

UNIT – 2

BIODIVERSITY AND ITS CONSERVATION

Lesson Structure

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2.0 Objective:

The basic objective of this unit is to provide comprehensive information to students about the Biodiversity, Threats etc. Furthermore, students will also be able to know about its conservation.

2.1 Introduction:

The great variety of life on earth has provided for man's needs over thousands of years. This diversity of living creatures forms a support system which has been used by each civilization for its growth and development. Those that used this "bounty of nature" carefully and sustainably survived. Those that overused or misused it disintegrated.

Science has attempted to classify and categorize the variability in nature for over a century. This has led to an understanding of its organisations, its communities of plants and animals. This formation has helped in utilizing the earth's biological wealth for the benefit of humanity and has been integral to the process of 'development' This includes better health care, better crops and the use of these life forms as raw material for industrial growth which has led to a higher standard of living for the developed world. However, this has also produced the modern consumerist society, which has had a negative effect on the diversity of biological resources upon which it is based. The diversity of life on earth is so great that if we use it sustainably we can go on developing new products from biodiversity for many generations. This can only happen if we manage biodiversity as a precious resource and prevent the extinction of species.

2.2 Meaning of Biodiversity:

Biodiversity is also known as biological diversity. The term 'biological diversity' was first used in year 1980 by lovejoy (most commonly used to describe the number of species).

'Biological diversity' or biodiversity is that part of nature which includes the differences in genes among the individuals of a species, the variety and richness of all the plant and animal species at different scales in space, locality, in a region, in the country and the world, and various types of ecosystems, both terrestrial and aquatic within a defined area.

Biological diversity deals with the degree of nature's variety in the biosphere. This variety can be observed at three levels; the genetic variability within a species, the variety of species within a community, and the organisation of species in an area into distinctive plant and animal communities.

2.3 Threats:

Casual factors of threat may be natural or man made. They are–

1. Extinction–Extinction is a natural event and, from biological perspective, routine. We now know that most species that have ever lived have gone extinct. The average rate over the past 200 m yrs is 1-2 species per year and 3-4 families per m.yrs. The average duration of a species is 2-10 m. yrs. (based on last 200 m.yrs). There have also been occasional episodes of mass extinction. When many groups representing a wide array of life forms have gone extinct in the same blink of geological time. In the modern era, due to human actions, species and ecosystems are threatened with destruction to an extent rarely seen in earth history, probably only during the handful of mass extinction events have so many species been threathed, in so short a time. In 2006 many species were formally classified as rare or endangered or threatened. Moreover, scientists have estimated that millions more species are at risk which have not been formally recognized. About 40% of the 40,177 species assessed using the IUCN red list criteria are now listed as threatened with extinction–a total of 16,119. The most authoritative classification in use today is IUCN's classification of direct threats which has been adopted by major international conservation organisations such as the US nature conservancy, the world wild life fund. Conservation International and bird life international.

2. Over-hunting–Over hunting has been a significant cause of the extinction of hundreds of species and the endangerment of many more, such as whales and many Africal large mamals. Most extinction over past several hundred years is mainly due to over-harvestig for food, fashion and profit.

3. Habitat–loss (or degradation / fragmentation)–It is an important cause of known extinctions. As deforestation proceeds in tropical forests, this promises to become the cause of mass extinctions caused by human activity. Factors contributing to habitat loss are : over consumption, over population, land use change, deforestation, pollution and global warming or climate change. Habitat damage, especially the conversion of forested land to agriculture (and, often, subsequent abandonment as marginal land), has a long hisotry. It began in china about 4000 years ago, was largely completed in Europe by about 100 years ago and swept across USA over the past 200 years or so. Viewed in this historical context, we are now mopping up the last forests of pacific North-West. In the new world tropics, low land, seasonal, diciduous forest began to disappear after 1500 with spanish and protuguese colonization of the new world. Direct observations, reinforced by satellite data, documents that these forests are declining. The original exten of tropical rain forests was 15 million km². Now there remains about 7.5-8 million km², so half is gone. The current rate of loss is estimated at near 2% annually.

While there is uncertainty regarding the rate of loss, and what it will be in future, the likelihood is that tropical forest will be reduced to 10-25% of their original extent by late 21st Century.

4. Invasion of non-native species—It is an important and often-over looked cause of extinctions. The Afirca great lakes Victoria, Malawi and Tanganyika are famous for their great diversity of endemic species termed ‘species flocks’ of cichlid fishes. In lake Victoria, a single exotic species, the Nile perch, became established and caused the extinction of most of the native species, by simply eating them all. It was a purposeful introduction for subsistence and sports fishing and a great disaster. The exotic organism may be predatory, parasites or may simply outcompete indigenous species for nutrients, water and light. At present, several countries have already imported so may exotic species, particularly agricultural and ornamental plants, that their own indigenous fauna or Flora may be outnumbered.

5. Genetic pollution—Endemic species can be threatened with extinction through the process of genetic pollution, i.e. uncontrolled hybridization, introgression and genetic swamping. Genetic pollution leads to homogenization or replacement of local genomes as a result of either a numerical and fitness advantage of an introduced species. Hybridization and introgression are side-effects of introduction and invasion. These phenomena can be especially detrimental to rare species that come into contact with more abundant ones. The abundant species can interbreed with the rare species, swamping its gene pool. This problem is not always apparent from morphological observations alone. Some degree of gene flow is normal adaptation and not all gene and genotype constellations can be preserved. However, hybridization with or without introgression may, nevertheless threaten a rare species existence.

6. Climate change—A changing global climate threatens species and ecosystems, Global warming is also considered to be a major potential threat to global biodiversity in the future. For example coral reefs which are biodiversity hotspots-will be lost in 20 to 40 years if global warming continues at the current trend. Climate change has many claims about potential to affect biodiversity but evidence supporting the statement is tenuous. Increasing atmospheric carbon dioxide certainly affects plants morphology and is acidifying oceans and modifying temperature that affects species ranges, Phenology and weather. We have not documented major extinctions yet, even as climate change drastically alters the biology of many species. In 2004, an international collaborative study on four continents estimated that 10% of speices would become extinct by 2050 because of global warming.

2.4 Conservation of Biodiversity:

The very existence of human being is threatened due to continuous loss of biodiversity. Tropical rain forests have been the focal point of the debates on biodiversity conservation. In fact, the rain forest covers only 7% of the earth’s geographical area but supoorts more than half of the world’s identified species. Of these, 15 rain forests have been identified as hotspots. Tropical deforestation will be the single greatest cause of species extinction in the next century.

Strategies of Conservation—

Future strategy for conservation has 4 goals—

1. Maintenance of adequate resources.
2. Conservation of resources through reduction in demand and achievement of greater end use
3. Maximum use of renewable resources.
4. Reduction in depency of non-renewable resources.

In situ Strategy–This strategy emphasizes on the conservation work at original site of biodiversity i.e., in wild. conservation of overall diversity of genes, populations, species, communities, and the ecological processes comes under this strategy. There are 37,000 protected area in the world (World Conservation Monitoring Centre–WCMC). India has 17 biosphere reserves, and 19 Ramsar heetlands. Amongst the protected areas, India has 102 national parks and 490 sanctuaries covering an area of 1.53 lakh sq. km.

Ex-Situ strategy–This strategy says that conservation work should be done outside the natural habitat in form of botanical and zoological gardens, conservation stand, seed and seedling banks, pollen banks, germ plasm banks, tissues culture banks, gene and DNA banks etc. In India, conservation of genetic diversity of cultivated plants and their wild relatives is done by NBPGR (National Bureau of Plant Genetic Resources).

Reduction of Anthropogenic Pressure–Increasing populations and its demand pose remarkable threat to human being. About 70% of identified medicinal plants of Indian Himalaya are exposed to destructive harvesting. Cultivation of such plants else where would contribute to their conservation.

Restoration of endangered Species–It is tough and difficult strategy. It requires specific knowledge about species and its surroundings. This strategy includes diagonosis of factors responsible for the decline of species, habitat conservation, captive breeding and restriction of harvesting etc. the strategy include :

- 1 Reintroduction programmes in the original site of living.
- 1 Augmentation programmes to increase the existing population size and genetic diversity of a speices.
- 1 Introduction programmes for a new year.

Biosphere Reserves–Biosphere reserve programme was launched by UNESCO in 1971 under its MAB (Man and biosphere programme). Biosphere are sites where protection is granted not only to the flora and fauna of the protected region, but also to the human communities who inhabit these regions, and their ways of life. Biosphere reserves are sites established by countries and recognized under UNESO’s. Man and the Biosphere (MAB) program to promote sustainable development based on local community efforts and sound science, currently there are 580 sites across 114 counties. The Indian government has established 17 Biosphere reserve of India. Seven of the seventeen biosphere reserves are a part of the world network of biosphere reserves, based on the UNESCO man and the Biophere (MAB) Program list.

Biosphere reserves of India :

Sl. No.	Name of Biosphere Reserve	Location
1.	Great Rann of Kutch	Gujarat
2.	Nokrek	Meghalays
3.	Manas	Assam
4.	Gulf of Munnar	Tamilnadu
5.	Sundarban	W. Bengal
6.	Nandadevi	Uttrakhand
7.	Nilgiri	Tamilnadu, Kerala, Karnatka
8.	Dehang Debarg	Assam
9.	Panchmani	Madhya Pradesh
10.	Amarkantak	Madhy Pradesh and Chhatisgarh

2.5 Summary:

The term 'biological diversity' commonly shortened to 'biodeversity', is used to describe the number, variety and variability of living organism. Thus, it may be described in term of genes, species and ecosytems, corresponding to three fundamental levels of biological organisation. Genetic diversity is the total genetic information contained in the genes of individuals of plants, animals and micro-organizms. Each species is the repository of an immense amount of genetic information. Species diversity implies the variability of population with respect to the reproductive distinctiveness of each of the individuals. It is a texanomic unit of the biological world. Lastly, the ecosystem diversity relates to the variety of habitats, biotic communities and ecological processes in the biosphere as well as the diversity within ecosystems.

2.6 Questions for Exercise :

1. What is Biodiversity ?
2. Explain the important threats of biodiversity.
3. Describe the Biodiversity and its conservation.

2.7 Suggested Readings:

1. Bryant Peter, J. : Biodiversity and Conservation
2. Santra, S.C. : Envrionmental Science
3. Saxena, H.M. : Environmental Geography

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