

A study of Biodiversity and it's Conservation in India

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Abstract:

The loss of biodiversity is a global crisis. Biodiversity, or biological diversity, is variety of all species on earth. It is the different plants, animals and micro-organisms, their genes, and the terrestrial, marine and freshwater ecosystems of which they are a part. Biodiversity is both essential for our existence and intrinsically valuable in its own right because biodiversity provides the fundamental building blocks for the many goods and services a healthy environment provides. India is one of the 12th mega diversity regions of the world with 7.7% of genetic resources of the world but it has suffered a rapid decline in biodiversity in last few decades. Despite efforts to manage threats and pressures to biodiversity in India, it is still in decline. The objective of this paper to document the status and major threats to the biodiversity in the India, as well as deals with the various conservation strategies which is guiding our government, community, industries and scientists to manage and protect the plants, animals and ecosystems of India.

Keywords: Global Crisis, Biodiversity, Ecosystems, Conservation Strategies.

Introduction:

The concept of biodiversity has been known to man ever since he began to minutely observe the living being around him. The term biological diversity was used by Robert E. Jenkins and Thomas Lovejoy in 1980. The word biodiversity itself may have been coined by W. G. Rosen in 1985. The term biodiversity was used as the title for a symposium organized by National Research Council in Washington in 1986. At about that time, as people became more aware of the extinction crisis, biodiversity emerged as a significant issue. Biodiversity became a familiar term to general public when the United Nations Conference on the Environmental and Development (UNCED) held at Rio de Janerio (Brazil) in 1992. It defined the biodiversity as a new perspective.

Biodiversity:

“Bio” mean life and “diversity” means variety, so biodiversity (or biological diversity) is the incredible variety of living things in nature and how they interact with each other. It is one of the most precious treasures. ‘Biodiversity means 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.’ Every human being, plant

and animal contribute to the diversity, beauty and functioning of the earth. Biodiversity is very complex and is often explained as the variety and variability of genes, species and ecosystems.

India: A Megadiverse Country:

The variety of animals and plants on Earth is truly wondrous. It is estimated that about 5-50 million species of living forms exists on the earth. However, only 1.7 million have been identified so far. These include 4,27,205 species of green plants, fungi, bacteria and viruses; 61,917 species of vertebrates and protochordata; and 12,32,490 species of invertebrates including protista. India is one of the 12 mega diverse countries of the world. The country has two major realms called Palearctic and the Indo-Malayan, and three biomes namely the tropical humid forests, the tropical dry/deciduous forests and the warm desert/semi deserts. India is divided into 10 biogeographic regions, Trans-Himalayan, Himalayan, Indian Desert, Semi-Arid, Western Ghats, Deccan Peninsula, Gangetic plains, North-East India, Coasts and Islands, and this diversity creates rich biodiversity in the country. The wide variety in physical features and climatic conditions have resulted in a diversity of ecological habitats like forests, grasslands, wetlands, coastal and marine ecosystems and desert ecosystems, which harbor and sustain the immense biodiversity.

With only 2.45% of the world's land area, it has 16.7% of the world's human population and 18% livestock, which contributes about 8.10% of the known global biodiversity. Currently available data place India in the tenth position in the world and fourth in Asia in plant diversity. In terms of number of mammalian species, India ranks tenth in the world, in terms of endemic species of higher vertebrates, it ranks eleventh. It stands seventh in the world for the number of species contributed to agriculture and animal husbandry. The Himalaya and the Western Ghats are the two Indian mountain biodiversity global hotspots. These both show rich and unique biodiversity in terms of rich species endemism. In addition, India is one of the very important Vavilovian center of diversity and origin of over 167 important cultivated plant species, 320 species of wild crop relatives, and several species of domesticated animals.

In flora, the country can boast of 45,944 species, which accounts for 10.75% of the known world plants. Of the 18,000 species of flowering plants (angiosperms) 36% are endemic and located in 26 endemic centers. Our country is very rich in faunal wealth too. The country has nearly 89,317 animal species, about 75 percent of which are insects, 4,952 vertebrates including protochordata and about 84,365 are invertebrates, including protista. In animals, the rate of endemism in reptiles is 33%, in amphibians 41%, in mammals 9%, and birds 4%.

4.2 Reasons for extinction of Biodiversity

Destruction of habitat:

The natural habitat may be destroyed by man for his settlement, grazing grounds, agriculture, mining, industries, highway construction, drainage, dam building, etc. as a consequence of this; the species must

adapt to the changes, move elsewhere or may succumb to predation, starvation or disease and eventually die. This is the most pervasive threat to birds, mammals and plants affecting 89% of all threatened birds, 83% of the threatened animals assessed. In our country, several rare butterfly species are facing extinction with the uncannily swift habitat destruction of the Western Ghats. Of the 370 butterfly species available in the Ghats, up to 70 are at the brink of extinction.

Hunting:

From time immemorial, man has hunted for food. Commercially, wild animals are hunted for their products such as hide and skin, tusk, antlers, fur meat, pharmaceuticals, perfumes, cosmetics and decoration purposes. For example, in India, rhino is hunted for its horns, tigers for bones and skin, musk deer for musk (have medicinal value), elephant for ivory, gharial and crocodile for their skin, and jackal for thriving fur trade in Kashmir. One of the most publicized commercial hunts is that of whale. The whalebone or 'baleen' is used to make combs and other products. Poaching of the Indian tiger has been risen because of the increasing demand from pharmaceutical industries, which consume the bones of 100 tigers per year. Such huge demand has been met by poachers from India. Even the Project tiger Programme failed to check poaching and resultantly the tigers have been almost disappeared from Ranthambore and Keoladeo national parks. Smuggling of tiger bones and skins is a lucrative business. Hunting for sport is also a factor for loss of wild animals.

Over exploitation:

This is one of the main causes of the loss of not only economic species but also biological curiosities like the insectivorous and primitive species and other taxa needed for teaching or laboratory (like *Nepenthes*, *Gnetum*, *Psilotum*, etc.). commercial exploitation of wild plants has invariably causes their overuse and eventual destruction. This has been true in case of Indian wild mango trees, which were turned into plywood as of the whales that were hunted for tallow. Plants of medicinal value like *Podophyllum hexandrum*, *Coptis teeta*, *Aconitum*, *Disocorea deltoidea*, *Rauwolfia serpentine*, *Paphiopedilum druryi*, etc., and horticultural plants like orchids and rhododendrons come under the over-exploited category. Faunal losses have been mainly because of over-exploitation. For instance, excessive harvesting of marine organisms such as fish, mollusks, sea cows and sea turtles has resulted in extinction of these animals.

Collection for zoo and research:

Animals and plants are collected throughout the world for zoo and biological laboratories for study and research in science and medicine. For example, primates such as monkey and chimpanzees are sacrificed for research as they have anatomical, genetic and physiological similarities to human being.

Introduction of exotic species:

Native species are subjected to competition for food and space due to competition for food and space due to introduction of exotic species. For example, introduction of goats and rabbits in the Pacific and Indian regions has resulted in destruction of habitats of several plants, birds and reptiles.

Pollution:

Pollution alters the natural habitat. Water pollution is especially injurious to the biotic components of estuary and coastal ecosystem. Toxic wastes entering the water bodies disturb the food chain, and so to the aquatic ecosystems. Insecticides, pesticides, sulphur dioxide, nitrogen oxides, acid rain, ozone depletion and global warming too, affect adversely the plant and animal species. The impact of coastal pollution is also very important, it is seen that coral reefs are being threatened by pollution from industrialization along the coast, oil transport and offshore mining. Noise pollution is also the cause of wildlife extinction. According to a study Arctic whales are seen on the verge of extinction as a result of increasing noise of ships, particularly ice breakers and tankers.

Deforestation:

One of the main causes for the loss of wildlife is population explosion and the resultant deforestation. Deforestation mainly results from population settlement, shifting cultivation, development projects, demand for fuel wood, demand of wood as a raw material for many industries such as paper and pulp, match, veneer and plywood, furniture etc. In the Country, the current rate of deforestation is 13,000 sq. km annually. If this rate of deforestation continues, one can imagine the ultimate fate of our forest and biological richness. It is presumed that in coming years, the global loss of biodiversity from deforestation alone would be 100 species every day.

Biodiversity conservation strategies:

Since the biodiversity affects every living being on this planet and to a great extent is influenced by the human activities, the responsibility to protect it must be a shared goal of all the nations and communities. In this context the Convention on Biological Diversity (CBD (signed in 1992) was inspired by the world community's growing commitment to sustainable development. It represents a dramatic step forward in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources. India was one of the early signatories to the UN CBD. Prior to CBD, the following were the legal provisions to conserve the biodiversity.

- Indian Forest Act, 1927
- Wildlife (Protection) Act 1972

- Forest (Conservation) Act 1980

During the last twenty years, plans for biodiversity conservation have been developed by the WRI and the IUCN with support from World Bank and other institution. Basically, the conservation plan should have a holistic approach and encompasses whole spectrum of biota and activities ranging from ecosystems at the macro level to DNA libraries at the molecular level. There are two approaches of biodiversity conservation namely in situ (on site) conservation which tries to protect the specie where they are, i.e., in their natural habitat and ex situ (off site) conservation which attempts to protect and preserve a species in place away from its natural habitat

In situ Conservation:

In situ conservation means the conservation of ecosystem and natural habitat and maintenance and recovery of viable population of species in the natural surrounding where they have developed their distinctive characteristics.

In situ conservation requires only elimination of factors detrimental to the existence of the species and allows the larger number of species to grow simultaneously and flourish in their natural environment in which they were growing since a long time. The only disadvantage of in situ conservation is that it requires larger areas and minimizes the space for inhibiting human population which is increasing tremendously. The following areas may be set aside for in situ conservation:

- **National Parks**
- **Wildlife Sanctuaries**
- **Biosphere Reserves**

In India, the Wildlife Protection act of 1972 empowers the State Governments to declare an area as a Sanctuary or National Park. This is done for protecting, propagating and developing wildlife and its environment. Section 18 to 34 and 38 of the Act, deal with the declaration of sanctuaries, Section 35 and 38 with National Parks and Section 37 with closed areas. There are 102 national parks and 512 wildlife Sanctuaries, 47 Conservation Reserves and 4 Community Reserves in the country, covering an area of 1,61,221.57 km² (4.90% of total geographic area).

Special Projects for Endangered Wildlife:

These special projects have been designated for species specific management of endangered species and their habitats.

Project Tiger:

In India Project Tiger was launched in 1973 with an objective “to ensure maintenance of a viable population of tigers in India for scientific, economic, aesthetic, cultural and ecological values and to preserve for all times areas of biological importance as a national heritage for benefit and enjoyment of the people”. The Project has been successfully implemented and under this project, 44 Tiger Reserves

have been set up in the country till June 2011, covering an area of over 52,653 km² of tiger habitat distributed in 21 states and few more have been proposed.. However, due to intense poaching, there is decline in tiger reserves as well as in wild. For strengthening tiger conservation measures and ensuring anti-poaching activities, National Tiger Conservation Authority and Crime Control Bureau were constituted w.e.f. 04.09.2006 and 06.06.2007, respectively. According to an estimate the number of tigers which was about 4026 in 1989 went down to about 1233 in 2000. Surprisingly no tiger in Sariska is seen since 2004. A survey of numbers of tigers in 2011 revealed that there are about 1706 tigers in India. The Project Tiger is undisputedly the custodian of major gene pool of the country and a repository of some of the most valuable ecosystems and habitats for wildlife.

Project Elephant:

This was launched in 1992 with the aim at ensuring long term survival of identified viable populations of elephant population. There have been drawn lines to restore the lost and degraded habitats of elephant including creation of corridors for their migration, mitigation of man-elephant conflict and establishment of data base on the migration and population dynamics of elephants. It also aims at improving quality of life of people living around elephant habitats through sustainable development. The project is being implemented in 13 states and 30 Elephant reserves have been established.

Gir Lion Project:

The Gir forest in Saurashtra peninsula of Gujarat is unique as the only surviving habitat of the Asian lion *Panthera leo persica*. At present in whole of the Asia, this lion is found only in Gir forest of Gujarat. Clearing of forest for agriculture, excessive cattle grazing and other factors led to decline in the lion population. A five year plan scheme was thus prepared in 1972 by the Govt. of Gujarat for this project. The total area of Gir sanctuary is now 1412.12 km². The central core of about 140.40 km² was constituted as a National Park in 1975. In 1978 an additional area of 118.13 km² was declared as National Park increasing the area to 258.71 km². Ultimately the entire sanctuary was declared as National Park. As a result of this there has been increase in the lion population. In 1968, there were 177 lions in the Gir. This number increases to 180 in 1974.

Ex situ Conservation:

Ex situ conservation means the conservation of biological diversity components outside their natural habitat. It involves cultivation of rare plants/rearing of threatened animals outside of their natural habitats and also holding of plants and animal species in botanical and zoological gardens, and in arboreta or store them in the form of seeds in seed bank (gene banks) or some other suitable forms by means of tissue cultures techniques. There are a number of tissue cultures techniques. There are a number of plant

and animal species, which have become more or less extinct in the wild, but they are being conserved in gardens or zoos, e.g. cheetah (*Acinonyx jubatus*)

However, because of the prohibitive cost captive breeding should only be restored to when populations are in imminent danger of extinction in the wild. Therefore, priorities in selecting species for captive breeding efforts in zoos need to be carefully established. Some of the steps involved in ex situ conservation of animals species include:

- Establishing minimum target population goals to provide for maintenance of captive genetic diversity at least for the next 100 years,
- Compiling animal husbandry programmes for circulation to all breeding facilities
- Implement an overall plan that contributes to the objectives of maintaining viable captive populations across the globe.

Reintroduction of the threatened plant species is done in the same way, in the areas from where they have become extinct: rare, endangered and even plants, which are extinct in their natural habitats, are cultivated in gardens.

Zoological Parks:

There are roughly 5, 00,000 mammals, birds, reptiles and amphibians in captivity in zoos throughout the world. Zoos contribute in many ways to the conservation of biodiversity:

- They propagate and reintroduce endangered species
- They serve as centers for research to improve management of captive and wild populations
- They raise public awareness for biotic improvement.
- They enlighten the public that animals are equally important and are essential for the life support system.

In India first Zoo was set up in Madras in the year 1855, which was soon followed by Trivendrum (1857), Bombay (1863), Calcutta (1875), Jaipur (1876), and Udaipur (1878). After independence a number of zoos were set up. The important ones are Municipal Hill Garden Zoo (Ahmedabad) Delhi Zoological Park (Delhi), Himalayan Zoological Park (Darjeeling), Nehru Zoological Park (Hyderabad), Assam State Zoo (Guwahati), Van Vihar (Bhopal), Nandankanan (Bhubneswar), Sakkarbang zoo (Junagarh).

Aquaria:

The role of aquaria in the captive propagation of threatened freshwater species is significant. Accordingly, the captive Breeding Specialist Group of the World Conservation Union (IUCN) is mounting a major effort to develop captive breeding programmes for endangered fish species, starting from the lake Victoria, the desert fishes of North America, and Appalachian stream fishes. The programme shall also include the restoration of natural habitats, provides protection against loss of wild restoration of natural habitats, provides protection against loss of wild species and help educate the public on threats to fishes.

Gene Banks:

A gene bank is a facility/institution where valuable plant materials likely to become irretrievably lost in the wild or in cultivation can be preserved in viable condition. Gene banks conserve stocks of both seeds and vegetative plant parts. The seeds of many species can be stored in dry, low temperature, vacuum containers. Storage at extremely low temperature, below -196°C may extend the life of some of these species to more than a century (cryopreservation). The stored germplasm not only safeguards the species threatened but is also utilized actively by the plant scientists and breeders to develop novel varieties as desired. The technique is efficient, reproducible, and feasible for short, medium and long-term storage.

Pollen/Semen Conservation:

Preservation of pollen and spores is of significant value for conservation of biodiversity of important flowering and spore bearing plants. The procedure for institution of pollen and spore banks is almost similar to that of gene banks. Cryogenic technique is useful in preserving pollen from flowering or cone bearing plants, and spores from non-flowering plants, such as ferns and mosses. Pollen preservation is thus advantageous over seeds preservation, as it gives opportunity to preserve the full range of variation within the population in a very simple manner. Pollen grains can be stored under appropriate condition allowing subsequent use for crossing with living plants materials. Stored semen can also be used for artificial insemination in animals. A pollen bank can be an extremely powerful tool in plant breeding since it frees breeders from the tyranny of time. Also, it is useful in selfsterilised plant species.

Tissue Culture Technique:

Tissue culture technique becomes necessary under the following conditions:

- If a specific genetic type (clone) is to be conserved and maintained;
- If the seeds progeny are highly variable
- If plants have recalcitrant seeds

Shoot tips are preferred materials for conservation as they are more stable, easier to regenerate into whole plants, and produce virus free clonal plants. Shoot tips are also convenient materials for international exchange of germplasm.

Recombinant DNA Technology:

The recombinant DNA technology allows us to clone any DNA in *Escherichia coli*, and soon it will hopefully be possible to extend such cloning to yeast and other organisms. Cloned DNA, therefore, appears to be an attractive candidate for genetic conservation. In addition to cloned genes, the entire genomic DNA

of plant population can be preserved. Recombinant DNA technology has still another novel advantage in that it can make use of genes of plant material that has lost viability. From DNA libraries of such material, a relevant gene or gene combination can be retrieved and put to use.

CONCLUSIONS:

It is imperative that the phenomenon of biodiversity is very vast, complex and interdependent and there is no single over-arching effect of diversity on either productivity or stability. The realized effects will depend heavily on environmental context and the time scale over which the effects are studied. However, it has become obvious that biodiversity is indeed important for both managed and natural ecosystems, though the relative contributions of diversity and composition remain unclear. It is therefore necessary for legislators to understand the basic science in order to maintain diversity at its current levels. If current human growth and resource management patterns do not change, it is likely that we will lose many important species, and the ecosystems of the world may never recover. In present paper the various conservation strategies by government, voluntary organizations, public participation as well as the individual efforts have been discussed, that how they commutatively plays a major role for the conservation of the biodiversity. Human is only one more of natural creatures and should not be alien to the other life-forms. We have no moral right to destroy nature and other beings that dwell on earth. We should treat all animals and plants with compassion. Every individual can make a small and yet significant effort in the race to save our planet and conserve biodiversity.

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