Dolphin Lifesavers, Part 2
How Dolphins See with Sound

San Diego, CA (SPAWAR - Navy) -- Dolphins use echolocation to find mines underwater. Engineers create tools that sense echoes in real time alongside the dolphin as it searches for mines. The information is used to create a virtual reality model of the dolphin's search strategy. Using technology helps engineers to understand how dolphins can find potentially dangerous objects underwater.

"Echolocation is locating objects by the echoes produced when sound hits them."
Dorian Houser, dolphin bioacoustics scientist

Framework

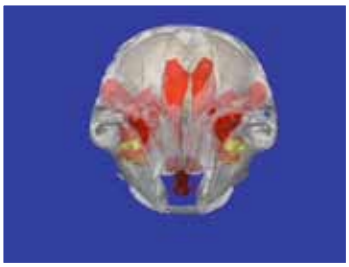
Middle School

Standards

- NSES - C.i.1 ➤ Structure and function are related.
- NSES - C.iii.3 ➤ Behavior is a response to environmental stimulus.
- STL - 3.F ➤ Knowledge from other fields (such as animal behavior) has an effect on the development of technology.
- STL - 17.I ➤ Communication systems have different parts.

Content Illustrated

- Structure and function for echolocation shown in CAT scan of dolphin head.



Content

Life Science

- It's easier for dolphins than humans to perform some tasks, such as finding underwater targets.
- Bottlenose dolphins use echolocation to find objects. Dolphins emanate a clicking sound as they are swimming. They locate objects by sensing the echoes produced when sound hits the objects.
- Scientists study the dolphins' anatomical features as well as the strategies dolphins use for finding things.
- A CAT scan of a dolphin's head shows the position of air spaces, skull bones, and ear bones. Unlike human ears, the dolphin's ear bones are separated from its skull and surrounded by air. The position of air chambers helps the dolphin know where the echoes are coming from.
- When a dolphin finds the target, it makes a certain kind of sound or call. It then gives its own "victory" call as a self-reward.

Technology

- Engineers have created a BMT–a biosonar monitoring tool - to help them model the behavior of a dolphin searching for mines. The dolphin carries the BMT as it swims, using a bite plate. The BMT has a hydrophone (underwater microphone) which picks up the clicks as the dolphin produces them. When the signals bounce off the sea floor or the target object, the hydrophone receives the echo much like the dolphin's ears do. The BMT also has sensors to record the dolphin's speed, location, and depth.
- The information from the BMT is used to make a virtual reality representation of the searching dolphin and so that scientists can get a better understanding of the dolphin's actions.

Guiding Questions

To think about as you watch:

- Do animals other than dolphins use echolocation?
- What are some examples of different ways that animals find things or navigate the world?

Suggested Activities

- Find and compare pictures of the heads and sense organs of different cetaceans.
- Devise an experiment to observe the difference between sound traveling underwater, through the air, or through a partially immersed tube.
- Find pictures of different sound waves.

Keywords

bioacoustics
biosonar
monitoring tool
bottlenose dolphin
echolocation
hydrophone
virtual reality

Dolphin Lifesavers can be found online at www.ndep.us/Dolphin-Lifesavers-pt-2. Visit www.ndep.us/LabTV for a list of process skills modeled in webisodes.