BIODIVERSITY

CONCEPT AND DEFINITION

The term 'biodiversity' includes variety of living organisms, genetic differences among them, communities and ecosystems which they inhabit, and ecological and evolutionary process that keep them functioning, ever changing and adapting. Thomas Lovejoy coined the term 'biological diversity' in 1980. E. O. Wilson coined and applied the term 'biodiversity' in a report for the first American Forum in Biological Diversity. Popularity of the term biodiversity has increased in the past decade. However, biodiversity is often mistaken as species diversity.

The 1992 United Nations Earth Summit at Rio de Janeiro defined biodiversity as "the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part: this includes diversity within species, between species and of ecosystems".

Biodiversity is also defined in other ways as follows:

1. "Biodiversity refers to the variety and variability of organisms, of genetic material and of community or ecosystem. This includes diversity within species (genetic diversity), between species (organismal diversity) and ecosystem or community (ecological diversity)".
2. "Biodiversity encompasses all the levels of natural variations from the molecular and genetic to the species level, where we have most of our interaction with biodiversity through enjoyment of the common, strange and beautiful form of life or through suffering caused by the effects of pests, parasites and diseases".
3. "Global diversity is defined as the total diversity and variability of living organisms and of the systems of which they are a part. This covers the total range of variation and variability among systems and organisms at the bioregional, landscape, ecosystem, habitat and organismal level down to species, populations, individuals and genes".
4. "The variety of organisms considered at all levels of genetic variants belonging to the same species through arrays of species, genera, families and still higher taxonomic levels including the variety of ecosystems which comprise both communities of organisms within a particular habitat and the physical condition under which they live".

The simplest approach to define biodiversity is, the ensemble and the interacts of the genetic, species and the ecological diversity in a given place and time.

IMPORTANCE OF BIODIVERSITY

Biodiversity plays a vital role in the material well-being of man as one of the species on this earth. Following points clearly emphasizes the significance of biodiversity on this planet.

1. The diverse organisms comprising this biodiversity interact with the environment over billions of years and provide an atmosphere to breathe, soil to grow crops and fresh water to drink.
2. It provides us valuable natural resources to satisfy the everlasting needs of the mankind. For example, fruits, vegetables, flowers, animals, etc fulfill our needs in some or the other way.
3. Man depends on genetic resources for food supply, medicines and clothes, in some region for fuel and building material and also for our mental and spiritual welfare.
4. Genetic diversity increases the species ability to resist pests and diseases, helps adapt species to the changing environment and recover from disasters.
5. Diverse communities of plants, animals, microbes, etc provide us ecological services like recycling of waste, reducing pollution, pollination, maintaining ecological balance, etc.
6. A diversity of biological communities and ecosystems such as parks, gardens, national parks, sanctuaries, ecotourism zones, hills, beaches, etc are important sites for research as well as recreational activities.
7. Man still uses old or wild varieties of crops available in the nature for its vigor for improving the yield of desirable crops and making them more resistant. New strains of crops are developed. This helps in agricultural industry.
8. Research in new medicines is still dependent on the active chemical constituents found in many medicinal plants available in the nature. Man is tapping all possible resources to obtain information about these through ethnobotanical data. Plants are the main sources of such healing drugs. Thus, the biodiversity of such plants is helpful for the pharmaceutical industry.
9. The vast fauna contains large number of such species which are efficient crop pollinators, good weed control agents and biological pest control agents. Parasites are sometimes used on insect pests based on their natural hosts, thus curbing the attack of pests to a large extent. Earthworms and snakes are efficient friends of farmers as they help in the agricultural field in many different ways.
10. Biodiversity is the backbone of agriculture, aquaculture, animal husbandry and forestry and it is linked with social, religious and cultural practices of a region. In short, life of man is impossible without this immense diversity in the nature.

STATUS OF BIODIVERSITY

Global Level: -

It is estimated that nearly 8.7 million species are quoted as working estimate for the number of species on earth presently. For e.g., it is interesting to know that there are more than 20,000 species of ants, 3,00,000 species of beetles and nearly 20,000 species of orchids on earth.

The tropical forests are regarded as a rich storehouse of biodiversity on earth. More than half of the species on earth live in moist tropical forests, which is only 7% of the total land surface. It is maximum in the tropical rainforests, e.g., Amazon rainforest which includes about 40,000 plant species, 1300 bird species, 427 mammals, etc. Insects and primates make up most of these species. Tropical rainforests, the major diversity hubs, are yet to be explored completely. Some exorbitant numbers like existence of 20 to 50 million species have been made. But Robert May has given a convincing estimate of about 7 million species in such ecosystems. This includes approximately 2,87,655 species of plants. The reasons for high species diversity in the tropics are:

- The conditions for evolution were optimum and for extinction fewer.
- Species diversity in tropics was conserved over geological time due to low rates of extinction prevailing here.
- Biological diversity is the result of interaction between climate, organisms, topography, parent soil materials, time and heredity.

According to IUCN (2014), the total number of species on the earth are mentioned below:

	Approximate No. of species
Mammals	5,513
Birds	10,425
Reptiles	10,038
Fish	32,900
Amphibians	7,302
Insects	10,00,000
Plants	30,7,674
Lichens	17,000

National Level: -

The Indian landmass extends over a total geographical area of about 3029 million hectares. It is bounded by Himalayas in the north, Bay of Bengal in the east, the Arabian Sea in the west and Indian Ocean in the south. The wide variety of physical features and climatic situations have resulted in a diversity of ecological habitats in India. This richness in biodiversity is due to the immense variety of climatic and altitudinal conditions coupled with varied ecological habitats. India has a sizeable percentage of endemic flora and fauna. These vary from the humid tropical Western Ghats to the hot deserts of Rajasthan, from the cold desert of Ladakh and the icy mountains of the Himalayas to the warm coasts of peninsular India.

Information regarding flora and fauna available in the country are patchy. Hundreds of new species may be present here awaiting discovery. India boasts a handsome share of 8.1% of total biodiversity wealth of the earth. One of the 17 megadiversity countries of the globe, India has 2.4% of the total land area of the world. We have identified around 45,000 plant species and nearly double the number of animal species from our natural wealth. According to Robert May, we have recorded only 22% of our natural wealth. The major concern though is the possibility of loss of these species before being identified because of activities like reclamation and deforestation.

The Indian Gene Centre is among the 17 megadiversity regions of the world India has various types of ecosystems like deserts, forests, grasslands, wetlands, mangroves, etc. More than 20 crop species were domesticated here. It is known to possess more than 49,000 species of plants including major and minor crop plants and their wild relatives. Around 1,000 wild edible plant species are widely exploited by native tribes. In addition, nearly 9,500 plant species of ethnobotanical uses have been reported from the country of which around 7,500 are of ethnomedicinal importance and about 3,900 are multipurpose edible species.

Documentation of the status of biodiversity at both national and global level both is equally important. It helps in making valuable reports based on need-based monitoring. Wider dissemination of these assists in bringing awareness about the current status of biodiversity.

WORLD BIODIVERSITY DAY: 22ND MAY

LEVELS OF BIODIVERSITY

The earth's biodiversity is organized at three distinct levels and all the three levels or components form an intricate web. They are as follows.

(1) Genetic diversity:

It refers to the variation of genes. A specific region of DNA coding for single polypeptide chain is known as a gene. It is the functional unit of inheritance. The entire biological information of an organism is stored in it. This type of diversity occurs within as well as across species. It also covers genetic variation

within a population. Quantitative genetics provides certain parameters for estimating the genetic diversity of quantitative traits between individuals. These parameters are genotypic coefficient of variation (GCV), D^2-statistic, metroglyph analysis, etc. Molecular biology has also developed some distinct tools like RFLP, RAPD, etc. for measuring genetic diversity.

(2) Species diversity:

It is the next higher level of biodiversity. Species diversity refers to the variety of living species in an ecosystem, eg. Plants, insects, humans, etc. Species diversity can be measured by species richness (number of species in a defined area), species abundance (relative number in each species) and phylogenetic diversity (evolutionary relationship between different groups of species). Species diversity is highest in the equatorial regions and decreases towards the polar regions. It is essential for the proper functioning of communities in an ecosystem.

(3) Ecosystem diversity:

This is the highest level of biodiversity. It refers to the variation of different ecosystems, such as rainforest, lakes, coral reefs, etc. Ecosystem diversity arises due to the variation in energy flow, food chain and water cycle of different ecosystems. It also includes the diversity of habitats and ecological processes occurring within each ecosystem. Ecosystem diversity exists in three different perspectives.

(i) Alpha (α) diversity – It is the species diversity in a community which is expressed in terms of species richness and evenness.

(ii) Beta (β) diversity – This type measures the diversity of species among different communities. It is a measure of the rate and extent of change in species along a gradient from one habitat to another.

(iii) Gamma (γ) diversity – It is the diversity of species across a larger landscape level. It explains the diversity of species within a large geographical range.

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