluents from industries and thermal power plants, chemical pollution, and oil spillage. The desert of Western India, which is one of the high-density populated deserts in the world with more livestock, is under heavy biotic pressure.

1.15 Threats to Species and Genetic Diversity

India is also facing threats to the species and genetic diversity like other parts of the world, and these threats are directly affecting the ecosystem. Other major facts are habitat destruction, over exploitation, floods, droughts, and cyclones. In the past century, the following species are reported to have become extinct, e.g., the Indian cheetah, the lesser Indian rhino, the pink-headed duck, the forest owlet, and the Himalayan mountain quail. Among the reported animal species in India, 32 mammal species, 11 bird species, 17 reptiles, 3 amphibians, 4 fishes, and good number of butterflies, moths, and beetles are listed under various threatened categories of IUCN (Ramakrishna and Alfred 2007).

1.16 Government of India Efforts for Conservation of Biodiversity

1.16.1 Protected Areas

A total of 103 national parks covering 39,155 km^2, 537 wildlife sanctuaries, 67 conservation reserves, and 26 community reserves were found in India with extent of 160,901.77 km^2 (Table 1.15).

1.16.2 Project Tiger

The Government of India launched the Project Tiger during the year 1973 in order to conserve their natural habitats. Initially, nine reserves were designated during 1973–1974; however at present, the number of tiger reserves is raised up to 50 with extent of 71,027.10 (Table 1.16).

Table 1.15 National parks and wildlife sanctuaries in different biogeographic zones (km^2)

Sl. no.	Name of the biogeographic zone	National parks	Extent of area	Wildlife sanctuaries	Extent of area
1	Trans-Himalaya	3	5809.00	4	10,438.56
2	Himalaya	12	7366.92	65	16,065.85
3	Desert	1	3162.00	5	12,914.09
4	Semiarid	10	1505.78	81	12,410.66
5	Western Ghats	16	3673.52	47	10,018.86
6	Deccan Peninsula	24	9712.24	127	44,329.08
7	Gangetic Plain	6	2363.62	32	5473.24
8	Coasts	5	1731.18	20	2959.45
9	North East	13	2674.00	36	3428.62
10	Island	9	1156.91	96	389.39
Grand total		99	39,155.00	513	118,417.00

Source: wiienvis.nic.in

Table 1.16 List of tiger reserves in India

Sl. no.	Name of the tiger reserve	States	Core area (km^2)	Butter area (km^2)	Total (km^2)
1	Bandipur	Karnataka	872.24	584.06	1456.3
2	Corbett	Uttarakhand	821.99	466.32	1288.31
	Amangarh (buffer of Corbett TR)	Uttar Pradesh		80.60	80.60
3	Kanha	Madhya Pradesh	917.43	1134.361	2051.791
4	Manas	Assam	840.04	2310.88	3150.92
5	Melghat	Maharashtra	1500.49	1268.03	2768.52
6	Palamau	Jharkhand	414.08	715.85	1129.93
7	Ranthambore	Rajasthan	1113.364	297.9265	1411.291
8	Simlipal	Odisha	1194.75	1555.25	2750.00
9	Sunderbans	West Bengal	1699.62	885.27	2584.89
10	Periyar	Kerala	881.00	44.00	925.00
11	Sariska	Rajasthan	881.1124	332.23	1213.342
12	Buxa	West Bengal	390.5813	367.3225	757.9038
13	Indravati	Chhattisgarh	1258.37	1540.70	2799.07
14	Namdapha	Arunachal Pradesh	1807.82	245.00	2052.82
15	Dudhwa	Uttar Pradesh	1093.79	1107.9848	2201.7748
16	Kalakkad-Mundanthurai	Tamil Nadu	895.00	706.542	1601.542
17	Valmiki	Bihar	598.45	300.93	899.38
18	Pench	Madhya Pradesh	411.33	768.30225	1179.63225
19	Tadoba-Andhari	Maharashtra	625.82	1101.7711	1727.5911
20	Bandhavgarh	Madhya Pradesh	716.903	820.03509	1598.10
21	Panna	Madhya Pradesh	576.13	1021.97	1578.55
22	Dampa	Mizoram	500.00	488.00	988.00
23	Bhadra	Karnataka	492.46	571.83	1064.29
24	Pench	Maharashtra	257.26	483.96	741.22
25	Pakke	Arunachal Pradesh	683.45	515.00	1198.45
26	Nameri	Assam	200.00	144.00	344.00
27	Satpura	Madhya Pradesh	1339.264	794.04397	2133.30797
28	Anamalai	Tamil Nadu	958.59	521.28	1479.87
29	Udanti-Sitanadi	Chhattisgarh	851.09	991.45	1842.54
30	Satkosia	Odisha	523.61	440.26	963.87
31	Kaziranga	Assam	625.58	548.00	1173.58
32	Achanakmar	Chhattisgarh	626.195	287.822	914.017

(continued)

Table 1.16 (continued)

Sl. no.	Name of the tiger reserve	States	Core area (km^2)	Butter area (km^2)	Total (km^2)
33	Dandeli-Anshi	Karnataka	814.884	282.63	1097.514
34	Sanjay-Dubri	Madhya Pradesh	812.571	861.931	1674.502
35	Mudumalai	Tamil Nadu	321.00	367.59	688.59
36	Nagarahole	Karnataka	643.35	562.41	1205.76
37	Parambikulam	Kerala	390.89	252.772	643.662
38	Sahyadri	Maharashtra	600.12	565.45	1165.57
39	Biligiri Ranganatha Temple	Karnataka	359.10	215.72	574.82
40	Kawal	Telangana	893.23	1125.89	2019.12
41	Sathyamangalam	Tamil Nadu	793.49	614.91	1408.40
42	Mukundra Hills	Rajasthan	417.17	342.82	759.99
43	Navegaon-Nagzira	Maharashtra	653.674	–	653.674
44	Nagarjunsagar-Srisailam (part)	Andhra Pradesh	2595.72	700.59	3296.31
45	Amrabad	Telangana	2166.37	445.02	2611.39
46	Pilibhit	Uttar Pradesh	602.7980	127.4518	730.2498
47	Bor	Maharashtra	138.12	–	138.12
48	Rajaji	Uttarakhand	819.54	255.63	1075.17
49	Orang	Assam	79.28	413.18	492.46
50	Kamlang	Arunachal Pradesh	671.00	112.00	783.00
Total			40,340.12	30,686.98	71,027.10

Source: wiienvis.nic.in

1.16.3 Project Elephant

The Indian elephant *Elephas maximus* occurs in the 16 states of the country, and their population is showing an increasing trend in different distributional ranges. The Indian elephant is listed in the Schedule I of the Indian Wildlife (Protection) Act, 1972, and Appendix I of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES). The Project Elephant was launched by the Government of India during the year 1992 under the Centrally Sponsored Scheme (CSS) in 16 different states and union territories, namely, Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Jharkhand, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Orissa, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, and West Bengal. The Ministry of Environment, Forest, and Climate Change provides the financial and technical support to major elephant range states in the country through Project Elephant. There are 32 elephant reserves in India (Table 1.17).

Table 1.17 List of elephant reserves in India

Sl. no.	Elephant reserve (ER)	Elephant range	Name of state	Date of notification	Total area (Km^2)
1	Mayurjharna		West Bengal	24/10/2002	414
2	Singhbhum	East-Central	Jharkhand	26/09/2001	4530
3	Mayurbhanj	Landscape	Orissa	29/09/2001	3214
4	Mahanadi	(Southwest	Orissa	20/07/2002	1038
5	Sambalpur	Bengal-Jharkhand –	Orissa	27/03/2002	427
6	Baitami	Orissa)	Orissa		1755
7	South Orissa		Orissa		4216
8	Lemru ER		Chhattisgarh		450
9	Badalkhol-Tamor Pingla		Chhattisgarh		1048.3
				Total	**17,092.3**
10	Kameng	Kameng-Sonitpur Landscape	Arunachal	19/06/2003	1892
11	Sonitpur	Arunachal – Assam	Assam	06/03/2003	1420
				Total	**3312**
12	Dehing-Patkai	Eastern-South Bank Landscape	Assam	17/04/2003	937
13	South Arunachal	Assam-Arunachal	Arunachal Pradesh	29/02/2008	1957.5
				Total	**2894.5**
14	Kaziranga-Karbi Anglong	Kaziranga-Karbi	Assam	17/04/2003	3270
15	Dhansiri-Lungding	Anglong-Intanki Landscape	Assam	19/04/2003	2740
16	Intanki	Assam-Nagaland	Nagaland	28/02/2005	202
				Total	**6212**
17	Chirang-Ripu	North Bengal- Greater Manas Landscape	Assam	07/03/2003	2600
18	Eastern Dooars	Assam-West Bengal	West Bengal	28/08/2002	978
				Total	**3578**
19	Garo Hills	Meghalaya Landscape	Meghalaya	31/10/2001	3500
20	Khasi Hills	Meghalaya	Meghalaya		1331
				Total	**4831**
21	Mysore	Brahmagiri-Nilgiri-Eastern	Karnataka	25/11/2002	6724
22	Wayanad	Ghat Landscape	Kerala	02/04/2002	1200
23	Nilgiri	Karnataka-Kerala	Tamil Nadu	19/09/2003	4663
24	Rayala	Tamil Nadu- Andhra	Andhra Pradesh	09/12/2003	766
25	Nilambur		Kerala	02/04/2002	1419
26	Coimbatore		Tamil Nadu	19/09/2003	566
				Total	**15,335**
27	Anamalai	Anamalai-Nelliyampathy – High-Range Landscape	Tamil Nadu	19/09/2003	1457

(continued)

Table 1.17 (continued)

Sl. no.	Elephant reserve (ER)	Elephant range	Name of state	Date of notification	Total area (Km^2)
28	Anamudi	Tamil Nadu-Kerala	Kerala	02/04/2002	3728
				Total	**5185**
29	Periyar	Periyar-Agasthyamalai Landscape	Kerala	02/04/2002	3742
30	Srivilliputhur	Kerala-Tamil Nadu	Tamil Nadu	19/09/2003	1249
				Total	**4991**
31	Shivalik	Northwestern Landscape	Uttarakhand	28/10/2002	5405
32	Uttar Pradesh	Uttarakhand-Uttar Pradesh	Uttar Pradesh	09/09/2009	744
				Total	**6149**
				Grand total	**69,582.80**

Source: wiienvis.nic.in

1.17 Biosphere Reserves of India

The Man and the Biosphere Programme (MAB) was initiated by the UNESCO in the year 1971, and the purpose of the formation is to conserve the biodiversity under in situ program. A total of 651 biosphere reserves were designated in 120 countries, and 18 biosphere reserves exist in India (Table 1.18).

1.18 Marine Protected Areas in India

At present 27 coastal and marine protected areas are found in India. Among these, 18 areas are offshore or away from the Indian mainland, which is protecting or conserving exclusively marine life forms, and these protected areas are considered as exclusive marine protected areas (Tables 1.19 and 1.20).

1.19 The Ramsar Convention

The Ramsar Convention is an international treaty for the conservation and sustainable utilization of wetlands, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. There are over 2000 Ramsar sites on the territories of over 160 Ramsar Contracting Parties across the world. In India the Ramsar Convention came into force in 1975, and 26 wetlands were identified and designated with extent of 12,119 km^2 (Table 1.21).

Table 1.18 Biosphere reserves in India

Sl. no.	Name of the reserve	Extent of area (km^2)	Date of declaration
1.	Nilgiri	5520	01.08.1986
2.	Nanda Devi	5860.69	18.01.1988
3.	Nokrek	820	01.09.1988
4.	Manas	2837	14.03.1989
5	Sunderbans	9640	29.03.1989
6.	Gulf of Mannar	10,500	18.02.1989
7.	Great Nicobar	885	06.01.1989
8.	Simlipal	4374	21.06.1994
9.	Dibru-Saikhowa	765	28.07.1997
10.	Dehang-Debang	5111.5	02.09.1998
11.	Pachmarhi	4981.72	03.03.1999
12.	Khangchendzonga	2612.92	07.02.2000
13.	Agasthyamalai	3500.36	12.11.2001
14.	Achanakmar-Amarkantak	3835.51	30.03.2005
15.	Kachchh	12,454	29.01.2008
16.	Cold desert	7770	28.08.2009
17.	Seshachalam	4655.997	20.09.2010
18.	Panna	2998.98	25.08.2011

Source: wiienvis.nic.in

Table 1.19 Marine protected area (MPA) in India (Mainland)

States	MPA	Year of establishment	Area (ha)	Conservation importance
Gujarat	Gulf of Kachchh Marine Sanctuary	1980	29,503	Corals, dugongs, turtles
	Gulf of Kachchh Marine National Park	1982	16,289	Corals, mangroves
Maharashtra	Malvan Marine Sanctuary	1987	2912	Corals, mangroves, and marine life
Orissa	Gahirmatha Wildlife Sanctuary	1997	143,500	Turtles, dolphins
Tamil Nadu	Gulf of Mannar Marine National Park	1980	623	Corals, mangroves, seagrass

Source: wiienvis.nic.in

Table 1.20 Marine protected area (MPA) in India (islands)

States	MPA	Year of establishment	Area (ha)	Conservation importance
Lakshadweep	Pitti		1	Birds
Andaman and Nicobar	Mahatma Gandhi Marine National Park	1983	28,150	Corals, dolphins, turtles, and other marine life forms
	Rani Jhansi Marine National Park	1996	25,614	Corals, dolphins, turtles, and other marine life forms
	Cinque Marine Sanctuary	1987	991	Corals and other marine life forms
	North Button National Park	1987	44	Corals, turtles, and other marine life forms
	Middle Button National Park	1987	44	Corals, turtles, and other marine life forms
	South Button National Park	1987	3	Corals,, turtles, and other marine life forms
	Cuthbert Bay Sanctuary	1997	582	Sea turtles
	Galathea Bay Sanctuary	1992	1144	Sea turtles
	North-Reef Marine Sanctuary	1987	348	Corals and other marine life forms
	South-Reef Marine Sanctuary	1987	117	Corals and other marine life forms

Source: wiienvis.nic.in

Table 1.21 List of designated Ramsar sites in India

Sl. no.	States	Name of the site	Date designation	Extent of area (km^2)
1.	Andhra Pradesh	Kolleru Lake	19.8.2002	673
2.	Assam	Deepor Beel	19.8.2002	4.14
3.	Gujarat	Nalsarovar Bird Sanctuary	24/09/12	120
4.	Himachal Pradesh	Chandertal Wetland	8.11.2005	38.56
5.		Pong Dam Lake	19.8.2002	307.29
6.		Renuka Wetland	8.11.2005	*
7.	Jammu and Kashmir	Wular Lake	23.3.1990	173
8.		Hokera Wetland	8.11.2005	13.75
9.		Surinsar-Mansar Lakes	8.11.2005	3.50
10.		Tso Moriri Lake	19.8.2002	120
11.	Kerala	Ashtamudi Wetland	19.8.2002	1860
12.		Sasthamkotta Lake	19.8.2002	11.3
13.		Vembanad-Kol Wetland	19.8.2002	4583
14.	Madhya Pradesh	Bhoj Wetlands	19.8.2002	31

(continued)

Table 1.21 (continued)

Sl. no.	States	Name of the site	Date designation	Extent of area (km^2)
15.	Manipur	Loktak Lake	23.3.1990	945
16.	Orissa	Bhitarkanika Mangroves	19.8.2002	525
17.		Chilka Lake	1.10.1981	1140
18.	Punjab	Harike Lake	23.3.1990	86
19.		Kanjli Lake	22.1.2002	14.84
20.		Ropar Lake	22.1.2002	41.36
21.	Rajasthan	Keoladeo Ghana NP	1.10.1981	28.73
22.		Sambhar Lake	23.3.1990	736
23.	Tamil Nadu	Point Calimere	19.8.2002	17.26
24.	Tripura	Rudrasagar Lake	8.11.2005	2.40
25.	Uttar Pradesh	Upper Ganga River (Brijghat to Narora stretch)	8.11.2005	265.90
26.	West Bengal	East Calcutta Wetlands	19.8.2002	378
		Total		**12,119.03**

Source: wiienvis.nic.in
* = 0.2

1.20 Species Recovery Program for Saving Critically Endangered Animals

The country's flagship and charismatic species face a variety of threats, ranging from habitat destruction and illegal wildlife trade to reduction in forest cover outside protected areas. Significant populations of these species exist outside protected areas moving for dispersal from their natal habitats or for seasonal migrations. The Government of India has identified 16 terrestrial and 7 aquatic critically endangered species/ecosystems in order to provide protection outside protected areas in different habitat and landscapes. The objective of this program was saving the critically endangered species in their native habitat. The following programs are initially proposed under this component, namely, Asian wild buffalo, Asiatic lion, brow-antlered deer or sangai, dugong, edible-nest swiftlet, Gangetic river dolphin, great Indian bustard, Hangul, Indian rhino or great one-horned rhinoceros, Jerdon's courser, Malabar civet, marine turtles, Nicobar megapode, Nilgiri tahr, snow leopard, swamp deer, and vultures.

1.21 Legislative and Policy Framework

The Central and State Government legislates and formulates policies and program on the subject. At present, the major Central Acts having direct bearing on biodiversity issues are the following:

- The Indian Forest Act, 1942
- The Forest (Conservation) Act, 1980

- The Wildlife (Protection) Act, 1972
- The Environment (Protection) Act, 1986

The National Forest Policy, as amended in 1988, stresses the sustainable use of forests and the need for greater attention to ecologically fragile but biologically rich mountain and island ecosystem. The National Wildlife Action Plan (1973) identified broad goals of establishing a network of representative protected areas and developing appropriate management systems. One of the major considerations in the environment impact assessment of development project carried out by the Ministry of Environment and Forests is the protection of habitat and valuable ecosystem. The National Afforestation and Eco-Development Board of the ministry undertakes large-scale rehabilitation of degraded forest lands in the country. India is an active participant in the following International Conventions and agreement relevant to biodiversity: the Convention on International Trade in Wildlife Species of Endangered Fauna and Flora (CITES), the Ramsar Convention on Wetlands of International Importance especially as Water Fowl Habitat, the World Heritage Convention, the Bonn Convention on Conservation of Migratory Species of Wild Animals, the FAO commission on Plant Genetic Resources, and the UN Law of the Seas (UNCLOS).

1.22 National Biodiversity Authority

India is a party to the Convention on Biological Diversity (CBD) 1992 which recognizes the sovereign rights of states to use their own biological resources. In order to help in realizing the objectives of CBD, India has enacted an umbrella legislation called the Biological Diversity Act, 2002 (No.18 of 2003) aimed at conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner. In the exercise of the powers conferred by Subsection (1) (4) of Section 8 of the Biological Diversity Act, 2002 (18 of 2003), the Central Government has established a statutory body called the National Biodiversity Authority, on and from the 1st day of October, 2003. The main functions of the Authority are:

1. To lay down procedures and guidelines to govern the activities provided under Section 3, 4, and 6 (permission to foreigners/NRI's foreign companies)
2. Regulate activities, approve, and advice the government of India on research, commercial, bio-survey, and bio-utilization
3. Grant approval to Section 3, 4, and 6
   - Certain persons not to undertake biodiversity-related activities without approval of National Biodiversity Authority (Section 3) (access to biological resources or associated knowledge)
   - Results of research not to be transferred to certain persons without approval of National Biodiversity Authority (Section 4) (Transfer of Research Results)
   - Application of IPR rights not to be made without approval of National Biodiversity Authority (Section 6) (Seeking IPR)

4. Certain persons not to transfer of biological resource or knowledge without approval of National Biodiversity Authority (Section 20) (Third Party Transfer)
5. Determination of equitable benefit sharing arising out of the use of accessed biological resources (Section 21)

1.23 Other Important Central Acts Relevant to Biodiversity

- Fisheries Act, 1987
- Destructive Insect and Pest Act, 1914
- Indian Coffee Act, 1942
- Agricultural Produce (Grading and Marketing) Act, 1937
- Import and Export (Control) Act, 1947
- Rubber (Production and Marketing) Act, 1947
- Tea Act, 1953
- Prevention of Cruelty to Animals Act, 1960
- Customs Act, 1962
- Cardamom Act, 1965
- Seeds Act, 1966
- Marine Products Exports Development Authority Act, 1972
- Water (prevention and Control of Pollution) Act, 1974
- Tobacco Board Act, 1975
- Territorial Water, Continental Shelf, Exclusive Economic Zone, and Other Maritime Zones Act, 1976
- Water (Prevention and Control of Pollution) Cess Act, 1977
- Coconut Development Board Act, 1979
- Maritime Zones of India (Regulation and Fishing by Foreign Vessels) Act, 1980
- Air (Prevention and Control of Pollution) Act, 1981
- National Oilseeds and Vegetable Oils Development Board, 1983
- Agricultural and Processed Food Products Export Development Authority Act, 1985/1986
- Spices Board Act, 1986
- National Dairy Development Board Act, 1987
- New Seed Development Policy, 1988
- Foreign Trade (Development and Regulation) Act, 1992

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