KU NATURAL HISTORY MUSEUM
& BIODIVERSITY INSTITUTE

Whale World: Hearing Underwater

What you need

- Metal wrench with closed loop on one end, or metal utensil (preferably a spoon)
- String
- Table or desk

Follow the steps below to make a model that mimics how cetaceans (whales, dolphins, porpoises) hear sounds underwater.

Preparation

1. Cut a 3-foot length of string.
2. Find the mid-point of the string and tie it through the closed loop end of the wrench, creating two equal lengths (approximately 1.5 feet long) attached to the wrench.
    a. Alternatively, if using a metal utensil, find the mid-point of the string and tie it around the utensil handle. You may need to secure it with tape. There should be two equal lengths of string attached to the utensil.
3. Grab the two equal lengths of string; the wrench or utensil will hang in the center. Wrap the string a few times around each index finger, but leave plenty of string loose so that the wrench or utensil hangs & swings.

What to do

1. Lightly swing the wrench or utensil to bump it against a table or desk. Observe what you hear.
2. Press your index fingers, with string wrapped around, against the tragus of each ear (i.e., plugging your ears). The wrench or utensil should be hanging under your chin. Then bend over and lightly swing the wrench or utensil to bump it against the table or desk. Observe how the sound is louder and deeper in tone; you may even notice vibrations in your jaw!

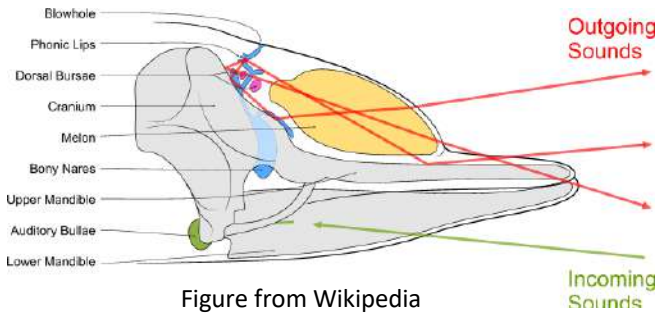

Figure from Wikipedia

What is happening?

Hitting the wrench or utensil against the table causes it to vibrate. These vibrations (sound waves) are conducted up the string, through your fingers, through the bones of your skull and into the inner ear. Because the sounds are traveling through solids (instead of through air like the first observation), the sounds are louder and deeper. This is similar to how cetaceans hear underwater. In toothed whales, instead of sound coming in through an ear canal, sound comes in through fatty tissues in the jaw. The fatty tissues in the whale's jaw are attached to an "acoustic funnel," where the ear bones vibrate and translate sounds to the fluid-filled inner ear.