

Shouting Whales

Lesson F: A Whale's Perspective

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

What would it be like to be a whale?

Suggested Prior Lesson

Lesson E: Role of a Researcher

Suggested Subsequent Lesson

This lesson could be used as the second to last lesson, or it could be the opening lesson in the unit. If it used as an opening lesson, it can be followed with Lesson A: Human Sounds in the Ocean.

Grade Level

6-8

Time Required

2-3 sessions, depending on activities chosen

Abstract

In this lesson, students participate in activities to try and understand "What is it like to be a whale?" Using simple games, experiments, and a bit of imagination, students try and understand noise pollution from a whale's perspective. Students record their experiences with and without noise pollution in order to gain empathy for whales and experience noise pollution from a whale's perspective.

Prior Knowledge/ Background for Students

Students will benefit from some prior knowledge about ocean ecosystems and human activity in the ocean. It is beneficial to touch on west coast ecosystems and the ocean conditions around Vancouver Island. Lesson A: Human Sounds in the Ocean can be used as a prior lesson for students, though it is not mandatory.

Objectives

- ☐ Explore and identify the different types of orca whales found off the coast of North America.
- ☐ Create a baseline for normal whale senses to compare against in future lessons.
- ☐ Explore how orcas use sound as part of their social structure, breeding, and feeding behaviors.

Materials

- ☐ A large space
- ☐ Small, palm-sized noise maker
- ☐ Waxed paper

Suggested Links and Downloads

- ☐ *Words - Do You Speak My Language?.docx*
- ☐ *Spot the Differences 1.jpeg*
- ☐ *Spot the Differences 2.jpeg*
- ☐ *Lesson F Interviews.mp4*
- ☐ *Lesson F Show What You Know Rubrics.docx*

The "Hook" (Suggested Introduction)

- ☐ Brainstorm with the students: "What would it be like to be a whale?"
- ☐ Explore the following points in your discussion:
 - ☐ How do whales communicate with one another?
 - ☐ How do whales see under water?
 - ☐ How do whales hunt for food?
 - ☐ Do all whales use the same hunting strategy?
 - ☐ How do whales know who are the members of their pod?
 - ☐ How would noise pollution impact all of these survival strategies?
- ☐ After the students have had some time to brainstorm, explain that during this lesson they are going to try and emulate what it's like to be a killer whale using simple experiments with and without noise pollution.

Activity Outline

Not all activities are required. For comparison it is good to complete at least two activities, though all can be completed if there is time.

The lesson takes place in two parts. In both parts the students participate in each activity and gather data on each task by recording information such as:

- ☐ how long each task took
- ☐ how many successful attempts were achieved
- ☐ how the experience related to how a whale might respond in an environment
- ☐ their own personal observations

In Part One, the activities selected are completed with no background music. For Part Two, the same activities selected in Part One are repeated, this time with loud music playing to create noise pollution. (Activity Four is an exception to this. Please see description.) For authenticity, instead of music you may choose to use loud ship sounds, sonar pings, or construction sounds to create the noise pollution. The students then compare the results of the first part of the lesson with those in the second. It is important that after each activity the students record the same information as the first time, so they can compare their experiences with and without noise pollution.

The intention of the lesson is to create an understanding of what the whales normally experience, and compare it to what the whales may experience with noise pollution.

Activity	Resources	Teaching Points
Hunt Like a Biggs Killer Whale	A large space Small, palm-sized noise maker	<p>See “Activity Details” at the end of this lesson plan for complete description of this activity as well as additional background information.</p> <p>If suitable for your class, have the students brainstorm and pursue inquiry around the Biggs killer whale before completing this activity.</p> <p>In this activity, one group of students is a whale pod, and the rest of the students are seals. Using sound clues, the whales try and catch a seal.</p> <p>Remember to try the activity once without extra sound, and once with noise pollution (for example, play very loud music).</p> <p>After the activity, give the students time to record their experience. Did they have any surprises?</p>
Echolocate to the End	A large space	<p>See “Activity Details” at the end of this lesson plan for complete description of this activity as well as additional background information.</p> <p>In this activity, students make a human tunnel through which a blindfolded “whale” navigates to a fish. The tunnel helps the whale by making noise when the whale strays off course.</p>

Remember to try the activity once without extra sound, and once with noise pollution (for example, play very loud music).

After the activity, have the students discuss their experiences.

- ☐ How difficult was it to find the fish?
- ☐ How difficult was it to trust their ears rather than their eyes?

Do You Speak My Language? *Words - Do You Speak My Language?.docx*

See "Activity Details" at the end of this lesson plan for complete description of this activity as well as additional background information.

During the activity, students are each given a word to say out loud. They must listen for their pod member (who will be saying the identical word), and their clan members (who will be saying similar words).

Remember to try the activity once without extra sound, and once with noise pollution (for example, play very loud music).

After the activity, discuss:

- ☐ How did sound impact this activity?
- ☐ How much more difficult would it be if you needed to hear complete messages, instead of just words?

Where Is It? *Spot the Differences 1.jpeg*
Spot the Differences 2.jpeg

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

Waxed paper

In this activity students search for the differences between two similar images. Layers of semi-transparent waxed paper are added, making it more difficult to see.

This is the only activity that does not need additional sound. The wax paper acts as a blind, the same way aggressive ocean noise can blind a whale. The activity is meant to help students make the connection that whales use their sense of hearing the way that we use our sense of sight, to navigate our environment. Another analogy is that a loud noise to a whale is much like a bright flash of light to us.

After the activity discuss how the extra layers of waxed paper impacted the speed and accuracy of their searches.

Researcher Interviews

Lesson F Interviews.mp4

Researchers interviewed:

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

Questions asked:

- ☐ What is echolocation?
- ☐ How does echolocation work?
- ☐ During echolocation is there a different sound that bounces back off of different species or things?
- ☐ How far can a killer whale echolocate?
- ☐ How important is sound to an orca whale?
- ☐ In what way is noise pollution affecting orca whales?

Suggested Summary

Come together as a class and collect the data from the activities.

- ☐ Compare:
 - How often were the whales successful at catching the seals?
 - How long did it take for the orca to find the fish via echolocation?
 - How successful were the whale pods at finding one another and their clans?
 - How long did it take for the whales to find all the differences in the search? (Or, alternatively, how many differences did they find in the given time?)
- ☐ Ask the students and explore:
 - Why is it important to understand how animals behave in undisturbed conditions?
 - Is it even possible for us to achieve these conditions?

Guide the discussion toward the idea that understanding our impacts on animals can only be done by knowing how they may be behaving when we are not present. Although tissue and fecal samples can be tested for stress, we can only identify behaviour as abnormal if we understand normal behaviour.

- ☐ If you wish, you may also want to discuss why it is important to have an understanding of how our actions are affecting animals (empathy for the animals), and why this may be important in guiding policy making.

Show What You Know

Make a Written Piece

Discuss and explore: What is it like to be a whale in the marine environment? How does excess noise impact whales? For this activity, you may choose to write from the first person in the 'voice' of the whale.

Make a Media Presentation

Graphically represent the data collected during the experiments. What does it tell you about being a whale? What would readers need to know about how whales experience the marine soundscape?

Take on a Role

Put yourself in the role of a scientist. What did today's observations tell you about normal whale behaviour? If you were asked to present on normal or undisturbed whale behaviour, what would you say?

Assessment Options

- Overall lesson assessment questions
 - Observe how accurately students take their recordings and measurements.
 - Assess student engagement and care in the experiments. Do they participate fully and allow others to do so as well? Are the students accurately recording their data and making hypotheses about how the experiment might proceed?
 - Have students respond to questions such as: Why is sound important to whales? How is sound used by whales in their environment?
 - Assess students' engagement in activities. Do they use the activities to create a baseline for comparison or engage in off-topic behaviour?
- Show What You Know
 - See: *Lesson F Show What You Know Rubrics.docx*

Activity Details

Hunt Like a Biggs Killer Whale

Background information:

Biggs killer whales use passive listening to hunt for their food. This means that, rather than calling out and listening for a return echo, Biggs killer whales listen for the natural noises created by their prey. They then try and subdue their prey as quietly as possible, without alerting the prey to their presence. This means they need to communicate with one another without making noise. Biggs killer whales hunt mammals and if they vocalize or communicate, their prey will hear them coming. In order to capture their prey, they need to sneak up on it.

How to play:

Have the students spread out in a large space. Five students are Biggs killer whales, and they are looking for food—a seal. The student acting as the seal has a small noise-maker, a rattle, or clicker hidden in her or his hand. The rest of the students are decoys, and should stand throughout the space. On “go”, the seal starts shaking the noise-maker. The whales have three minutes to surround the seal and “capture it”. Remind students that they cannot talk to each other – they must communicate silently. The whales make a capture by making a ring around the correct seal. Allow a few teams to try and surround different seals so all the students have a chance to try an activity.

Remember to try the activity once without extra sound, and once with noise pollution (for example, play very loud music).

After the activity, give the students time to record their experience. Did they have any surprises?

Echolocate to the End

Background information:

All orcas use echolocation to navigate in their environment to some extent. Southern and Northern resident orca, fish-eating orca, use echolocation to find food in the form of fish. In this activity, students work as a team to navigate to food.

How to play:

Divide the class into two lines, and have them stand face-to-face across from each other, with a space in the middle (creating a tunnel of people facing in). For an added challenge, put a few bends and curves in the tunnel. Select one student to be the “whale”. Without the “whale” seeing, select one member of the tunnel to hold the fish—a noisemaker that can be shaken or rattled works well. As you run through the activity, be sure to move the position of the fish.

Students on the sides of the tunnel need to help keep the whale safe by directing them to the food and making noise when they get too close to the tunnel walls. The right side of the tunnel snaps their fingers if the whale begins to get close. The faster the snapping, the closer the whale is to the wall. The left side of the tunnel claps their hands gently. The faster they clap their hands, the closer the whale is to them. Meanwhile, the fish, hidden somewhere in the tunnel, starts shaking the noisemaker. The fish should be an audible but subtle sound.

When everyone is ready, blindfold the whale and start the whale at one end of the tunnel. The whale will have to navigate the tunnel blindfolded to find the fish. To keep from bumping into the tunnel walls, the whale will have to listen for clues from the sound tunnel, as if using echolocation to navigate. On “go”, the whale has one chance to get to the fish without hitting the tunnel wall. If the student does bump a wall, that student is out and another student will become the whale.

Remind the students making the tunnel that if the whale is going to bump into them, they can hold up their hands gently to direct the whale back towards the middle of the tunnel. As the teacher, record how many times the whale “bumps” the tunnel wall and how long it takes the whale to find the fish. Students will use this baseline data later as a comparison. Run through a few trials using different whales and different fish. Record the results for later.

Remember to try the activity once without extra sound, and once with noise pollution (for example, play very loud music).

After the activity, have the students discuss their experiences:

- ☐ How difficult was it to find the fish?
- ☐ How difficult was it to trust their ears, rather than their eyes?

Do You Speak My Language?

Background information:

Orca whales communicate with a set of calls, whistles, and clicks. The Northern Residents, Southern Residents, and Biggs killer whales are all separate communities; scientists have found that these communities have very different acoustic repertoires (like a language), and thus do not communicate with each other. Within these communities there are groups of whales, pods that live together and “speak” with similar sounds. The Northern Residents are separated into clans A, G, and R. There are several pods within each clan. All of these pods can communicate with each other, but each pod has a slightly different dialect. Scientists can identify the different pods and clans based on their calls. Similarly, the Southern Residents are separated in pods J, K, and L, but there is only one clan, which is known as J clan. Each of these pods has a different dialect, but they all can all communicate with others in the clan.

Analogy:

A pod dialect is analogous to people from Britain, Canada, and Australia all trying to communicate. Each person speaks English, but there some differences in their phrases, accents, and slang words that may be unknown to the others. For example, a Canadian may say “I have to go pee!”, whereas a common phrase in Britain is “I have to spend a penny!”.

So, orca whales communicate and use the same dialect as other members of their pod (i.e. L or J or K). Whales from a particular pod (i.e. J pod) can communicate with other pods (i.e. K and Ls) from their clan (i.e. J) but some sounds are different since they use different dialects.

How to play:

Before starting, prepare by printing *Words - Do You Speak My Language?.docx* and cutting out the words. There are four boxes of words in the document. Each box contains two copies of a set of similar words. During the activity, students listen for their pod member (they have the identical word), and their clan members (similar words).

Randomly hand out the words to students and remind them to keep their word a secret until the game begins. Have the students spread out safely in a large, obstacle-free playing area. On “go”, players walk through the area saying their word and trying to find their partner (pod).

Remember, pods have the same word, and clan members have words that are similar. For example, one student might say banana over and over again. This student will listen to find the other person saying banana – their pod-mate. As they look for their pod, they can also look for members in their clan. Their clan members will use similar words (banana bread, banana split, banana peel) and the object of the game is to find your clan as quickly as possible. Record how long it takes for the class to find the respective members of each clan for comparison later.

Extensions:

This activity can be done sighted or, if your students can move safely in the space, they can try the activity with their eyes closed. This will increase the difficulty of the activity and emphasize the difficulty of moving safely using sound as opposed to sight.

Run the activity a few times having the students use different words to find their pod. This will give you a baseline to compare against later.

Repeat the activity with added noise pollution (for example, play very loud music).

After the activity, discuss how sound impacted this activity. How much more difficult would it be if you needed to hear complete messages, instead of just words?

Where Is It?

1. Refer to *Spot the Differences 1.jpeg* and *Spot the Differences 2.jpeg*. Print enough copies of each for half the class (students will swap part way through).
2. Give each student one image and a sheet of waxed paper.
3. Have students lay the waxed paper over the image and then try to spot the differences between the images on the page. You may either time how long it takes for them to find the objects, or see how many they can find in a set amount of time (i.e. 3 min.).

Noise pollution can blind a whale if it is not able to hear the return echoes from echolocation. For the second trial of the activity, have the students swap images (so that they have a new “spot the differences” picture in front of them). Repeat step 3 above, but this time with three more sheets of waxed paper placed over the image (for a total of four).

Discuss how the extra layers of waxed paper impacted the speed and accuracy of their searches.