



#### OCEAN ACIDIFICATION

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### What is Ocean Acidification?

- An emerging global problem
- Decrease in Ocean pH
- Called "climate change's equally evil twin"
  - It is a significant and harmful consequence due to excess carbon dioxide in the atmosphere. We do not see or feel this because the effects are happening underwater.

Carbon dioxide dissolves in the ocean to make carbonic acid. The amount of acid has increased over the past 150 years.



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### Impact on Coral Reefs

- Reef building corals craft own home from calcium carbonate. This provides a home for coral animals as well as habitat for other organisms.
- Acidification limits coral growth corrodes pre-existing coral skeletons
- Larvae in acidic water have trouble finding a good place to settle they are prevented from becoming adults
- Each coral specie reacts differently
- In the next century common types of coral found in reefs will be shifting
- Many organisms that depend on coral reefs will be affected. This includes the fish that we eat.

#### More research is necessary to know all the ways coral reefs will be

affected





# Impact on Oysters, Mussels, Urchins, and Starfish

- Shelled animals will have trouble building shells
- Mussels grow 25% less shell by end of century
- Oysters grow 10% less shell by end of century
- Less shell or weaker shells mean an increased chance of being crushed or eaten
- This also means that species could also be at a greater risk of dying-off
- These organisms will also have much larger effects on the food chain because they are food and habitat for other species



## Impact on Zooplankton

There are two types : foraminifera and pteropods Foraminifera are not as tolerant with the acidity They cannot grow and develop fast enough before their shell is depleted They are tiny, but are major in the food web of the ocean Critical in the carbon cycle – when die they carry calcium carbonate shells with them and are deposited as rock or sediment. – Zooplankton help remove carbon dioxide from the atmosphere Shells are susceptible because made of aragonite (delicate form of calcium carbonate) Aragonite is 50% more soluble in seawater



Here is what happens to a pteropods' shell when placed in sea water with the pH and carbonate levels projected for 2100

### Impact on Plants and Algae

- Some plants and algae may thrive under acidic conditions
- They make their energy form combining sunlight and carbon dioxide
- Seagrasses: form shallow-water ecosystems that serve as nurseries
  - Under more acidic lab conditions they were able to reproduce and grow better
- Coralline Algae: build calcium carbonate skeletons and help cement coral reefs
  - In acidifying conditions researchers found coralline algae covered 92% less area





## Impact on Fish

- The lower pH of surrounding water causes a fish's cell to come into balance with seawater by taking in carbonic acid.
  - This changes the pH of the fish's blood (acidosis)
- Fish are very sensitive and puts its body in overdrive to bring its chemistry back to normal use a lot of energy to excrete excess acid out of its blood through its gills, kidneys and intestines
- This increase in energy reduces the energy available for other tasks like escaping predator, catching food, reproducing and growing
- For example: Clownfish normally they hear and avoid noisy predators, but in acidic water they do not flee. They also travel further from home and have trouble finding their way back



Facts

- In last 250 years the acidity of the world's ocean has increased by 30%
- The ocean absorbs 25% of world global emissions
- It is predicted that by 2100 the ocean will be 150% more acidic
- In the past 200 years the oceans have absorbed more than 150 billion metric tons of carbon from humans
  - That's an average of 15 pounds per person a week
  - This is enough to fill a coal train long enough to encircle the equator 13 times a year
- Around 10 years ago the annual \$117 million West Coast shellfish industry almost collapsed due to ocean acidification. This industry supports more than 3,000 job









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#### The Future



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8.3

8.2

8.1

8

7.9

7.8

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7.5

### How can we help?

#### • Educate Yourself and Others

- Reduce your "carbon footprint"
- Power down shutting off lights, replacing light bulbs with more efficient models, dry laundry outside, carpool, etc.
- Find alternative energy sources solar power
- Don't touch reefs when diving
- Careful when anchoring a boat as to not rip out seagrass beds or scar reefs
- Be careful with what you put in the water waterways are connected
  - Limit pesticides, fertilizers, non-toxic cleaning supplies













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SOMEBODY NEEDS TO DO SOMETHING BAD NEWS! RECENT REPORTS RECENT REPORTS SAY OUR CORAL REEFS AREE IN CRITICER -MAN WILL SAVE 0 9 DANGER AFTER ALL MAN 15 RESPONSIBLE FUNNY... 1 WOULDN'T USE "MAN" AND "RESPONSIBLE" IN THE SAME SENTENCE...

## Some Videos for More Information

Acid Test: The Global Challenge of Ocean Acidification - YouTube

https://www.youtube.com/watch?v=5cqCvcX7buo

The Effects of Ocean Acidification on Pteropod Shells

https://www.youtube.com/watch?v=6H\_VDhXiFk4

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