



## Impact of Global Warming on Aquatic Ecosystem: A Review

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**Abstract:** *At present, greenhouse gas emissions are continuously increasing in the environment due to human activities, and these conditions are responsible for global warming. Global warming has a negative impact on aquatic ecosystems and biodiversity. Global warming and climate changes adversely affect water levels; increase in the sea and a decrease in lakes as well as changes in annual precipitation and flow, have a negative impact on aquatic biodiversity, including plankton to aquatic mammals. Temperature is a major environmental factor that affects species distribution patterns and the relationship between global warming and biodiversity in aquatic environments.*

**Key words:** *Global warming, Temperature, Greenhouse gases, Environment, Biodiversity.*

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### Introduction -

Global warming is the continuous rise in global temperature caused by the rapid increase of certain gases in the atmosphere caused by anthropogenic activities, known as greenhouse gases. These gases are to blame for the rise in global temperatures caused by global warming (Anonim, 2007a). Aquatic environments, such as seas and oceans are significantly influenced by global warming. Due to changes in temperature of aquatic water body are responsible for alteration in physical and chemical characteristics of water. These conditions create an unsuitable habitat for aquatic animals, from plankton to aquatic mammals. Water temperature is one of the most important environmental factors that affect the life cycle, physiology and behavior of aquatic life (Tekinay ve Guroy, 2007). Global warming has a negative impact on natural ecosystems via the enhanced melting of glaciers and ice caps, the rise of sea level, the increased rate of water evaporation from lakes and rivers, the greenhouse effect, increased ocean acidification and biological invasions (Eissa and Zaki, 2011). Changes in climate caused by global warming have direct and indirect impacts on aquatic and terrestrial environments. Global climate changes also influenced the patterns of distribution of flora and fauna. The most prominent examples include the earlier advent of spring and the lengthening of the crop growing season, which are usually observed in a number of global regions (Porter *et al.*, 2013). Global warming also increases the risk of extinction for some species. These extinct species have a direct impact on other species. Thus, conditions create fluctuations in the equilibrium of the food chain and food web (Anonim, 2006b). According to International governmental Panel of Climate Change report (2007), said that if the average global temperature rises by 1-2°C, one-third of the species on earth will either relocate or become extinct (Anonim, 2007c). Some recent studies provide evidence related to the impact of global warming on the habitat degradation of marine ecosystems and biodiversity (Reddy *et al.*, (2007; Pasha *et al.*, 2012; Abdullah *et al.*, 2013). Global warming also increases organic matter and pollutant loads in aquatic ecosystems; these conditions are responsible for severe algal blooms in water. These types of conditions have been reported from various parts of the world, including Europe, the United States, Australia and Japan (Beaufort *et al.*, 2011; Yates and Rogers, 2011). In this review, I discuss factors responsible for global warming and the impact of global warming on aquatic ecosystems, including coastal habitat, fish, amphibians, reptiles and mammalian communities.

### 1. Factor Responsible for Global Warming: -

The majority of the sun's short waves are absorbed directly by greenhouse gases in the atmosphere, whereas the long waves reach the earth and are emitted back into the atmosphere after the earth has warmed. This is a natural and atmospheric phenomenon also known as the "natural greenhouse effect". Changes in the amount and concentrations of greenhouse gases in the atmosphere influenced the atmosphere's natural equilibrium. Changes in the amount and concentration of greenhouse gases and temperature of the atmosphere are responsible for increased earth temperatures and global warming (Anonim, 2007b). The greenhouse effect is caused by methane, CO<sub>2</sub>, chlorofluorocarbons, nitrous oxides, ozone and water vapours. These greenhouse gases are responsible for global warming. Anthropogenic activities are responsible for increasing greenhouse gases in the environment, which leads to global warming and rises in earth's temperature. The average global surface temperature is expected to rise by 1.5°C to 5.8°C by 2100, according to Houghton *et al.* (2001), but it may be higher in the United States (Wigley, 1999).



## 2. Impact of Global Warming on Aquatic Eco-system:

Global warming and climate change cause adverse impacts on the biology, fertility, growth and behaviour of animals in various habitats, including aquatic and terrestrial (Cochrane, 2009). Aquatic ecosystems are influenced by global warming in several ways. Global warming not only increases the temperature of the atmosphere but is also responsible for the temperature increase of water bodies such as lakes, seas, oceans and ponds and also influences hydrological events. Global warming also influenced the physicochemical properties of water (Gurer, 2007). High temperatures and CO<sub>2</sub> concentrations influence aquatic ecosystems, which have an indirect effect on global precipitation and the melting of glaciers and ice covers (Anonymous, 2007a).

In northern latitudes, glaciers and ice covers continuously melt and convert into water. These conditions create an unfavourable environment for aquatic life and also influence species composition, distribution patterns, seasonality and the production of the planktonic community. Changes among these events influence the food web and water quality. Changes in winter precipitation patterns have an impact on boreal peatlands and their communities. Global warming also influenced the seasonal habits and migration routes of aquatic animals and these conditions became limiting factors for their survival. Changes in the temperature of the environment also cause adverse impacts on coastal wetland salinity, sediment input and nutrient load (Anonymus, 2007a; Ozdemir and Altindag, 2007). The water level and community of the lake ecosystem are also affected by global warming. Several lakes around the world have lost most of their water due to global warming, including the Aral Sea, the Yellow River in China, Owens Lake in North America, the Chad Lake in Africa, the Rio Grande in Mexico, USA, the Ganga River in India and the Platte Lake in central Europe (Anonim, 2007d).

## 3. Impact of Global Warming on Coral Reef Ecosystem and Fish Community:

The coral ecosystem has been negatively impacted by global warming, and coral bleaching has increased significantly (Ozdemir & Altindag, 2007). The effects of global warming and climate change will be most pronounced around the coastal area. Coastal habitat is the most productive area of the ocean (Anonymous, 2007). The bacterial community in the sea has also been influenced by global warming. Higher temperatures increase the disease-causing capacity and survival of bacteria. These bacteria become threats to the survival of other aquatic fauna. Global warming poses serious threats to fish breeding and reproduction (Anonymous, 2007). Because most coral disease occurs at higher temperatures than normal, evaluated temperature increases disease risk in the coral ecosystem (Rosenber and Ben-Haim, 2002). Water temperature also influences the breeding patterns of the fish community. A temperature that is optimal in the water is required for fish development and growth. During the pre-adolescent stages known as larvae, juvenile fish are extremely sensitive to changes in water temperature (Anonymous, 2007). Global warming affects coastal marine habitats and their biodiversity. Furthermore, sea contamination comes specifically from breaking and recycling. Due to industrial pollution, improper disposal of solid wastes, overfishing also negatively influence marine biodiversity (Rooker *et al.*, 2008; Srinivasan *et al.*, 2010).

## 4. Impact of Global Warming on Aquatic Amphibians, Reptiles and Mammals:

Due to the destruction of coastal habitat, the reproduction efficiency of sea turtles has also been influenced (Ozdemir & Altindag, 2007). Because the sex ratio (males to females) in some species is determined by environmental temperatures, global warming has a negative impact on digestion, activities, growth rate, and reproduction rates in alligators and turtles (Anonim, 2008a). Changes in sea level will jeopardize coastal habitats and species such as the sea turtle, which needs beaches for reproduction and lays eggs there, will be negatively impacted as their reproduction sites become more restricted (Anonymous, 2007).

The melting of glaciers and ice has a negative impact on the polar bear. Because global warming enhanced the melting of ice and reduced the food availability of polar bears. These conditions lead to malnutrition in polar bears due to food scarcity. Previous studies concluded that the polar bear population has declined by 30% due to habitat loss and deteriorating habitat quality (Anonim, 2008b).

## REFERENCES

1. Anonymous (2006b). What are the effects of global warming? [http://www.bey.tcb.org/bcb\\_ki\\_etkileri\\_nedir.htm](http://www.bey.tcb.org/bcb_ki_etkileri_nedir.htm)
2. Abdullah, H.M., Mahboob, M.G., Banu, M.R., Seker, D.Z., 2013. Monitoring the drastic growth of ship breaking yards in Sitakunda, a threat to the coastal environment of Bangladesh. *Environ. Monit. Assess.*, 185: 3839-3851.
3. Anonim (2006a). The new century will come with disasters. <http://teknoloji.milliyet.com.tr/detay.asp?id=1443>.
4. Anonim (2007b). Global climate change and global warming. [http://www.iklim.cevreorman.gov.tr/Gazi/makale\\_sengun.htm](http://www.iklim.cevreorman.gov.tr/Gazi/makale_sengun.htm).



5. Anonim (2007c). The effect of global warming emerges. <http://hurarsiv.hurriyet.com.tr/goster/haber.aspx?id=6234501&tarih=2007-03-30>.
6. Anonim (2008a). Turtles and crocodiles in danger. [http://www.gençbilim.com/news/science\\_news.php?id=2616](http://www.gençbilim.com/news/science_news.php?id=2616).
7. Anonim (2008b). Polar bear. [http://tr.wikipedia.org/wiki/Kutup\\_ay%C4%B1s%C4%B1](http://tr.wikipedia.org/wiki/Kutup_ay%C4%B1s%C4%B1)
8. Beaufort, L., Probert, I., de Garidel-Thoron, T., Bendif, E.M., Ruiz-Pino, D., Metzl, N., Goyet, C., Buchet, N., Coupel, P., & Grelaud, M. (2011). Sensitivity of coccolithophores to carbonate chemistry and ocean acidification. *Nature*, 476: 80-83.
9. Cochrane, K., & De Young, C., & Soto, D. (2009). Climate change implications for fisheries and aquaculture: Overview of current scientific knowledge. *Fisheries Technical Paper*, 530. FAO, Rome, 2009, 216pp
10. Eissa, A.E., Zaki, M.M., (2011). The impact of global climatic changes on the aquatic environment. *Urban environ. Pollut.*, 4:251-259.
11. Gurer, I. (2007). Global warming, Turkey's water resources, possible interaction. I. 8-27. 11-13 April 2007, Istanbul.
12. Houghton, J. T., Ding, Y., Griggs, D.J., Noguer, M., van der Linden, P.J., & V. Xiaosu, V.eds.(2001).Climate Change 2001: The Scientific Basis. Intergovernmental Panel on Climate Change: Working Group I. Cambridge University Press, Cambridge, UK.
13. Ozdemir, E., & Ahmet Altindag, A. (2007). The Impact of Global Warming on Aquatic Life. Kuresel Isinmanın Sucul Yaşam Uzerine Etkisi. <https://dergipark.org.tr/pub/ucevrebilim/issue/40127/477395>
14. Pasha, M., Mahmood, A.H., Rahman, I., & Hasnat, A., (2012). Assessment of ship breaking and recycling industries in Bangladesh - An effective step towards the achievement of environmental sustainability. In: International Conference on Agricultural, Environment and Biological Sciences. ICAEBS'2012, May 26-27, Phuket.
15. Porter, E.M., Bowman, W.D., Clark, C.M., Compton, J.E., Pardo, L.H., & Soong, J.L. (2013). Interactive effects of anthropogenic nitrogen enrichment and climate change on terrestrial and aquatic biodiversity. *Biogeochemistry*, 114: 93-120.
16. Reddy, M.S., Mehta, B., Dave, S., Joshi, M., Karthikeyan, L., Sarma, V.K.S., Basha, S., Ramachandraiah, G., & Bhatt, P. (2007). Bioaccumulation of heavy metals in some commercial fishes and crabs of the Gulf of Cambay. *Current Science*, 92: 1489-1491.
17. Rooker, J.R., Secor, D.H., De Metrio, G., Schloesser, R., Block, B.A., & Neilson, J.D. (2008). Natal homing and connectivity in Atlantic bluefin tuna populations. *Science*, 322: 742-744.
18. Rosenberg, D.M., Mcculy, P., & Pringle, C.M. (2000). Global-Scale Environmental Effects of Hydrological Alterations: Introduction. *Bioscience*, 50:746.
19. Rosenberg, E., & Ben-Haim, Y. (2002). Microbial diseases of corals and global warming. *Environmental Microbiology*, 4(6):318-326.
20. Srinivasan, U.T., Cheung, W.L., Watson, R., & Sumaila, U.R. (2010). Food security implication of global marine catch losses due to overfishing. *J. Bioecon.*, 12: 183-200.
21. Tekinay, A., & Guroy, D. (2007). How will climate change affect fish production in Turkey? I. Turkey Climate Change Congress, Proceedings: 329-334. 11-13 April 2007, Istanbul.
22. Wigley, T.M.L. (1999). The Science of Climate Change: Global and U.S. Perspectives. Pew Center on Global Climate Change, Arlington, VA.
23. Yates, B.S., & Rogers, W.J. (2011). Atrazine selects for ichthyotoxic *Prymnesium parvum*, a possible explanation for golden algae blooms in lakes of Texas, USA. *Ecotoxicology*, 20: 2003-2010.