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Biodiversity of aquatic ecosystem: A review

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Abstract
Aquatic ecosystems are the main source of biodiversity. These are an essential reservoir and a source of many biological products. Both aquatic ecosystems and the biodiversity are interrelated to each other and they perform major functions and are valuable and essential for the sustainability of biotic communities. Aquatic biodiversity in both freshwater and marine water are under continuous decline because of over exploitation of species, pollution sources from cities, industries and agricultural zones, loss and changes in ecological niche. Their conservation and management is essential for the protection of the aquatic biodiversity. This review is presenting information on biodiversity in aquatic habitats and their resource in marine and freshwater ecosystems and restoration mechanism.

Keywords: Aquatic ecosystem, biodiversity, restoration

Introductions
"Biodiversity is the existence of a number of different kinds of animals and plants which together make a good and healthy environment." Biodiversity can be termed as the variations among living biota performing their ecological functions in the terrestrial, marine and fresh water ecosystems and the other ecological complexities where they are living. Aquatic biodiversity is broad term that comprises fresh water ecosystem with lakes, ponds, reservoirs, rivers, streams, ground water and wetlands. The another way of aquatic biodiversity has marine ecosystem which includes ocean, estuaries, coral reefs, mangroves and algal colonies etc. Different kinds of phytoplanktons, zooplanktons, aquatic plants, insects, fishes, birds and mammals are also important part of an aquatic biodiversity.

Sea and ocean water contributes about 90% of the marine ecosystem and shares about 10% of the total marine animals population whereas fresh water resources occur in significant proportions comparison to other water systems on the earth and their distribution and uses are also not balanced.

Human life has been closely associated to the water bodies with various functions. Water reservoirs and aquatic biodiversity have interrelated and both have ecologically interdependent on each other. Evaporation of surface water from the ocean has major role in continuation of water circulation from atmosphere to lithosphere. Ocean has a great capacity to transport heat from the earth, with atmosphere, providing optimum temp for occurrence and growth of organism.

Ocean are significantly involved in the global weather conditions and climatic transitions. Recently, there is a great emphasis on the function between the ocean and the climate change. The ocean ecosystem not only stores a great amount of water but also absorb plenty of carbon in the form of 'carbon sink'. Marine phytoplankton are capable of processing annual net primary production of around 50 billion tons of carbon, this amount is approximately equal to the primary production of terrestrial plants. Primary production turn overs are fast moving and the transportation of matters is highly active.

Primary producers of the ocean are occupying the photic zones down to about 200 m from the water surface and sea bottoms areas adjacent to the shallow coastal water. In the deep sea zone, there is an existence of entire different life. It is a true fact that the oceans and seas are support system of an extended no of biodiversity species, which are very important for the ecological diversity. There are total 222,000-230,000 marine species listed and almost 200,000 belong to Animalia.

Sensitivity of the biodiversity in fresh water resources is more than any other terrestrial ecosystem. The vulnerability of the fresh water habitat is because disproportionate numbers of the plants and animals communities are growing in the water bodies. As estimated by Lundberg *et al*. fresh water bodies are enriched with more than 10,000 fish species which comprises approximately 40% of global fish communities and 1/4th of diverse vertebrate population at global scale.

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Combing countless no. of amphibians, reptiles and mammals population to the total quantity of fresh-water fish clearly depicts the fresh water habitat as the only favorite biological spot of all vertebrates comprehensive information about the total species diversity in the fresh water resources is incomplete especially among invertebrates and microbes and in the tropical zone of the world that serves as a dwelling spot of different species of the world. From amphibians phylum total of 5778 species has been identified since last 10 years. Recent research estimation has revealed fish wealth of about 1700 species. It has been noticed that fresh water biological regions are given less interests than terrestrial zones. Documentation about invertebrate animals diversity in tropical fresh waters is not available. Information on microbial biodiversity in the fresh water bodies is also not well recorded, not indicating the vital function of microorganisms in biogeochemical cycles operation on the earth. Most of the prokaryotic taxonomic groups are still not discovered.

Aquatic biodiversity increases with latitudes with maximum in the tropical zones. Not only marine systems but many fresh water ecosystems are also a favourable biological spot of unique species, because fresh water habitats are isolated environment on the natural landscape, facing obstacles of distance and weather conditions which is a difficult task to tolerate. Such kind of ecological phenomenon favours the evolution of new species in different fresh water resources.

Large aquatic bodies in the tropics have more species diversity than those in temperate regions. In this review information on biodiversity in aquatic habitats and their resources in marine and fresh water ecosystems, their importance and restoration mechanisms was discussed in brief.

Threats to Aquatic Biodiversity

The threats to global aquatic biodiversity are very clearly known and the reasons can also be perceived, yet the extent of these damages varies from regions to region. Identifying these threats can have little effect on the conservation. So it is advisable to mitigate the threats that can be a practical approach towards restoration.

Colonization of new species in the aquatic system through human activities whether knowingly or unknowingly is becoming global environmental issue. Newly arrived species in the ecosystems creates many problems for the native species, as they start breeding and population growth in more area other than their particular spot. These introduced species produce negative impact on native organism of the water resources, such as preying of animals, competition and niche alteration; inter specific breeding, disease and parasitic infection development. This introduction can be economically profitable initially but later it can produce disadvantages on economical and ecological terms due to their fast growth. Thus invasive species are a severe threat to biodiversity of the ecosystem.

1) Over exploitation of Species

Over exploitation of particular species to full fill the demand of human need can result in the loss of genetic diversity and that lowers the relative species abundance of individual or groups of interacting species. Fishing exploitation disrupts the genetic constitution of fish population because of loss of some alleles from the genome, reducing the genetic diversity.

2) Habitat modification

Structural modification in the habitat may also bring species extinction for example, dam construction, deforestation, diverting water course for agriculture supply etc. Building dams on rivers obstructs the migration of fishes from the source point and cause movement of populations from their natural spawning areas and divides the population into smaller groups. The deforestation leads to progressive degradation of catchment area due to soil erosion causing sedimentation and siltation. This process has negative impact not only on the breeding zone of aquatic organisms but also results in blockage of gills in small fishes.

3) Organic Pollutants drainage/suspended solids/sewage discharge

This includes toxic and poisonous compounds like metals, agrochemical substances, penolic and acidic discharge, promoting the mortality rate suppresses the reproductive function of the aquatic animals. Suspended solids create problems and suffocation in respiration physiology and production of mucus that makes the fishes prone to infections produced by aquatic pathogens. Sewage discharge results in eutrophic aquatic system, causing deoxygenation and increases death rate in aquatic organism and submerged aquatic flora.

4) Thermal Pollution

It produce changes in the surrounding water temperature and reduced the concentration of dissolved oxygen in the water consequently death of small and sensitive aquatic animals. Death rate acceleration in the aquatic organisms affects the aquatic biodiversity either by promoting extinction of species population.

Conclusion

Study reports have shown that habitats having extended biodiversity have changes to adapt in the new environment and regrow from various disasters either anthropogenic or natural. This can be considered as benefit in support of biodiversity since different species are performing the similar functions in a biologically diverse ecosystem, a disruption affecting one species may produce little impact on the entire ecosystem. Public awareness is essential, citizens has to teach that only healthy functional aquatic ecosystems can provide all the benefits of improved water quality, water production and biodiversity richness. Immediate action in the form of strategic plan, economic incentives, public awareness and state holder involvement should be taken for the management and restoration of water resources and aquatic ecosystems. The management of water resources and aquatic ecosystems need proper land management and sustainable implementation of land practices and holistic sense to identify the relevance between natural and manmade effects and developments with the increase in population and human activities there will be more utilization of water resources for the biodiversity. Hence, restoration of aquatic habitat and conservation of biodiversity it the need of this modern time to maintain the quality of life.

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