The jeoparadised wonderland of aquatic ecosystem

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ABSTRACT

Human activities have dangerously altered the balance of aquatic Ecosystem. Over fishing, trawling and dredging, plastic debris & nets, waste dumping, toxin washing, oil spills and piracy on the high seas has done extensive damage to the ecosystem. The aquatic ecosystem is vital to the health and welfare of all life forms that pass through it. The present paper attempts to recount the immeasurable benefits of aquatic ecosystem which are indispensable for the ecological balance and preservation of the planet 'Earth'. The human callousness has jeopardized the costal wetlands and oceans to irreversible levels causing increase in water temperature, drying of lacks, change in streams, increase in the distribution areas of ailment vectors, change in precipitation amounts and models. Loss of this magnitude has impacted the entire ecosystem depriving valuable resources of food, medicines and industrial materials for human beings.

Key words: Global Warming, Bio-diversity, Aquatic Ecosystem, Wet land, mangroves, Ecology, Coral Reefs, Pollutants, Phytoplankton, Green house, Crustaceans.

INTRODUCTION

What is Ecosystem ?

The word Ecosystem' stems from the Greek word 'Oikos', meaning 'Home' and 'systema' or 'System'. This word was proposed by British ecologist A.G. Tansley (1935). Thus ecosystem is a biological community of interacting organisms within their physical and chemical environment. Ecosystem embodies the terrestrial ecosystems – where the organism and their environment interact on landmasses and Aquatic Ecosystems – where plants, animals and their physical environment interact in water.

The aquatic Ecosystem – The Wonderland !

The Aquatic Ecosystem is located in the body of water. Mutually dependent communities of Organisms live in the Aquatic Ecosystems. Aquatic Ecosystem are of 2 types :-

i) Marine Ecosystem

ii) Freshwater Ecosystem

Marine Ecosystem

Covers approximately 71 percent of the Earth's surface and contains approximately 97 percent of the planet's water. They generate 32 percent of the world's net Primary Production. Unlike freshwater ecosystem, they have dissolved compounds especially salts, in the water. Approximately 85 percent of the dissolved materials in sea water are sodium and chlorine. Seawater has an average salinity of 35 parts per thousand (ppt) of water. Marine Ecosystem can be divided into the following Zones :-

- i) Oceanic the relatively shallow part of the Ocean that lies over the continental shelf
- ii) Profundal Bottom or deep water
- iii) Benthic bottom substrates
- iv) Intertidal area between high and low tides
- v) Estuaries salt marshes and coral reef
- vi) Hydrothermal vents (where chemosynthetic surface bacteria from the food base⁽¹⁾

Classes of Organisms found in marine ecosystems include brown Algae, Dinoflagillates Corals, Cephalopods, Echinoderms and Sharks,

Freshwater Ecosystem

Freshwater Ecosystems cover 0.8% of its total water. They generate nearly 3% of its net primary production⁽¹⁾. Freshwater ecosystem contain 41% of the world's known Fish species⁽²⁾. There are three basic types of freshwater Ecosystems.

- Lentic : Slow moving water, including pools, pond and lakes
- ii) Lotic : Rapidly moving water, for example streams and rives
- Wet land : Areas where the solid is saturated or inundated for at least part of the time⁽³⁾.

Benefits of aquatic ecosystems

Water, the most precious of all natural resources is the basis of life on earth. Freshwater and Coastal wetlands cover about 6 percent of the Earth's surface but produce three fourth of the world's Fish. Coastal marshes and mangrove play a major role in supporting diversity in the oceans. They serve as spawning grounds and nurseries for two-thirds of the salt water fish and shell fish caught for commercial purposes worldwide. Wetlands perform a major role in preventing floods by retaining rainwater for slow release during the year and absorbing large amounts of rainfall, runoff and snowmelt. Wetland also filters out contaminants. Some communities in the United States now construct wetlands for the purpose of filtering treated sewage. The Aquatic Ecosystem renders dollar values of ecological services. It absorbs rainwater, thus, preventing floods, provides a nursery area for Aquatic wildlife and preserves woodland, which produces oxygen Estuaries and costal wetlands are nurseries for multi billion - dollar fisheries and shell fisheries while they are also valuable in preventing floods

The threatened salt marshes of Georgia were found to have large deposits of phosphate. Dr. Eugene Odum, who founded the Science of Ecology, proved to the state legislature that the longterm gain from these marshes as nurseries for the invaluable shrimp and fish industries were significant. Since then coastal marshes and other wetlands have attracted millions of tourists.

The coastal wetlands and mangroves are productive nurseries due to the nutrients they receive from ocean tides and freshwater runoff and rive. Delta wetlands are especially rich in these nutrients brought by inland rivers and the tides. These floods bring nitrates, nitrates and minerals that nourish the vegetation of the wetland. Among the grasses and reeds, microscopic life and invertebrates feed a great diversity of fish, shrimp, crabs, mammals, reptiles, amphibians and birds. Bivalves filter the water of aquatic ecosystems, keeping it clear and free of silt and pollutants. Freshwater marshes, lakes and ponds are breeding area of crustaceans, mollusks and many vertebrates. Millions of waterfowl breed in the seasonal sloughs and potholes of North America Prairies. Temporary wetlands, such as the vernal pools or wet season ponds, provide important habitat and breeding areas for frogs, toads, turtles, birds and a rich variety of invertebrates and plants. Every continent except Antarctica has peatlands and sphagnum bogs. These wetlands absorb vast amounts of rainwater and store it year round.

Swamp forests, were once extensive in many parts of the world. They provided habitat for water-birds, mammals, amphibians, and other wildlife, while preventing floods. Such forests once covered the Mississippi river and the shorelines in United States. Deposits of soil from flooded river provide nutrients and anchoring for trees and plants. There swamp forests were cut and replaced with agriculture by settlers and today the region is plagued with floods.

Migratory Aquatic animals needs habitat. Salmon live in the open ocean but spawn and die in freshwater streams and rives where the next generation hatches. Cranes and other water birds feed and breed in both salt and freshwater marshes. They use other wetlands while migration. Wetland and surrounding woodlands interact to provide habitat for many types of wildlife. Felling of wetland trees adversely affect the water flow and wildlife living therein. Some kinds of Toad, for example need both wetlands, such as pond or lakes where they lay their eggs and woodland where they seek for damp areas to spend most of the year, wetlands and its neighbouring environment are both indispensable.

Mangroves, which line 75% of the world's tropical shores, create condition for sea grass and coral reefs that are extremely productive ecosystems. Mangroves are pioneer species - they create new land. They trap sediments and create soil by setting down shoots into the sand or mud. They enhance the trees' ability to survive in saltwater and allow them to colonize coastal areas. Anchored by roots in mud, they absorb oxygen through breathing roots that grow in the open air above the mud enabling them to survive in soils devoid of oxygen. Old mangrove trees have huge, abovewater roots that form a network of hanging branches. Their fallen leaves decay and provide food for fish and shrimp. The hanging roots become overgrown with an array of algae, sponges, barnacles and mussels providing shelter for crabs, fish and shrimp. The upper branches are used by water birds for perching and nesting. Alligators, crocodiles manatees, young sea turtles and dolphins find refuge here. Sediments are held in place by mangrove preventing clouding and silting of water. They enable dense mats of sea grass to flourish which provides shelter for fish, crabs and other marine life. Mangroves prevent inland floods. Bangladesh and other countries that have cut their mangroves have been inundated by disastrous floods, causing great loss of human life and property.

Oceans have a vital role in recycling important elements for the survival of living organisms –Carbon Nitrogen, Oxygen, Phosphorous and Sulphur Phytoplankton living in marine environments produces between 33 and 50 percent of the world's Oxygen supply and absorbs vast amounts of Carbon Dioxide. Oceans are crucial in affecting world's weather patterns.

Corals are the oldest ecosystem with a residence on earth of at least 450 Million years. Glovers Reef off the Belize Coast in the Caribbean rises 6000 feet from the sea floor and began developing about 20 Millions ago. Coral reefs occur in a band approximately 30 degrees north and 30 degrees south of the equator. Reefs buffer shorelines from ocean wages and in turn prevent erosion, as well as provide water for the grasses to grow closer to shore. These grasses in turn are fed by endangered manatees, sea turtles, fish and shell fish. Corals are the most endangered aquatic ecosystem on earth. Their diversity, beauty and productivity make them vital ecosystem. The greatest diversity of corals grows in the Pacific and Indian Oceans, in the Indonesian – Australian region, where at least 450 species are found. The world's largest coral reef, Australia's Great Barrier Reef, runs for 1,400 Miles along the North Easter Coast of their continent.

Ocean creatures have proven valuable to medical research supplying compounds that treat inflammations, asthma, heart diseases, tumour, infection, viruses and pain. Sea animals, such as cone shells, sea snakes and stonefish contain some of the most toxic poisons in nature. Such compounds are offering non-addictive solutions to the treatment of pain and other medical problems. Some chemicals in sponges and sea slugs are useful as insecticides. Glucosamine a compound found in the shells of the crab and related animals has proven to be extremely effective in treating osteoarthritis. Sea and coastal ecosystem tourism has prospered in recent years. Whale watching is several billion industry worldwide. Cruises to Alaska sport fishing, bird watching, hiking and other activities in non-tropical and freshwater destination have become important source of income.

The jeopardy plaguing aquatic ecosystem

Population explosion has increased the deterioration of the world's Aquatic ecosystem. Ocean is our planet's life support system. Unfortunately it is treated as global garbage dump. Ocean absorbs a great amount of Carbon Dioxide and pollutants. But, pollution levels of earth have increased beyond carrying capacity. Two thirds of the major cities in the world are situated along coasts and millions of people vacation at shorelines. Pollution from developed areas drains into the ocean killing marine life, threatens human health, causes toxic algae blooms and forces beach closure⁽⁴⁾. Human population is destroying coral reefs and coastal habitat which are vital for breeding, food and shelter for marine species. For instance, in Caribbean in 1989-90 the increase in the temperature of the sea water by two degrees water temperatures to 30-31°C from 28-29°C have caused mass death of corals. Extinction of corals does not only lead to the destruction of biodiversity in the seas. But, it also causes a decrease in the

absorption of Co2, which causes global warming⁵ (Various amounts of pollution are draining into ocean water daily from human related activities. Pollutants have caused major decline species and we threatening the planet's ecological stability, for instance small crustaceans that are called Krill and that feed on phytoplankton have decreased by 80%. This is due to the decreasing of the ice cover by South Ocean in winter since winter ice is of great importance for life cycle of algae and Krill feed on algae extinction of Krill that are the nutrition resource for many sea mammals and living beings in sea may mean destruction of the food chain in South Ocean⁶.

Sewage, toxic chemicals, pulp mill and manufacturing Wastes, fertilizers, soaps detergents, litter and refuse disposals, radioactive wastes, plastics, oilspils and leaks, runoff and insecticides are contaminating our ocean and freshwater sources on a daily basis – far in excess of what the natural filtering and recycling systems can sustain⁷.

Carbon emissions are polluting the ocean depleting the Ozone layer causing global warming and destruction of species. Excessive carbon in the atmosphere from the burning of fossil fuels over the last two centuries has caused increased acidity in our oceans, which is threatening eco systems sea creatures and their food suppliers. The rising levels of acidity along with the effects of global warming, could affect the ability of the reason to absorb greenhouse gases. Ocean acidification have reached irrevocable levels. Continued depletion of the Ozone layer in the upper atmosphere (from chemicals released by human actions on earth) could cause a drastic decline in the world' Oceanic plankton. Plankton is tiny organism floating in vast numbers in the ocean which are the first link in providing food supporting marine/sea life. With less protection provided by the Ozone layer, more harmful Ultraviolet, radiation reaches the earth. A decrease in plankton would lead to domino effect thought the aquatic food chain and severely impact all aquatic species and marine wildlife. To cite an example, Polar bears are among the living being that will be mostly affected by the decrease in the sea ice. The decreasing of the sea ice, which allows them to feed at remote distances, due to global warming will cause the polar bear not to feed properly. The decrease of fat rate in their bodies because of malnutrition means extinction of polar bears due to reduced reproductivity. So, the habitat loss and decreasing habitat quality will result in 30% decrease in polar bear population⁸.

Plastic Debris and nets are destroying wildlife. Wildlife is dying from litter and uncontained trash improperly discarded by humans. Species like gull get entangled in plastic container holders that hold canned drinks such as sodas and beer. Marine animals sometimes mistake debris for food and swallow it or become caught in it and die. Debris and trash can be carried downstream in rivers endangering all aquatic life on its way to the sea where it will drift through the ocean currents for year and years. Plastic floating in the ocean can resemble jelly fish. Many leatherback turtles die from ingesting plastic bags, which they mistake for their favourite food, jelly fish. Of the approximately 1 billion tons of litter that enters the world's ocean each year about 60 percent is of a plastic composition (Plastics includes bags, bottles, strapping bands, sheeting synthetic ropes, synthetic fishing nets, floats, fiberglass, piping, insulation, paints and adhesives). It is estimated that 1 million seabirds and 1000000ther marine animals including endangered species die as a result of having swallowed plastic, litters or been caught in it. A rare Bryde's whale died in 2000 examination of its stomach showed compaction from plastic sheets, bait bags, zip top bags, fertilizers bards, plastic strips, supermarket bags and frayed rope pieces. Lost and discarded fishing lines and nets cause terrible wounds and suffocation to sea animals. Huge 'wall of death' driftnets have entrapped mammals as large as whales and cut into them down to the bone, causing a long painful death from wounds and suffocation. Millions of dolphins have drowned in fishing net that are set out to catch other fish. These huge fishing net captures, injures and kills an enormous amount of sea-life of all varieties.

Healthy seafloor communities are crucial to maintaining biodiversity in the ocean, yet unregulated trawlers drag huge heavy nets, chains and gear along the bottom of the ocean floor scraping away all life forms and habitat, and destroying vast ecosystems. Ocean bottom inhabitants and marine ecosystems are ripped up, crushed, exposed, and buried, leaving the seafloor looking like an underwater desert. What took centuries, and in some areas thousands of years, to develop is swept up and totally destroyed by one pass of a fishing trawler. Sea corals provide critical habitat for fish and other organisms in marine ecosystems. As much as 70 percent of sea life scraped up in the nets is not "usable" or sought by the trawlers. These dead and dying "non-target" fish and marine animals are tossed back into the ocean. This is referred to as "bycatch," and "trawler trash." Bottom trawling is believed to have caused the decline of major fisheries. Trawling the ocean bottom is like vacuuming up all life and the habitat which supports life under water⁹.

A major source of ocean pollution is from oil. Oil spills and leaks come from oil tankers, oil wells, runoff from land spills and leaks into rivers and underground watersheds from industry, oil refineries and storage facilities; and believe it or not, from deliberate oil pollution such as the deliberate release of 465 million gallons of oil into the Persian Gulf by Iraq during the Persian Gulf War in 1991. Some oil spills are accidental, but it's not accidental when they come from rusted-out gasoline tanks and inadequate old oil tankers or from careless and uncaring humans. Oil coats the ocean surface, seabirds, fish, and marine mammals. It washes onshore and destroys shoreline habitat. Vast numbers of plants and animals die, and entire fishing industries have been destroyed. Coastal communities suffer economic damage. Oil damage cleanup costs run into the millions of dollars. Recovery takes years, and some areas will never recover fully. The greatest loss is to the environment and life forms. Since the devastating and widespread Exxon/Valdez spill, improved ship hull designs and additional safety procedures have been implemented for oil-carrying vessels.

Piracy on the high sea is a growing menace. Looting the oceans is netting vast sums of money for those countries/industries/individuals that care more about their own greed than they do the global environment or species survival.

CONCLUSION

The above analysis depicts the callousness of human beings towards the natural resources. The indiscriminate exploitation to appease their greed has brought about devastating destruction thereby disturbing the ecological balance concomitant to the healthy and peaceful living of all the species on this planet

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