



Impacts of Ocean Acidification On Coral Ecology

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Introduction

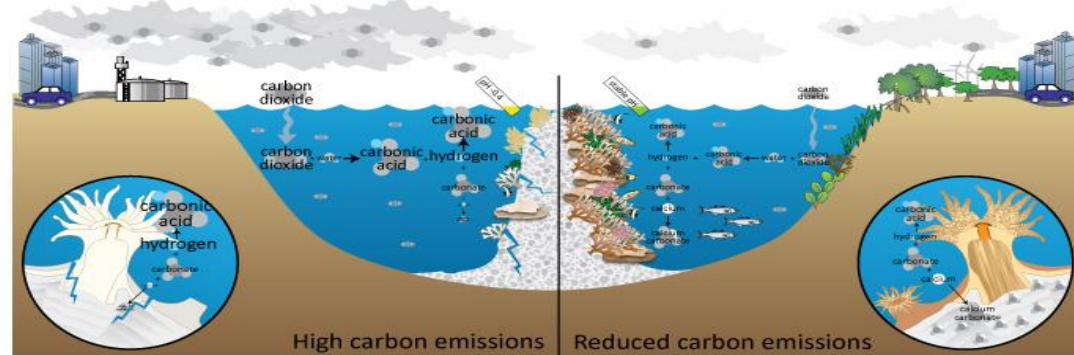
The purpose of this research is to explore how ocean acidification impacts various parts of an ecosystem, such as corals. Ocean acidification is the reduction of seawater pH worldwide as the consequence of the absorption of anthropogenic carbon dioxide by the oceans. Since the beginning of the Industrial Revolution, there has been a significant increase in acidity, which is detrimental to the ocean environment. Corals support marine biodiversity, because they are an important producer of biominerals. They are also essential for reef framework, and provide nutrients and homes for several living organisms. The increase in ocean acidity negatively impacts the presence of corals in the ocean, and it also will intensify the effects of global warming. This research will further discuss what acidification is, how it affects coral and the environment, and examine what steps have been taken to combat the negative effects of ocean acidification. The effects are far reaching and impact not only the environment, but human economy as well.

The Importance of Coral Reefs

- Coral reefs are some of the most valuable ecosystems on earth.
- They provide shelter to thousands of species of fish. Symbiotic relationship with zooxanthellae algae.
- The biodiversity that Corals produce has led to the development of many drugs in the 21st Century.
- Healthy reefs attract tourists and provides jobs, which sustain local economies.
- Coral Reefs buffer adjacent shorelines to prevent erosion.



Image from: NOAA



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Acidification Mechanism

- CO₂ is absorbed by the atmosphere and is dissolved in seawater.
- CO₂ reacts with water and forms carbonic acid, releasing a bicarbonate ion and hydrogen ion. The increase of hydrogen ions decrease pH.
- The hydrogen ions bond with free carbonate ions in the water forming more bicarbonate ions.
- This bonding reduces the free carbonate that would otherwise be available to marine animals for making calcium carbonate shells and skeletons.

Affected Ecosystem Services

- **Ecosystem Services:** Any service completed by an ecosystem that is beneficial to humans, typically beyond an understandable value.
- **Provisional Services:** Supply of mollusks, crustaceans, and fish to support commercial and recreational aquaculture. Includes pearls, shells and corals for jewelry. Fisheries surrounding coral reefs alone are a \$5.9 billion market (Cooley et al., 2009)
- **Regulatory Services:** Coastline protection and shoreline stabilization. Global value of shoreline protection from coral is estimated to be \$9 billion annually (Cooley et al., 2009).
- **Cultural Services:** Include recreation, tourism, spiritual benefits that contribute to communities' sense of identity, estimated to be priceless.
- **Supporting Services:** Carbon sequestration and nutrient recycling are estimated to be a \$4 billion job annually (Cooley et al., 2009).
- Decreases in any of the above lead to higher production costs that will have a ripple effect throughout supporting business and the economy as a whole.

Discussion

In the US, action must be taken by the federal government to help combat ocean acidification. Suggestions include creating more technology based Clean Water Act standards, enhancing wastewater treatment, providing funds for bay and estuary research, and enforcing criminal statutes dealing with water pollution. Most importantly, we must reduce our carbon footprint by decreasing the amount of carbon dioxide emitted into the atmosphere.

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