

Lesson E: The Role of a Researcher

Unit Questions How is sound related to marine species survival? What is the relationship between a marine animal's soundscape, sound output, sound reception, and the overall survival and well-being of that animal? Lesson Question How do researchers study whales and sound data?	Suggested Prior Lesson Lesson B: Properties of Sound Lesson D: Visual Representations of Sound Suggested Subsequent Lesson Lesson F: A Whale's Perspective
Grade Level 6-8	Time Required One session

Abstract

In this lesson, students will explore how scientists identify and understand whale sounds and interactions. Students will explore different sounds both with audio and visual (spectrogram) interpretations. In the lesson, students will explore how researchers draw conclusions about whales and how they study the different types of calls. Students will also learn how researchers interpret hydrophone data, and how hydrophones are used for passive study of large marine animals.

Prior Knowledge/ Background for Students

For this lesson, it is helpful for students to understand fundamentals of sound, including decibel, frequency, pitch, and tone.

Objectives ☐ Learn how scientists interpret spectrograph and hydrophone data to help them determine which animals are present. ☐ Explore and discover how researchers communicate with one another about their research themes and findings	Materials None	Suggested Links and Downloads ☐ <i>Animal Calls in Writing.docx</i> ☐ <i>Humpback Whale.mov</i> ☐ <i>Biggs Killer Whale.mov</i> ☐ <i>Sealion.mov</i> ☐ <i>Blue Whale.mov</i> ☐ <i>Mystery Sounds (student).docx</i> ☐ <i>Mystery Sounds (teacher).docx</i> ☐ <i>Small Boat.mov</i> ☐ <i>Unknown Mammal.mov</i> ☐ <i>Grey Whale.mov</i> ☐ <i>Sperm Whale.mov</i> ☐ <i>Whales Bother Seals.mov</i> ☐ <i>Orca Sound Sort (student).docx</i> ☐ <i>Orca Sound Sort (teacher).docx</i> ☐ <i>Biggs.mov</i> ☐ <i>L pod.mov</i> ☐ <i>K pod.mov</i> ☐ <i>Off-shores whales.mov</i> ☐ <i>Example 1.mov</i> ☐ <i>Example 2.mov</i> ☐ <i>Example 3.mov</i> ☐ <i>Lesson E Interviews.mp4</i> ☐ <i>Lesson E Show What You Know Rubrics.docx</i>
---	--------------------------	--

The “Hook” (Suggested Introduction)

- Refer to *Animal Calls in Writing.docx*, a printable sheet of flashcards that have four animal calls written out in words as well as a key for you. Print these out ahead of time and cut them out. Select four volunteers to read one of the calls out to the class. Warning, this may lead to a bit of giggling!
- After each student has read each call, ask the students to talk about the calls as if they were scientists.
 - What were the differences in each call?
 - How did the changes in pitch and tone surprise them?
 - As researchers, what did they learn from the whale calls?

You will likely find your students have trouble answering the questions as they have not really heard the calls, only their classmates’ attempts to “say” them.

- One at a time, ask the volunteers to read out the call again and then play the audio clips of the actual animal calls (audio only, do not show the spectrograms). Some of the clips will be from the previous lessons and will likely be familiar. Clips:
 - Animal A = humpback whale (*Humpback Whale.mov*)
 - Animal B = orca whale (*Biggs Killer Whale.mov*)
 - Animal C = sea lion (*Sealion.mov*)
 - Animal D = blue whale (*Blue Whale.mov*)
- Now that they’ve heard the actual calls, can they identify any of the animals? You may want to revisit the questions you asked previously and discuss how the answers might be different now that you’ve heard the actual calls.
- Lead into the first activity, “How do researchers share data?”

Activity Outline

Activity	Resources	Teaching Points
How do Researchers Share Data?	<i>Humpback Whale.mov</i> <i>Biggs Killer Whale.mov</i> <i>Sealion.mov</i> <i>Blue Whale.mov</i>	Discuss with students: □ As a researcher, how would you explain calls heard in one region to a researcher in another region? You may re-play the audio clips from The “Hook”, but do not show the spectrograms because it will give away some of the answers in the next activity.
Mystery Sounds (spectrogram matching activity)	<i>Mystery Sounds (student).docx</i> <i>Mystery Sounds (teacher).docx</i> <i>Small Boat.mov</i> <i>Unknown Mammal.mov</i> <i>Biggs Killer Whale.mov</i> <i>Blue Whale.mov</i> <i>Grey Whale.mov</i> <i>Humpback Whale.mov</i> <i>Sperm Whale.mov</i>	See “Activity Details” at the end of this lesson plan for complete description of this activity. Students will match given spectrograms to a list of ocean sounds. The activity is completed in two parts: first without hearing the sounds and then with the sounds.
Explain That Sound	<i>Whales Bother Seals.mov</i>	Show students the spectrogram of this clip (without audio). What do they think is happening? After a few minutes of discussion, play the audio for students. Ask students to take on the role of a researcher. Discuss with students:

This group of orca, G-clan, is known for eating salmon and salmonid fish, yet it sounds like they are interacting with another animal. What might this animal be?

After a few minutes of discussion about the sound, reveal that the orca may be interacting with a seal.

Brainstorm:

- ☐ Why would an orca interact with a seal?
- ☐ How would you share this unusual occurrence with another researcher?

Orca Whale
Sound Sort

Orca Sound Sort (student).docx
Orca Sound Sort (teacher).docx
Biggs.mov
L pod.mov
K pod.mov
Off-shores whales.mov
Example 1.mov
Example 2.mov
Example 3.mov

See “Activity Details” at the end of this lesson plan for complete description of this activity.

Students will identify three whale calls, from a set of seven, that belong to the same clan. They will first sort based on given spectrograms and then refine their sort based on hearing the audio clips.

Researcher Interviews

Lesson E Interviews.mp4

Researchers interviewed:

- ☐ Amalis Riera
Researcher, University of Victoria
- ☐ Lance Barrett-Lennard
Research Scientist, Vancouver Aquarium

Questions asked:

- ☐ What kind of orca groups do we have around Vancouver Island?
- ☐ What is the difference between the offshore, transient, and resident orcas?
- ☐ Are there differences among the sounds made by the different groups of whales?
- ☐ What are the habitats of each group of whales?
- ☐ Do whales talk with each other?
- ☐ Are these dialects distinct between groups or pods?
- ☐ What were some record moments in studying orcas?

Suggested Summary

Discuss with the students:

- ☐ How did the spectrograms help you (as scientists) to determine which animals were present in the clips?
- ☐ Scientists categorize calls so that they can distinguish them from one another, and so that they can identify the location of animals and clans.
- ☐ Think/Pair/Share: How would you label and categorize the calls of the whales? How would and/or could this help you communicate your findings and ideas with other whale researchers?

Show What You Know

Make a Written Piece

Explain: How does sorting the sounds and calls recorded on a hydrophone help researchers understand what is happening in the ocean? How can knowing what a 'normal' sound looks and sounds like help researchers understand changes in the ocean?

Make a Media Presentation

Make a visual presentation that shows how your group chose to sort the calls from either the mixed animal group or from the killer-whale group alone. What key features did you look and listen for in your group? What would a viewer need to know about the different features of a call?

Take on a Role

Take on the role of an interpreter. Explain how you would educate a group of interested people about the differences in whale calls. If you were asked to talk about the differences among whale clans, what would you say?

Assessment Options

- ☐ Overall lesson assessment questions
 - ☐ Observe the students. Are they contributing to the discussions?
 - ☐ Have the students respond to questions such as: How do scientists communicate with one another about whale behaviour and different clans? How is a visual understanding of sound more important than just an audio understanding? How is dialect important to understanding different pods of whales?
 - ☐ Assess engagement and impact. Are students participating actively and fully in class?
- ☐ Show what you know
 - ☐ See: *Lesson E Show What You Know Rubrics.docx*

Activity Details

Mystery Sounds

Divide students into groups of three to five. This activity will consist of two parts.

Part one:

Give each group a package of spectrogram calls (*Mystery Sounds (student).docx*). Their task is to match the spectrograms to the list of ocean sounds provided, without actually hearing the sounds. The package also contains a list of clues. An answer key is provided in *Mystery Sounds (teacher).docx*.

Students should know the spectrograms include:

- ☐ a small boat
- ☐ an unknown mammal, most likely a pinniped (seal)
- ☐ Biggs killer whale
- ☐ blue whale
- ☐ grey whale
- ☐ humpback whale
- ☐ sperm whale

Part two:

1. Play each audio clip for the students in the order they are listed above.
2. Ask students if they are still happy with their sorting or if they wish to make any changes. (Groups may have different answers.)
3. Tell students to imagine that each of the groups represents an independent researcher. How would they communicate their findings to one another and come to a consensus on the sounds?
4. Have the students discuss their rationales and come to a consensus on the sources of the sounds.
5. Reveal the answers. Discuss with students.

Orca Whale Sound Sort

Explain to students:

One revelation for researchers was the discovery that orca whales have very different calls depending on their clan. In this activity, they will be asked to identify calls that belong to the same clan.

Divide students into groups of three to five. Give each group a package of spectrogram calls (*Orca Sound Sort (student).docx*). Their task is to identify three whale calls that belong to the same clan. An answer key is provided in *Orca Sound Sort (teacher).docx*. You may want to have students cut the spectrogram pages in half so that they have each spectrogram on a separate piece of paper and can physically move them around to sort and compare.

Allow students to come up with their own sorting methods based on what they've learned in the activities so far. This time, they are not provided with clues.

Have the groups share their sorting methods with the class. What key features did they use in their sorting?

Then, play the audio clips for the students. Do they wish to refine their sorting? Did their sorting methods change? Why, or why not?

Reveal the answers.
