Instructions for Educators: The Biology of Sounds in the Ocean

Focus:

To learn about the amazing field of marine bioacoustics through exploration of topics including fish physiology, marine ecology, physics of sound underwater, acoustic data collection and analysis, and human impacts.

Learning Objectives

During this workshop, participants will:

1. Describe fish communication
2. Compare the speed of sound in air versus water
3. Differentiate and describe natural soundscapes
4. Understand how fishes hear and make sounds
5. Listen to many different fish sounds
6. Examine how scientists record and “see” sound
7. Reflect on human impacts on marine ecosystems

Keywords:

Bioacoustics, Fish sounds, Marine ecology, Noise pollution, Ocean literacy, Science jobs

Summary (for educators):

Participants will learn about fish communication, how fast sounds travel underwater, marine soundscapes, fish hearing, what fishes sound like, how scientists study underwater sounds, and human-caused noise pollution through a series of brainstorm questions, riddles, website exploration, interactive guessing games, and discussion.

Accessibility Information:

We want FishSounds Educate to be an accessible learning experience. This workshop features engaging visual and audio components, highly readable text (e.g., large,

high-contrast, left-aligned), alt text for all images, informative headings, links embedded into text, and slide components ordered with screen readers in mind.

How to Use the Workshop:

Most of the topics in this workshop can be adapted to any age group by adjusting the level of detail provided. The full workshop takes 60-90 minutes, but can be made shorter by removing segments or longer by spending more time on class discussions. The workshop can be accessed as either Google Slides or PowerPoint with the associated sound files and an optional fill-in worksheet and colouring page. Instructions are provided in the notes section of each slide as well as in a separate document that can be printed (i.e., FishSounds Workshop Slides Notes for Teachers).

Materials Required:

Computer (with internet if using Google Slides or the FishSounds website), projector, speaker. Helpful if students have their own phones or laptops to navigate the FishSounds website.

British Columbia Curriculum Connections

All Sciences:

- Construct, analyze, and interpret graphs, models, and/or diagrams
- Analyze cause-and-effect relationships
- Consider social, ethical, and environmental implications of the findings from their own and others' investigations
- Connect scientific explorations to careers in science

Physics 11

- Contribute to care for self, others, community, and world through individual or collaborative approaches
- Characteristics of sound, for example, pitch, volume, and speed

Environmental Science 12:

- Human actions affect the quality of water and its ability to sustain life

Science for Citizens 11:

- Impact of technologies, human impacts on Earth's systems

Segment 1 – Mystery Sound and Introduction

Acknowledge Indigenous stewardship of the lands and waters where the workshop is happening, capture participants' attention with a mystery sound, and introduce the workshop.

Segment 2 – Fish Communication and Marine Soundscapes

Explore how fishes communicate and why sound is especially useful, then brainstorm what fishes hear from non-living and living natural sources (no humans yet!) and define "marine soundscape".

Segment 3 – Fish Hearing and Sound Production

Learn how fishes hear using ear bones and how they make sounds in interesting ways.

Segment 4 – So Many Fish Sounds!

Explore the world of fish sounds using FishSounds.net, listen to many different fish sounds by playing "Guess that sound!", and get a little bit silly with "Fish or fart?!".

Segment 5 – "Seeing" Sounds

Learn how scientists study underwater sounds using hydrophones and spectrograms, and test participant understanding with "Guess that spectrogram".

Segment 6 - Human Impacts and Noise Pollution

Discover how boat noise makes it difficult for fish to communicate, brainstorm what other human sounds fishes hear and how these are impacting marine soundscapes, discuss how we can help reduce noise pollution, and finish by watching a short (6:47 mins) BBC Earth video with inspiring footage that ties together many of the workshop concepts (if time permits).

Feedback:

We appreciate feedback on our resources! If you would like to send us comments or suggestions, please fill out this Google Form.