TOPIC: BIODIVERSITY AND CONSERVATION OF WILDLIFE

LECTURE NO:04
B.SC PART 1
ZOOLOGY(HONS.)-PAPER I-GROUP B
CHAPTER 3
DATE:27TH MARCH 2020
AUTHOR-DR.NIRMAL KUMARI

OBJECTIVES

Develop the understanding of current global issue such as global warming, pollution, environmental deterioration, loss of biodiversity and climate change and study of the various aspect of conservation biology through the study of protected are network.

INTRODUCTION

In the present time biodiversity of the organism is the main issue regarding their utility as well as conservation. Diversity of animals, plants and microbial life has been evolving billions of years. As more and more forms of life evolve, replacing some and helping the development of others, the networking of life becomes more encompassing and complicated. The evolving nature of natural organism was the resultant of their diversification. In the same way biodiversity spans the whole spectrum of life from microorganism to plants and animals. In present time there are

many causes which are directly or indirectly responsible for the loss of biological

organism in order to their flora and fauna. Exact number of exiting species on earth is still unknown. The estimated global species diversity contains approximately 13-14 million species. In which 1.75 species are described so far and many more still being discovered. Today's need to focus on this aspect of life science. And in the same way a lot of conservational programmers and resource management is necessary for the benefit of flora.

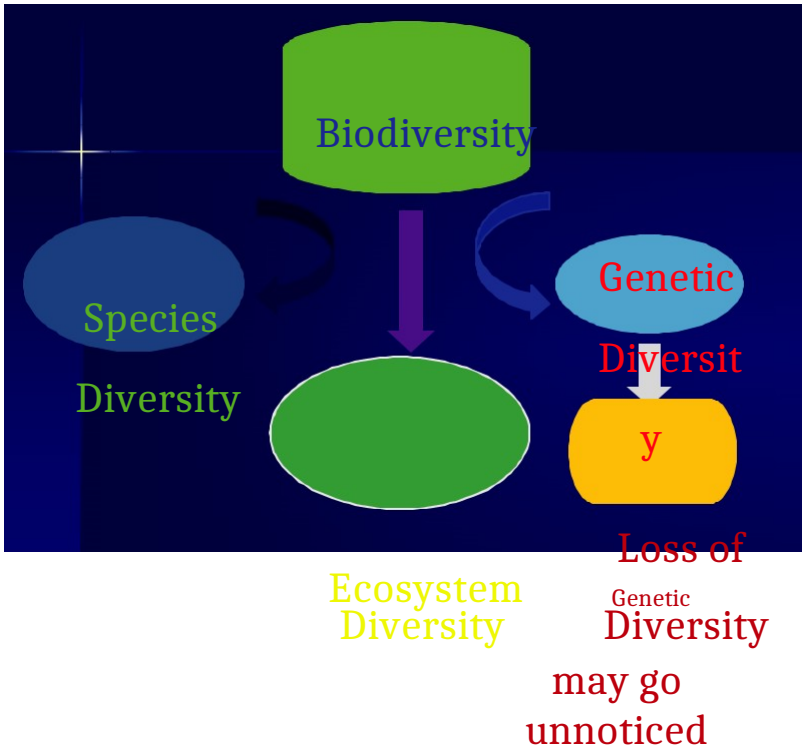

Fig 6.1. Combination of biodiversity

BASIC CONCEPT OF BIODIVERSITY

DEFINITION OF BIODIVERSITY

Variability of biological organism is called biodiversity. Bio-diversity is interrelatedness of genes, species, and ecosystems and in turn, their interactions with the environment. In present time biodiversity of the organism is the main issue regarding their utility as well as conservation. Diversity of animals, plants and microbial life has been evolving billions of years. As more and more forms of life evolve, replacing some and helping the development of others, the networking of life becomes more encompassing and complicated. The evolving nature of natural organism was the resultant of their diversification. In the same way biodiversity spans the whole spectrum of life from microorganism to plants and animals. In fishes morphological variations are the resultant of either environment or genetic or the combination of both. Biological diversity is the fundamental interest of biology in which intraspecific diversity is considered as a component of biological diversity. Biodiversity can be measured in term of species, genes ecosystem. Species diversity can be classified into

two type's i.e. interspecific and intraspecific diversity. According to the article 2 of conventions of biodiversity,

Biological diversity" 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."Biological resources' includes genetic resources, organisms or parts of their populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.

TYPES OF BIODIVERSITY (GENETIC, SPECIES & ECOSYSTEM BIODIVERSITY)

Biodiversity can exemplify in term of species, level of genes and at broad level ecosystems.

1) Species diversity is the combination of the different species, as well as the differences within and between different species.

2) Genetic diversity is all the different genes contained in all the living species, including individual plants, animals, fungi, and microorganisms

3) Ecosystem diversity is all the different habitats, biological communities and ecological processes, as well as variation within individual ecosystems.

Genetic Diversity

Simply Genes are the segments of DNA, but their complexity is increases from prokaryotes to eukaryotes. In prokaryotes a set of genes are regulated by single promoters and operator's on the other hand eukaryotic gene is regulated by each promoter and operator. Genes regulated the overall process of organism including morphological traits, physiological traits in combination with the environmental plasticity. Genetic polymorphism has important implications for the conservation and evolution of species. Genetic diversity is blue print of the species in order to their single nucleotide (SNPs) variation. The number of genes is variable in the organism which exhibit by the genome of the organisms. Genetic diversity retains a variety of genetic information of all the individual plants, animals and microorganisms.

Fig 6.2 Total No. of genetic characteristic of a specific species within a population

Simply it is the variation of genes in their promoter region as well as in the coding sequence, with in species and populations. Species evolution is driven by a number of different factors, including migration and settlement in different environments, genetic mutation, natural selection, and genetic drift. The product of these different forces is genetic diversity within a population. The genetic variability in the organism is driven by the many factors as fig2. These factors are crossing over which is the primary source of variation for evolution while the mutation is the ultimate source of evolution. The other factors such as independent segregation of alleles (alleles are the alternative forms of genes), random fertilization. These factors lead to the sexual recombination as resultant genetic

Genetic Variation can be measured by Several Methods

Genetic variation can be measured by the different markers such as single nucleotide polymorphism(SNPs) are the preferred markers for measuring genetic variation, other markers also have been used for the quantification of genetic

variation. Including microsatellites. These are variable number tandem repeat (VNTR) sequences in the genome. VNTRs can be “short” (involving two to five nucleotide repeats) or “long”

(involving more substantial repeat sequences). VNTRs are still used in studies today and are especially useful where the candidate gene is known or a specific region is being scanned. Earlier studies used restriction enzymes to identify different VNTRs and SNPs. To determine VNTR genotypes, one or more restriction enzymes that cut the DNA sequence above and below the region encoding the VNTR sequences can be used and DNA fragments of different sizes can be obtained. After digestion with the appropriate enzyme(s), the DNA sample can be run by electrophoresis on either an agarose gel or a polyacrylamide gel to reveal the size(s) of the fragments and thus the number of sequence repeats in each individual sample. Genotypes can be assigned based on the pattern obtained on the gel. This method is known as restriction fragment length polymorphism (RFLP) analysis. RFLP analysis was also used to detect SNPs where the differences in the DNA sequence can be detected by use of restriction enzymes that cut the DNA at a particular sequence encoded by

one allele, but not the other. Multiple enzymes were often used when genotyping SNPs in order to obtain readable accurate results. Different enzymes are used to detect different polymorphisms. Later studies substituted RFLP genotyping for more reliable polymerase chain reaction (PCR) genotyping using primers specific for the

gene sequence of interest. This method uses a polymerase enzyme purified from the hot-springs “thermophilic” bacteria Thermus aquaticus to amplify multiple copies of the gene sequence. These amplified sequences are then run out on a gel using the same process as that used with RFLP fragments and genotypes can be assigned from the specific banding patterns obtained for each sample.

Species Diversity

Diversification of species is known as species diversity. Species diversity can be measured as either within the species or between the species. Species diversity and genetic diversity are influenced by a complex set of processes across a range of spatial and temporal scales (Huston 1994; Rosenzweig 1995; Hedrick 2000; Frankham et al. 2002) Species diversity can be

classified into two types: i.e. Intraspecific and Interspecific diversity. Species diversity

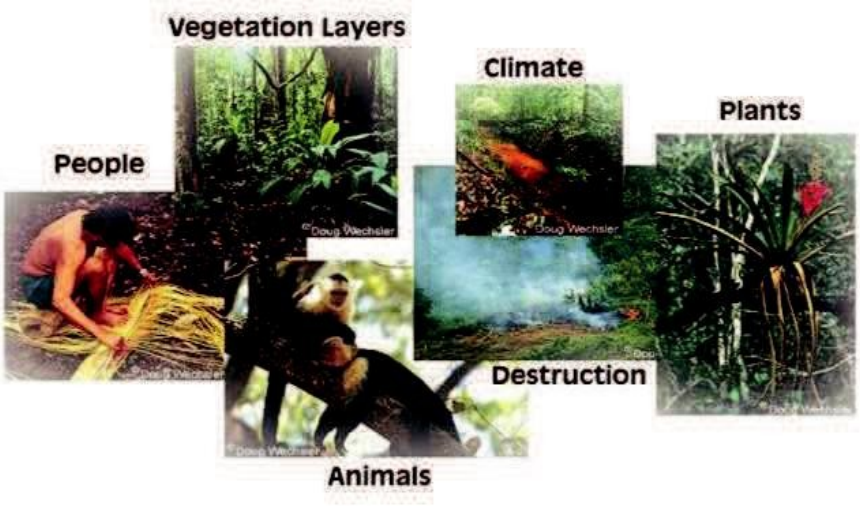

Fig 6.3 Species diversity

also described by the following ways, Species Richness – Species richness may defined as the total numbers of species defined in area. Various indices are used including the Mangalet and Menhink index. This refers to the total count/number of species in a defined area. Various indices are used including the Mangalet index and Menhink index.

Species Abundance:-

Species abundance may be defined as the relative numbers among species. If all the species have the same equal abundance, this means that the variation is high hence high diversity, Taxonomic or phylogenetic diversity - This considers the genetic relationships between the different groups of species. The measures are based on analysis, resulting into a hierarchical classification representing the phylogenetic evolution of the taxa concerned.

Ecosystem Diversity

Ecosystem is the unit of environment. Diversity of organism in relation to ecosystem is considered as ecosystem diversity. This relates to the variety of habitats, biotic communities and ecological processes in the biosphere. The variety of ecosystem found on Earth-the forest, desert, lakes, costal coral and other ecosystem. “Ecosystem“i. e. a dynamic complex of plant, animal and micro-organismal communities and their non-living environment interacting as a functional unit. **(Article 2 of the Convention on Biological Diversity).**The Ecosystem Approach is the primary framework for action under the Convention on Biological Diversity and is defined as a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. It is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment. It recognises that humans, with their cultural diversity, are an integral component of ecosystems. This approach will be implemented over time in management practices in relation

to key ecosystems. India has very diverse terrestrial and aquatic ecosystems ranging from ice-capped

Himalayas to deserts, from arid scrub to grassland to wetlands and tropical rainforests, from coral reefs to the deep sea. Each of these comprises a great variety of habitats and interactions between and within biotic and abiotic components. The most diversity-rich are western-ghats and the north-eastern region. A very large number of species found in these ecosystems are **endemic** or found in these areas only in India i.e. they are found nowhere else except in India. The endemics are concentrated mainly in north-east, western-ghats, north-west Himalaya, and Andaman and Nicobar Islands. About 33% of the flowering plants recorded in India are endemic to our country. Indian region is also notable for endemic fauna. For example, out of recorded vertebrates, 53% freshwater fish, 60% amphibians, 36% reptiles and 10% mammalian fauna are endemic.

IMPORTANCE OF BIODIVERSITY

Biodiversity has a great importance because it includes a variety of plant, animal life and microorganisms, and the variety of these types of Earth's ecosystems supports life. It supports the survival strategy of human either directly or indirectly. Biodiversity is the very stuff that supports the

evolution and differentiation among the varying species. Resource management is an important aspect for proper

utilization of resources and energy transfer across the ecosystem. Biodiversity contained ecosystems of forest, grassland, desert marine lake, river, and pond even our aquarium also which retains and supports many organism in term of shelter and food .Nature and its natural things has a great importance. Biodiversity has a direct value in food, agriculture, medicine and in industry also. Biodiversity maintains an ecological balance and continues as evolutionary process.

HOT SPOTS OF BIODIVERSITY

The constant diversity of organism is not throughout across the green planet.Certain regions of the earth are very rich in biodiversity; such biodiversity rich regions are called “mega diversity zones According to him, the hot spots are the richest and the most threatened reservoirs of biodiversity on the earth. The criteria for determining a hot spot are:

A. The area should support >1500 endemic species
B. It must have lost over 70 % of the original habitat

There are thirty four identified hot spots of the world in which four are found in India. These four are Eastern Himalaya, Indo-Burma, Western Ghats and Sri Lanka, and Sundaland. The endemic species are those species which are confined in a specific geographic area or a particular area The hotpots of the worlds are shown in the figure no 6.3.

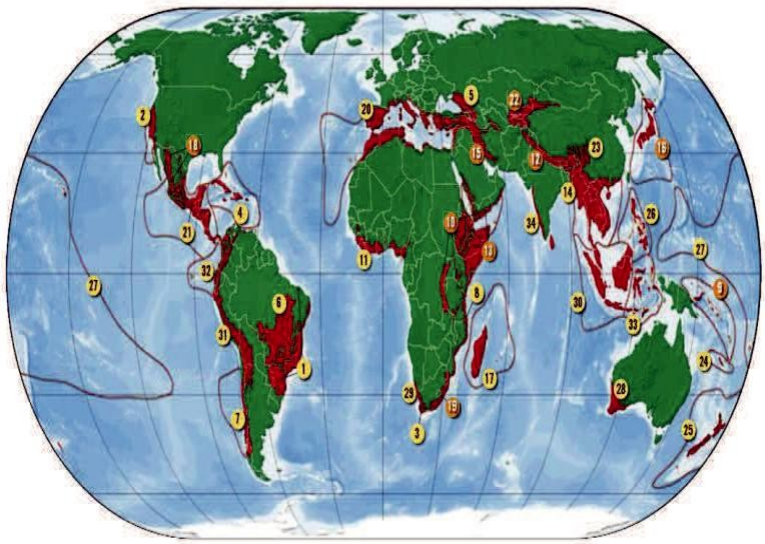

Fig.6.3 Hot –spot area

(1) Atlantic Forest
(2) California Floristic Province
(3) Cape Floristic Region
(4) Carribbean Islands
(5) Caucasus
(6) Cerrado
(7) Chilean Winter Rainfall
(8) Valdivian Forest
(9) Coastal Forest of Eastern Africa
(10) East Melanesian Islands

(11) Eastern Afromontane
(12) Guinean Forests of West Africa
(13) Eastern Himalaya
(14) Horn of Africa
(15) Indo Burma
(16) Irano Anatolian
(17) Japan
(18) Madagascar and Indian Ocean Islands
(19) Maderan Pine-oak woodlands
(20) Maputaland-Pondoland Albany
(21) Mediterranean Basin
(22) Mesoamerica
(23) Mountains of central Asia
(24) Mountains of southwest China
(25) Wallace
(26) New celedonia
(27) New Zealand Polynesisa
(28) Philippines
(29) Micronesia
(30) Southwest Australia
(31) Succulent caro
(32) Sunderland
(33) Tropical Andes
(34) Southwest Australia

Thirty four biodiversity hot spots have been identified in the world. These hot spots are characterized by posing exceptionally high biodiversity. For example the total area of these 25 hot spots cover 1.4% of the total land area, support 44% of plant and 35% terrestrial vertebrates. (Refer to the Fig. 15.3) Among the 25 hot spots of the world, 2 are found in India namely Western Ghats and the eastern Himalayas. These two areas of the country are

exceptionally rich in flowering plants, reptiles, amphibians, butterflies and some species of mammals. The eastern Himalayan hot spot extends to the north – eastern India and Bhutan. The temperate forests are found at an altitude of 1780 to 3500 m. Many deep and semi isolated valleys are exceptionally rich in endemic plant species. The Western Ghat region lies parallel to the western coast of Indian peninsula for almost 1600 km, in Maharashtra, Karnataka, Tamil Nadu and Kerala. These forests at low elevation (500 m above mean sea level) are mostly evergreen, while those at 500- 1500 m height are generally semi-evergreen forests.

1. Tropical Andes, 2. Mesoamerica, 3. Caribbean, 4. Brazil's Atlantic Forests, 5. Choco/Darien/Western Ecuad
6. Brazil's Cerrado, 7. Central Chile, 8. California Floristic Province, 9. Madagascar, 10. Eastern Arc & Coastal Fore
of Tanzania/Kenya, 11. West African Forests, 12. Cape Floristic Province, 13. Succulent Karoo, 14. Mediterrane
Basin, 15. Caucasus, 16. Sundland, 17. Wallacea, 18. Philippines, 19. Indo-Burma, 20. South-Central Chir
21. Western Ghats/Sri Lanka, 22. Southwest Australia, 23. New Caledonia, 24. New Zealand, 25. Polynesia/Micrones