LESSON 5

Snapping Shrimp

INTRODUCTION & BACKGROUND

What are Snapping Shrimp?

Snapping shrimp are small shrimp with a big claw. These small shrimp are causing scientists to sit up and listen. For many years, scientists had noted a certain crackling noise in the ocean. The question facing them was "How is this sound being made?" Finally, scientists were able to capture snapping shrimp on video while recording underwater sounds. Using this information, the scientists discovered how the sounds are produced.

Snapping shrimp have one large claw that they use for defense and predation. When the claw snaps shut, a bubble forms between the sections of the claw and a jet of water shoots out. As the bubble travels, pressure changes cause the bubble to implode, producing a "snapping sound". This noise is part of the "tropical biological background" noise. It can be heard by military SONAR sensors in submarines and even by snorklers swimming near tropical reefs.

Scientists who have studied snapping shrimp have noticed that these sounds vary. They are more pronounced in the evenings when the shrimp are more active. Snapping shrimp use their jets of water to stun prey and predators (other shrimp, crabs, invertebrates) up close. They also use the sound to warn other snapping shrimp to keep their distance.

Where do Snapping Shrimp Live?

Snapping shrimp are found in shallow, protected, warm waters. They do not live in polar regions. Snapping shrimp live in small niches among rocks and coral, digging out sand and lightweight material. Typically, they are solitary animals. However, they have been observed in mutualistic relationships with Goby fish – the shrimp digs a protected hiding spot they can share, and the fish (who has better eyesight than the shrimp) alerts the shrimp to the presence of predators.

The researchers aboard *Ocean Watch* will be using a **hydrophone** during the expedition to record different types of underwater sounds. It is likely that they will hear snapping shrimp when they are in protected, tropical waters and ports.

Scientists on Ocean Watch *use a hydrophone (right) to listen to underwater sounds.*
Image courtesy of J. R. Olson, Cetacean Research Technology

ACTIVITY MISSION

Time: 15-30 min.

By taking on the role of a snapping shrimp or the sensors that detect them, students will explore the unique adaptations of snapping shrimp and how they are detected.

CONCEPTS

- Snapping shrimp are only one example of the variety of living organisms that the ocean supports.
- Snapping shrimp have unique adaptations.
- Scientists use technology (visual and auditory) to learn about snapping shrimp.

LEARNING OBJECTIVES

- Students will be able to demonstrate their comprehension of the human connections with the ocean and its unique inhabitants by describing their personal experience and observations with "shrimp static."

STANDARDS & PRINCIPLES

U.S.: 6, 9.7, 9.8, 12.1, 13.6

Canada: 109-2, 111-2, 111-5, 422

Ocean Literacy Principles: 5d

PRE-DELIVERY PREP

Supplies Needing a Day or More to Prepare

- Signs

Hard-to-Obtain Materials

- None

SAFETY GUIDELINES

Safety Procedures

Hazardous Materials

- None

Safety Concerns for Students

Tripping Hazard: Adequate space should be given for students to move around without contacting desks, chairs, or personal items.

SUMMARY OF SUPPLIES

Durable Supplies

ITEM	DESCRIPTION	QUANTITY
None required; All are optional.		
Scenario cards: "Night"/"Day" "Boat", Whale", "Predator"/"Prey" or other crustacean activity	Laminated (See Procedure for description)	1 each
Sound-maker	"Clickers" or household objects that can be used to make soft sounds	About 12

Consumable Supplies

None

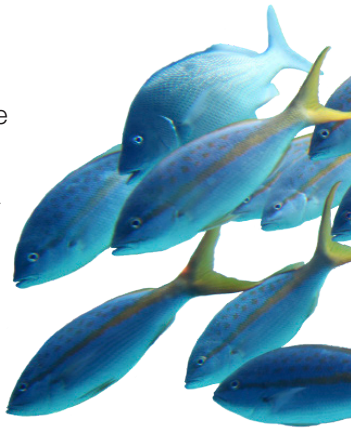
PROCESS & PROCEDURE

Pre-simulation Preparation:

This simulation may be done in the classroom or a large open area. Adequate space should be given for "shrimp" to move around.

1. Assign students in the class to one of three different roles: "Detector," "Emitter" or "Snapping Shrimp." (More than one student may be "Detector" or "Emitter", but the majority of the class should play Shrimp.)
   - **Detector:** Mimics a hydrophone by listening for signals. The Detector tries to locate/track the emitter and remember the sequence and location of sounds. The Detector produces a sound when it detects and records a signal. (You may wish to designate a specific sound the Detector is detecting, such as whale sounds.)
   - **Emitter:** Produces signals mimicking marine sounds, such as boats, submarines, whales or dolphins. Emitters should make soft sounds that can be made repetitively and heard by the Detector. They can be representative, rather than realistic, e.g. a spoken "ping", soft bell, click of "clicker", tap wooden sticks, etc.).
   - **Snapping Shrimp:** busy scurrying around the rocky, ocean shallows, will SNAP (using one hand, salad tongs, etc.) when other shrimp come too close to their territory (e.g., just beyond arms reach); more active at night than during the day.
2. Designate the "ocean" – the area that will be monitored by hydrophones. (You may decide if the Emitters and Shrimp must stay within this region of the ocean or if, boats or whales can "pass through.")

3. The Detectors stand at a fixed location in the ocean (near the surface, at middle depths or on the ocean floor). They stand still. (You may decide which way the Detectors should face: toward the surface, the ocean floor, at an angle, etc.) They keep their eyes closed or are blindfolded so they cannot see the activity of the shrimp. (This sensor array has no optic sensors.)
4. The Shrimp and the Emitters are free to move about in the "ocean", but cannot touch another shrimp or the sensors.)
5. The Emitter "pings"; the Detector responds with a sound.
6. The Shrimp mill about, SNAPPING when they meet other snapping shrimp.
7. As the "shrimp" acclimate to their role and environment, their activity (and SNAPPING) will increase. (You can silently cue the activity of shrimp and emitters by holding up various scenario cards –
   a. "Day" – shrimp active in and around burrows, but not at great distances
   b. "Night" – shrimp activity increases because it is difficult for predators to see them
   c. "Boat" – travel near "ocean surface"
   d. "Whale" – low tones, swim at all ocean levels
   e. "Predator", "Prey" or other crustacean activity.
8. After a few moments of "ping"-ing and SNAPPING, stop the simulation.
9. If possible, rotate roles so every student has a turn being a shrimp and either a Detector or Emitter.



(Note to Teachers: If students get carried away with snapping and it's difficult to be heard over the noise, the students have fulfilled the simulation in their own way – creating noise interference.)

Reflection

- What did you observe/experience as a shrimp/emitter/detector?
- How did this activity illustrate snapping shrimp and their habitat?

K–5 ADAPTATIONS

Write and illustrate a short story about your experience. Would you stay quiet or increase your snapping if a predator came near you? What happens to a snapping shrimp? How do researchers learn about them? What technologies do they use?