



Science Unit: *Marine Critters and Communities*

Lesson 12: *The Role of Sound in the Lives of Marine Animals*

School Year: 2011/2012

Developed for: Tecumseh Elementary School, Vancouver School District

Developed by: Kathy Heise (scientist); Teresa Harris, Stephanie Pearce, Chuck McNicholl (teachers)

Grade level: Presented to grade 7; appropriate for grades 5 – 7 with age appropriate modifications

Duration of lesson: 1 hour

Notes: This presentation is based on a Powerpoint presentation and numerous sound files prepared by Kathy Heise. Please contact her at kathaheise@gmail.com if you would like to access a copy.

Objectives

1. Learn about the physics of sound waves in air and water.
2. Appreciate the important role that sound plays in the lives of marine animals.
3. Increase student's awareness of anthropogenic underwater noise and the marine animals that could potentially be impacted by it.

Background Information

Sound travels much more readily in water (1500 m/s) than in air (300 m/s). For many marine animals, it is their principal sense, as they use sound in the way terrestrial animals use vision. As a result, it is important to consider the impact of anthropogenic (manmade) noise on marine animals. Shipping is a chronic source of noise in the world's oceans, and has increased over 10 decibels since the 1960s. Acute sources of noise include seismic surveys, military sonars, pile driving, explosions and dredging.

Vocabulary

Frequency: The number of cycles per second in a sound wave, often described as 'pitch'

Hertz: Unit of measurement that describes the frequency or pitch of a sound

Decibels: Unit of measurement that describes the loudness of a sound

Hydrophone: Underwater microphone

Seismic surveys: Designed to explore the seafloor by shooting pulses of air into the water column that are reflected and refracted back to an array of hydrophones towed behind the survey vessel

Military sonars: Sonars used by navies to acquire information about objects (generally submarines)

Pile Driving: Used in construction to place pilings into substrate, on both land and in water. Pilings are repeatedly hammered into the substrate until they are deep enough to remain secure



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Materials

- Powerpoint presentation 'Understand Sound in the Ocean' and associated sound files*
- Earbones of fish and mammals*
- Audio speakers
- Internet access
- Question sheet 'Understanding sound in the ocean'

*Some samples available by contacting Kathy Heise at kathyaheise@gmail.com

In the Classroom

1. Begin by stating that before the students can understand sound in water, they need some background information about sound in air. Ask students what they would draw, if they had to draw a sound. Hand out worksheet.
2. Compare the speed of sound in air and water, and between the speed of light and sound in air. The first video by DSN animation nicely illustrates particle motion and why sound acts like a wave. The video ends with a discussion of how sound waves are received by the human ear. This is a great place to show 'earbones' of other animals, if available, and to reinforce the concept that the hearing mechanism in fish, marine and terrestrial mammals, including humans, is functionally similar.
3. Discuss high and low pitched sounds to illustrate sound frequencies. Using one of many hearing tests available on YouTube, conduct a classroom wide hearing test. Students raise their hands if they can hear the tone that is broadcast. Teachers will have much poorer performance than their students. Discuss how noise exposure can impact long-term hearing.
4. Discuss sources of naturally occurring underwater sounds, and play a few samples to the class (most of the recordings are from www.dosits.org, an excellent reference site for background information on sounds in the sea)
5. Discuss anthropogenic sources of noise and their potential impacts on marine animals. More recordings are available on www.dosits.org.
6. Play recordings of the sounds of various fish, invertebrate and marine mammals (sounds are available on www.dosits.org), and discuss what the sounds are used for.

Closure Discussion

1. Did you have any idea that fish/ and or invertebrates produce as well as listen for sounds in their environment?
2. Which was your favourite sound?
3. Do you have any ideas on how we can make the oceans quieter?



References

1. <<http://www.dosits.org>> Discovery of Sound in the Sea. Graduate School of Oceanography, University of Rhode Island. Accessed May 21, 2012. Excellent general reference website with information for teachers as well as students.
2. <<http://www.youtube.com/watch?v=27a26e2CnuM>> DSN Animation: What is Sound? Accessed May 21, 2012
3. <<http://www.youtube.com/watch?v=bWpSePfbTxc>> Mosquito Sound Test: Test Your Ears. Video by www.hamtechblog.com. Start the clip at 4 sec from the beginning to avoid some poor grammar. Accessed May 21, 2012



Name: _____ Date: _____

Understanding Sound in the Ocean

1. What is the speed of sound in air?
2. What is the speed of light in air?
3. What is the speed of sound in water?
4. Draw a low and a high frequency sound. Remember to label your axes!

Low frequency	High frequency

5. What is the highest frequency sound **you** can hear? Make sure to include units.
6. What units describe the 'loudness' of a sound?
7. What are three naturally occurring sources of sound in the ocean?
8. What are three anthropogenic sources of sound in the ocean?
9. Why do fish and invertebrates produce sound?
10. Which was your favourite sound?