

Biodiversity-Global, National and Karnataka State Status

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Abstract: According to the International Convention on Biodiversity (CBD), Biodiversity is the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, including diversity within species, between species and ecosystems. In a broad sense, it includes the entire life on earth. In emerging age of biodiversity is the crucial resource for nations to thrive realising this, there has been global efforts to evolve internationally acceptable norms for conservation, sustainable utilisation and equitable sharing benefits of biodiversity, since the earth summit of 1992. The CBD, which has been ratified by more than 170 signatory nations including India, was the starting point of such a development. The recent enactment of Biological Diversity Act-2002 which ascertains the sovereign rights of the nation over its biodiversity resources was an important step taken by India towards fulfilling its commitment to the objectives of CBD.

1. Introduction

Biodiversity can be understood and measured at various levels of biological organisation. Accordingly, it is divided into three types:

Genetic diversity: Genetic diversity refers to the variations or differences present among the individuals of the same species or it represents the diversity in the populations of the same species. Such variations are due to the differences in genetic makeup of individuals. In other words, every individual, plant or animal is unique in its genetic characteristics.

As a result of genetic diversity, many varieties are seen within plant species like rice, brinjal, etc. Ex. Mango has many wild and cultivated varieties like thothapuri, mundappa, ratnagiri, badami, neelam, appemidi. More than 80,000 traditional varieties existed in rice all of which belong to the same species *Oryza sativa*.

Similarly, many breeds are found in animals like cattle, sheep, bulls, cocks and others. Ex. Hallikar, Malenadu gidda, Jersey are some of the cattle breeds which are different from other.

Species diversity: Species diversity refers to the number of different species present in a geographical region or habitat. It is the measure of diversity at the level of species.

Species is a group of similar looking organisms. Ex. all humans together make up one species called *Homo sapiens*. All breeds of cattle together form another species. All those different variety of mangoes constitute a single species called *Mangifera indica*.

As species represents the easily recognisable units of biological organisation, species diversity is the easiest method of measuring biodiversity.

Ex. 1.7 million species exist on earth. Species diversity of India is about 1.2 lakh and Karnataka is about 22,000.

Eco system or Habitat diversity: Ecosystem or Habitat diversity refers to the variety of ecosystems or habitats

occurring a geographical region. An ecosystem or habitat is the assemblage of many different species living in interaction with each other and also with the surrounding non-living factors. Water scapes and land scapes like ponds, rivers forests, grass lands, deserts, mountains, etc are examples for distinctive ecosystems.

Each of these ecosystems or habitat has its own set of species. The set of species found in a pond ecosystem is different from the set of species in a forest. Therefore, biodiversity increases with types of ecosystem. In other words, a region supporting many different ecosystems or habitats will be richer in biodiversity than another area where only one or two ecosystems exist.

Global Biodiversity

The world is estimated to have 5 to 50 million species of organisms. However, it has not been possible to identify and proceed all these species. So far, only 1.7 million species have been described globally. The distribution of these species in the world is highly uneven. About thirty seven percent of the world's total land area including the tropical region is home of the world's species.

The top 12 countries which are highly biodiversity and considered as the Mega-Diversity nations are Australia, Brazil, China, Columbia, Ecuador, Indonesia, Madagascar, Malaysia, Mexico, Peru, Zaire and India.

2. India as a Mega-diversity Nation

India contains a great wealth of Biological diversity in its forests, its wetlands and in its marine areas. It has over 1,20,000 species which is over 7% of the global about 17,00,000 species. Owing to this species richness, India is considered as one among the 12 mega-diversity nations of the world. Species Diversity of India is shown in absolute numbers of species and the proportion they represent of the world total in Table 1.

Some of the important features of biodiversity of India are

- 1) The Western Ghats and the Eastern Himalaya are the two regions in India which are particularly rich in biodiversity. These two are added among the 34

biodiversity hotspots identified all over the world. Hotspots are areas particularly rich in total biodiversity which consists of a high percentage of endemic species.

Table 1: Comparison between the number of species in India and world

Group	Global Diversity	India	Endemics
Prokaryotes	4800	850	---
Fungi	69000	23000	---
Algae	26900	2500	---
Angiosperms	250000	17500	5750
Insects	800000	60000	---
Molluscs	50000	5050	---
Fishes	23000	2500	---
Amphibians	4200	204	110
Reptiles	6300	446	187
Birds	9000	1250	70
Mammals	4000	372	44

- India is one of the 12 centres of origin of cultivated plants. It is a centre of diversity of crop plants and is the homeland of 165 cultivated species and 320 wild relatives of crop plants.
- India has 5 world heritage sites, 12 bioSphere reserves, and 6 Ramsar wetlands. Amongst the protected areas, India has about 88 national parks and 490 sanctuaries covering an area of 1.53 lakh sq. km.
- About 33% Of the country's recorded plants are endemic which means they are found exclusively in India and nowhere else in the world. About 62% of the known amphibian species and 50% of the lizards are endemic, with the majority occurring in the Western Ghats.

Endemic species

Endemic species are those which occur only in a restricted geographical area like an island, a peninsula, a mountain range or a phyto-geographical area. Since they are highly extinction-prone, they are considered on priority for conservation care.

India has many endemic plant and vertebrate species. Among plants, species endemism is estimated at 33% with about 5750 endemic species. Areas rich in endemism are North-East India, the Western Ghats and the North, diversity of Western and Eastern Himalayas. Of these, The Western Ghats and the Eastern Himalaya are considered among the 34 global biodiversity hotspots which together support the major share of world's endemic species. The data on extent of endemism of some important groups in these regions is given in table 2.

Table 2: Major Indian centers of endemic biodiversity

Group	Eastern Himalaya	Western Ghats	Andaman & Nicobar Islands
Angiosperms	3500	1720	144
Reptiles	20	91	23
Amphibian	25	84	2
Mammals	---	7	---

Threatened Species:

Threatened Species are such species which are facing the danger of disappearance in the immediate future. The IUCN (International Union for Conservation of Nature and Natural Resources) has recognized three categories of threatened species namely **Critically endangered**, **Endangered** and

Vulnerable based on the magnitude of the danger they are facing.

India contains about 172 species of animal considered globally threatened by IUCN which include 53 species of mammal, 69 birds, 23 reptiles and 3 amphibians. India contains globally important populations of some of Asia's rarest animals, such as the Bengal Fox, Asiatic Cheetah, Marbled Cat, Asiatic Lion, Indian Elephant, Asiatic Wild Ass, Indian Rhinoceros, Markhor, Gaur, Wild Asiatic Water Buffalo etc. More than 4000 species of plants are threatened of which about 425 are endangered.

Biodiversity hotspots:

The earth's biodiversity is not distributed uniformly. Some regions are highly rich in species while others very poor with only a few species. Areas in the world which contain high proportion of rare and valuable biodiversity are called biodiversity hotspots.

The idea of hotspots was first proposed by a British ecologist Norman Myers in 1988. According to him, hotspots are areas of exceptional plant, animal and microbial wealth which is under threat.

To qualify as a hotspot, a region must meet two strict criteria: it must contain at least 1,500 species of vascular plants (>0.5 percent of the world's total) as endemics, and it has to have lost at least 70 percent of its original habitat.

Initially, Myers identified 18 biodiversity hotspots all over the world which was later updated to 25 hotspots. These 25 hotspots together constituted only 1.4% of the world's total geographical area, but they contained as large as 44% of total plant diversity and 35% of land vertebrates. Therefore, these regions attracted international attention as priority sites for biodiversity conservation efforts.

Recently, Conservation International, in its publication entitled **Hotspots Revisited** published in 2005, has recognized another 9 new hotspots, thereby increasing the total number of biodiversity hotspots to 34. According to the new estimation, about 50% of all plant and animal Species on Earth are found in these hotspots, which originally covered about 15.7% of Earth's surface area. But, presently only 10% the original habitat remains

Both in the earlier and revised list of hot Spots, two regions of India are included. They are the Western Ghats (along with Sri Lanka) and the Eastern Himalayas These are included amongst the top eight most important or hottest hotSpotS

The Western Ghats as a biodiversity hotspot:

The Western Ghats, known locally as the Sahyadri Hills, are formed by the Malabar Plains and the chain of mountains running parallel to India's western coast, about 30 to 50 kilometers inland, They cover an area of about 160,000 km² and stretch for 1,600 kilometers from the country's southern tip to Gujarat in the north, interrupted only by the 30 kilometers Palghat Gap.

The Wide variation of rainfall patterns in the Western Ghats, coupled with the region's complex geography, produces a great variety of vegetation types. These include scrub forests in the low-lying areas and the plains, deciduous and tropical rainforests up to about 1,500 meters, and a unique mosaic of montane forests and shola grasslands above 1,500 meters. In fact, the Western Ghats contains last patches of world's most precious biodiversity rich rain forests.

The Western Ghats mediates the rainfall regime of peninsular India by intercepting the southwestern monsoon winds. The western slopes of the mountains experience heavy annual rainfall (with 80 percent of it falling during the southwest monsoon from June to September), while the eastern slopes are drier; rainfall also decreases from south to north. Dozens of rivers originate in these mountains, including the peninsula's three major eastward-flowing rivers Krishna, Tungabhadra and Kaveri. Thus, they are important sources of drinking water, irrigation, and power.

The Western Ghats are included in the global list of 34 biodiversity hotspots because of the following reasons:

- 1) It is very rich in biodiversity having more than 4500 species of plants and about 11,000 animals, in its different types of forests.
- 2) It has a high percentage of local or endemic species. A major share of life forms occurring here are found nowhere else in the world. Experts estimate that more than 1600 species of plants, 91 reptiles, 84 types of amphibians, 16 birds and 7 species of mammals are found only in the Western Ghats.
- 3) The precious biodiversity wealth of this region is under threat or facing the danger of disappearance due to various developmental and other projects.

Some common plants endemic to the Western Ghats are **Hebbalasu** (*Artocarpus hirsutus*), **Murgula Hanna** (*Garcinia indica*), **Seeme hunse** (*Garcinia gummigulta*), **Kiral bhogi** (*Hopea parviflora*) and **Dhupada Mara** (*Vateria indica*).

Singalika or Lion tailed macaque (*Macaca silenus*), **Nilgiri Langur** (*Trachypithecus johni*), **Kadu bekku** or **Brown palm civet** (*Paradoxurus jerdoni*) and **Nilgiri tahr** (*Hemitragus hylocrius*) are the mammals which are found only in the Western Ghats or endemic to the Western Ghats. This hotspot also has important populations of the endangered Asian elephant (*Elephas maximus*).

Species Diversity of Karnataka

Karnataka is one of the biodiversity rich states of India. According to reliable estimations, Karnataka has over 22,000 known species. This includes about 4,500 species of flowering plants, 800 species of fishes, 600 species of birds, 160 species of reptiles, 126 species of mammals and 70 species of frogs.

A comprehensive database of floral resources of Karnataka has indicated that the state has 4758 species of flowering plants belonging to 1408 genera and 178 families. This accounts for 27% of the floral richness of the entire country.

Karnataka can boast of some species which have been reported as occurring only in the state. It includes the newly described plant species like *Semecarpus kathlekanensis* (Anacardiaceae) occurring only in the Myristica swamps of Uttara Kannada district, *Paracautleya bhatii* (Zingiberaceae) and *Isachne veldkampii* (Poaceae), both reported from Udupi district.

The spider *Ornithoctonus gadgillii*, frog *Nyctibatrachus izussaini* and the fresh water fish *Parabatasio sharavatensis* are among the species of animals newly reported from the State.

Hubbardia heptaneuron is a grass species, which is reportedly extinct from the state. This was growing in the Jogfalls area prior to the construction of Linganamakki reservoir. However, later attempts to relocate this species have failed.

Information available about threatened plants and animals of Karnataka is summarised in table 3.

Table 3: Threatened flora and fauna of Karnataka

Group	No. Of Threatened SPS	Some Important SPS
Plants	330+(30 endangered)	<i>Artocarpus hirsutus</i> (Hebbalasu). (<i>coscinium fenestratum</i> (Maradarasina), <i>Pterocarpus santalinus</i> (Raktha chandana). <i>Persea macrantha</i> (Gulmavu) <i>Rauwolfia serpentina</i> (Sarpagandha), <i>Drosera indica</i> (Hula hiduka)
Birds	45+	Long billed Vulture, Great Indian Bustard, Lesser Florican. backed Vulture
Mammals	18+	Blackbuck, Gaur, Tiger, Sloth bear. Elephant. Lion, tailed macaque, Palm civet, Nilgiri leaf monkey. fishing cat Bengal fox, Smooth Indian otter
Reptiles	08	Indian python, Olive ridley turtle, black pond turtle
Fishes	50+	<i>Lebeo spp</i> , <i>channa spp</i> , <i>puntius spp</i> , <i>scillago spp</i>

Diversity in Peril one more mass extinction of species?

Presently, the World is losing at least one species a day. According to an UN analysis on Convention on Biodiversity, about 40% of the biodiversity has vanished during the last 30 year period between 1970 to 2000. About half of the total biodiversity face the risk of extinction by the end of 2,100. If this happens, it will be the sixth mass extinction of species entering into the history of evolution of life and probably one of the most disastrous of such events. The last such extinction has occurred about 650 lakhs years back leading to the disappearance of the great dinosaurs.

According to a latest report by IUCN, nearly a quarter of the world's land mammals are at the risk of immediate extinction. At least 1,141 of the 5,487 known species of mammals are threatened, with as many as 100 listed in the Critically Endangered Category. One out of three marine mammals is also threatened. Experts also fear that about 30 species of mammals have already become extinct in the last 40 years, including the Yangtze river dolphin and Little earth hutia (a small rodent endemic to Cuba).

Its alarming to note that much of the threatened species are concentrated in South Asia and South-East Asia. Other hotspots of species extinction are the Tropical Andes, Central Africa and the Western Ghats. The important contributing factors are habitat loss from deforestation and overexploitation of natural resources. Climate Change is also predicted to have a negative impact on biodiversity.

The Value of India’s Forest Cover:

Over the course of a series of hearings in the Supreme Court (SC) on forest conservation, it decreed that those who cut forests must now pay for the loss of the intangible benefits of forests, in addition to the usual payment for the loss of trees. The SC has assigned a range of Net Present Values (NPV) to forests that will be sacrificed to developmental projects. The NPV assigned to different types of forests is as follows:

Forest Type	NPV IN Rs./Hectare
Scrub Forest Land	5.8 lakh
Open Forest Land	7.0 lakh
Dense Forest Land	9.2 lakh

If this NPV is applied to the standing forests of the different states of India, what would be the total value of the forest cover of India? It sums up to an amazing amount of Rs 59,20,190.2 crore! The state-wise NPV of forests is given below:

State	NPV of forest	State	NPV of forest
Andhra Pradesh	426739.0	Mizoram	144825.8
Arunachal Pradesh	595783.2	Nagaland	105552.2
Assam	230123.2	Orissa	436940.0
Bihar	48166	Punjab	20605.8
Chhattisgarh	479623.0	Rajasthan	157042.4
Goa	18592.0	Sikkim	29589.0
Gujarat	139111.0	Tamil Nadu	196315.8
Haryana	15294.2	Tripura	57328.8
Himachal Pradesh	126746.6	Uttar Pradesh	119877.4
Jammu & Kashmir	192629.2	Uttaranchal	212885.0
Jharkhand	190051.2	West Bengal	89676.4
Karnataka	335301.2	A & N Islands	63014.6
Kerala	135230.2	Chandigarh	74.0
Madhya Pradesh	658521.4	D & N Haveli	1865.2
Maharashtra	435935.4	Daman & Diu	46.4
Manipur	132146.0	Delhi	883.8
Meghalaya	123088.4	Lakshadweep	248.4
		Total	5920190.2 Crore

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