NAVAL HISTORY STEM-H LESSON PLAN

LESSON PLAN: The Great Green Fleet
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ACTIVITY THREE: Sonar and Environmental Stewardship

OBJECTIVE: This activity presents students with the issue of integrating environmental stewardship and advanced science into the real world need of providing national security and protecting natural resources (marine mammals). Students will view a video covering Navy sonar and environmental stewardship and discuss the implications of using active sonar in waters that marine mammals call home.

PACIFIC OCEAN (Jan. 27, 2008) While standing watch aboard the Arleigh Burke-class guided missile destroyer USS Momsen (DDG 92), Boatswain's Mate Seaman Alden Fenton discusses some of the training he has received to help him spot and identify marine mammals with a journalist from Reuters. Secretary of the Navy (SECNAV) The Honorable Dr. Donald Winter visited Momsen with members of the press to observe protective measures Navy employs to protect marine mammals during joint task force exercise. Momsen and other members of the Abraham Lincoln Strike Group are participating in a joint task force exercise off the coast of Southern California. U.S. Navy photo by Mass Communication Specialist 2nd Class James R. Evans (Released)

MATERIALS:

Navy Sonar and Environmental Stewardship Video Questions (below)

Video (http://www.youtube.com/watch?v=BXcAglCyrF0&feature=youtu.be
(Navy Sonar and Environmental Stewardship)

INSTRUCTIONS: Watch the video linked above, then answer the following questions. Discuss the answers to the questions with your team or class, then complete the writing assignment below.

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Navy Sonar and Environmental Stewardship Video Questions and Writing Prompt ANSWERS

1. In what ways do marine animals rely on acoustics?
   Sense their surroundings, communicate, locate food, and navigate.
2. Why might the Navy be especially interested in coastal water?
   The sounds from enemy vessels are easily disguised due to the vast and varied numbers of sounds in coastal waters. Over 40 nations, terrorists organizations, and drug traffickers are developing submarine technology and represent a large threat to Navy forces.
3. What is the Navy's most effective means for identifying and detecting submerged enemy vessels?
   Active and passive sonar
4. What is the difference between active and passive sonar?
   Actives sonar works by sending out sound transmissions (pings) and listening to what comes back from reflection. Passive sonar involves only listening for sounds coming from the object itself.
5. Why doesn't the Navy just use passive sonar?
   Vessels can disguise or quiet themselves, making them hard if not impossible to detect with active sonar, therefore the Navy must train and work with active sonar.
6. Why has the Navy's use of active sonar been controversial?
   If marine mammals gets too close to a ship while active sonar is activated it could potentially disturb or injure them. Marine mammals usually swim away when they sense loud active sonar sounds, which could interrupt their natural behavioral patterns. When sonar combines with other factors there have been limited cases of animals becoming stranded or even dying.
7. What are some protective measures taken by the Navy to avoid or minimize the impact of sonar on marine mammals?
   Training for personnel involved in sonar operations.
   Monitoring the area for marine species prior to training activities.
   Posting qualified marine mammal observers on ships at all times to watch for marine life and make adjustment to sonar operations.
   Conducting safe navigation to avoid collisions with marine mammals.
   Reporting sightings of marine mammals to the National Marine Fishery Service.
   Establishing safety zones for marine species so that if a marine mammal is sighted within a zone the active sonar will be powered down or shut off.
8. What does Dr. Darlene Ketten from the Woods Hole Oceanographic Institution do?
   Provides a better understanding of where the animals are and how they use their environment. Communicate with the Navy, scientists, and the general public regarding what each species can hear, where they are sensitive in their hearing range, what sounds we need to avoid in order to avoid impacting their ability to hear.

9. What conclusion does Dr. Ketten make and what evidence does she use to support it?

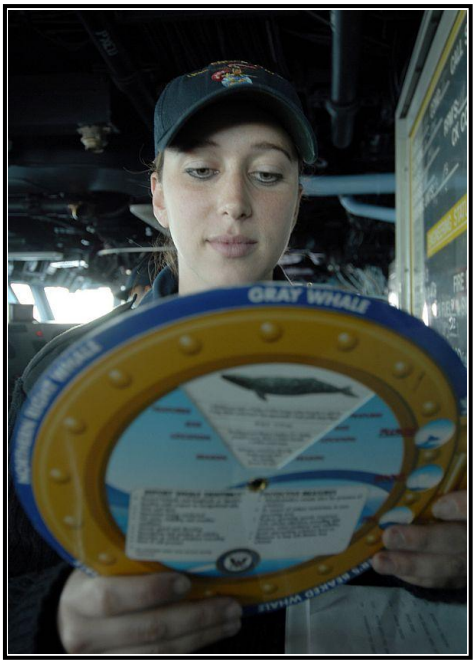
   Dr. Ketten uses the ears and heads from the stranded animals that have died and looks for signs of hearing problems or trauma. After years of research and communication with other researchers working in a similar capacity she states there is no evidence of direct acoustic trauma of sonar.

10. Does Dr. Ketten's conclusion mean that the Navy should stop researching the effect of sonar on marine mammals?

    No, the conclusion that there is no direct evidence of acoustic trauma caused by sonar does not mean that there is no indirect disturbance of marine mammals caused by sonar. The Navy should continue to research marine mammals to better understand how they survive in their environment (including the natural sounds tolerated by different organisms in different regions). By integrating environmental stewardship into decision making the Navy can provide national security, comply with environmental laws, and contribute to our overall understanding of the ocean environment.

Writing Prompt

You are a naval marine scientist working with the Marine Mammal Protection group. The Navy has commissioned you to write a short report describing the niche of dolphins or whales in a coastal marine environment. Discuss the abiotic and biotic factors that affect the marine mammals. Create a coastal oceanic food web and explain the effect on the food web if the dolphins or whales are harmed by the use of active sonar. Lastly, develop a plan to monitor and train in this area using active sonar while minimizing the effect on the marine mammals.



CORAL SEA (July 13, 2009) Boatswain's Mate 3rd Class Morgan Baker, assigned to the forward-deployed amphibious assault ship USS Essex (LHD 2), looks over the marine mammal recognizer while standing boatswain mate of the watch on the bridge. (U.S. Navy photo by Mass Communication Specialist Seaman