

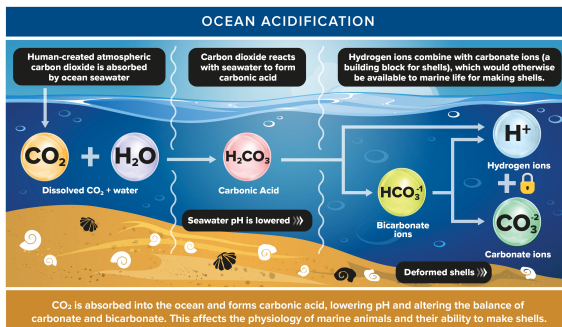


Mollusks and Ocean Acidification

by Heir Elijah Bartlett, 2017

Mollusks are affected by ocean acidification which is caused by humans creating carbon dioxide (CO₂) by

burning fossil fuels and other activities. The emission of carbon dioxide from cars, planes, and burning coal is causing ocean acidification that is hurting some of our animals because the ocean is getting more acidic. One type of animal that is affected by ocean acidification is the mollusk species. Some mollusks have shells and they are



http://biology.ucdavis.edu/local_resources/downloads/ocean-acidification-feature.pdf

dissolving in acidic waters, which is making them more vulnerable to their predators. We have to protect mollusks because they are an important part of the marine ecosystem.

In 2012, National Geographic declared that the world produced the biggest amount yet, at 34.5 billion metric tons, of CO₂ from burning fossil fuels and the largest producer was coal.¹ The burning of fossil fuels is the first contributor to climate change. The second is deforestation.² Deforestation is a contributor for several reasons. When trees are cut down, they can not do the photosynthesis process anymore. The trees cannot take in carbon dioxide and produce oxygen. Secondly, carbon dioxide gets released when the trees get burned or logged out by the trucks. Carbon emissions from transportation is another big problem. The World Bank states that 20% of the world's carbon emissions are from transportation, such as planes, trains, cars, motorcycles and trucks, etc.³ CO₂ is affecting everything, from you to zooplankton, the tiniest animals of the sea. We are dumping CO₂ into the air at a rate 24,000,000,000 tons per year and 761 tons per second.⁴



Dr. Tessa Hill at the Bodega Marine Laboratory said, on Science Friday in 2016, "As we put carbon dioxide into the atmosphere through driving our cars

¹ Nijhuis, Michelle, "Can Coal Ever Be Clean?" <http://ngm.nationalgeographic.com/2014/04/coal/nijhuis-text>, 2014, April.

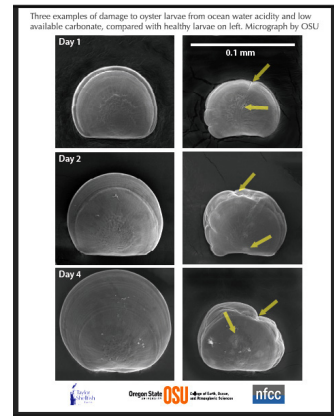
² Climate Change: Our Priorities, <http://www.nature.org/ourinitiatives/urgentissues/global-warming-climate-change/how-we-work/reducing-emissions-from-deforestation.xml>, 2016, December.

³ CO₂ emissions from transport (% of total fuel combustion), <http://data.worldbank.org/indicator/EN.CO2.TRAN.ZS>, 2014.

⁴ Carbon emissions per second and per hour, <http://www.ecoglobe.ch/climate/e/co2psec.htm>, 2006.

or industrial activities, the ocean is a tremendous sponge for that carbon dioxide...it fundamentally changes the chemistry of the ocean. It makes the ocean more acidic.”

Ocean acidification is caused by 30% of man-made CO₂ getting absorbed by the ocean⁵. A chemical reaction from the chemicals in the ocean and the chemicals coming from the CO₂ emissions react to lower the ocean pH causing it to be more acidic. With the acidic water, some of the animals are affected. Some of the animals are mollusks. The mollusk's shells dissolve because mollusks need calcium carbonate to form shells. Ocean acidification causes less calcium carbonate to be available and this leads to the shelled-mollusks having weak shells. Dr. Hill said, “Shellfish, or corals, or sea urchins, anything with sort of hard parts or shells, as they're trying to build their shell, they're pulling building blocks of their shell out of the seawater. And as the seawater becomes more acidic, there are less of those building blocks available. So they have a harder time making their shells.” This makes them vulnerable to predators and the crashing waves.



But why are mollusks important? When they are in their larval stage, or zooplankton form, they are the base of the marine food web. Whales and other large ocean creatures feed on zooplankton and phytoplankton, and when they die, they take carbon to the deep ocean. Also, in years when currents change and upwelling doesn't occur, there is a lack of plankton blooms⁶. This causes forage fish to move elsewhere or die and then forage fish predators, like penguins and seals can't feed their young and they starve.



<http://bluelivingideas.com/2014/10/28/know-ovsters-means-better-water/>

Mollusks, like clams and oysters, in their adult form are food for mammals, birds and fish. They clean the water and make it healthy. They are recyclers of plant and animal waste and a major food source for humans. Always, humans have harvested mollusks for food. Europe, Japan and the United States alone, produce over 1 billion pounds of oyster meat each year.⁷

⁵ Chu, Jennifer, “Study finds increased ocean acidification due to human activities.” <http://news.mit.edu/2016/increased-ocean-acidification-human-activities-0907>, 2016, September 2.

⁶ Importance of Zooplankton, <http://www.actforlibraries.org/importance-of-zooplankton/>, 2016, November.

⁷ Bourquin, Arvil, Man and Mollusc/Mollusk, Food, http://www.manandmollusc.net/beginners_uses/1.html, 2016, November.

There are many uses of mollusks that generate income. These are some of the uses that are important today:

- Jewelry designers and manufacturers make beautiful shells into necklaces and rings.
- The construction industry uses gravel and shells to make roads and they use lime from the shells as an important part of making plaster and concrete.
- The fertilizer manufacturers also use the lime as a very important part of plant fertilizer because plants need the nutrients from it.
- The pearl industry farms both salt and fresh water pearls. Worldwide, pearls are a \$20 billion dollar industry.⁸
- “Aquaculture, also known as aquafarming, is the farming of fish, crustaceans, mollusks, aquatic plants, algae, and other aquatic organisms.”⁹ The United States 2013 Aquaculture Census stated that the sales of mollusks for consumption was \$328,567,000.

The mollusks in my back yard -- the ocean -- are dying because of ocean acidification. We need to do something to protect them before it is too late. There are some things scientists can do and there are some that all of us can do!

At an ocean acidification talk in April 2017, Dr. Tessa Hill presented several solutions she is researching. One of the solutions is replanting seagrasses in estuaries. The second is working with businesses to collect data and send it to the government to change laws about CO₂ emissions.

Seagrasses are plants in the ocean that are found in shallow waters in many parts of the world, from the tropical waters to the Arctic. They are more like a land plant than a kelp, which is an algae. Seagrasses could hold up to 83,000 metric tons of carbon¹⁰ in the sediment below their meadows, per square kilometer. Scientists are trying to against pollution and erosion in coastal waters by replanting seagrass. Seagrasses absorb carbon through photosynthesis, stop erosion, and create diverse habitats for many different marine animals.

Dr. Tessa Hill is working with Hog Island Oyster Company along with other scientists who are working with companies to collect data. Data is collected about the acidifying pH of the water, the temperature, and the salinity. The data is sent to government law makers to change the laws of carbon emissions, to help our environment.

⁸ Bourquin, Arvil, Man and Mollusc/Mollusk, http://www.manandmollusc.net/advanced_uses/industry.html, 2016, November.

⁹ <https://en.wikipedia.org/wiki/Aquaculture>

¹⁰ James W. Fourqurean et al, Nature Geoscience, “*Seagrass ecosystems as a globally significant carbon stock*”, 2012, May.

To help our oceans we can:

- Carpool,
- Reduce airplane travel,
- Stop eating beef,
- Use solar power or wind power,
- Plant trees,
- Reduce deforestation.

You or your family and friends can always contribute to protecting our planet.

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www.heirstoouroceans.org