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MODULE 3:

BIODIVERSITY AND ITS CONSERVATION

The term biodiversity was coined as a contraction of biological diversity by E.O. Wilson in 1985. Biodiversity may be defined as the variety and variability of living organisms and the ecological complexes in which they exist. In other words, biodiversity is the occurrence of different types of ecosystems, different species of organisms with the whole range of their variants and genes adapted to different climates, environments along with their interactions and processes.

Biodiversity includes the genetic variability (for which different varieties of species have appeared in the course of evolution) and diversity of life forms such as plants, animal microbes, etc. living in a wide range of ecosystems.

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The diversity may be inter specific (within species) and inter specific (in between the species) but these are well supported by ecosystem. It is seen that the diverse living forms of the ecosystem are modulated with the global environmental changes.

1. Types of Biodiversity:

There are three interrelated hierarchical levels of biodiversity namely, genetic diversity, species diversity and community or ecosystem diversity. The discussion on each type of diversity is given below:

a. Genetic diversity:

It describes the variation in the number and types of genes as well as chromosomes present in different species. The magnitude of variation in genes of a species increases with increase in size and environmental parameters of the habitat. The genetic variation arises by gene and chromosome mutation in individuals and in sexually reproducing organisms and it is spread in the population by recombination of genetic materials during cell division after sexual reproduction.

Genetic diversity has the following importance:

- (i) It helps in speciation or evolution of new species;
- (ii) It is useful in adaptation to changes in environmental conditions;
- (iii) It is important for agricultural productivity and development.

b. Species diversity:

It describes the variety in the number and richness of the species within a region. The species richness may be defined as the number of species per unit area. The richness of a species tells about the extent of biodiversity of a site and provides a means for comparing different sites.

The species richness depends largely on climatic conditions. The number of individuals of different species within a region represents species evenness or species equitability. The product of species richness and species evenness gives species diversity of a region. When a species is confined entirely to a particular area, it is termed as endemic species.

c. Ecosystem diversity:

It describes the assemblage and interaction of species living together and the physical environment in a given area. It relates varieties of habitats, biotic community's ecological processes in biosphere. It also tells about the diversity within the ecosystem.

It is referred as landscape diversity because it includes placement and size of various ecosystems. For example, the landscapes like grasslands, deserts, mountains etc. show ecosystem diversity. The ecosystem diversity is due to diversity of niches, trophic levels and ecological processes like nutrient cycling, food webs, energy flow, role of dominant species and various related biotic interactions. Such type of diversity can generate more productive and stable ecosystems or communities capable of tolerating various types of stresses e.g. drought, flood etc.

2. Biodiversity of India:

As per available data, the varieties of species living on the earth are 1753739. Out of the above species, 134781 are residing in India although surface area of India is 2% of the earth's surface. Wild life Institute of India has divided it into ten biogeographically regions and twenty-five biotic provinces.

Biogeographically regions are:

- (i) Trans Himalayas,
- (ii) Genetic plain,
- (iii) Desert,
- (iv) Semiarid zone;
- (v) Western Ghats;

- (vi) Deccan peninsula,
- (vii) North eastern zone,
- (viii) Coastal lands
- (ix) Himalayas,
- (x) Islands.

India is one of the twelve mega diversity nations of the world due to the following reasons:

- (i) It has 7.3% of the global fauna and 10.88% of global flora as per the data collected by Ministry of Environment and forest.
- (ii) It has 350 different mammals, 1200 species of birds- 453 different reptiles, 182 amphibians and 45,000 plants spices.
- (iii) It has 50,000 known species of insects which include 13,000 butterflies and moths.
- (iv) It has 10 different biogeographically regions and 25 biotic provinces having varieties of lands and species.
- (v) In addition to geographical distribution, geological events in the land mass provide high level of biological diversity.
- (vi) Several crops arose in the country and spread throughout the world.
- (vii) There is wide variety of domestic animals like cows, buffaloes, goats, sheep, pigs, horses etc.
- (viii) The marine biota includes sea weeds, fishes, crustaceans, molluscs, corals, reptiles etc.
- (ix) There are a number of hot spots (namely Eastern Ghats, Western Ghats, North Eastern hills etc.).

Importance of Biodiversity:

The living organisms on earth are of great diversity, living in diverse habitats and possessing diverse qualities and are vital to human existence providing food, shelter, clothing's, medicines etc. The biodiversity has the following importance's:

1. Productive values:

Biodiversity produces a number of products harvested from nature and sold in commercial markets. Indirectly it provides economic benefits to people who include water quality soil protection, equalization of climate, environmental monitoring, scientific research, recreation etc.

2. Consumptive value:

The consumptive value can be assigned to goods such as fuel woods, leaves, forest products etc. which may be consumed locally and do not figure in national and international market.

3. Social value:

The loss of biodiversity directly influences the social life of the country possibly through influencing ecosystem functions (energy flow and biogeochemical cycle). This be easily understood by observing detrimental effects of global warming and acid rain which cause an unfavorable alteration in logical processes.

4. Aesthetic value:

Aesthetic values such as refreshing fragrance of the flowers, taste of berries, softness of mossed, melodious songs of birds, etc. compel the human beings to preserve them. The earth's natural beauty with its color and hues, thick forest, and graceful beasts has inspired the human beings from their date of birth to take necessary steps for its maintenance. Similarly, botanical and zoological gardens are the means of biodiversity conservation and are of aesthetic values.

5. Legal values:

Since earth is homeland of all living organisms, all have equal right to coexist on the surface of earth with all benefits. Unless some legal value is attached to biodiversity, it will not be possible to protect the rapid extinction of species.

6. Ethical value:

Biodiversity must be seen in the light of holding ethical value. Since man is the most intelligent amongst the living organisms, it should be prime responsibility and moral obligation of man to preserve and conserve other organisms which will directly or indirectly favor the existence of the man.

7. Ecological value:

Biodiversity holds great ecological value because it is indispensable to maintain the ecological balance. Any disturbance in the delicately fabricated ecological balance maintained by different organisms, will lead to severe problems, which may threaten the survival of human beings.

8. Economic value:

Biodiversity has great economic value because economic development depends upon efficient and economic management of biotic resources.

In the day to day life, human beings are maintaining their lifestyle at the sacrifice of surrounding species which come from diversity of plants and animals struggling for their existence.

So, it is highly essential for the human beings to take care of their surrounding species and make optimum use of their service, for better economic development. Thus, it is rightly told, survival of the man depends upon the survival of the biosphere.

4. Uses of Biodiversity:

Biodiversity has the following uses for the development humanity:

- (i) It provides food of all types.
- (ii) It provides fibres', sources for the preparation of clothes.
- (iii) It provides different types of oil seeds for the preparation of oils.
- (iv) It provides new varieties of rice, potato etc. through the process of hybridization.
- (v) It provides different drugs and medicines which are based on different plant products.
- (vi) It is very essential for natural pest control, maintenance of population of various species, pollination by insects and birds, nutrient cycling, conservation and purification of water, formation of soil etc. All these services together are valued 16.54 trillion dollars per year.

5. Threats to Biodiversity:

Biodiversity is considered as a reservoir of resources to be used for the manufacture of food, medicine, industrial products, etc. But with an increased demand of rapid population growth, biodiversity is gradually depleting. A number of plants" and animal species have already become extinct and many are endangered.

The different factors responsible for causing threat to biodiversity are as follows:

1. Habitat destruction:

The primary cause of loss of biodiversity is habitat loss or destruction which is resulted due to the large industrial and commercial activities associated with agriculture, irrigation, construction of dams, mining, fishing etc.

2. Habitat fragmentation:

With increased population, the habitats are fragmented into pieces by roads, fields, canals, power lines, towns etc. The isolated fragment of habitats restricts the potential of species for dispersal and colonization. In addition, the habitat fragmentation also brings about microclimatic changes in light, temperature, wind etc.

3. Pollution:

The most dreaded factor inducing loss of biodiversity is environmental pollution which include air pollution, Water pollution, industrial pollution, pollution due to chemical Pastes, pesticides radioactive materials etc.

4. Over exploitation:

The natural resources are over exploited to meet growing rural poverty, intensive technological growth and globalization of economy. All these factors together may be responsible for the extinction of a number of species.

Conservation of Biodiversity: Biodiversity is being depleted by the loss of habitat, fragmentation of habitat, over exploitation of resources, human sponsored ecosystems, climatic changes, pollution invasive exotic species, diseases, shifting cultivation, poaching of wild life etc.

Since the human beings are enjoying all the benefits from biodiversity, they should take proper care for the preservation of biodiversity in all its form and good health for the future generation i.e., the human being should prevent the degradation and destruction of the habitats thereby maintaining the biodiversity at its optimum level.

Conservation of biodiversity is protection, up liftment and scientific management of biodiversity so as to maintain it at its threshold level and derive sustainable benefits for the present and future generation. In other words, conservation of bio-diversity is the proper management of the biosphere by human beings in such a way that it gives maximum benefits for the present generation and also develops its potential so as to meet the needs of the future generations.

Mainly the conservation of biodiversity has three basic objectives:

- (a) To maintain essential ecological processes and life supporting systems.
- (b) To preserve the diversity of species.
- (c) To make sustainable utilization of species and ecosystems.

Strategies for Conservation of Biodiversity:

The following strategies should be undertaken in order to conserve biodiversity:

- (1) All the possible varieties (old or new) of food, forage and timber plants, livestock, agriculture animals and microbes should be conserved.
- (2) All the economically important organisms in protected areas should be identified and conserved.
- (3) Critical habitats for each species should be identified and safeguarded.
- (4) Priority should be given to preserve unique ecosystems.
- (5) There should be sustainable utilization of resources.
- (6) International trade in wild life should be highly regulated.
- (7) The poaching and hunting of wildlife should be prevented as far as practicable.

- (8) Care should be taken for the development of reserves and protected areas.
- (9) Efforts should be made to reduce the level of pollutants in the environment.
- (10) Public awareness should be created regarding biodiversity and its importance for the living organisms.
- (11) Priority should be given in wildlife conservation programmed to endangered species over vulnerable species and to vulnerable species over rare species.
- (12) The habitats of migratory birds should be protected by bilateral and multilateral agreement.
- (13) The over exploitation of useful products of wild life should be prevented.
- (14) The useful animals, plants and their wild relatives should be protected both in their natural habitat (in-situ) and in zoological botanical gardens (ex-situ)
- (15) Efforts should be made for setting up of National parks and wild life sanctuaries to safeguard the genetic diversity and their continuing evolution.
- (16) Environmental laws should be strictly followed.

Conservation Methods:

There are two types of conservation methods namely in-situ and ex-situ conservations. Let us discuss the different conservation methods along with their importance.

(a) In situ conservation:

The conservation of species in their natural habitat or natural ecosystem is known as in situ conservation. In the process, the natural surrounding or ecosystem is protected and maintained so that all the constituent species (known or unknown) are conserved and benefited. The factors which are detrimental to the existence of species concerned are eliminated by suitable mechanism.

The different advantages of in situ conservation are as follows:

- (a) It is a cheap and convenient way of conserving biological diversity.
- (b) It offers a way to preserve many organisms simultaneously, known or unknown to us.
- (c) The existence in natural ecosystem provides an opportunity to the living organisms to adjust to differed environmental conditions and to evolve in to a better life form. The only disadvantage of in situ conservation is that it requires large space of earth which is often difficult because of growing demand for space.