STATUS OF BIODIVERSITY IN INDIA: ISSUES AND CHALLENGES

*Surendra Singh Chauhan

Department of Environmental Science, University of Rajasthan, Jaipur-302004 *Author for Correspondence

ABSTRACT

India is a country of rich biological diversity, has over 91,200 species of animals and 45,500 species of plants in its ten bio-geographic regions. Besides, it is recognized as one of the eight Vavilovian centres of origin and diversity of crop plants, having more than 300 wild ancestors and close relatives of cultivated plants, which are still evolving under natural conditions. India is also a vast repository of traditional knowledge associated with biological resources. India ranks among the top ten species-rich nations and shows high endemism. India has four global biodiversity hot spots. The varied edaphic, climatic and topographic conditions and years of geological stability have resulted in a wide range of ecosystems and habitats in India. Unfortunately, as elsewhere on earth, Indian biodiversity is also threatened with destruction due to population pressures and ill-conceived developmental activities. The Government of India has become aware of the situation and has created wildlife sanctuaries, national parks and biosphere reserves for *in-situ* conservation of biodiversity and scientific organisations (gene banks) for *ex-situ* conservation.

Keywords: Biodiversity, India

INTRODUCTION

India is situated north of the equator between 66°E to 98°E and 8°N to 36°N. It is bordered by Nepal, China and Bhutan in the north; Bangladesh and Myanmar in the east; the Bay of Bengal in the south east; the Indian Ocean in the south; the Arabian Sea in the west; and Pakistan in the north-west.

The varied edaphic, climatic and topographic conditions have resulted in a wide range of ecosystems and habitats such as forests, grasslands, wetlands, coastal and marine ecosystems, and deserts. The mountainous region covers an area close to 100 mha, arid and semi-arid zones are spread over 30 mha and the coastline is about 8000 km long.

India is a country of vast biodiversity. It has diverse biogeographical and climatic conditions, ranging from the cold and high Himalayas in the north to the hot and humid peninsula in the south, and from the wet, green, north-eastern forest to the dry north-western desert.

Vegetation ranges from the wet evergreen forest of the Western Ghats and the north-eastern hills to the dry deciduous forest of Central India and the thorny forest of the Thar Desert. About 61.5% of flora in India is endemic.

There are about 3,000 endemic species in the Himalayas and the Khasi Hills of north-eastern India and 2,000 in the Deccan Peninsula in the south. The richest area from the biodiversity point of view lies in the Silent Valley of Kerala in the Western Ghats and the north-eastern hills of Assam and Meghalaya.

Biogeographical Zones of India

India represents (i) Two 'Realms' – the Himalayan region represented by Palearctic Realm and the rest of the sub-continent represented by Malayan Realm; (ii) Five Biomes e.g. Tropical Humid Forests; Tropical Dry Deciduous Forests (including Monsoon Forests); Warm Deserts and Semi-deserts; Coniferous Forests; Alpine Meadows; and (iii) Ten biogeographic zones and Twenty-seven biogeographic provinces (Table-1).

Table 1: Biogeographical zones of India

S.N.	Biogeographical Zones	Biogeographical Provinces %	6 of geographical area of India
1.	Trans Himalaya	1A: Himalaya - Ladakh Mountains 1B: Himalaya -Tibetan Plateau 1C: Trans - Himalaya Sikkim	3.3 2.2 <0.1
2.	The Himalaya	 2A: Himalaya - North West Himalaya 2B: Himalaya - West Himalaya 2C: Himalaya - Central Himalaya 2D: Himalaya - East Himalaya 	2.1 1.6 0.2 2.5
3.	The Indian Desert	3A: Desert - Thar 3B: Desert - Kutch	5.4 1.1
4.	The Semi Arid	4A: Semi - Arid - Punjab Plains 4B: Semi - Arid - Gujarat Rajputana	3.7 12.9
5.	The Western Ghats	5A: Western Ghats - Malabar Plains5B: Western Ghats -Western Ghats Mount	2.0 tains 2.0
6.	The Deccan Peninsula	 6A: Deccan Peninsular - Central Highland 6B: Deccan Peninsular - Chotta Nagpur 6C: Deccan Peninsular - Eastern Highland 6D: Deccan Peninsular - Central Plateau 6E: Deccan Peninsular - Deccan South 	ls 7.3 5.4 ls 6.3 12.5 10.4
7.	The Gangetic Plains	7A: Gangetic Plain - Upper Gangetic Plain 7B: Gangetic Plain - Lower Gangetic Plain	ns 6.3 ns 4.5
8.	The Coasts	8A: Coasts - West Coast8B: Coasts - East Coast8C: Coasts - Lakshdweep	0.6 1.9 <0.1
9.	Northeast India	9A: North - East - Brahamputra Valley 9B: North - East - North East Hills	2.0 3.2
10. '	Islands	10A: Islands - Andamans 10B: Islands - Nicobars	0.2 0.1

Source: Wildlife Research Institute of India, 2009

Zone 1: Trans Himalaya

Zone 1 covers an area of 186,200 km² in the cold and arid regions with sparse alpine steppe vegetation and several endemic species. It is home to communities of wild sheep and goats, the urial, ibex, wild yak and Tibetan ass, gazelle and antelope. Among the carnivores are the snow leopard, Tibetan wolf and the endemic pallas cat and smaller animals such as the marbled cat, pika and marmot. The brackishwater

Review Article

lakes and marshes have a good variety of avifauna, the most spectacular of which is the black-necked crane. The zone has two protected areas.

Zone 2: The Himalaya

Zone 2 covers an area of about 236,000 km² in the Himalayas. It displays a wide altitudinal range and is among the richest zones in terms of species and habitat diversity - the sambar, muntjac, wild boar in the subtropical foothills, the musk deer, serow, goral, tahr, kokla and pheasant in the temperate, sub-alpine regions and the bharal, snow leopard, brown bear and snowcock in the alpine region. The zone has fiftysix protected areas. There are more endangered species in the Himalaya than anywhere else in India. The Sikkim stag may already have become extinct. The tahr, markhor and western tragopan may be facing extinction.

Zone 3: The Indian Desert

Zone 3 is a highly fragile ecosystem and its biological richness may be lost very rapidly. The zone covers an area of 225,000 km², of which about 89 km² is protected. The wild ass, a distinct sub-species, is restricted to the Rann of Kutch. This is also the only breeding site for flamingoes on the Indian subcontinent. It is home to the desert fox, desert cat, houbara, bustard and to some sandgrouse species. Other species are the chinkara, blackbuck, wolf, caracal and great Indian bustard.

Zone 4: The Semi-Arid

Spread over 508,000 km² in the semi-arid regions, Zone 4 has two major tiger reserves. There are fiftytwo protected areas covering 11,675 km². The Gir lion, one of the very few endemic species in this zone, now needs a second home.

Zone 5: The Western Ghats

A 1,500 km long mountain range with a wet western face and a dry eastern slope, the Western Ghats cover an area of about 159,000 km². This zone consists of a diversity of forests, from evergreen to dry deciduous. The richest of India's evergreen forests are located here. It is a continually expanding "genetic storehouse" of India. The Western Ghats cover only 5% of India's land surface but contain more than a quarter (about 4,000) of the country's plant species.

About 1,800 of these species are endemic, many highly localised and extremely vulnerable due to increasing habitat destruction. This zone also has viable populations of most of the vertebrate species found in peninsular India, in addition to endemic species like the Nilgiri langur, the lion-tailed macaque, the Nilgiri tahr and the Malabar grey hornbill. Most of the amphibian species here too are endemic. The Travancore tortoise and cane turtle are restricted to small areas of the central Western Ghats. There are forty-four protected areas covering 15,935 km2.

Zone 6: The Deccan Peninsula

Zone 6 covers 1,421,000 km² - about 43% of India's total land surface. Most of India's protected areas are in this zone. Most wildlife species - the tiger, leopard, sloth bear, gaur, sambar, chital, chowsingha, wild boar, etc. - are widespread throughout the whole zone. There are small relict populations of elephant, wild buffalo and barasingha. There are about 115 protected areas covering $4,610 \text{ km}^2$.

Zone 7: The Gangetic Plain

Centuries ago, Zone 7 had rich vegetal cover and diverse wildlife but both are now depleted with the extension of agriculture. The elephant, barasingha, blackbuck, gazelle, rhino and Bengal florican, which used to be numerous, have only relict populations surviving. In the many wetlands, lakes and swamps the waterfowl community (partly migratory) is exceptionally dense. Crocodile and freshwater turtle populations are also quite good. Spread over 359,000 km², the zone has twenty-five protected areas.

Zone 8: The Coasts

Zone 8 comprises mangrove vegetation and is biologically rich. Animal species include dugong and humpback whale, inshore dolphin, marine and estuarine turtles, and estuarine and saltwater crocodile. Avifauna include oceanic visitors. The Sunderbans Sanctuary on the east coast is a tiger reserve with Indian's highest population of tigers. Together with Bangladesh this is one of the world's largest protected mangrove ecosystems.

Zone 9: North-east India

Zone 9 is the biogeographical gateway for much of India's flora and fauna. This zone is one of the richest in biological resources, both endemic and others. The Brahmaputra valley contains extensive areas of natural vegetation - swamps, grasslands and fringe forests. The elephant, rhinoceros, buffalo, swamp deer, hog deer, pygmy hog and hispid hare are the wildlife of the zone. The diversity in plant communities and species is extremely high. The animal communities are also diverse. In fact, smaller carnivores exhibit a richness not seen anywhere else in the world. India's highest populations of elephants are here. The region also forms an important flyway on the route of migratory birds to and from Siberia and China. There are seventeen protected areas covering 1,880 km2.

Zone 10: Islands

Andaman and Nicobar are a group of 348 islands which are biologically immensely rich. About 2,200 species of higher plants are found, of which 200 are strictly endemic. The avifauna comprises 225 distinctive species, of which 112 are endemic. This zone is India's richest in fish and coral communities. On these islands, there are one hundred protected areas covering 708 km².

Distribution of Forest in India

India is endowed with vast forest resources. Forests play a vital role in social, cultural, historical, economic and indsutrial development of the country and in maintaining its ecological balance. They are the resource base for sustenance of its population and a storehouse of biodiversity. Other land use practices, such as agriculture and animal husbandry are benefitted by forests. Realizing the crucial role of forests in maintaining the ecological balance and socio-economic development, the National Forest Policy, 1988 aims at maintaining a minimum of 33% of country's geographical area under forest and tree cover. The forests in the country have been classified into 16 major types and 251 subtypes on the basis of climatic and edaphic features. Distribution of diverse forest types across the country is presented in Table-2.

Major Groups	Type and Group	Area (m ha)	% of forest area
Tropical Forests	Wet evergreen forest	4.5	5.8
	Semi-evergreen forest	1.9	2.5
	Moist deciduous forest	23.3	30.3
	Littoral and swamp forest	0.7	0.9
	Dry deciduous forest	29.4	38.2
	Thorn forest	5.2	6.7
	Dry evergreen forest	0.1	0.1
Sub-tropical Forests	Subtropical broad leaved hill forest	0.3	0.4
	Sub tropical pine forest	3.7	5.0
	Sub tropical dry evergreen forest	0.2	0.2
Temperate Forests	Montane wet temperate forest	1.6	2.0
	Himalayan moist temperate forest	2.6	3.4
	Himalayan dry temperate forest	0.2	0.2
Sub-alpine & Alpine Forests	Sub-alpine forest	-	-
	Moist alpine scrub	3.3	4.3
	Alpine scrub	-	-

Table 2: Diversity and distribution of major forest types in India

Source: Indian Council of Forestry Research and Education (ICFRE), 2000

© Copyright 2014 | Centre for Info Bio Technology (CIBTech)

The Biodiversity of India Animal Diversity

There are about 91,200 species of animals in India, from tiny protozoans to large mammals. Among the 397 species of mammals, nearly 30 are endemic, of which 19 are primates. Among the 458 species of birds, 42 are endemic. The reptile fauna comprises over 245 species of snakes, 171 species of lizards, 41 species of turtles and 3 species of crocodiles. The amphibian fauna comprises 248 species of salamanders, caecilians, frogs and toads. There is a high degree of endemism in this group and out of 153 endemics, 84 occur in the Western Ghats and 20 in the north-east (Table-3). The Indian fauna has been enriched by the migration of birds from Siberia and other parts of Europe, and animals from Nepal, Burma, Bhutan, Malaysia and Bangladesh.

radie 5. Animai uiversity in mula							
Group	World	India	(%) in India				
	(number of species)	(number of species)					
Mammals	4629	397	8.58				
Birds	8,400	458	5.45				
Reptiles	5817	460	7.91				
Amphibians	5150	248	4.81				
Fishes	23,400	5749	24.56				
Insects	867391	61151	7.04				
Molluscs	66535	5072	7.62				

Table 3: Animal diversity in India

Source: National Biodiversity Action Plan, 2011

Plant Diversity

It is estimated that about 45,500 species of plants occur in India. Vascular plants, mainly flowering plants (angiosperms), comprise 17,527 species, of which more than 6% are thought to be endemic (There are 250,000 species of angiosperms throughout the world). The rest are non-flowering plants, comprising pteridophytes, bryophytes, lichens, algae, fungi, and bacteria etc. (Table-4).

Table 4: Flant diversity in India						
Group	World (number of	India (number of	% in India			
	species)	species)				
Virus/Bacteria	8,050	850	10.6			
Algae	40,000	7175	17.9			
Fungi	72,000	14,500	20.1			
Lichens	13,500	2223	16.4			
Bryophytes	14500	2500	17.2			
Pteridophytes	10,000	1,200	12.0			
Gymnosperms	650	67	10.3			
Angiosperms	2,50,000	17,527	7.0			

Table 4. Plant diversity in India

Source: Botanical Survey of India, 2011

The endemic species and genera are largely concentrated in two principal biogeographical regions - the Himalayas (about 4,200 species) and peninsular India (about 2,600 species). Nearly 1,000 plant species are endangered. India alone has given nearly 167 economically important plants whose centre of origin/diversity lies in India, along with their 320 species of wild relatives and landraces (traditional varieties).

Genetic Diversity in Crop Plants

The Indian subcontinent is floristically rich, with plants of diverse economic uses (Table-5)

Review Article

Economic Uses	Number of Species	
As food plant	1,200	
As fodder plant	2,200	
As fuel and timber	1,000	
As medicinal herbs	3,000	
As fibre plants	150	
As spices	120	
As oil seed plants	100	

Table 5: Diversity of plant use in India

Source: National Biodiversity Action Plan, 2011

Due to the rich mosaic of ethnic cultures and a rich heritage of civilization, India possesses one of the richest centres of crop plant variability, landraces and progenitors in the world. Over 320 species, considered to be the wild relatives of economically important plants, are also reported on the Indian subcontinent. Rich genetic diversity is available in many cereal crops, legumes, oilseeds, vegetables, spices and condiments, fibre crops, fruits, medicinal and aromatic plants and also in nutritive grasses and useful trees. The Indian gene centre has a rich diversity of crop plants of both native and exotic species. Over 160 species of cultivated and 320 of wild related types occur in different agro-ecological regions. A wide range of agro-ecological regions and ethnic variations, interlinked with traditional agriculture, has generated enormous landrace diversity in India (Table-6).

Agro-ecological Regions		Crops
Western Himalaya	•	Barley, wheat, maize, buckwheat, amaranth, prosomillet, finger millet
	•	French bean, soyabean, lentil, black gram, peas
	•	Pumpkin, cucumber, Alliums pp., ginger, Brassicae
	•	Pome, stone, soft and nut fruits
Eastern Himalaya	•	Barley, maize, buckwheat, amaranth, finger millet, foxtail millet
	•	French bean, soyabean, cowpea, black gram, peas, scarlet bean
	•	Pumpkin, cucumber, Alliums pp. ginger, chayote, tree tomato, Brassicae
	•	Pome and stone fruits
North-Eastern Region	•	Rice, maize, sorghum, finger millet, foxtail millet, job's tears
	•	French bean, soyabean, pigeonpea (perennial), black gram, rice bean, Dolichos bean, winged bean
	•	Pumpkin, chayote, cucumber, okra, eggplant, chilli/capsicum spp., Pointed gourd, ash gourd
	•	Taros, yams
	•	Citrus-Lime/lemon/orange/grape fruit, banana

Table 6. A	A gra-ecologic	al regions	of cron	diversity	in	India
Table 0. P	agi u-ccologic	an regions	on crop	unversity	111	muia

	•	Tea, tree cotton, jute, kenaf and mesta, large cardamom, ginger, long pepper, sugarcane					
Gangetic Plains	•	Rice, sorghum, barnyard millet, little millet/Panicum					
	•	Chickpea, cowpea, mung bean					
	•	Okra, eggplant, bitterground, cucumis spp., Luffa spp.					
	•	Jackfruit, mango, lemon/lime, orange, jujube, Indian gooseberry/Emblica, jumun/Syzygium, melons					
	•	Linseed, niger, sesame, Brassicae					
	•	Sugarcane, mulberry					
Indus Plains	•	Durum wheat, pearl millet					
	•	Moth bean, cluster bean, chickpea, black gram					
	•	Okra, Cucumis spp.					
	•	Jujube, Khirni/Mimusops, Phalsa/Grewia					
	•	Sesame, Taramira/Eruca,Cotton					
Eastern Peninsular	•	Rice, sorghum, finger millet, pearl millet, foxtail millet, little millet, prosomillet, kodo millet					
Region/E.Ghats/	•	Black gram, green gram, cowpea, horse gram, Mucuna, pigeonpea, Dolichos bean, rice bean					
Deccan	•	Taros, yams, elephant-food yam					
	•	Banana, mango, lemon/lime, jackfruit					
	•	Niger, Brassicae, sesame					
	•	Ginger, turmeric, chilli, kenaf, sugarcane, coconut, cotton					
Western Peninsular	•	Rice, sorghum, finger millet, small millet/Panicum					
Region/Western	•	Black gram, green gram, cowpea, pigeonpea, Dolichos bean, horse gram, sword bean					
Ghats/Malabar	•	Okra, eggplant, cucumber, chilli/Capsicum					
	•	Taros, yams, elephant-foot yam					
	•	Jackfruit, banana, lime/lemon, orange, jumun/Syzygium					
	•	Sugarcane, black pepper, turmeric, ginger, coconut, arecanut, cotton					
The Islands Regions	•	Coconut, breadfruit, chilli, taros, yams, Xanthosoma					

Source: http://www. biodiversityinternational. org/publications/Web_version /I 74/ch06.htm

Genetic Diversity in Livestock

India, endowed with varied forms of animal genetic resources, is traditionally considered as an important rearing centre for domesticated animals. India has vast resources of livestock (485 million) and poultry (489 million), which play a vital role in rural livelihood security. In terms of population, India ranks first in buffaloes, second in cattle and goats, third in sheep, fourth in ducks, fifth in chicken and sixth in camels in the world. The genetic resources of farm animals in India are represented by a broad spectrum

of native breeds of cattle, buffaloes, goats, sheep, swine, equines, camel and poultry. There are around 140 listed breeds of livestock and poultry in India, with 30 breeds of cattle, 10 of buffalo, 42 of sheep, 20 of goat, 3 of pig, 6 of horse and pony, 8 of camel and 18 of poultry, Besides, there are breeds of yak, mithun, ducks, quails and several nondescript populations.

The Erosion of Biodiversity in India

The loss of biodiversity and the extinction of species in India are alarming. Because of intense population pressure and ill-conceived developmental activities more and more species are becoming endangered and are at risk of becoming extinct (Table-7,8,9). The hunting leopard (*Acinonyx jubatus*) is already extinct. The last three hunting leopards were shot dead in 1947 in Bastar.

As per the IUCN Red List, 2008, India has 43 globally threatened faunal species, which is approximately 4.9% of the world's total number of threatened faunal species. The number of threatened faunal species in different categories which are listed in the WPA and the Appendices of CITES, and Convention on Migratory Species (CMS) are given in (Table-7).

Table 7: Threatened Indian species										
Schedules of I WPA			Appendices	Appendices of CITES			s of CN	/IS		
Ι	Π	III	IV	V	Ι	II	III	Ι	I/II	Π
16	6	1	-	-	56	31	5	4	4	10
10	-	-	23	-	87	55	5	4	18	-
10	-	-	1	-	10	8	-	1	4	-
18	11	-	28	-	-	-	-	-	-	-
-	2	-	-	-	-	3	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
58	19	1	52	-	153	97	10	9	26	10
	ed Indian Sch I 16 10 10 10 18 - - 3 - 3 - 1 1 - 58	I II 16 6 10 - 18 11 - 2 - - 3 - - - 1 - 58 19	II III 16 6 1 10 - - 10 - - 10 - - 10 - - 13 11 - - 2 - - - - 3 - - - - - 1 - - - - - 3 - - - - - 1 - - 58 19 1	II III IV 16 6 1 - 10 - - 23 10 - - 1 18 11 - 28 - 22 - - 3 - - - - 2 - - 1 - - - - 2 - - - 2 - - - - - - 3 - - - - - - - 1 - - - - - - - - - - - - - - - - - - - - - - - - - - - 58 19	II III IV V 16 6 1 - - 10 - - 23 - 10 - - 1 - 18 11 - 28 - - 22 - - - 3 - - - - 3 - - - - 1 - - - - - 10 - - 1 - - - 10 - - 1 -	Mathematical Schedules of I WPA Appendices I II III IV V I 16 6 1 - - 56 10 - - 23 - 87 10 - - 10 - 10 18 11 - 28 - - - 2 - - - - 3 1 - 28 - - - 2 - - - - 3 - - - - - - - - - - - 1 - - - - - 1 - - - - - 1 - - - - - 1 - - - - - 1 -	I II III IV V I II 16 6 1 - - 56 31 10 - 23 - 87 55 10 - 1 1 - 87 55 10 - 1 1 - 10 8 18 11 - 28 - - - - 2 - - - 3 - - - 2 - - - - - - - 3 1 - 28 - - - - - 3 - - - - - - - - - - - 3 - - - - - - - - - - - - - - - -	Appendices of CITES II III IV V I II III 16 6 1 - - 56 31 5 10 - 23 - 87 55 5 10 - 1 - 10 8 - 18 11 - 28 - - 3 - - 2 - - - - - - 3 11 - 28 - - - - - 2 - - - - - - - - - - - - - - 3 - - - - - - - - - - - - - - - - - - - - -	Appendices of UVPA Appendices of CUTES Appendices I II III IV V I II III I 16 6 1 - - 56 31 5 4 10 - 23 - 87 55 5 4 10 - 1 - 10 8 - 1 18 11 - 28 - 10 8 - - - 2 - - - - - - - 18 11 - 28 - - - - - - 2 - - - - - - - - - - - - - - - - - - - - - - - - - - -	Appendices of CITES Appendices of CIN I II III IV V I II III I I/II 16 6 1 - - 56 31 5 4 4 10 - 23 - 87 55 5 4 18 10 - 1 1 - 10 8 - 1 4 18 11 - 28 - 10 8 - 1 4 18 11 - 28 -

Source: www.wii.gov.in/indianfauna/globally%20threatened%20indian%20fauna.pdf

As per the IUCN Red List, 2008, India has 246 globally threatened floral species which constitute approximately 2.9% of the World's total number of threatened floral species (8457). In the Western Ghats alone, 100 species of flowering plants are seriously threatened. The Botanical Survey of India has so far listed may plants species from different parts of the country under various categories, such as extinct, possibly extinct, endangered, vulnerable and rare (Table-8).

Review Article

Table 8: Some threatened plant species of India

Species	Habitat	Ecological Status
Abies pindrow	Himalayas	Endangered
Aconitum kerox	Himalayas	Rare
Astragalus strobiliferus	Himalayas	Vulnerable
Atropa acutminata	Himalayas	Endangered
Balanophora dioica	Himalayas	Endangered
Colchicum luteum	Himalayas	Vulnerable
Cyathea gigantea	Himalayas	Indeterminate
Dianthus coschemiricus	Himalayas	Rare
Dioscorea delfoidea	Himalayas	Rare
Drosera burmannivahi	Khasi Hills	Endangered
Magnolia griffithii	Himalayas	Vulnerable
Nepenthes khasiana	Khasi Hills	Endangered
Orchis latifolia	Western Himalaya	Endangered
Angelica glauca	Western Himalaya	Endangered
Polygonum alpinum	Western Himalaya	Endangered
Polygonum verticillatum	Western Himalaya	Endangered
Curculigo orchioides	Western Ghats	Endangered
Tinospora malabarica	Western Ghats	Endangered
Commiphora mukul	Western Ghats	Endangered
Boswellia cordifolia	Western Ghats	Endangered
Sesamum indicum	Western Ghats	Endangered
Tarminalia pallida	Western Ghats	Endangered
Osmunda regalis	Himalayas	Indeterminate
Rauwolfia serpentina	Western Ghats	Critical
Rhododendron dalhousiae	Western Ghats	Endangered
Vanda coeruleo	Western Ghats	Critical
Commiphora wightii	Thar Desert	Endangered
Gnetum ula	Western Ghats	Rare
Ginkgo biloba	Himalayas	Critical
Santalum album	Western Ghats	Endangered
Dioscorea deltoides	Himalayas	Rare
Delphinium denudatum	Himalayas	Rare
Acorus calamus	Himalayas	Vulnerable
Saussurea lappa	Himalayas	Indeterminate
Podophyllum hexandrum	Himalayas	Rare
Diplomeris hirsuta	Himalayas	Rare
Ephedra gerardiana	Western India	Endangered
Picrorhiza kurroa	Himalayas	Endangered
Oryza nivara	Western Ghats	Endangered
Swertia chirayita	Himalayas	Endangered
Juniperus communis	Western Himalaya	Endangered
Citrus assamensis	Eastern Himalaya	Endangered
Drosera pettata	Western Ghats	Critical
Vigna mungo	Western Ghats	Vulnerable
Dolichos bracteatus	Western Ghats	Vulnerable

Source: National Biodiversity Action Plan, 2011

© Copyright 2014 / Centre for Info Bio Technology (CIBTech)

Common Name	Scientific Name	Habitat	Ecological Status		
Lion tailed macaque	Macaca silenus	Western Ghats	Endangered		
Slow loris	Loris tardigradus	Nilgiris	Vulnerable		
Slender loris	Nycticebus coucang	North-east	Endangered		
Nilgiri langur	Presbytis johni	Western Ghats	Vulnerable		
Hoolock gibbon	Hylobates hoolock	North-east	Rare		
Great Indian bustard	Chariotes nigriceps	East coast	Endangered		
Great pied hornbill	Buceros bicornis	Western Ghats	Rare		
Siberian crane	Grus leucogeranus	Migratory (Bharatpur)	Critical		
Blacknecked crane	Grus nigricollis	Ladakh	Rare		
Pink head duck	Rhodonessa caryophyllaceae	Whole India	Extinct		
Peacock pheasant	Polyplectron bicalcaratum	Himalayas	Critical		
Crocodile	Crocodylus porosus	East coast	Endangered		
Monitor lizards	Varnus spp.	Whole India	Endangered		
Green sea turtle	Chelonia mydas	Indian Ocean	Endangered		
Great Indian python	Python spp.	North-east	Endangered		
			Critical		
Asiatic lion	Panthera leo persica	Gir Forest			
Snow leopard	Panthera uncia	Himalayas	Endangered		
Tiger	Panthera tigris	Whole India	Vulnerable		
Leopard cat	Felis bengalhensis	Whole India	Vulnerable		
Desert cat	Felis libyca	Thar Desert Endangered			
Hispid hare	Caprolagus hispidus	Assam	Vulnerable		
Giant flying squirrel	Petaurista candidulus	Himalayas	Endangered		
Grizzled giant squirrel	Ratufa macroura	South India	Rare		
Malabar large spotted civet	Viverra megaspila civettina	Western Ghats	Endangered		
Indian wild ass	Equus hemionus khur	Rann of Kutch	Endangered		

Table 9: Some threatened animal species of India

© Copyright 2014 / Centre for Info Bio Technology (CIBTech)

Kashmir stag	Cerevus calphus hanglu	Kashmir	Endangered
Swamp deer	Cerevus duvancelli	Central India	Rare
Brow-antlered deer	Cerevus eldi eldi	Manipur	Critical
Musk deer	Moschus moschus	Himalayas	Critical
Mouse deer	Tragulus meminna	South India	Rare
Himalayan ibex	Capra ibex	Himalayas	Endangered
Wild dog	Cuon alpinus	Central India	Rare
Indian wolf	Canis lupus	Whole India	Endangered
Desert fox	Vulpes vulpes	Thar Desert	Endangered
Wild Asiatic water buffalo	Bubalus bubalis	Assam	Rare
Wild yak	Bos gruniens	Ladakh	Vulnerable
Indian bison	Bos gaurus	Whole India	Endangered
Gangetic dolphin	Platanista gangetica	Ganges	Vulnerable
Asiatic elephant	Elephas maximus	Whole India	Vulnerable
Greater Indian rhino	Rhinoceros unicornis	Assam and Bengal	Endangered
Pygmy hog	Sus sulvanius	North-East	Rare
Red panda	Ailurus fulgens	Himalayas	Rare
Himalayan brown bear	Urses arctos	Himalayas	Rare
Blue sheep	Pseudovis nahoor	Himalayas	Vulnerable
Western tragopan	Tragopan nelano cephalus	Himalayas	Rare

Source: National Biodiversity Action Plan, 2011

Other wildlife species of India which are at risk are the Himalayan quail and Himalayan newt from the Western Himalayas, the white-winged wood duck and Garo Hills tree toad from North-East India, the coconut crab from the Andaman and Nicobar Islands, the Himalayan dragonfly from the Himalayas, the forest owlet from the Satpura Hills, and the Malabar tree toad and the Nilgiri tahr from the Western Ghats.

It is estimated that the Western Ghats, considered to be the biological treasure of India, have more than 6,000 species of flowering and non-flowering plants. More than 700 species of flowering plants of the Western Ghats have become rare. The Western Ghats are home to some of the world's rare animals and birds species, such as the lion-tailed macaque (*Mancaca silenus*), the Nilgiri langur (*Presbytis johni*), Nilgiri tahr (*Hemitrogus hylocrius*), grizzled giant squirrel (*Ratufa macroura*), Malabar giant squirrel (*Ratufa indica*), flying squirrel (*Petaurista candidulus*), Malabar pied hornbill (*Beceros bicornis*) and the great Indian hornbill (*Beceros* spp.) The lion-tailed macaque, Nilgiri langur and the Nilgiri tahr are

Review Article

endemic to the Western Ghats and are not found in the world anywhere else. They are highly endangered and face the threat of extinction.

The Botanical Survey of India has compiled three volumes of the Red Book of Indian Plants, which identify 622 threatened plant species, including 132 highly endangered species which are facing extinction. Another twenty-four plant species are possibly already extinct, not having been sighted since the turn of the century.

Conclusion

In ancient India, biodiversity conservation was synonymous with the preservation of big cats and large mammals. But, now there is an urgent need to give attention to smaller animals like the musk deer, fish, frogs, turtles, butterflies and earthworms. In addition, higher plants, particularly trees and medicinal herbs, orchids, agricultural and non-agricultural micro-organisms, blue-green algae and marine organisms, also need protection.

Mere legal sanctions will also not help. It is essential for the conservation of biodiversity in India that there has to be a mass awakening among people and support from government and non-government organisations. A realisation of the importance of biodiversity for human survival and welfare has to be built up systematically among the people, showing what it means to the present generation and, more importantly, to future generations. Biodiversity conservation does not mean only propagation of the given species in a limited protected area in national parks and wildlife sanctuaries. It also requires the rehabilitation of given species in a second home - ecologically similar habitats still available elsewhere in the biosphere. It is extremely risky to have the sole surviving population of an endangered species in only one area. A single catastrophic event could lead to its extinction. Therefore, the concept of biodiversity conservation should be in totality, involving plants, animals, man and also the micro-organisms on which they live and on which they depend for their very survival.

REFERENCES

Anonymous (1990). Endangered Species of India, Mongraphs of Indian Institute of Ecology and Environment, New Delhi.

Botanical Survey of India (2011). Contribution towards Preparation of Status Report on Conservation of Biodiversity in India II, BSI, Calcutta.

Chauhan SS (2001). Biodiversity, Biopiracy and Biopolitics: The Global Perspective, Kalinga Publications, Delhi.

Chauhan SS (2004). Environmental Protection and Management : From Stockholm to Rio and After, Kalinga Publication, Delhi.

Government of India (2010). *Ethnobiology in India: A Status Report*, Ministry of Environment and Forests, Government of India, New Delhi.

ICFRE (2000). Forest Research and Education Report, Dehradun.

IUCN (2008). Red List of Threatened Animals, World Conservation Monitoring Centre, Cambridge, UK.

Kaul GL (1987). Need for strengthening genetic resources in horticultural crops in India, *National Symposium on Plant Genetic Resources, NBPGR/IARI*, New Delhi, 3-6 March.

Khanna PP and Singh N (1987). Conservation of genetic resources in India: Present status and future prospects, *National Symposium on Plant Genetic Resources, NBPGR/IARI*, New Delhi, 3-6 March.

Khoshoo TN and Subrahmanyam GV (1986). *Conservation of Biological Diversity in Conservation for Productive Agriculture,* Indian Council of Agricultural Research (ICAR), New Delhi 58-72.

Manilal KS (1988). Flora of Silent Valley, Mathrubhumi Press, Calicut.

NBAP (2011). Biodiversity Report of India, Chennai.

Swaminathan MS (2010). Towards a Rich Genetic Estate, The Hindu, 2 January.

Wildlife Research Institu1e of India (2009). Biodiversity and its Conservation in India, WildlifeResearch Institute of India, Dehradun. Available:www.biodiversityinternational.org/publications/Web_version/I74/ch06.htm,www.wii.gov.in/indianfauna/globally%20threatened%20indian%20fauna.pdf.74/ch06.htm,

© Copyright 2014 | Centre for Info Bio Technology (CIBTech)