e-ISSN: 2320-4230, p-ISSN: 2961-6085

Journal of Drug Discovery and Therapeutics

Available Online at www.jddt.in

CODEN: - JDDTBP (Source: - American Chemical Society)

Volume 12, Issue 01; 2024, 40-52

ANALYZING INTERRELATIONSHIP BETWEEN AQUATIC ECOSYSTEM AND BIODIVERSITY

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Received: 02-10-2023 / Revised: 03-11-2023 / Accepted: 05-12-2023

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Conflict of interest: No conflict of interest.

Abstract:
Biological diversity on Earth is mostly sustained by aquatic habitats. Though they only hold 0.01% of the world's total water, freshwater environments are home to 10% of all known species. It's official, says the UN Environment Programme. Despite the obvious differences in marine biodiversity and the fact that the aquatic (freshwater and marine) environment comprises more than two thirds of the Earth's surface, the majority of data used in global and regional studies of biodiversity comes from the terrestrial environment. The Gangetic plains of the Indian subcontinent have been found to have the greatest rate of freshwater biodiversity loss. The initiative to preserve the region's natural resources has been taken up by the government for this same reason. From the highest peaks to the deepest hydrothermal vents, from the coldest arctic ice caps to the warmest tropical rain forests, every species on Earth has evolved to thrive in its own habitat. Biodiversity is not only the number of plant and animal species, but also the variation of their genes and the number of environments in which they exist. Ecosystems are made up of both living organisms and the inanimate substances (such as water, sunshine, and soils) upon which they need for survival.

Keywords: Aquatic, Biodiversity, Diversity, Fauna, Flora, Marine

INTRODUCTION

"Biodiversity is the variations among all organisms," according to the Convention on Biological Diversity. Biodiversity refers to the variety of organisms in an ecosystem, both within and between species, as well as the range of ecological functions performed by these organisms. This includes intraspecific diversity, interspecific diversity, and the diversity of biota within ecosystems. Lakes, ponds, reservoirs, rivers, streams, groundwater, and wetlands are all part of the freshwater environment known as "aquatic biodiversity." Marine habitats, which include the ocean, estuaries, salt marshes, coral reefs, mangroves, and algal colonies, make up the other half of aquatic biodiversity. Other organisms that play a significant role in aquatic biodiversity include phytoplanktons, zooplankton, aquatic plants, insects, fish, birds, and mammals.

Marine ecosystems are a source of great prosperity but also precariousness. About 10% of marine organisms live in the open ocean, yet it supports 90% of the marine environment. While freshwater resources are abundant relative to other water systems on Earth, they are neither distributed or used equitably [1]. Only around 0.8% of the Earth's surface is covered by water, and of that, only 0.01% is freshwater, according to a research by Gleick [2].

Due to the growing deterioration of inland water regions, West Bengal's freshwater finfish variety has been steadily declining in recent years. It is the vast beels, ponds, and bundhs found across the Paschim Medinipur districts that provide the majority of the fish consumed by the region's impoverished rural residents. The potential for fisheries, however, is only 33% owing to heavy siltation and weed growth in the remaining areas. There is a worldwide decline in the health of aquatic ecosystems and biodiversity (Dhawan and Kaur, 2002; Briones, Dey, et al., 2004), particularly in river ecosystems. The extinction rate of fish is far greater than that of other higher vertebrates in the global scenario (Georges and Cottingham, 2002), and freshwater finfishes are the second most vulnerable vertebrates after amphibians. Slow and insufficient conservation efforts are being taken to reduce the negative effects. Therefore, many important aquatic species are experiencing rapid declines. Habitat degradation and fragmentation, invasive species, water diversions, pollution, and the effects of global climate change are the primary causes of the decline in freshwater biodiversity.

While the ecosystem services that freshwater ecosystems give to people (such as potable water, flood control, temperature management, and food production) are important, they are not the major emphasis of this module. Similarly, this lesson does not concentrate on particular conservation dangers or methods. Instead, we want to teach students how to think critically about the ecology of freshwater ecosystems, including their structure, function, and distribution. We think such a structure is necessary for the advancement of research in the field of freshwater conservation biology.

Biodiversity refers to the wide range of species found in ecosystems and ecological communities, both on land and in water. There are both living organisms and inanimate objects in an ecosystem. Swamps, marshes, and wetlands are all part of the larger aquatic environment that also includes rivers, streams, lakes, seas, and bays. Diversity in aquatic environments varies from place to place just like it does in terrestrial ones. The tropics are home to the greatest variety of aquatic life. Approximately 11% of the world's 22,000 known fish species reside in Indian waters. The cold freshwater regime is home to 73 (3.32 percent) of the 2200 species known so far, the warm freshwater domain to 544 (24.73), the brackish water domain to 143 (6.5 percent), and the marine environment to 1440 (65.5 percent) (Venketraman and Raghunathan, 2015). Proper care is required to resist anthropogenic stressors, and adequate preservation of ecosystems is a vital necessity for the survival of all species. When it comes to economically valuable species, responsible harvesting is essential for long-term resource viability. Roughly 450 families of freshwater fishes may be found across the world. India is home to over 40 different warm freshwater species. There are economically significant species in around a quarter of these families. Almost a quarter of all marine species are found on coral reefs, making them an incredibly diverse ecosystem. The Great Barrier Reef is the biggest coral reef in the world, and it can be found just off the coast of Australia. It is home to 1,600 different types of fish and 4,000 different kinds of mollusks. Experts believe that there may be between 10 and 100 times as many unidentified species as there are known ones.

LITERATURE REVIEW

Bernhardt JR, O'Connor MI. (2021), Human survival, prosperity, and ecological equilibrium all rely on biodiversity. We are still learning about the wide-ranging effects of the rapid decline of biodiversity on human health and prosperity. Based on the notion of biodiversity and ecosystem functioning, we hypothesize that a variety of species and ecological functions make seafood diets capable of meeting a wide range of human nutritional needs. We showed that species with various ecological features had unique and complementary micronutrient profiles, but no change in protein content, by analyzing a freshly synthesized dataset of 7,245 observations of nutrient and contaminant concentrations in 801 aquatic animal taxa. More diversified diets, regardless of overall biomass ingested, provide greater nutritional advantages due to the same complementarity principles that provide favorable biodiversity impacts on ecosystem functioning in terrestrial ecosystems. Most commonly reported ecological measures of function, including productivity, are based on grasslands and forests, whereas nutritional metrics that capture various micronutrients and fatty acids vital to human well-being rely more heavily on biodiversity. We also discovered that the quantities of harmful metal pollutants in the diet rose along with the quantity of protein in seafood meals as species richness increased. The essential micronutrients and fatty acids found in seafood are a cornerstone of food and nutrition security on a global scale. Using the idea of biodiversity and ecosystem functioning, we show how ecological notions of biodiversity may help us get a more nuanced grasp of nature's gifts to humanity and how biodiversity and human welfare should be pursued as dual sustainability objectives.

It was published in 2018 by Schmidt-Kloiber and De Wever. Freshwater species are commonly investigated as a component of ecological monitoring programs since they are generally excellent indicators of the health/status of these ecosystems. When combined with information from other ecological research in freshwaters, the biodiversity data obtained during such monitoring procedures may serve as a significant resource for the conservation and management of aquatic ecosystems. The appeal for open access to data, which allows the reuse of data to solve large-scale and/or transdisciplinary research challenges, is gaining traction as a result of pressure from funding organizations like the EU. In this chapter, we look at several types of biodiversity data and explore the significance of properly documenting and characterizing them so that they may be more easily understood and found. To help data proprietors publish their data and identify relevant data for their study, we give an overview of current freshwater (biodiversity) information systems.

C. S. Zhao, T. L. Pan, S. T. Yang, Y. Sun, Y. Zhang, Y. R. Ge, B. E. Dong, Z. S. Zhang and H. M. Zhang (2018), Global attention is still focused on predicting and assessing the consequences of habitat change on aquatic biodiversity. This research created a workable framework for assessing the impacts of habitat alterations on aquatic biodiversity using ecosystem models. Important hydrological and water quality parameters that affect riverine aquatic creatures were analyzed using the partial least-squares (PLS) approach. Under natural circumstances, Ecosim was used to mimic the biomass of aquatic creatures. A multidimensional river hydrology-water quality-biodiversity response model was developed by using the correlation between habitat component variation and biodiversity variation. The methods were used and tested in China's first water ecology pilot city, Jinan City, where it was shown that total phosphorus, total nitrogen, ammonia nitrogen, and dissolved oxygen were all major determinants of aquatic biodiversity. Water depth was shown to have a significant influence on fish diversity, whereas flow velocity had a significant impact on both fish and algae diversity as a hydrological component. Response models were shown to be applicable in modeling the impacts of habitat variation on biodiversity, as demonstrated by the application. This model is intended to serve as a scientific foundation for river management choices by assessing the impacts of climatic and human-induced stress on aquatic ecosystems.

According to the research of Vardakas, Perdikaris, Zogaris, Kalantzi, and Koutsikos in 2022, Despite extensive research on the biological effects of IAS, the social implications of IAS in freshwater environments remain understudied. Researchers in a Mediterranean nation with high levels of fish species endemism designed a questionnaire survey to gauge locals' and visitors' opinions on invasive non-indigenous freshwater fish species (NIFS). There were a total of 203 participants; the vast majority (n = 144) were employed in some kind of environmental research. The majority of respondents saw NIFS as a serious danger to the country, which may be due to the emotional impact of the word "non-indigenous" (interpreted as "intruder"). When compared to other stressors, however, NIFS were ranked as the least significant hazard to aquatic ecosystems. This divergent view may be due to the greater effect that large-scale events (such climate change) have on people than NIFS. Interestingly, laypeople did better than experts at recognizing NIFS and native species, although both groups reported a low level of identification success overall. Both experts and laypeople agreed that early detection is the most effective strategy for NIFS management and that the official authorities do not take any action in this area. They also agreed that government spending should be increased to manage NIFS even if it should be reduced for other needs. For NIFS to be contained and its effects mitigated, it is imperative that a countrywide network comprised of all relevant parties working on NIFS concerns be established.

Irfan, S. and Alatawi, A.M.M. (2019), Biological diversity on Earth is mostly sustained by aquatic habitats. They store vital information and distribute a huge chunk of the planet's biological output. Aquatic biodiversity and aquatic resources are inextricably linked; the former serve as a foundation for the latter, while both are crucial to the long-term health of biotic communities. Overexploitation of species, introduction of alien plant or animal, pollution sources from cities, industry, and agricultural zones, loss and changes to ecological niche, and climate change are only some of the threats to aquatic biodiversity. The preservation of aquatic biodiversity requires their conservation and management in the form of bio reserve sites, bioregional management, and global monitoring. This overview discusses the significance of marine and fresh water ecosystems, the resources they provide, the need of conserving them, and the methods that have been developed to restore them.

Role of Biodiversity in the Ecosystem

Figure 1 represents the vast functions and services provided by the ecosystem biodiversity, which is continuously supporting the mankind and its existence.

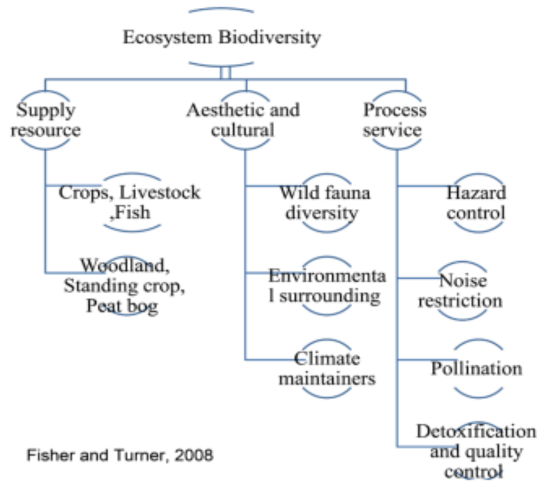

Figure 1: Showing various uses of ecosystem biodiversity.

Threats to Aquatic Biodiversity

The United Nations General Assembly adopted a resolution in December 2003 designating 2005–2015 as the International Year of Aquatic Life in an effort to curb the risks to aquatic biodiversity and ensure its preservation and protection. Countries banded together to achieve the water-related goals set forth in the Millennium Declaration of 2000 after the resolution called for a significant focus on global water challenges and development efforts. Agenda 21 was adopted out of serious concern for ensuring that all people, wherever, have access to clean water and sanitary facilities, since they are recognized as human rights [21]. While the biodiversity and biological resources of water resources were threatened by human activity, the United Nations enacted its "Water for Life" resolution. Although the threats to aquatic biodiversity across the world and the factors behind them are both well understood, the severity of the harm they cause differs greatly from one place to the next. There may not be much of an impact on conservation from identifying these concerns, therefore it's best to focus on lessening the impact they make as a more tangible step toward restoration.

Long recognized as a place of exceptional marine biodiversity [23] and endemism [10], the Red Sea is home to over a thousand different species of fish and more than 50 different genera of reef-forming (hermatypic) corals. Recent project studies have showed that many huge fishes in the Red Sea coral reefs ecosystem in Saudi Arabia might become extinct; however, if the reefs are restored to their former state, some of the predator fishes can still be maintained [24]. The marine ecology of the Red Sea is a large coral reef system that is home to several unique indigenous species. The Red Sea is also essential to the survival of communities of sea grasses, meadows, and mangroves. Threats to the health of this marine environment come from a variety of sources, including human activities including fishing, shipping, oil extraction, aquaculture, marine water desalination, and plastic garbage.

Freshwater ecosystems in Trinidad and Tobago were under constant attack, and the harm to these ecosystems was evident [25]. Deforestation, the use of pesticides in agriculture and water for irrigation purposes, population growth in urban and industrial areas, water regulation for dam and hydroelectricity production, mineral and petroleum extraction, solid wastes dumps, bottom dredging and water flow channelization, fishing and aquarium market, and the loss of aquatic biodiversity are all major causes of concern [26]. Freshwater ecosystems of Trinidad and Tobago are highly endangered, despite their high local importance as a biologically distinct system, as stated by Olsen et al. [27]. The preservation of these freshwater systems was ranked highly on a regional scale. In order to preserve the invasive species of Salmonids in Chile, efforts to maintain the country's freshwater resources have focused on protecting their habitats. The conservation of native flora and animals and the maintenance of ecological equilibrium were both aided by these efforts to manage biodiversity [28, 29]. The same thing occurred in New Zealand, where protecting Salmonids and other key fish species has had a significant effect on the evolution of habitat preservation measures.

Human-caused introductions of exotic species into aquatic ecosystems, whether deliberate or accidental, are rising to the level of a worldwide environmental crisis. The threat of invasive species is growing in America's freshwater systems. In 1920, six new species of foreign fish were introduced to freshwater systems; by 1945, there were a few more, and by 1980, there were even more. Problems arise for native species when introduced ones begin mating and expanding their number outside their original habitat. When it comes to aquatic ecosystems, it is possible to remove chemical contaminations by eliminating them at the source or restoring the environment after the pollution peak, but after species introduction has started, it is extremely difficult to reverse this process. In addition to this, imported or alien species may negatively affect native organisms in water resources via predation, competition, niche change, interspecific breeding, illness, and parasite development. Economic benefit or the satisfaction of developmental needs, such as aquaculture, motivate the introduction of species to a new area. Although this introduction may be financially beneficial at first, its invasive expansion may have long-term consequences for the economy and the environment. Oysters are a kind of invasive species that have been introduced to coastal waterways across the world for human consumption. The role that oysters play in the estuarine ecology causes a number of intricate shifts. On the other hand, when native oysters mate with non-native oysters, the resulting hybrids become stuck to their shells, leading to a disordered aquatic ecosystem [31]. The proliferation and other negative impacts of introduced invasive species in the maritime environment generate ecological and economic disturbance, which poses a serious danger to the ecosystem's biodiversity.

1) **Overexploitation of species:** Loss of genetic variety and consequent reduction in the relative abundance of individual or groups of interacting species may come from overexploitation of some species to satisfy the need of human avarice. Because of the disruption in the age structure and sex mix of the population, this procedure has the potential to lower the population size. Loss of certain alleles from the genome due to fishing activity reduces genetic diversity and alters the genetic make-up of fish populations.
2) Two, structural changes to the habitat, such as dam building, deforestation, diverting water courses for agricultural supplies, modifying marsh land and tiny water entities for other use, may lead to the extinction of species. The construction of river dams prevents fish from reaching their breeding grounds in their natural habitats and fragments the fish population. Another example is the soil erosion , sedimentation and siltation that result from deforestation and subsequently degrade the catchment region. This procedure not only disrupts the breeding zone of aquatic creatures, but it also causes gill obstruction in smaller fish.
3) Toxic and poisonous chemicals, such as metals, agrochemical substances, phenolic and acidic discharge, and drainage/suspended solids/sewage discharge, increase the death rate and reduce the reproductive function of aquatic animals [32]. Fishes are especially vulnerable to infections

caused by aquatic pathogens because of the disruption and asphyxia caused by suspended particles in their respiratory physiology and mucus production. The mortality rate of aquatic organisms and submerged aquatic vegetation is accelerated by the deoxygenation brought on by sewage discharge, which in turn causes eutrophic aquatic systems.

4) The fourth kind of pollution is thermal pollution, which causes temperature shifts in the surrounding water and lowers the amount of dissolved oxygen in the water column, killing off delicate aquatic organisms. Accelerating mortality in aquatic creatures threatens aquatic biodiversity by hastening the extinction of species or reducing population sizes. Scientists have expressed concern that coral bleaching might continue beyond 2017 [33] as a result of the remarkable spike in ocean water temperature caused by the significant El Nio event. Rising ocean temperatures, widely blamed on climate change and global warming, pose a serious danger to the world's coral reef ecosystems.

Fresh water biodiversity

One category of aquatic habitats on Earth is freshwater ecosystems. You may find them in places like marshes, rivers, streams, lakes, ponds, and bogs. Limnology, or the study of freshwater environments, is a subfield of biology. Hydrobiology includes this study. Temperature, light levels, nutrient levels, and the presence or absence of vegetation are only few of the ways freshwater ecosystems may be categorized (Robert, 2001). There are a number of unique thermal features of water that contribute to the lack of temperature change in fresh water environments. The turbidity of water is determined by the types and quantities of suspended particles present. Because of its effect on light transmission, turbidity has a significant role in determining the biodiversity of a given area. There are more types of life in large rivers than in smaller streams. Many people believe that the greater size and volume of bigger systems, together with the higher variety of their habitats, are to blame for this tendency. However, there are systems where the ratio of total area to total number of species is not good. Autotrophs (producers), phagotrophs (macroconsumers), saprotrophs (decomposer or microconsumers), benthos (bottom), periphyton (attached to other plants), planktons (floating), nekton (swimming), and neuston (resting or swimming on surface) are the general categories used to categorize organisms in fresh water habitats. There are two types of freshwater ecosystems: those found in still water (lentic) and those found in moving water (lotic).

Fish, which can only be found in water, are thought to have been the first vertebrates to evolve. Live Science (2014) suggests that a little fish may be the progenitor of all modern animals. Some of them went on to develop into amphibians, animals that can both swim and walk on land. Some marine animals like seals, dolphins, and whales developed from fish that landed on land. Some aquatic biomes rely on aquatic plants like kelp and algae for support. Primary producers like plankton and phytoplankton constitute the backbone of the marine food web. Many things endanger freshwater ecosystems, including as industrial pollution, rising acidity, and agricultural runoff tainted with pesticides and fertilizers. In addition, several river habitats are lost due to dam construction. When wetlands are filled in, for example, human activity destroys or eliminates a vital aquatic ecosystem. In the 20th century, Chaudhuri and Hora laid the groundwork for extensive research on the many families and groupings of freshwater fishes. A Guide to Identifying Commercial Fishes of India and Pakistan and The Fauna of India and Neighboring Countries were both published by Misra (1976). In Fishes of the Laccadive Archipelago, Jones and Kumaran outlined around sixty different fish species. Researchers may still benefit from using FAO Species Identification Sheets for Fishery Purposes - Western Indian Ocean (Fischer and Bianchi).

Lentic communities

Littoral, limnetic, and profundal zones are home to unique lentic populations. Plants that produce seeds, such as rooted and benthic plants (Nymphaea, Nelumbo), as well as rooted hydrophytes (Typha, Scirpus, sagittaria, Eleocharis, etc.), and phytoplanktons (floating green plants), are dispersed across these zones. These microorganisms include the unicellular desmid, the filamentous (attached or floating) Spirogyra, Oedogonium, Cladophora, Chara, etc., and the colonial (single-celled) Volvox, Hydrodictylon, etc. These blue-green algae are diatoms, green algae, and colonial (single-celled) Volvox, Hydrodictylon, etc. Animals in the littoral zone have more pronounced vertical zonation than horizontal. Although there are just a handful of zooplankton species, their numbers are high. Rotifers, cladocerans, and copepods predominate. Lentic systems are also often inhabited by other vertebrate species, including more common types. There are many different kinds of birds and amphibians as well as reptiles including snakes, turtles, and alligators that call these areas home (Moss, 1998). Many fish species play crucial roles in the food webs of the aforementioned larger vertebrate groups. Fish are able to utilize a wide range of zonation areas because of their size, movement, and sensory skills. Feeding guilds apply to fish just as they do to invertebrates. Herbivores in the pelagic zone feed on periphyton, macrophytes, and phytoplankton that float to the surface. Fish that consume other fish (piscivores) as well as zooplankton in the water column (zooplanktivores) and insects on the water's surface, on benthic structures, or in the sediment (insectivores) are considered carnivores. Detritivores are fish that feed on debris for the organic matter it contains. Plants, animals, and even debris may all make up part of an omnivore's diet. Parasitic guild members get their sustenance from a host species, often another fish or big vertebrate (Poff et al., 2006). Depending on their habitat and the types of food sources available, different species of fish will eat differently. Dietary changes occur throughout development in several animals as well. Therefore, it is probable that, over its lifespan, any one fish will occupy various feeding guilds (Lytle, 1999).

Lotic communities

Lotic systems typically connect to each other, forming a path to the ocean (spring → stream → river → ocean). Some lotic systems have insect populations that reach up to 90 percent. These species' wide range of diversity is reflected in their widespread distribution over a wide variety of environments, from the tops of rocks to the depths of the substratum, and even in the film that covers the whole planet. In lotic systems, invertebrates play a crucial role as both consumers and prey. Insects have adapted a wide variety of survival mechanisms to the chaotic fluxes seen in lotic systems. Some species avoid locations with strong currents, instead choosing to live in the substratum or on the leeward side of rocks (LeRoy et al., 2006). Insects in stream habitats have evolved a wide variety of life cycle adaptations, including specialized behaviors and body plans (Lytle et al., 2004). Insects belonging to the orders Diptera (true flies), Coleoptera (beetles), Odonata (dragonflies and damselflies), and Hemiptera (true bugs) are frequently encountered in river ecosystems. Mollusks like snails, limpets, clams, and mussels, as well as crustaceans like crayfish, amphipoda, and crabs, are also widespread in flowing waterways.

The fish in lotic systems are the most well-known residents. The capacity to swim quickly and sustain that speed for an extended period of time is crucial to a fish's survival in moving water. Fishes only spend brief periods of time in full current because constant swimming requires a lot of energy. As an alternative, individuals tend to stay close to the bottom or the banks, hiding behind obstructions and out of the stream unless while foraging or migrating. Some organisms can only survive by staying on the bottom of the system at all times. These fishes have eyes atop their heads to keep an eye on what's going on above them and are flattened dorsoventrally to lessen flow resistance. Some additionally use sensing barrels placed under the skull for probing the ground below. In addition to fish, salamanders, frogs, and toads, other vertebrates that call lotic systems home include snakes, turtles, crocodiles, and alligators, as well as a wide variety of birds and mammals, including otters, beavers, hippos, and river dolphins. In addition to fish, salamanders, frogs, and toads, other vertebrates that call lotic systems home include snakes, turtles, crocodiles, and alligators, as well as a wide variety of birds and mammals, including otters, beavers, hippos, and river dolphins. These animals, with a few exceptions, spend at least some of their time outside of aquatic environments, in land habitats (Giller and Malmqvist, 1998). Many fish species play crucial roles as either consumers or prey for the aforementioned bigger vertebrate groups.

Marine diversity

The marine biome is the most extensive biosphere on Earth. The ocean is home to a vast majority of the planet's species. Many marine species have yet to be identified, thus it's impossible to put a precise number on this enormous percentage. The ocean is a fascinating, multidimensional realm that takes up around 71% of Earth's total surface area (Marine Conservation Institute, 2013). The presence of dissolved chemicals, notably salts, sets these ecosystems apart from their freshwater counterparts. Thus, "Life on Earth" encompasses both terrestrial biodiversity and marine biodiversity, or "Life in the Seas and Oceans." In fact, of the 33 phyla of creatures that have been documented so far, 32 may be found in marine environments (MarBEF's, 2009). On the ocean, more species are exploited at a higher tropic level than on land. The plants, animals, and other species found in the salt water of the sea or ocean, or the brackish water of coastal estuaries, are collectively referred to as marine life. Marine life has a fundamental impact on Earth's biosphere. Most of the oxygen we breathe comes from marine life. Marine creatures play an important role in the formation of new land and in the maintenance of existing shorelines. The pattern or link between organisms and the marine environment is crucial to the maintenance of marine diversity. There is far less oversight of the marine bioprospecting industry compared to the agricultural sector (Heip et al., 1998; Giller et al., 2004). Temporally and geographically, environmental change in the ocean occurs far less often than it does on land. Numerous bio-geochemical processes, such as those involved in food production and natural substance synthesis, as well as the maintenance of the biosphere, are dependent on marine species.

Species might potentially spread across significantly larger areas in the ocean because marine systems are more accessible than terrestrial ones (Heip et al., 1998). Primary producers in the ocean tend to be tiny and mobile, whereas their terrestrial counterparts tend to be quite massive and stationary. In contrast to land, where primary producers outnumber grazers, the opposite is true in the ocean. No photosynthesis takes place at all in the vast majority of the ocean, which is below the shallow surface layers (Heip et al., 1998; Giller et al., 2004). Furthermore, pollution from the air, land, and freshwater all makes its way into the ocean, making marine biodiversity the most vulnerable and having the greatest impact on the destiny of pollutants worldwide (Heip et al., 1998). The water depth and coastline characteristics provide a variety of zones for marine ecosystems. Estuaries, salt marshes, coral reefs, lagoons, and mangrove swamps are all examples of habitats that thrive in the shallow water zone known as the Neritic zone, which is found on the continental shelf. The term "Intertidal zone" is used to describe the area between the high and low tides. Beyond the continental shelf is the Oceanic region, which consists of the Bathyal zone (the area of continental slop and rise), the Abyssal zone (the area of the ocean deeps), and the light compensation zone (the area of transition between the upper, thin Euphotic zone and the vastly thicker Aphotic zone; see Figure 2).

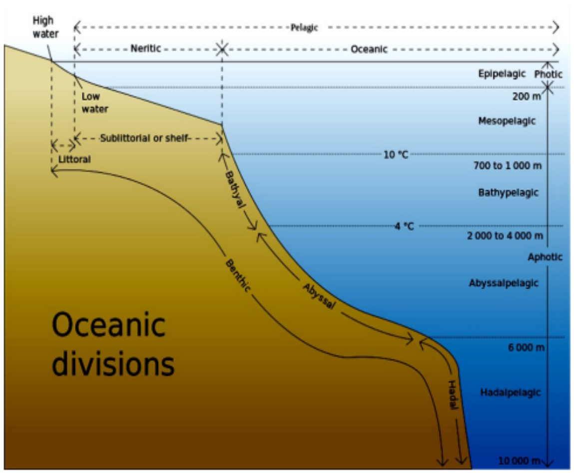

Figure 2: Division of oceanic zones

There is such a wide variety of marine species that trying to catalog them all would be an impossible task. The invertebrates found in aquatic environments are known as marine invertebrates. The word "invertebrate" is used to describe any animal that is not a member of the chordate phylum (which includes vertebrates). Some invertebrates have developed a shell or exoskeleton to compensate for their lack of a spinal column. Like their terrestrial and aerial counterparts, marine invertebrates have a wide range of body designs that have led to their division into more than 30 distinct phyla. They constitute the vast majority of oceanic macroorganisms. In other words, vertebrates evolved after marine invertebrates. In contrast to plants, algae, and fungus, animals are unicellular eukaryotes (Davidson et al., 2005). In contrast to the vertebrate members of the chordate phylum, marine invertebrates do not possess a spinal column and are thus classified as invertebrates. Some species have developed a protective shell or exoskeleton. There are several phyla that classify invertebrates. Phyla may be thought of informally as a classification system for groups of creatures that have a common body plan (Valentine et al., 2004). An organism's symmetry, segmentation, and appendage arrangement are only few of the features that may be found on a body plan. The marine environment places a premium on coelenterates, sponges, echinoderms, annelids, and other animals that are either nonexistent or weakly represented in freshwater. Because insects are uncommon in marine environments, crustaceans have earned the nickname "Insect of the Sea" (Venkataraman and Raghunathan, 2015). The oceans were the original homes for the vast majority of life on Earth. The seas cover nearly 90 percent of the habitable Earth.

To cope with low oxygen levels, marine invertebrates have evolved a broad variety of adaptations, such as breathing tubes like those seen in Molluscan siphons. More vertebrate species than any other group have been described so far (33,400, including both bony and cartilaginous fish). According to Moyle and Leidy (1992), over 60 percent of fish species are found in saltwater. Although certain fish, like the lungfish, have both gills and lungs, this is the norm rather than the exception among fish. Dolphins, whales, otters, and seals are just few of the marine species that need to surface occasionally to breathe air. There are around 20,000 different species of marine fish, making the total number of recorded marine species at 230,000 (Bob, 2009).

Sea turtles, sea snakes, terrapins, the marine iguana, and the saltwater crocodile are only few of the aquatic reptiles. With the exception of a few species of sea snakes, most living marine reptiles are oviparous, meaning they must return to land in order to deposit their eggs. This means that with the exception of sea turtles, most animals spend the vast majority of their time on or near land. Sea snakes are able to survive in salt water, but they still prefer the warmer, shallower waters that may be found near land, on islands, and in estuaries. (Stidworthy, 1974; Sea snakes at the United Nations Food and Agriculture Organization, 2007). Extinct aquatic reptiles like ichthyosaurs became viviparous so they didn't have to come back to land to have babies. Plankton and phytoplankton, the smallest marine organisms, can be as small as 0.02 micrometers in size, while the largest animal on Earth, the blue whale, can grow to a length of 33 meters (108 feet) (Paul, 2010; Bortolotti, 2008). National Oceanic and Atmospheric Administration - Ocean estimates that microorganisms like bacteria and viruses make up around 70% of the marine biomass.

CONCLUSION

Scientific studies have demonstrated that ecosystems with high biodiversity are better able to recover from natural and man-made calamities. Since various species are performing the same duties in a biologically varied environment, a disturbance affecting one species may create minimal influence on the ecosystem as a whole, which is good news for biodiversity. Any little disruption to the survival of a single species may have a catastrophic effect on the web of relationships in a less diverse habitat. Water quality, water production, and biodiversity may all benefit from a more educated public's understanding that only healthy, functioning aquatic ecosystems can deliver those advantages. A watershed's disruption may have far-reaching effects on aquatic ecosystems, including those in rivers, lakes, estuaries, and even the seas. Different characteristics, like as temperature, light penetration, nutrient content, and vegetation, may be used to categorize freshwater ecosystems. Overfishing is perhaps the biggest risk to marine life. Many fishing practices result in the unnecessary deaths of noncommercial fish species as well as countless reptiles, birds, and marine mammals, in addition to decreasing commercial species of fish, bivalves, and crustaceans. Many different kinds of life may thrive due to the varying conditions of the land. As a result, India's forest, wetland, mangrove, and maritime environments are home to a wide variety of plant and animal species. There is so much flora and wildlife here that it is considered one of the world's 12 mega-biodiversity nations.

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