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CLIMATE CHANGE AND ITS IMPACTS ON AQUATIC ECOSYSTEM

V. MARY KENSA

Department of Botany, S.T. Hindu College, Nagercoil, Tamil Nadu, India

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ABSTRACT

The effects of increased atmospheric CO_2 concentrations-such as changes in ocean chemistry-will adversely affect the physical and biological characteristics of coastal systems, modifying their ecosystem structure and functioning. As a result, coastal nations face losses of marine biodiversity, fisheries, and shorelines. Coral reefs, which are among the most bio diverse ecosystems on Earth, are highly sensitive to increases in sea surface temperature. A 2°C increase, associated with CO_2 concentrations of 500 ppm, threatens to destroy most coral reefs. Along with increasing temperatures, more acidic conditions in the ocean associated with dissolved CO_2 from Earth's atmosphere threaten to transform living reefs into seaweed dominated mounds of rubble. These impacts will add to the stress already resulting from local anthropogenic effects; combined, they represent an unprecedented challenge to the global biosphere. While the impacts are being felt globally, some regions will be more acutely affected than others.

INTRODUCTION

The diversity of life on earth is dramatically affected by human alterations of ecosystems (Baillie *et al*., 2004). Biodiversity is continually transformed by a changing climate. Now days, a new type of climate change, brought about by human activities, is being added to this natural variability, threatening to accelerate the loss of biodiversity already under stress due to other human stresses. Approximately 70% of the earth's surface is covered by water. Climate change is already changing the distribution and abundance of aquatic ecosystem. Even minor changes to water temperature will result in changes to the currents that flow across the earth's surface. An aquatic ecosystem is broadly fall in to two categories (a) Marine ecosystem and b) Fresh water ecosystem.

Climate change within the ocean

The increase in greenhouse gases within the earth's atmosphere is set to change three fundamental variables:

(i). Reduced Total Carbonate alkalinity

Total carbonate alkalinity of seawater will decrease as CO_2 increases within the earth's atmosphere (Gattuso *et al*., 1998; kleypas *et al*., 1999). This particular variable is expected to substantially change the acidity

***Address for correspondence - Email :** surejkensa@gmail.com

and carbonate ion pool of the global ocean. Doubling carbon dioxide concentrations in the atmosphere will decrease the aragonite saturation state in the tropics by 30% by 2050.

ii). Increased Sea level

Changes in sea level have had major impacts on the abundance and particularly the distribution of both marine and terrestrial diversity. Sea level will rise as climate changes pushes planetary temperature higher. This occurs due to the thermal expansion of ocean water, the melting of glaciers, and changes to the distribution of ice sheets. The expected increase in sea level is approximately 9 - 29 cm over the next 40 years or 28 - 29 cm by 2090 (Church *et al*., 2001; IPPC 2001). According to Nichols and colleagues (1999), sea level rise could cause the loss of up to 22% of the world's coastal west lands by 2080. Combined with other human impacts, this number is likely to climb to a loss of 70% of the world's coastal wetlands by the end of the 21st century.

iii) Sea temperature increase

Significant increase in heat content has not been distributed evenly. Sea temperature in turn influences of the marine environment. Due to its direct effects on the density of seawater, changes in global temperatures can play directly upon the rates and directions of ocean water movement.

Deep sea biodiversity

The deep sea is increasingly recognized as a major reservoir of biodiversity. It is believed that the deep seabed support more species than all other marine environment. Marine biodiversity and ecosystem are threatened by pollution, shipping, military activities and climate change, but today fishing presents the greatest threat.

The greatest threat to biodiversity in the deep sea is bottom trawling. This type of high seas fishing is more damaging to seamounts and the cold-water corals they sustain. These habitats are home for several commercial bottoms- dwelling fish species.

Fish populations

Coastal fisheries are critical resources for hundreds of millions of people. Many scientists now point to the dramatic over exploitation of fisheries and the subsequent decline in fish stocks as the major factor in ecosystem change over the past two centuries (Jackson *et al*., 2001). Recent evidence has revealed that oceanographic and climatic variability may play a dominant role in fish stocks (Klyashtorein, 1998; Babcock Hollowed *et al*., 2001; Attrill and Power, 2002). The relationship between climate variability and fish stocks is probably complex. In some cases, subtle changes may affect conditions and crucial changes in the life history of the fish species. The most widespread effects of climate occur on the primary and secondary production in marine ecosystems.

Coral Reef

Tropical intertidal and sub tidal regions are dominated by ecosystems that are characterized by a framework of scleractinian corals. They have undergone major changes over the past 20 years, much of which has been associated with climate change and other stresses. (Bryant *et al*., 1998). Despite the lack of external nutrients, these ecosystem from rich and complex food chains that support large populations of fish, birds, turtles and marine mammals. Light, temperature and the carbonate alkalinity of seawater decrease in a pole ward direction, making the formation of carbonate reefs more difficult at higher latitudes. Coral reefs have already experienced major impact from climate changes. Major disturbances to coral reefs have increased dramatically over the past 30 years and have been linked irrefutably to periods of warmer than normal sea temperatures.

Coral bleaching occurs when corals rapidly lose the cells. Bleaching results in colonies turning from brown to while, often with spectacular host pigments being exposed. Reef building corals that lose these important symbionts may experience mortality rates that may exceed 90% changes in reef building coral communities are likely to have huge impacts on marine biodiversity. Corals form the essential framework within which a multitude of other species makes their home. Fish that depend on corals for food, shelter or settlement cares may experience dramatic changes in reef building coral communities are likely to have huge impacts on marine biodiversity. Corals form the essential framework within which a multitude of other species makes their home. Fish that depend on corals for food, shelter or settlement cures may experience dramatic changes in abundance or go extinct. Thousands of other organisms are also vulnerable impacts on marine biodiversity. Corals form the essential framework within which a multitude of other species makes their home. Fish that depend on corals for food, shelter or settlement cares may experience dramatic changes in reef building

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b) Freshwater Ecosystem

The threats to freshwater fauna fall into several broad categories: nutrient enrichment, hydrological modifications, habitat loss and degradation, pollution, and the spread of invasive species. A changing climate and increasing levels of UV light pose additional risks that superimpose upon existing threats. The combination of rapid landuse change, habitat alteration and a changing climate is viewed as a particular serious challenge to aquatic ecosystems.

Importance of freshwater ecosystems

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Importance of freshwater ecosystems

Surface freshwater are a small fraction of global water. Healthy freshwater ecosystems provide vital ecosystem services to human societies including the provision of clean water for drinking for agriculture, for fisheries, and for recreation. Many regions, in the world have insufficient clean water to meet even the minimal demands for human survival.

Climate change and the hydrologic cycle

Freshwater ecosystems will naturally be sensitive to change in the hydrologic cycle and these are difficult to predict. A warmer climate will result in greater evaporation from water surfaces and greater transpiration by plants which will result in a more vigorous water cycle. Future climate change will directly affect lake ecosystems through warmer temperature and changes to the hydrologic cycle.

Biological impacts

Rapid climate change has many negative implications for the biodiversity of rivers and streams. Climate change may cause extinction at several taxonomic levels. At the species level, those species that are highly restricted in their geographic ecologically are vulnerable to global extinction. This is true for fish where there are regional differences in the proportional occurrence of specialized species are vulnerable to global extinction.

CONCLUSION

Human demands for aquatic ecosystem quantity and quality now pose severe threats. The multiple human stressors of aquatic ecosystems will interact with future climate change. Current biodiversity changes are still largely driver by anthropogenic alteration of habitat. Biodiversity is sensitive to even small changes in the earth's climate. Every man need more wants, when this need should single want and then only we can develop a sustainable biodiversity.

We cannot blame anyone squarely for this current scenario of food crisis across the nation. Poverty, hunger, corruption, societal ills etc. are all ills and form a part of one viscous huge cycle. Public discourse and action at the grass root level are the need of the hour. Political will and good governance need to translate into specific reform steps. We must come forward and work together to help the impoverished people

in our country.

Conservation of biodiversity is the planning and management of biological resources in a way so as to secure their wide use and continuous supply, maintaining their quality, value and diversity. There is a need for prevention of extinction through sound planning and management. There is an urgent need to step up efforts to mitigate the losses in biodiversity and implement long term measures to preserve this rich treasure. There is need to think about our future investments, whether we want to invest in future of mankind or their distribution. Biodiversity conservation cannot be brought about by enforcement of laws only. It must come from within because we love the earth and all living beings thereof. The slogan for the International year of Biodiversity is Biodiversity is life. Biodiversity is our life. We have to keep in mind that biodiversity is nature's insurance policy against disasters.

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