

Impact of Climate Change on Hawaiian Monk Seals Activity 3: Seals, Corals and Dollars

Region: Pacific Islands

Grade Level(s): 5-8

Time Required: One class period (approximately 45 minutes)

Focus Questions:

- What possible factors have caused the Hawaiian monk seals to become endangered?
- What is the ecological relationship between coral reefs and the monk seal?
- What can humans do to help increase monk seal populations?

Learning Objectives:

- Students will describe the ecological relationships between Hawaiian monk seals and deep-water precious corals.
- Students will explain at least two different viewpoints on how monk seals and precious coral resources might be managed in the Northwestern Hawaiian Islands.
- Students will list at least four reasons that Hawaiian monk seals are endangered.
- Students will propose a management strategy for monk seals and precious coral resources and explain their rationale for selecting this strategy.

Materials:

- Monk Seals: 'Dogs that Run in the Sea'
(http://oceanexplorer.noaa.gov/explorations/02hawaii/background/monk_seals/monk_seals.html)
- Saving Precious Corals (http://www.oar.noaa.gov/spotlite/archive/spot_corals.html)
- Managing Precious Corals and Monk Seals
(http://www.soest.hawaii.edu/HURL/precious_corals.html)
- A struggle to survive: Environmental threats endanger monk seals
(<http://www.pbs.org/kqed/oceanadventures/episodes/kure/oceanscience.html>)
- Hawaiian Monk Seals (<http://www.earthtrust.org/wlcurric/seals.html>)

Background:

- The Northwestern Hawaiian Islands are home to Hawaiian monk seals—one of two remaining monk seal species (the other is the Mediterranean monk seal). The Caribbean monk seal was declared extinct in 1994. The Northwestern Islands may be an important seal feeding area. Seals appear to feed on fish that live among deep-water coral communities. These corals are also of interest -some because they are commercially valuable for jewelry and others for the unique natural product chemicals they produce. The 2002 Ocean Exploration Expedition to the Northwestern Hawaiian Islands studied the ecological relationships between monk seals and the deep-sea environments of the

Northwestern Islands, as well as mapping the previously unexplored deep-sea regions around the islands, investigations of deepwater fishes, and exploration of deepwater habitats. This activity focuses on management issues posed by an endangered species—the Hawaiian monk seal—that depends to an unknown extent upon deep-water habitats that have commercial value and are being considered for exploitation.

Procedures/Instructional Strategies:

1. Introduce the location of the Northwestern Hawaiian Islands and point out some of the features that make this area important.
2. Challenge the student groups to prepare a report based on one of the following web pages containing information about monk seals and/or precious corals.
 - a. http://oceanexplorer.noaa.gov/explorations/02hawaii/background/monk_seals/monk_seals.html
 - b. http://www.oar.noaa.gov/spotlite/archive/spot_corals.html
 - c. http://www.soest.hawaii.edu/HURL/precious_corals.html
 - d. <http://www.pbs.org/kqed/oceanadventures/episodes/kure/oceanscience.html>
 - e. <http://www.earthtrust.org/wlcurric/seals.html>
3. Have each group present its report in the order given above. Lead a discussion of these reports, including the following:
 - a. What is the distinction between endemic, indigenous, and alien species?
 - b. What are the feeding and habitat preferences of Hawaiian monk seals?
 - c. Why are Hawaiian monk seals endangered?
 - d. Why are precious corals important? Students should identify commercial importance as well as the role of these corals in natural ecosystems.
 - e. What groups have expressed views about the need to manage precious corals, and how do these views differ? Do any of them have a vested interest—that is, they are going to make money on them? Students should distinguish between management objectives directed toward a sustainable harvest of precious corals and bio-prospecting and objectives directed toward maintaining the corals as a key habitat element for an endangered species.
 - f. What options should be considered in developing management plans for monk seals and precious corals in the Northwestern Hawaiian Islands? Students should recognize that the interests of commercial exploitation and conservation are in potential conflict and that options range from “Do nothing” to “Ban all human interaction with these species.” Resource managers generally try to balance desired uses; however, the monk seals are protected by the U.S. Endangered Species Act as well as the Marine Mammal Protection Act that limit management options.
 - g. What formal management measures have been taken to address concerns about monk seals and precious corals? Do students believe these measures are sufficient?

Extensions:

- Develop a grading rubric that includes performance on the group research and report

(Step #2) and participation in the overall discussion (Step #3). Alternatively, following the oral reports in Step #3, you may want to have students prepare individual written responses to the questions prior to discussing these questions with the entire class.

- Visit <http://www.radiojerry.com/frigate/> for an “up close and personal” account of life on French Frigate Shoals and encounters with monk seals.

National Science Education Standards:

Regulation and Behavior

- Behavior is one kind of response an organism can make to an internal or environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience.
- An organism’s behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species’ evolutionary history.

Populations and Ecosystems

- A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.
- Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some micro-organisms are producers--they make their own food. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.
- For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.
- The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

Diversity and Adaptations of Organisms

- Biological evolution accounts for the diversity of species developed through gradual processes over many generations. Species acquire many of their unique characteristics through biological adaptation, which involves the selection of naturally occurring variations in populations. Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment.
- Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. Fossils indicate that many organisms that lived long ago are extinct. Extinction of species is common; most of the species that have lived on the earth no longer exist.

Additional Resources:

- Monk seal reference on the NOAA National Marine Sanctuary Encyclopedia of the Sanctuary
<http://www8.nos.noaa.gov/onms/park/Parks/SpeciesCard.aspx?refID=1&CreatureID=1078&pID=12>
- Lesson plan “Mysteries of the Monk Seal”
<http://www.nationalgeographic.com/xpeditions/lessons/18/g35/ccmonkseal.html>
- Article from Hawaii on the monk seal
<http://www.aloha-hawaii.com/hawaii/monk+seal/>
- Lesson plan “Diving in the Save the Monk Seal”
<http://www.nationalgeographic.com/xpeditions/lessons/18/g68/ccmonkseal.html>

References

- This lesson plan was adapted from NOAA’s Ocean Exploration web site
http://oceanexplorer.noaa.gov/explorations/02hawaii/background/education/media/nwhi_seals.pdf