

Mission Background

Duration: 15 minutes

Digital Science Journal:

Tutorial (Page 1)

Mission Background (Page 2)

More About Snails (Page 3)

Web Virtual Reality:

View Hunt

NGSS Performance Expectations:

Contributes to MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Students who demonstrate understanding can:

- Summarize how venomous marine snails hunt prey
- Recall that marine snail venom is being studied with applications for medicinal uses in humans
- Generate questions based on observations of venomous marine snails' habitat, food sources, and hunting techniques
- Identify three types of venomous marine snails prey
- Predict two types of venomous marine snails predators
- Select water turbidity levels in venomous marine snails habitats

Context for Lesson:

In Lesson 1, students are introduced to the Digital Science Journal (DSJ) and Web VR components of BioDive.

They will have several opportunities to view the anchoring phenomena of venomous marine snails stunning and eating prey, as videos and in virtual reality. News articles will provide more context about where the marine snails live, and why researching them is important to human beings.

By documenting and making observations, students also learn how to identify different aspects of marine ecosystems and practice asking questions to guide further inquiry.

This lesson extends student knowledge around predator prey relationships and provides concrete representations and manipulatives of food chains in a single ecosystem. This will prepare students to understand and describe the impact of abiotic and biotic variables on ecosystems.

Student Prior Knowledge:

Before beginning this lesson students should know:

- What devices they will be using throughout this experience
- The locations of their laptops/iPads and VR headsets
- The routine for distributing and collecting devices.

Potential misconceptions:

The specific content about venomous marine snails will probably be unfamiliar to most students, and misconceptions may come from prior knowledge about garden snails or other marine creatures.

The venomous marine snails' habitat (tropical waters), size (3-4 inches in length), and levels of aggression (not aggressive toward humans) may all motivate students' initial questions, and will be addressed through the material or in discussions.

SEP:

Asking Questions and Defining Problems

Developing and Using Models

DCI:

LS2.A: Interdependent Relationships in Ecosystems

CCC:

Patterns

Cause and Effect

Activity	Learning Experience	Duration
Direct Instruction	Students are introduced to BioDive and how to use the DSJ and Web VR, collect their devices, and log in.	2 Minutes
DSJ Tutorial, Mission Background	Students complete the tutorial, observe the anchoring phenomenon, and develop questions about venomous marine snails.	5 Minutes
Web VR View Hunt	Students observe venomous marine snails hunting three kinds of prey in an immersive VR experience.	3 Minutes
DSJ More About Snails	Students recall the venomous marine snails' prey and predict their predators to prime them for trophic level work later in the experience, and are introduced to the concept of turbidity in the snails' habitat. The Deeper Dive provides real-world context for biomedical research about venomous marine snails.	5 Minutes

Potential Discussion Questions:

- 1. What are observations and why do you think they are important in science?** *A. Observations are things that you noticed within an environment. They are important because they are the first step in developing questions about how systems work.*
- 2. What types of observations were we able to make with the venomous marine snails from the field (ocean) that we wouldn't have been able to do in a laboratory setting?** *Answers will vary, see the venomous marine snails interact in their natural environment*
- 3. How can these observations help us protect the venomous marine snails and help scientists study them to create medicines?** *Answers will vary- see what venomous marine snails need to eat to survive, what kind of environment that is best for them to thrive, etc.*
- 4. Why is it important for scientists to develop questions from observations and define specific problems they want to research?** *A. Defining specific problems allows scientists to have a clear path to design a controlled experiment to test the specific problem based on their observations.*
- 5. Based on what you have observed so far, what are some of the abiotic (non-living) factors that are needed for a healthy reef?** *A. Low Turbidity, with coastal waters and lots of sunlight.*
- 6. What are a few questions you have after watching the venomous marine snails hunt their prey?** *A. Answers may vary, see if students can determine why scientists may have been interested in studying these snails to check for understanding and prime for question 2.*
- 7. Why are scientists studying venomous marine snails?** *A. Their deadly toxins can be turned into palliative (pain reducing) treatments for humans.*
- 8. What are the three different types of prey these venomous marine snails hunt with their deadly toxins?** *A. Mollusks, fish, worms*
- 9. What are some predators of venomous marine snails?** *A. Turtles and lobsters*

Duration: 15 minutes

Digital Science Journal:

Ocean Zones (page 4)

Ecosystem (page 5)

Seas Under Siege (page 6)

Trophic Levels (page 7)

Web Virtual Reality:

Start Dive

NGSS Performance Expectations:

Contributes to MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Contributes to MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Students who demonstrate understanding can:

- Classify and compare oceanic zones (Ocean Zones, pg 4)
- Identify organisms in their marine habitat (Ecosystem, pg 5)
- Predict essential features of a healthy marine ecosystem (Ecosystem, pg 5)
- Recognize organisms in a coral reef (Start Dive, VR)
- Compare organisms based on trophic levels (Start Dive, VR)
- Compare changes to biodiversity in the same ecosystem at two points in time (Seas Under Siege, pg 6)
- Categorize marine organisms by trophic level to distinguish between consumers and producers, autotrophs and heterotrophs (Trophic Levels, pg 7)

Context for Lesson:

Students are introduced to different ocean zones and observe how differences in abiotic factors influence the organisms that live in a habitat. Lesson 2 introduces the idea that industrial sites could threaten the venomous marine snails' habitat. This lesson increases student knowledge around oceanic zones, predator prey relationships, and provides concrete representations and manipulatives of food chains in a single ecosystem to prepare students to understand and describe the impact of abiotic and biotic variables on ecosystems.

Student Prior Knowledge:

Before beginning this lesson, students should know:

- The content from pages 1-3, especially the anchoring phenomenon of venomous marine snails hunting prey
- How observations help scientists define problems
- Ecosystems include both biotic and abiotic factors

Potential misconceptions:

This lesson introduces the narrative element of industrial activity affecting the marine ecosystem, and students may have misconceptions about the causal mechanisms behind changes in the ecosystem. Student may think abiotic factors have no effect on an ecosystem.

Students may believe coral is a producer, because it does not move and looks like a plant. However, coral is a primary consumer, and eats organisms like zooplankton to get their energy.

Students may get confused about which way the energy flows. Explain that energy flows start with the producer and flows to the primary, secondary, and tertiary consumers, then decomposers.

SEP:

Asking Questions and Defining Problems
Developing and Using Models

DCI:

LS2.A: Interdependent Relationships in Ecosystems
LS2.B: Cycle of Matter and Energy Transfer in Ecosystems
LS2.C: Ecosystem Dynamics, Functioning, and Resilience

CCC:

Cause and Effect
Systems and System Models

Activity	Learning Experience	Duration
DSJ Ocean Zones	Students classify oceanic zones and predict what organisms might live there.	3 Minutes
DSJ Ecosystem	Students predict essential features of a healthy marine ecosystem.	3 Minutes
Web VR Start Dive	Students embark on a dive to a healthy marine ecosystem where they'll observe diverse organisms across a variety of trophic levels.	3 Minutes
DSJ Seas Under Siege	Students return to the DSJ to distinguish changes to biodiversity at two points in time.	2 Minutes
DSJ Trophic Levels	Students use their understanding to categorize organisms by trophic level.	4 Minutes

Potential Discussion Questions:

- 1. Which zone do you think the venomous marine snails live in, and why?** A. *Intertidal or pelagic because they receive sunlight to create food for the snails' prey.*
- 2. How is a food chain different than a food web?** A. *Food webs contain many food chains. They both show how energy is passed through an ecosystem, but a food chain only shows one way energy flows in an ecosystem.*
- 3. What do we call the organisms at the bottom of the food web? Where do they get their energy from?** A. *Primary producers. They are plants and algae and get their energy from the sun through the process of photosynthesis.*
- 4. What is the name of the group of organisms that eat those producers?** A. *Primary consumers, which are also called herbivores.*
- 5. What is the name of the group of organisms that eat primary consumers?** A. *Secondary consumers. They might be carnivores or omnivores.*
- 6. What is the name of the group of organisms that eat secondary consumers?** A. *Tertiary consumers, they are usually carnivores.*
- 7. Who are our top predators?** A. *Apex predators.*
- 8. After looking at the two images, how would you define biodiversity?** A. *An ecosystem having a variety of different kinds of organisms.*