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Popular Article

## Climate change and its impact on marine life

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Climate change significantly impacts aquatic life, disrupting ecosystems and affecting various species. As temperatures rise, the warming of oceans, lakes, and rivers disturbs the habitats of many organisms that depend on specific temperature ranges for survival. This poses a serious threat to ecosystems. Global warming indicates the increase in the earth's average atmospheric temperature leading to climate. The twentieth century has seen a considerable rise in the emission of harmful gases such as carbon dioxide and methane. Human activities that produce carbon dioxide are a major contributor to global warming. These toxic gases have damaged the ozone layer, exposing the Earth to harmful solar radiation. Additionally, the emission of these gases forms a barrier around the planet that traps heat, leading to global warming, which in turn affects the environment and living organisms. The rise in air temperature is particularly detrimental to ocean life, as it decreases water density and disrupts the cold, nutrient-rich layers that sustain marine organisms. The warming of oceans also impacts the availability of food for marine species, and increasing temperatures contribute to ocean acidification.

### Causes of Climate Change

Climate change refers to a significant and long-term alteration in the statistical distribution of weather patterns. The Earth's climate has been undergoing rapid changes due to several factors. Firstly, variations in the intensity of solar radiation cause the Earth's surface to heat up or cool down, contributing to climate change. Secondly, oceans play a crucial role in influencing climate change because they store carbon dioxide. When carbon dioxide is released into the atmosphere, it increases environmental temperatures. Oceans absorb a large amount of heat, so even a minor shift in ocean currents can have a significant impact on coastal climates. For instance, when ocean currents move towards the Americas, they bring warmth due to the heat they carry. Thirdly, tectonic plate movements can cause continents to shift, leading to volcanic eruptions and mountain formation, which can result in notable changes in climate. Additionally, the absence of vegetation leaves the Earth's surface exposed to excessive heat, contributing to global warming. These factors collectively lead to substantial shifts in weather patterns. The interaction among these factors further amplifies the effects of climate change, as a change in one factor often triggers changes in others.

3534

## The Impacts

### 1. Photosynthesis

Photosynthesis is essential for oceanic plants to access nutrients. For instance, algae rely heavily on this process to survive in the marine environment. Through photosynthesis, carbon dioxide is removed from the atmosphere and converted into organic carbon and oxygen, which plants then use to produce food. Research indicates that phytoplankton, a critical component of the oceanic food web, thrives in cooler waters. However, with rising sea temperatures, there is likely to be a significant decline in phytoplankton populations (Center for Ocean Solutions). Additionally, algae production is suffering due to the excessive heat in the oceans. The increasing ocean temperatures also disrupt the upward movement of nutrients from the seabed to the surface, depriving marine life of essential organic gases like carbon and oxygen. This decline in sea plants results in food shortages for aquatic animals and decreases the supply of these crucial gases, ultimately threatening the survival of marine life.

### 2. Annual Growth Sequence

Both plants and marine organisms require a balanced amount of light and temperature for survival. The growth of organisms like phytoplankton is particularly dependent on ocean temperature (Guardian Environment Network). Rising temperatures accelerate the growth of phytoplankton, disrupting its natural growth cycle. Organisms whose growth is driven by light typically follow a synchronized life cycle. However, increasing ocean temperatures have disrupted the harmonious growth of these light-dependent organisms, leading to irregularities that disturb the marine food chain. For example, some organisms that traditionally move to the surface to feed now face significant challenges due to nutrient deficiencies.

### 3. Migration of Ocean Life

Due to intolerable ocean temperatures, some marine species are migrating to more hospitable areas. Many affected species are moving either to the eastern or western coasts, depending on their survival needs. Organisms capable of tolerating higher temperatures, like shrimp, are moving northward, while those more sensitive to heat are shifting southward. This migration will create unique mixes of species in new environments, leading to altered feeding patterns. Species unable to adapt to their new habitats may face extinction, causing imbalances in ocean ecosystems.

### 4. Acidification

The increasing concentration of carbon dioxide in the ocean alters the chemical balance, leading to greater acidity. This heightened acidity hinders plants' ability to absorb greenhouse gases. For example, phytoplankton populations are declining due to increased ocean acidity (Center for Ocean Solutions). Acidification also endangers the survival of various marine species. Excessive carbon dioxide levels are particularly harmful to organisms like shellfish and corals, which may face extinction in the coming decades. Coral reefs are vital to marine ecosystems, providing food for numerous sea creatures. Global warming has severely damaged coral reefs due to the accumulation of toxic gases and heat in the oceans. Coral relies on the formation of calcium carbonate to build its skeleton, but increased acidification neutralizes carbonate ions, slowing coral growth. The reduction of coral reefs will eventually lead to food shortages in the marine ecosystem, causing starvation and death among some species.



## 5. Coral Bleaching

Coral bleaching occurs when the symbiotic relationship between coral and marine plants, such as algae, breaks down due to increased warmth and carbon dioxide levels. This process weakens corals, as they lose their algae partners. The destruction of algae and corals disrupts the marine food chain, limiting food availability for many organisms. The decline in food sources leads to a reduction in ocean floor biomass, and as food becomes scarcer, sea creatures may shrink in size due to insufficient nutrition and organic gases. Deep-sea organisms are particularly vulnerable since they already struggle to access food. Scientists warn that the continued destruction of coral reefs could lead to a significant loss of biomass in the oceans in the future.

### Recommendations

To combat the effects of climate change on aquatic life, it is essential to implement a range of strategies focused on reducing greenhouse gas emissions, protecting vulnerable ecosystems, and enhancing resilience. Reducing emissions through a global shift to renewable energy sources like wind, solar, and hydroelectric power is paramount, as it will slow the warming of aquatic environments and mitigate ocean acidification. Protecting and restoring critical habitats such as coral reefs, mangroves, and wetlands is also crucial, as these ecosystems provide essential services like carbon sequestration and protection against storm surges. Additionally, sustainable fishing practices should be promoted to prevent overfishing and ensure that marine populations remain robust enough to withstand environmental changes. Investing in research and monitoring programs will help track the health of aquatic ecosystems, enabling early intervention when changes are detected. Finally, international cooperation is necessary to address the global nature of climate change, ensuring that policies and actions are coordinated across borders to effectively protect aquatic life.

### Conclusion

The rapid increase in ocean temperatures, driven by the accumulation of greenhouse gases, poses a significant threat to marine ecosystems. Global warming is emerging as a critical challenge in the marine environment, leading to the depletion of both food sources and essential organic gases. Key food producers for marine life, such as coral reefs and algae, are being devastated at an alarming rate by these rising temperatures. The destruction of these primary food sources is causing profound disruptions in the marine food chain. As a result, many marine species are being forced to migrate from their natural habitats in search of more favorable conditions. This shift in habitats not only alters the composition of marine communities but also threatens the survival of species unable to adapt to new environments. In the coming years, the biomass within the oceans is expected to decline sharply due to the ongoing depletion of food resources. This reduction in biomass could have cascading effects throughout marine ecosystems, potentially leading to the collapse of certain populations and further imbalance in the oceanic food web. Given the oceans' critical role in regulating the Earth's climate, it is imperative that urgent and effective measures be implemented to prevent further degradation of marine environments. Protecting the oceans is not only vital for maintaining biodiversity but also for mitigating broader climate change impacts.

