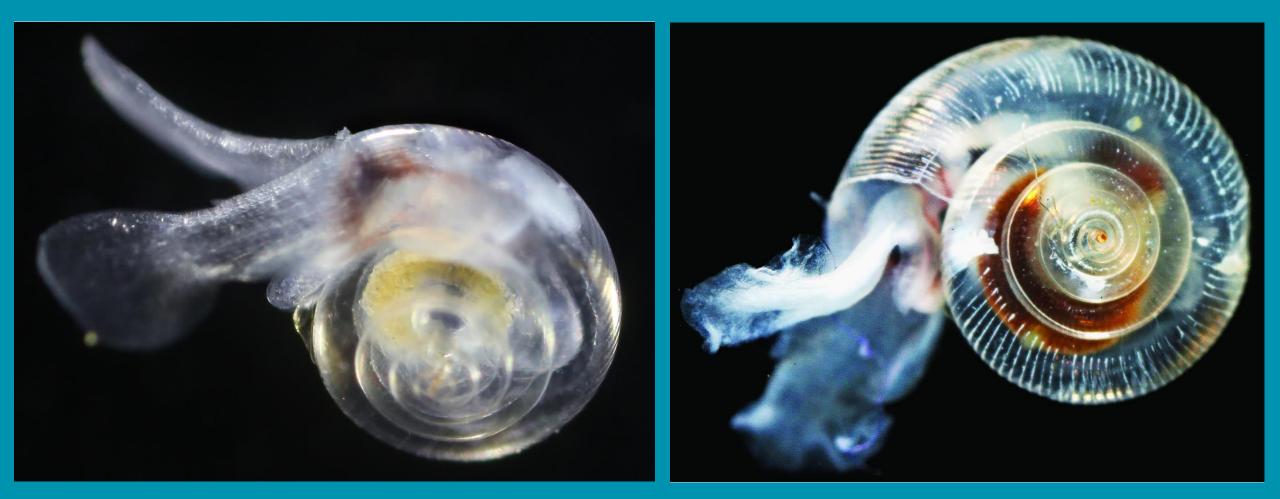


The Mystery of the Disappearing Shells

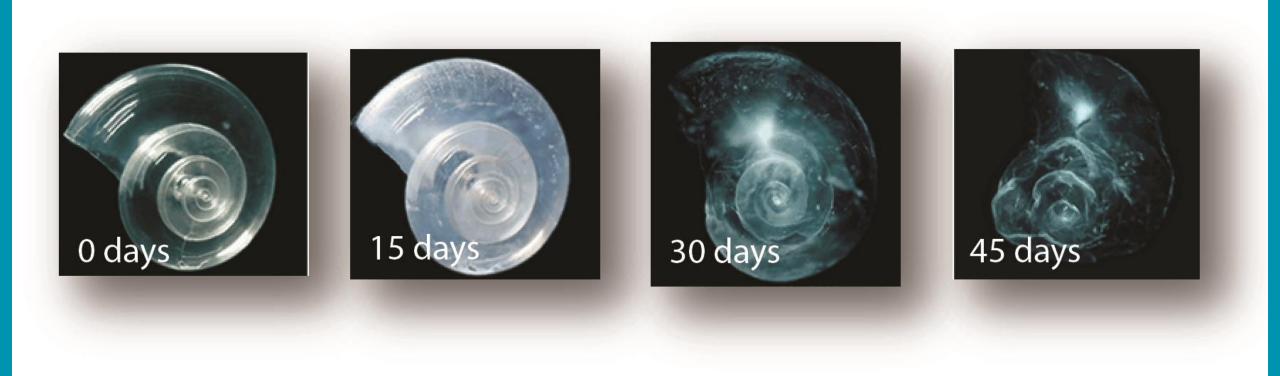


NATIONAL MARINE SANCTUARIES What type of organism might this be? What differences do you observe? Pteropods (Sea Butterflies)



Magnified from pinhead size

What is happening to the pteropod shown here? Why?



Magnified from pinhead size

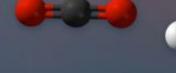
Let's Experiment!

OCEAN ACIDIFICATION

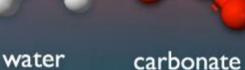
HOW WILL CHANGES IN OCEAN CHEMISTRY AFFECT MARINE LIFE?

CO2 absorbed from the atmosphere

 CO_2 + H_2O + CO_3^{2-} \rightarrow 2 HCO_3^{3-}



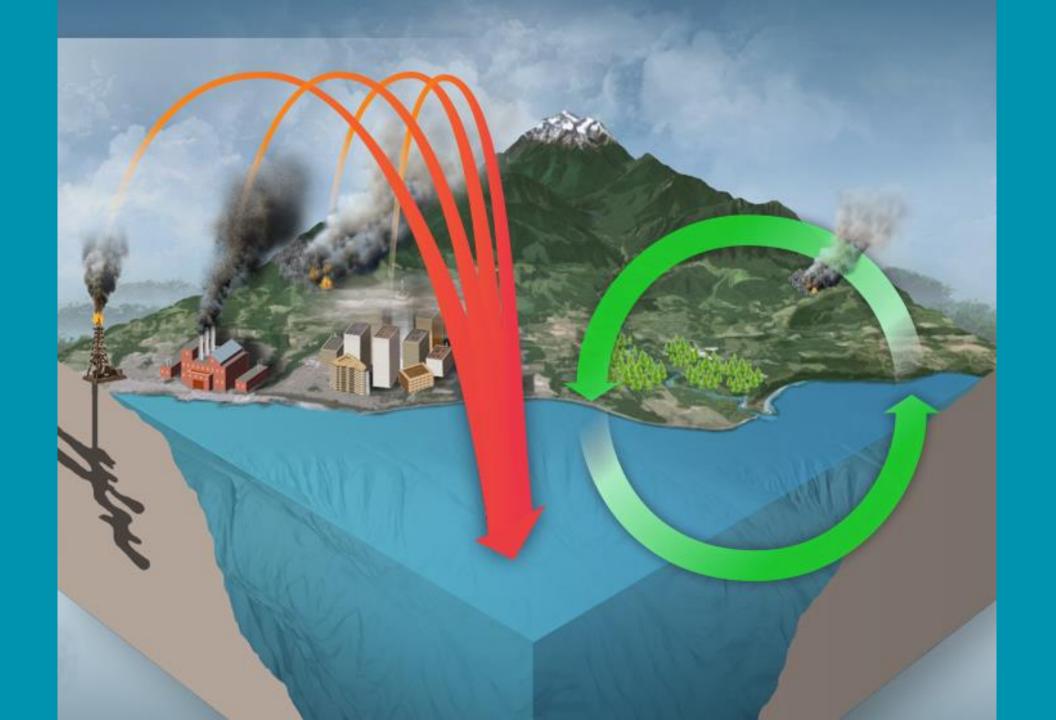
carbon dioxide



2 bicarbonate ions

consumption of carbonate ions impedes calcification

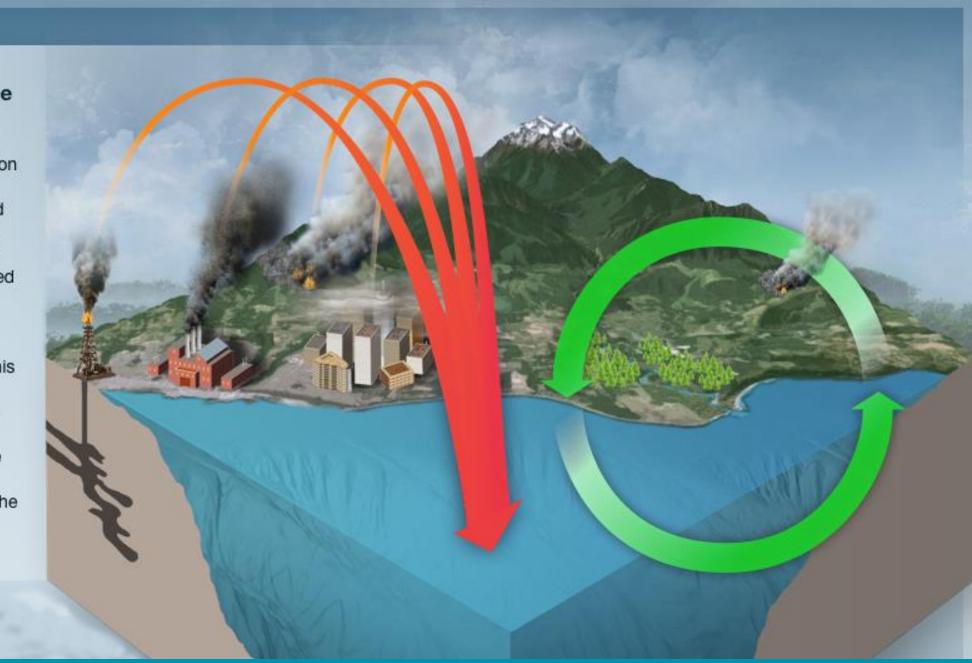
ion



The Ocean's Role in the Global Carbon Cycle

Prior to the industrial revolution carbon dioxide (CO₂) was absorbed from the air by land plants, exported via rivers to the ocean and released back into the air creating a balanced cycle on time scales of centuries to millennia.

Today, humans are altering this balance by releasing fossil carbon (e.g. coal, oil, natural gas). About one third of the fossil CO₂ is absorbed by the ocean, changing the ocean from a net source of CO₂ to the air to a net CO₂ sink.



ACIDIFICATION IN OUR OCEAN

blood flow in our bodies. Humidity, rain, and temperature are all controlled by our ocean. Burning fossil fuels adds excess heat and carbon dioxide that disrupt this system and make it harder to maintain a stable climate.

OCEAN ACIDIFICATION: Our ocean absorbs excess CO₂ when we burn fossil fuels to power cars and create electricity. This excess CO₂ increases acidity in our ocean on a global scale.

CO₂ CO₂ is produced when using

increased

acidity

The ocean absorbs CO., which mixes

with water and increases the acidity of

the water. Carbonate, used by coral and

shellfish to build their hard exteriors,

becomes scarce when ocean acidity

increases. Because many reef animals rely on coral for food and shelter, changing ocean chemistry can affect the entire coral reef ecosystem.

electricity, driving cars, and other industrial activities. We, as humans, are deeply connected to our ocean whether we realize it our not. Our ocean regulates climate like the heart regulates

COASTAL ACIDIFICATION: Nutrients entering the water from land exacerbates acidification in near shore waters.



Concentrated nutrients from septic systems and fertilizer runoff into our ocean, carrying nitrogen and organic carbon that harm the marine ecosystem.

Plankton populations thrive in high nutrient environments and can become so dense that they block light from sun-dependent organisms like coral. When this algal bloom dies, the plankton sink and are broken down. The decay process depletes oxygen and adds nutrients, exacerbating changes in ocean chemistry and creating a challenging environment for marine life.



https://oceanacidification.noaa.gov/

WHAT CAN WE DO TO HELP?



Cut back on watering your lawn or choose drought-tolerant landscaping to reduce runoff into the ocean.

Reduce the use of fertilizers with high nitrogen and phosphorus concentrations.

Y



Increased ocean acidity reduces fish size and populations. Some fish grow slower and cannot reproduce as well. Others have more difficulty avoiding predators.

> Eat a plant-rich diet and buy local produce to reduce transportation and production emissions.



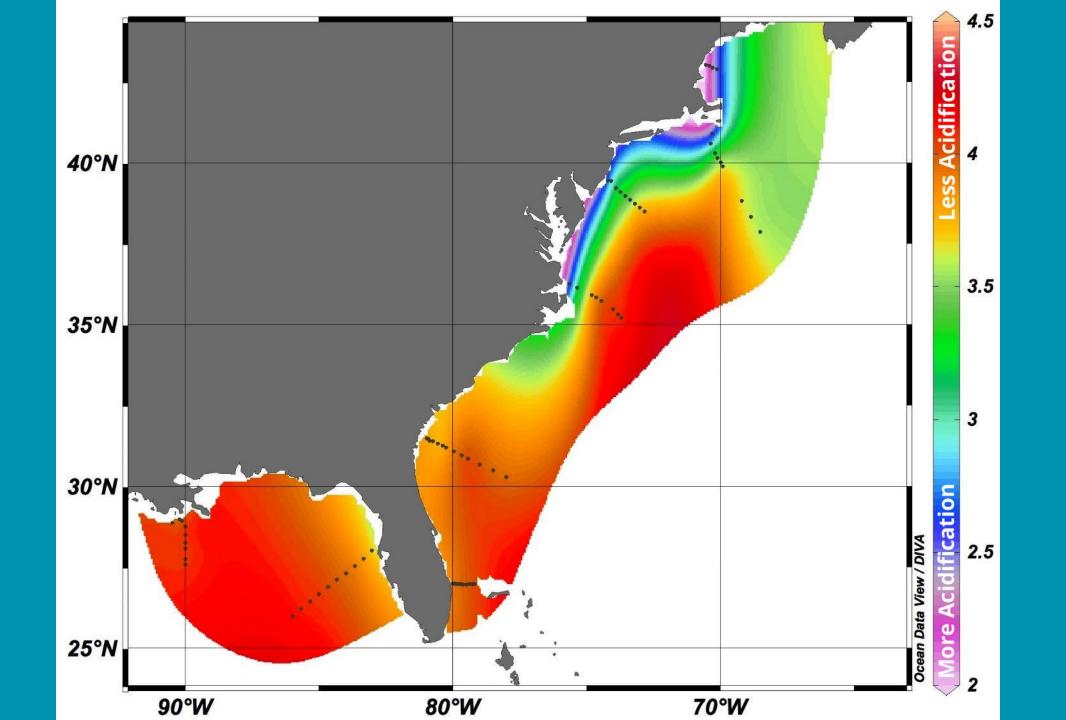
Reduce energy use by choosing energy efficient appliances and learn about solar initiatives in your community.

Which national marine sanctuaries might ocean acidification impact?



Ocean Acidification Monitoring Network







Learn More



NATIONAL MARINE SANCTUARIES

sanctuaries.noaa.gov



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Created by: Rick Reynolds, м.s.ed. + Krista Reynolds, мыз, м.ed. Engaging Every Student In collaboration with NOAA's Office of National Marine Sanctuaries, National Marine Sanctuary Foundation and National Geographic Society

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