

Global Warming and its Impact on Aquatic Organisms

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SUMMARY

Global warming and climate change are terms for the observed century scale rise in the average temperature of the Earth's climate system and its related effects. Multiple lines of scientific evidence show that the climate system is warming. Although the increase of near surface atmospheric temperature is the measure of global warming often reported in the popular press, most of the additional energy stored in the climate system since 1970 has gone into the oceans. The rest has melted ice and warmed the continents and atmosphere. Scientific understanding of global warming is increasing. The Intergovernmental Panel on Climate Change (IPCC) reported in 2014 that scientists were more than 95% certain that global warming is mostly being caused by human (anthropogenic) activities, mainly increasing concentrations of greenhouse gases such as methane and carbon dioxide (CO₂).

INTRODUCTION

Global warming is the process in which the earth's temperature and the temperature on the atmosphere layers that are close to earth rise artificially as a result of the intense increase in some gases that occur in consequence of various human activities and that are qualified as greenhouse gases in the atmosphere. As to global climate change, it is the phenomenon where other climatic factors change as well depending upon global warming.

How Global Warming Works?

Global warming is the term to describe the overall climate change to the Earth. What actually happens to cause global warming to occur? The effect is the Earth's sun warming the atmosphere. You know when you get into your car that's been sitting for quite a while on a hot, sunny day? The temperature outside is significantly cooler than in your stifling car. What happens is the sun's rays enter through the car's windows. The heat is absorbed by the elements in the car, i.e., the seats, the carpet, the steering wheel, etc. When those objects release the heat emitted by the sun, it doesn't quite get all out. The heat is reflected back in by the car. An increasing temperature on the planet can have domino falling effects for the future of Earth. Widespread changes in the Earth's climate would cause extreme weather changes, including, horrific storms, hurricanes, earthquakes, and other natural disasters. Ecological changes would mark the extinction of many types of species.

The Impact of Global Warming On Aquatic Organisms

Plankton

Along with global warming, precipitation regime will change due to changing atmospherically rhythm, nourishing loads will suddenly enter the sea, and thus, seasonal plankton blooms will be probable. As the case is today, with the accumulation of organic materials that reproduce more than they are consumed on the bottom and their degrading the marine sulphates to sulphurs, living beings' life will be trapped in a narrow zone. Fish such as anchovy (*Engraulis encrasicolus*) and sprat (*Sprattus sprattus*) feed on plankton and makes the absorption of organic loads in the water colony possible. In a process where this does not happen, that is, where the plankton drift on the bottom, H₂S formation on the bottom will speed up and thus, with the decreasing of fish consuming organic materials in the system, H₂S layer will rise even more.

Coral Reefs

Coral reefs are very important for oceans as these reefs are the places where the carbon cycle takes place. Coral reefs constitute a natural set against big ocean waves and tidal waves and serve for the protection of coastal lines. The fish and other crustaceans they hold are a significant source of food and mainstay. Reefs are places where many large living beings come to reproduce. Fish that are densely caught by humans either reproduce at these reefs or use the food produced by these reefs. If we consider that these form a chain in the shape of a pyramid, the destruction of the order in the reefs means the destruction of this chain.

Tropical coral reefs are increasingly threatened by shifts in the world's climate, overfishing and declining water quality. High levels of genetic diversity within populations of corals are likely to be an important element in evolutionary responses to climate change. Populations at high latitudes may be more vulnerable to climate change because they are typically at the margins of geographical ranges, and are likely to be small and isolated. Corals grow as long as they are not broken because of external influences. However, the changes in the temperature and acidity rates kill and solidify the corals. The dead corals that are white-grey in color cannot grow any more.

Turtles

Another living being that is under threat due to global warming is the turtles. For the majority of living beings, the sex of the juveniles are determined by the chromosomes, however, in some living beings such as the tortoises, the environmental conditions determine whether the juvenile will be male or female. Among the environmental factors that affect physiological characteristics such as the sex rates of the juveniles, incubation period, the process of building a nest, growth, activity and winter sleep, the most determinant factor is the temperature of the habitat. For species the juvenile's sex of which is determined by the habitat temperature during incubation period, male juveniles are formed in lower temperatures (20-27°C), and female juveniles are formed in temperatures higher than 30°C; and between 28-31°C the juvenile may be either male or female. As for the lizards and alligators, the juveniles coming out of the egg in high temperatures are male and the ones that come out in low temperatures are female. For this reason, reptiles, particularly turtles and alligators, are among the species that will perhaps be most drastically influenced by global warming. The increase in temperature will distort the sex rate in future generations and probably cause the emergence of groups of only females in turtles and only males in alligators that will definitely not be able to continue breeding. In a study carried out in the USA, it was presented that an increase of 1°C in the habitat temperature caused nearly all the juvenile turtles to be females. The digestion, growth rates, activities and reproduction rates of animals such as alligators and turtles are also affected negatively by the increase in temperature.

Marine Mammals

Climate change is now known to be affecting the oceans. It is widely anticipated that impacts on marine mammals will be mediated primarily via changes in prey distribution and abundance and that the more mobile (or otherwise adaptable) species may be able to respond to this to some extent. However, the extent of this adaptability is largely unknown. Meanwhile, within the last few years direct observations have been made of several marine mammal populations that illustrate reactions to climate change. These observations indicate that certain species and populations may be especially vulnerable, including those with a limited habitat range, such as the vaquita *Phocoena sinus*, or those for which sea ice provides an important part of their habitat, such as narwhals *Monodon monoceros*, bowhead *Balaena mysticetus* and beluga *Delphinapterus leucas* whales and polar bears *Ursus maritimus*. Polar bears are among the living beings 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 bears not to feed properly. Polar bears can still carry on their lives like that, but the fat rate in their bodies will decrease because of malnutrition. This case means extinction for polar bears which require a certain amount of fat rate in their bodies to reproduce. In the next 50-100 years, a significant decrease in sea glaciers is expected due to global temperature change. As a result of habitat loss and decreasing of the habitat quality, a decrease of 30% is estimated in the polar bear population.

CONCLUSION

Global warming and climate change which have caused the ecological systems, biodiversity and human life to confront the biggest problem of history have started to show their impacts on all living beings in the aquatic ecosystem from plankton to mammals. The studies that have been conducted indicate that the deterioration in the climate caused by global warming will continue to the future even if precautions are taken today. Just as the climate changes that we observe today are the results of phenomena that have piled up through years, the effects of the precautions to be taken that may be considered positive will require nearly the same amount of time. Since we do not have the chance to reverse the global warming and climate change phenomena, the only thing that needs to be done is to minimize the foreseen harms in the future. To this end, mankind needs to understand the global warming problem and cooperate on an international level.

REFERENCES

- Anonymus (2007). Working Group II Report "Impacts, Adaptation and Vulnerability": Intergovernmental Panel on Climate Change (IPCC), Switzerland.
- Ayre, D. J. and Hughes, T. P. (2004). Climate change, genotypic diversity and gene flow in reef building corals. *Ecology Letters* **7**: 273-278.
- Ozdemir, E. and Altindag, A. The Impact of Global Warming on Aquatic Life. Ankara University Faculty of Science Department of Biology Tandoğan, Ankara.
- Simond, M. P. and Isaac, S. T. 2007. The impact of climate change on marine mammals: early signs of significant problems. *Oryx* 41 (1): 19-26.