

Grades: 6-8

Nova, “Lethal Seas”

A deadly recipe threatens the survival of countless creatures throughout Earth's oceans. We've known for years that oceans absorb about a quarter of the carbon dioxide in our atmosphere. With carbon emissions sharply rising, the silent killer is entering the seas at a staggering rate - raising the oceans' acidity. As a result, the skeletons and shells of marine creatures that form the foundation of the web of life are dissolving. Follow scientists who are seeking solutions and making breakthrough discoveries, including a unique coral garden in Papua New Guinea that offers a glimpse of what the seas could be like in a half-century. Can experts crack the code of a rapidly changing ocean - before it's too late?

After watching this episode, choose from the following questions and/or tasks to extend your learning

Question Box 1

- What ingredients make up the deadly recipe that threatens the survival of countless creatures in the Earth's oceans?
- Explain how the pH of water affected the Larvae.
- What is responsible for global warming?
- How much is a quarter of the carbon dioxide in the Earth's atmosphere?
- What is the rate at which the “silent killer” enters the seas?
- How does carbon dioxide increase the acidity of the ocean?
- How does the acidity of the ocean dissolve skeletons and shells of the ocean's marine creatures?
- What breakthrough discoveries have scientists made to prevent the dissolution of the skeletons and shells of marine creatures?
- What experiment in Papua New Guinea is giving scientists a glimpse into the future of what the seas could look like in 50 years?
- Can experts crack the code of a rapidly changing ocean - before it's too late?
- What are Porites?
- Why do coral heads in lower pH sites have more algae on them?
- Why are animals in coral reefs important for other fish?
- What are the potato chips of the sea?
- How will rising ocean acidity affect the chemistry of these underwater organisms?
- Why is there a greater abundance of seagrass in the CO₂ rich environment?
- Explain upwelling in California.

Question Box 2

- What ingredients has mankind contributed to the *deadly recipe* that is killing marine life in the Earth's oceans? What contributions can you make to help the oceanic environment?
- Why should we save our oceans for our children and grandchildren?

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- Explain how corals are formed and why are they different colors?
- Why does cold water absorb more carbon dioxide than warm water?
- What would happen if the pteropod population declined?
- Why does the change in pH affect the physical structure of the brain in ocean animals?
- Should scientists genetically modify all the coral reef animals so they could withstand lower pH levels?

Box 3 (Tasks)

- Give examples of three things that you can do to reduce your carbon footprint.
- Locate areas around your neighborhood that release CO₂ into the atmosphere. (ELD) *Create a visual representation of your neighborhood with labels and present the information orally to a family member.*
- Compare how fish and humans smell.
- Show the chemical equation of how CO₂ enters the ocean environment, then tell the story of the chemical equation. In other words, use words to describe the equation with regards to ocean acidification.
- Fully describe the life cycle of Zooxanthellae including the symbiotic relationship between Zooxanthellae and polyps, as well as the range of environmental conditions necessary for their existence. Create a model/picture.

Box 4 (Enrichment)

- Make a PPT on the various coral reefs around the world that are endangered.
- Make models of coral using clay or play dough. Make models of coral heads.
- Collect pH level data of an aquarium if available to you.
- Make models of sea urchins.
- Using existing models of ocean acidification make a prediction of when the oceans will be too acidic to support coral production. Support your predictions with evidence you gathered during your research.
- Develop a diagram that shows specific organisms that are dependent on coral ecosystems. Identify which of these organisms are able to survive and reproduce in environments other than coral reef ecosystems.

Box 5 (Extend/Real-Life)

- Our current circumstances have led to an enormous reduction in commuting, air travel, shipping, etc.. How has this reduction impacted the state of the oceans? How has this reduction impacted the earth's atmosphere? With what you learned in the show, will these be long lasting impacts? Why or why not?
- It took many people to create this show. What careers, other than scientist, would have been necessary to make this show? Of the careers you listed which interests you the most and why?
- **What if:** Imagine you want to be a scientist that studies the environment.
- What classes could you take in high school that would help prepare you for this career?
- Are there any classes that you could take that may not seem related to this career? If so, what are they and how do they relate?
- What kind of job could you get (now) to gain experience that would help you build skills for your future career as a scientist? Describe the skills and how they would be useful as a scientist.

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