

Climate Change and the Marine Life

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1. INTRODUCTION

The ocean is our planet's largest ecosystem, containing somewhere from 50-80% of all life on Earth. It provides us with more than half of the world's oxygen and is home to millions of species that play critical roles in their marine ecosystems. And this is just the species we know about, as experts estimate that over 90% of the species in our oceans are yet to be classified. The ocean also plays an important role in the wider health of the planet as it is estimated that the ocean has sequestered 29% of the world's carbon emissions and holds roughly 42 times more carbon than the atmosphere, showing its importance as a carbon sink. Climate change and human caused threats like ocean noise pollution, vessel strikes,



and entanglement in fishing gear are threatening the lives of marine animals, while wasting water, overuse of plastics, and irresponsible travel cause direct harm to the ocean.

Climate change is one of the serious contemporary environmental challenges in present day. Global warming is one of the serious manifestations of climate change. It has serious effects on the ecosystem. Global warming refers to the rise in the earth's normal atmospheric heat that leads to analogous alterations in climate (World Wildlife Fund). There has been a significant increase in the emission of toxic gases, such as carbon dioxide and methane in the twentieth century.

Thus, human activities that generate carbon dioxide are one of the main causes of global warming. Toxic gases have obliterated the ozone layer. The destruction of the ozone layer has led to the exposure of the earth to harmful radiation from the sun. Emission of toxic gases into the atmosphere also leads to the creation of a shield around the globe, which traps heat inside the earth. Accumulation of heat leads to global warming, which affects the environment and living organisms.

An increase in air temperature is harmful to ocean life. Increase in temperature reduces water density and affects the cold layer of water that contains nutrients, which living organisms consume. The heating up of the oceans affect the availability of food for marine life. Additionally, oceans are becoming more acidic due to increasing temperatures. According to new study creatures which live deep beneath the ocean surface are likely to be badly hit by climate change over the next century.

This article discusses about causes and impacts of climate change on ocean life and proposes measures to prevent the destruction of ocean life.

2. FACTORS RESPONSIBLE FOR CLIMATE CHANGE

Climate change refers to a considerable and long-term transformation in the numerical distribution of weather conditions. The earth's climate has been changing rapidly due to the following factors. First, the varying intensity of radiation from the sun leads to the heating and cooling of the earth's surface. This process leads to climate change. Second, oceans influence climate change since they contain carbon dioxide.

When carbon dioxide is released into the atmosphere, it warms the environment. Oceans accumulate high amounts of warmth. Thus, a slight change in sea currents can greatly affect coastal climate. Therefore, the movement of ocean currents affects climate in several parts of the earth (World Wildlife Fund). For example, when the sea currents move towards the continent of America, it becomes warm since the currents contain heat.

Third, plate tectonic forces can trigger the movement of continents to various points on the earth. These movements lead to volcanic eruptions and the formation of mountains. This process can



lead to a significant change in the climate. Lack of vegetation cover exposes the earth's surface to a lot of heat, thereby leading to global warming.

All these factors lead to substantial changes in weather patterns. Nonetheless, the interaction of these factors has a significant effect on climate change. For instance, "a change in one of these factors leads to more changes in others".

3. THE EFFECTS OF CLIMATE CHANGE ON OCEAN LIFE

a. Photosynthesis

Photosynthesis is the process by which plants in the ocean access nutrients. For example, plants such as algae cannot survive in the ocean environment without photosynthesis. The process of photosynthesis eliminates carbon dioxide from the air and transforms it into natural carbon and oxygen, which plants use to process food.

Research findings suggest that phytoplankton thrives better in cool oceans. However, due to rising sea temperatures, phytoplankton is likely to reduce significantly (Center for Ocean Solutions). In addition, algae are being depleted because their production has been affected by excess heat in the oceans.

The rising temperatures in the oceans hinder the upward flow of nutrients from the seabed to the water surface. Thus, marine life cannot get enough organic gases such as carbon and oxygen. The depletion of sea plants leads to a shortage of food for aquatic animals. In addition, it reduces the supply of the aforementioned organic gases in the oceans. Consequently, depletion of food and oxygen negatively affect the survival of aquatic life.

b. Annual Growth Sequence

Plants and marine creatures require a balanced amount of temperature and light to survive. The ability of organisms such as phytoplankton to grow depends on the temperature of the ocean. An increase in temperature interferes with the growth cycle of phytoplankton by making it grow faster than usual. The life cycle of organisms, whose growth is facilitated by light, always begin at the same time.

Therefore, the rising temperatures in the oceans have affected the harmonious growth of light-driven organisms. Growth irregularities interfere with the marine food chain. For instance, some organisms that once moved to the water surface to feed are now encountering serious challenges due to deficiency of nutrients.

c. Migration of Ocean life

Some aquatic creatures have begun migrating to safer zones due to unbearable ocean



temperatures. Most of the affected organisms are either moving to the east or to the west coasts depending on the conditions that they need to survive. Organisms that can withstand high temperatures such as shrimps are moving northwards. On the other hand, organisms that are vulnerable to high temperatures are receding southwards.

This relocation will result in a unique mix of creatures in new surroundings. Ultimately, the feeding patterns will change. Organisms that will not be able to adapt to the new environments will eventually become extinct. Death of some creatures will lead to an imbalance in the ocean bionetwork.

d. Loss of biomass

There is a direct link between climate change and the loss of life on the sea floor. The surface-dwellers will themselves be threatened by a dwindling nutrient supply, triggered by climate impacts such as the slowing of the circulation of the world's oceans and increased separation between layers of water – known as stratification – as a result of warmer and rainier weather. The changes in seafloor communities are expected despite the fact that they live on average four kilometres beneath the ocean surface.

The study, by an international research team from the UK, Canada, Australia and France, is the first to quantify future losses in deep-sea marine life, using advanced climate models. The researchers say their results show that even the most remote deep-sea ecosystems are not safe from the impacts of a warming world. They say the weight of the marine creatures that will be lost is greater than the combined weight of every person on Earth.

The scientists predict that seafloor-dwelling organisms will decline by over five per cent globally and by 38% in the North Atlantic over the next century. This is because there will be a reduction in their food source, the plants and animals living at the ocean surface which nourish deep-sea communities when they die and sink to the depths. The changes will vary across the world, but most areas will experience damage. Over 80% of all identified key habitats – such as cold-water coral reefs, seamounts and canyons – will suffer losses in total biomass.

e. Acidification

The high concentration of carbon dioxide in the sea affects the concentration of chemicals, which leads to acidity in the ocean. Increase in acidity hinders plants from consuming greenhouse gases. For instance, phytoplankton is being depleted due to high levels of acidity (Center for Ocean Solutions). Acidity in the sea also affects the survival of aquatic creatures. For example, excess carbon dioxide concentration has affected marine organisms such as shellfish and corals, which are likely to become extinct in the next few decades.



Coral reefs are arguably one of the most significant aspects of the marine ecosystem because they provide food to many organisms in the sea. Due to global warming, coral reefs have been ravaged seriously by excess accumulation of toxic gases and heat in the oceans. Generally, coral generates minute crusts of calcium carbonate to facilitate the creation of its skeleton.

Increased acidification neutralizes the carbonate ions. This process retards the growth of coral reefs. Consequently, reduction of coral reefs will eventually lead to depletion of food in the marine ecosystem. Depletion of food will lead to starvation and death of some organisms.

f. Coral Bleaching

Coral bleaching refers to the breakup of the symbiotic association between coral and marine plants such as algae. This process is caused by warmth and increased the concentration of carbon dioxide, which breaks the bond between coral reefs and plants. Corals become weak once algae are detached from them. Destruction of algae and corals disrupts the marine food chain. Thus, many organisms cannot access food. Reduction in the availability of food leads to a decrease in the ocean floor biomass. Due to the limited availability of food, sea creatures reduce in size since they cannot get enough food and organic gases.

Organisms that inhabit deep waters are the most affected since they do not access food easily. Scientists have observed that in the future, there will be massive loss of biomass in the oceans if the coral reefs are destroyed. Nonetheless, “in the Southern and Arctic Oceans of the polar regions, seafloor biomass is expected to increase; however, this will not be sufficient to counterbalance the negative effects felt elsewhere” (National Geographic).

g. Holocene Climatic Optimum

“The Holocene Climatic Optimum refers to a general warming period in the history of mankind that occurred between 9000 to 5000 B.P” (Center for Ocean Solutions). Scientific evidence indicates that there was a serious climatic change during this period, which led to the extinction of many creatures and plants. For example, an important plant species called younger days was depleted gradually due to increase in temperature. The pattern of depletion of coral reefs and marine plants is similar to that of younger days. Depletion of important resources will lead to serious effects in the ecosystem.

In the Polar Regions, global warming has led to an increase in the melting of ice. The reduction of ice will affect the production of some species of algae, which thrive in cold conditions. Algae are the basic sources of food in the Arctic food chain. Therefore, thousands of organisms in the Polar Regions cannot survive without algae. The cold temperature in the Arctic is suitable for many animals,



such as polar bears and narwhals.

However, an increase in temperature in the Polar Regions leads to the melting of ice in the ocean, which in turn reduces the growth of algae and creates food shortages. Moreover, “reduction of ice in the sea results in the loss of vital habitats for seals, walruses, polar bears, penguins, and whales in both the Arctic and Antarctic”.

“Sea ice is a critical habitat for Antarctic krill, which is a source of food for many seabirds and mammals in the Southern Ocean” (Conservation International). Unfortunately, there has been a considerable reduction in the number of Antarctic krill due to an increase in the melting of ice in the sea.

h. Effects on Human beings

Although humans are not part of the marine ecosystem, a drastic change in the ocean environment affects them because they also feed on some marine organisms. “A small increase of two degrees Celsius would destroy almost all existing coral reefs”. Furthermore, changes in ocean flow due to an increase in temperature would seriously affect marine fisheries.

4. RECOMMENDATIONS

Based on the above discussion, various factors have led to global warming. However, human activities are the main causes of high temperatures in the ocean. For instance, many people still use fossil fuels, which generate toxic gases that destroy the oceans. Therefore, the reduction of carbon emissions is the best solution to the current challenge of global warming, which has led to the obliteration of marine life. In this case, the use of clean sources of energy should be encouraged to prevent further destruction of the environment.

Second, research that is more scientific should be carried out to find out the extent to which ocean life has been destroyed by high temperatures. Research activities are important because they will help in the formulation of evidence-based solutions to the current global warming. Additionally, resources should be mobilized to facilitate rehabilitation and protection of ocean life because they are important in the ecosystem.

5. CONCLUSION

This discussion has revealed that climatic changes have led to an increase in global warming, which has seriously affected the entire ecosystem. Currently, the temperature is increasing rapidly in the oceans due to the accumulation of gases. Therefore, global warming is becoming a big challenge in the marine environment because it leads to depletion of food and organic gases. The primary sources of food for marine life such as coral reefs and algae are being destroyed at an alarming rate by the



high temperatures in the sea. The destruction of primary food producers in the oceans will lead to significant changes in the marine food chain. For example, many sea creatures have started moving away from their original habitats because they are looking for better environments. Moreover, the amount of biomass in the oceans will reduce drastically in the next few years due to the depletion of food resources. Consequently, drastic measures should be taken to save the oceans from further destruction because they greatly influence changes in climate.

Oceans cover more than 70% of the planet and are home to important species and ecosystems that we rely on for food, livelihoods, climate regulation and more. But the oceans need our help. Saving the oceans can sometimes feel like an overwhelming task, but if we all pitch in, we can make a big difference. Our actions have an impact, and together, we can build a healthier future for the ocean.

