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Review Article

Genetic Diversity as Buffer in Biodiversity

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Abstract

Almost every ecosystem maintains its own environmental insurance system. In order to maintain this system, an ecosystem needs three kinds of diversity: biological, genetic and functional. Biological diversity refers to the richness of species in a particular area; genetic diversity refers a way for a particular species to adapt itself to changing environments while functional diversity equates to the biophysical processes that happen within the area. One of the most important impacts of genetic diversity is that it acts as a buffer against the variability of environmental conditions particularly in the medium and long terms.

Keywords: Biological Diversity; Genetic Diversity; Ecosystem; Conservation; Values; Society.

Introduction

Biodiversity or biological diversity refers to the variety of life on Earth, including plants, animals, micro-organisms and the genes they contain. It simply means the existence of a wide variety of plant and animal species in their natural environments or the diversity of plant and animal life in a particular habitat.

Biodiversity is viewed as a measure of the relative diversity among organisms present in different ecosystems. In this definition, diversity includes variation within species and among species, and comparative diversity among ecosystems. Biodiversity may also be defined as the 'totality of genes, species, and ecosystems of a region'.

The Convention on Biological Diversity (Glowka *et al*, 1994) defines biodiversity as the variability among living organisms from all sources including, among other things, 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.

A review of literature revealed that huge efforts have been taken and a number of scientists have worked a lot on biodiversity. Some of them are Kaushik *et al*, (2008), Odum (1971), Wilson (1988), Nair (1992), Bhatt (1997), Subba Rao (2001), Verma *et al*, (2015, 2016a, 2016b), Prakash *et al*, (2015, 2016a, 2016b), Verma (2016a, 2016b, 2016c, 2016d. 2017) etc.

The biodiversity is usually described at three levels and it has a large number of uses and values as well. In present discussion, author is trying to discuss genetic diversity as buffer and shock absorber of biodiversity in modern context.

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Three Basic Types of Biodiversity

The biodiversity is explored and described at three levels *namely*: ecosystem diversity, species diversity and genetic diversity. The ecosystem diversity is the diversity of habitats (place where an organism or a population of organisms naturally occurs), which include the different life forms within. Diversity at the level of community and ecosystem exists along 3 levels. First is alpha diversity (within community diversity), second is beta diversity (between

communities diversity) and the third is gamma diversity (diversity of the habitats over the total landscape or geographical area).

The species diversity refers to the variety of species within a region. It is the variability found within the population of a species or between different species of a community. The species is the real basic unit used to classify the organisms and its diversity is the most commonly used level for describing the biodiversity. It represents broadly the species richness and their abundance in a community. Species are therefore distinct units of diversity, each playing a specific role in the ecosystem. In nature, the number and kind of species, as well as the number of individuals per species vary, leading to greater diversity. The species are grouped together into families according to shared characteristics.

The genetic diversity is the diversity of the basic units of hereditary information (genes) within a species, which are passed from one generation to next. The genetic diversity results in variations hence the basic source of biodiversity and the amount of genetic variation is therefore the basis of speciation. The genetic diversity enables a population to adapt according to its environment hence important for natural selection. Genetic diversity within a species often increases with environmental variability but not all groups of animals have the same degree of genetic diversity. To conserve genetic diversity, different populations of a species must be conserved.

Existence Values of Biodiversity

Richard (2015) told that genetic diversity plays an important role in the survival and adaptability of a species. Its different values and uses include: consumptive use, productive use, social value, aesthetic value, scientific and evolutionary values etc. Moreover, biodiversity has ethical or existence value, which is based on the concept of '*Live and Let Live*'. It means biodiversity is valuable because if we want our human race to survive and continue then we must protect all biodiversity i.e. 'all life must be preserved'. If we want our human race to survive then we must protect all biodiversity because biodiversity has existence value from natural and ecological point of views.

According to Chris Maser (2009), almost every ecosystem maintains its own environmental insurance system, for which it needs three kinds of diversity: biological, genetic and functional. Biological diversity refers to the richness of species in a particular area; genetic diversity refers a way for a particular species to adapt itself to changing environments while functional diversity equates to the biophysical processes that happen within the area. One of the most important impacts of genetic diversity is that it acts as a buffer against the variability of environmental conditions particularly in the medium and long terms.

The living world has rich diversity of animals, plants and microbial life that appear to be well adapted according to the environment. This varied diversity must have to be maintained in order to mutual survival and existence of living beings. If a population of a species has a very diverse gene pool then there will be more variety in the traits of individuals of that population and consequently more traits for natural selection to act upon to select the fittest individuals to survive.

The biodiversity is being depleted by the loss and deterioration of habitats, over exploitation of resources, unprecedented climatic changes, pollution, diseases, cultivation shifting, poaching of wild life etc. Since the human beings are deriving all the benefits from biodiversity hence they should take proper care for the preservation of biodiversity in all its forms and good health as well as safety for the future generation.

Conclusion

An ecosystem is a set of life forms (biotic components) interacting with one another and with the non-living elements (abiotic components) of their environment. The ecosystem is therefore a community of organisms and their physical environment interacting together. As we lose species from existence, whether local or total or glocal, we lose not only their diversity of structure and function but also their genetic diversity. The loss of genetic diversity sooner or later leads in transforming complex ecosystems to so simple that they will lack the productivity and resilience to sustain us as a society.

Thus, biological diversity passed forward through genetic diversity that effectively maintains the functional diversity. The genetic diversity acts as a buffer against the variability of environmental conditions particularly in the medium and long terms. An ecosystem may be stable and able to respond positively to the disturbances in its own environment, to which it is adapted. Net result is that healthy environments can act as shock absorber in all types of disturbances.

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