



## Lesson 15: How do right whales communicate?

Objective: Students will learn how baleen whales use sound to communicate, and how human-created noise in the ocean may affect their ability to do so. Students will conduct an activity to simulate whale communication and interference by human noises.

### You will need:

- Computer with internet connection and speakers
- Ability to project what's on the computer (projector or smartboard)
- Masking tape or painter's tape
- Markers
- Music CD or other source of music
- Paper circles (or any shape) about 6" in diameter—you will need 5 different colors; three cut-outs of each color.
- Index cards or pieces of paper (1 for each person in the class). Label the cards as follows:
  - 5 cards for Whale 1 through 5 (Whale 1, Whale 2, Whale 3, Whale 4 and Whale 5)
  - 5 cards for Tracker 1 through Tracker 5
  - Label the remaining cards Sound Receiver 1 through Sound Receiver # (one for each remaining student).

Sunshine State Standards: SC.4.L.17.4. (Optional Activity 2 addresses SC.4.P.10.3)

### Vocabulary:

- Sound = repeated vibrations that animals can hear
- Amplitude = the measure of a sound wave
- Echo = a reflection of sound
- Pitch = how high or low a sound is; determined by the frequency of the vibration
- Sonic Boom = a shock wave that consists of compressed sound waves created when something moves faster than the speed of sound
- Sound Wave = sound travels in a wave, which is a moving pattern of high and low pressure or vibrations
- Speed of Sound = how fast sound moves through an object
- Vibrate = to move back and forth
- Volume = how much sound energy reaches the ear
- Wavelength = the length between the compressions in a sound wave

### Strategy:

1. Before class starts, open the websites listed in #8, #9 and #11 below. Make sure your computer's sound is turned up.
2. Also before class, use masking or painter's tape to mark out a grid on the floor. Horizontal and vertical lines should be about 2' apart. Ideally, you want to mark out an area that is about 20' x 20' (eleven horizontal and eleven vertical lines). Use a marker to write the



numbers 1-10, one in each square at the top or bottom of the grid (on the vertical lines) and the letters a-j on the leftmost or rightmost of the horizontal lines (see picture on page 15-4). If you have access to a floor area that consists of square flooring tiles, you can simply use pieces of paper with the numbers and letters on them lined up with existing rows and columns.

3. Start off by asking students how they communicate with each other and with their family and friends. [Answers might include by texting, by talking, by writing notes, by drawing pictures, by making faces, etc.]
4. Ask students to imagine that they are right whales, living underwater, in the huge North Atlantic Ocean.
5. How do the students think right whales can communicate with each other? [Sound. If students have completed lesson 7, they should already be familiar with the fact that sound waves can travel through water...]
6. Explain that you will be playing a game to see how well the students can listen. Inform the class that they will not be graded on how many answers they get right or wrong, but how well they participate in the activity. Explain that everyone will be told to close their eyes and that everyone will need to be very quiet. You will walk around the room and touch one student on the shoulder. That student will say (in their normal voice) the words “I am a right whale.” [write these words on the board as you explain this step]. Explain that the student can open his or her eyes to read the words off the board if they need to. When you say “OK,” all students will open their eyes and write the name of the student that they think spoke the words on a sheet of paper. You will repeat this 4 or 5 times, remembering to keep track of which students spoke each time. Once you have done this using several students in different parts of the room, review the correct answers with the class. How did they do? Ask the students how they knew who it was who was speaking [they should have recognized the person’s voice.]
7. Explain that whales and dolphins have different voices, but that they also use different types of calls to communicate in different ways.
8. Explain that you will be playing some right whale sounds. The students will need to be quiet, as some of the sounds are difficult to hear. Make sure your speaker volume is turned up. Go to <http://www.listenforwhales.org/page.aspx?pid=432> and click on the different right whale calls there. You may need to play them more than once for the students to hear them. Click on the “other whale sounds” link at the bottom of the page to get to three more types of right whale calls. Play each of these.
9. Go to <http://www.voicesinthesea.org> and select “Species,” “Baleen Whales”, then “blue whale”. Move your mouse over to “Blue whale videos” in the upper right portion of the screen and three options will appear. Click on the middle video (The Voice of the Blue Whale). [This is about a 1-minute video clip.]
10. Ask the students what challenges they can think of to communicating by sound in the ocean? If students cannot come up with any ideas, prompt them by asking if whales are the only things that make noise in the ocean. [The answer should be “no”—there are lots of other natural noises in the ocean, from fish to shrimp to underwater volcanoes, but there



are also lots of human-made noises in the ocean.] So... one of the main challenges for whales is being able to hear whale calls over all of the other sounds in the ocean.

11. Explain to the students that they are going to listen to a recording made underwater in Massachusetts Bay, which is the area where right whales feed in the spring and summer. Go to <http://www.listenforwhales.org/page.aspx?pid=441> and click on the link "Listen to ship noise in Massachusetts Bay." (You may want to have students close their eyes while they listen.)
12. Remind the students how short in duration and relatively quiet the right whale calls were. Ask the students if they think they could hear a right whale with all the ship noise going on.
13. Explain that researchers use underwater microphones to try to locate right whales in Massachusetts Bay. The [www.listenforwhales.org](http://www.listenforwhales.org) website has a map showing where these microphones are, and whether or not they have detected a right whale call in the past 24 hours. Explain that the class is going to do an activity to mimic tracking whales in the ocean using whale sounds.
14. Hand out nametags to the students. Five students should get nametags that say "Whale 1" through "Whale 5"; five should get "Tracker 1" through "Tracker 5" nametags and the rest should get "Sound receiver#" tags. If necessary, push back the chairs and desks/tables to clear the area that is marked off as a grid.
15. Give each tracker three cut-out paper circles (use a different color for each tracker) and a marker.
16. Position the Sound receivers throughout the grid (you may choose to arrange them in a pattern, or simply place them randomly).
17. Explain that each whale is going to communicate by saying their number. So, Whale 1 will say "one, one, one..." etc. The five whales will be moving around the 'ocean' that is marked off by the tape, and will be calling quietly as they go.
18. The receivers are going to close their eyes and are going to listen for the whales. When they hear one of the whales well enough to know which whale it is, they should point to that whale with one hand and raise their other hand with the proper number of fingers (one finger for Whale 1, two for Whale 2, etc.). If three receivers are pointing to the same whale, that whale's tracker should call out "stop." All of the whales should stop moving and should be quiet. The tracker will then write down the numbers of the trackers that "heard" the whale on a circle, and will tape the circle to the floor where the whale was "located".
19. Once the tracker has the position recorded, remind the receivers to make sure their eyes are closed, and have the whales start moving and calling their number again. Repeat until all whales have been "located" twice. Once a whale has been "located" twice, that whale and its tracker can sit down (outside the "ocean") and just observe.
20. Explain that the class will repeat this game but that there will be some "ship noise" added in. Warn the whales that they should not increase their volume. Repeat steps 14-19, but after a few minutes, start to play music (gradually increase the volume to represent the ship traveling very close to the receivers). The receivers will probably not be able to hear the whales any more. You can stop the game at any point after this.
21. Ask the receivers what happened once the music started? Was it more difficult for them to detect the whales? Ask the whales if they could hear each other. Ask the students if they



think that ship noise might make it harder for whales to communicate with each other [Yes!].

22. Summarize the day's lesson—Ask the students how whales communicate with each other (by sound) and what types of human activities might interfere with whales' abilities to hear each other (ships, airplanes, explosions, drilling, etc...). Why might this be bad for whales? [In other words, if whales cannot communicate with each other, what might happen?—many possible answers including mothers and calves may become separated/lost, whales won't be able to warn each other about dangers, whales won't be able to tell each other where good food is, whales won't be able to find each other to mate, etc...].

#### Optional Activities:

1. This can be done by individual students or small groups if several computers are available or by the class as a group if the website can be projected. Go to [www.voicesinthesea.org](http://www.voicesinthesea.org) and click on "Games," then "Call matching." There are other great things to do on this website as well ☺
2. (This requires students to have access to computers with sound...but internal speakers on a laptop are sufficient. Headphones would be ideal, but not required.) Have students go to: <http://www.engineeringinteract.org/resources/oceanodyssey.htm> . This is a great online game for the students to play—it teaches them about frequency, pitch and volume. Allow the students at least 30 minutes to complete. Once the students have successfully freed the princess/mermaid, they are done (the website gives an option to continue, which you can allow students to do. If they do continue, they will learn more information about sound, but it may take more time than is available).
3. A printable student worksheet on sound (and transmission of sound through different materials) can be found at: <http://www.gscdn.org/library/cms/11/14411.pdf>

#### References:

- Activities above are modified from *Pod Squad* ([http://cetus.ucsd.edu/voicesinthesea\\_org/Flash](http://cetus.ucsd.edu/voicesinthesea_org/Flash)) and *On the Trail of a Whale* (<http://www.dosits.org/files/dosits/Trail%20of%20Whale.pdf>).



Template for layout of tape and numbering/lettering for the grid used with whale detection activity:

<b>A</b>										
<b>B</b>										
<b>C</b>										
<b>D</b>										
<b>E</b>										
<b>F</b>										
<b>G</b>										
<b>H</b>										
<b>I</b>										
<b>J</b>										
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>