Elephant Seals Evolution

Lesson 1 of 3

In the first lesson students view videos in English and/or Spanish that detail the recent history of the northern elephant seal – from near extinction 100 years ago to the over 100,000 animals alive today. The videos give a general overview of the habitat and behaviors of elephant seals and discuss the genetic bottleneck that resulted from the near extinction of the species. Following the video, students work in groups to explore the types of adaptations that might have allowed elephant seals to become at home in the sea as they evolved from land mammals.

Objective

By the end of the lesson students will:

- Research why elephant seals were almost extinct 100 years ago and how their near extinction resulted in a genetic bottleneck creating little genetic variation in the current population.
- Reason that elephant seals are mammals, and like all mammals, their early mammalian ancestors were land dwellers.
- Explore the adaptations required for a mammal to live in a marine environment. They will understand that adaptations are caused by genetic variation and environmental factors, and are not the result of choices made by the individuals.

This exercise can be modified for high school classes, or advanced middle school classes by requiring students to explain how an adaptation might become fixed in a population. This would involve mutation, and selection of the trait due to its adaptive advantage.

Other Resources

Videoconference Lesson

- Teachers
- Students
- Photos and Diagrams
- Factoids
- Live Video
- Elephant Seal Review Power Point
- Marine Protected Areas Education Resources
- PORTS Ano Nuevo Outreach Handout

Materials/Resources

- Computer and digital projector or large-screen television.
- Videos (Spanish and English)
  - Spanish Video:
    Elefantes Marinos Serie Educacionales: Parte I Introduccion a los Elefantes Marinos
    ¿Quienes son los elefantes marinos?
    ▸QuickTime Movie version ▸Windows Media Player version

English translation Video:
▸QuickTime Movie version ▸Windows Media Player version

- Handouts: Pre and Post Assessment Sheet
- Adaptation Worksheet
- photos and diagrams
- list of web links
- Elephant Seal Genetic Bottleneck Information (http://evolution.berkeley.edu/evolibrary/article/bottlenecks_01)

Considerations

The time required for this lesson will vary depending on the number of ELL students and their level of English proficiency. For ELL classes, this lesson could be broken into two periods, or the pre-assessment could be given at an earlier time, and the introductory section shortened. For non-ELL classes, the Spanish version of the video can be omitted, and time required for discussing snorkeling/diving vocabulary will be greatly reduced.

Procedure

1. Pass out Pre and Post Assessment Sheet. Have students complete the sheets and turn them back into the teacher.

2. Begin the lesson by exploring students' knowledge of marine mammals. Ask them who has been to Sea World or similar locations, and what they liked best. Ask if they can name some marine mammals. Some will know that whales and dolphins are mammals. Ask if they know that the ancestors of whales and dolphins were land mammals that gradually moved to the sea millions of years ago. Remind them that humans and many other familiar animals are also mammals and have many of the same needs and characteristics as marine mammals (hair, breathing air, maintaining body temperature, feeding milk to young, etc.).

3. Let students know that in addition to whales and dolphins, the elephant seal is also a mammal (have them search key words "elephant seal" and "sea mammals" for images on the internet if there is access. Take 5-10 minutes to have students discover 2 or 3 facts about elephant seals on their own then share out to class or add to a class chart.
    a. ***Example:*** The ancestors of elephant seals also moved from land to the sea millions of years ago, but not as long as the whales and dolphins.

4. You might have students COMPARE side by side pictures of whales, dolphins, and elephant seals, and ask them to share what they notice.

5. Have students create an ongoing list of facts. After the unit is complete, they can create an info-quiz or iMovie on elephant seals using their own research and learning experiences. They can share their creation with the class or post on a class blog.
    a. ***Quick Research Idea:*** Venn Diagram Compare and Contrast
    Compare and contrast whales, dolphins, and elephant seals. (Whales and dolphins have been living in the ocean longer than elephant seals and have had more time to adapt to the marine environment. Elephant seals are also very much at home in the water, because they have developed many adaptations that make it easy for them to live there. In fact they can dive as deep as any whale, and spend 90% of their time underwater. But unlike whales and dolphins, they still spend some of their time on land.)

6. View the Año Nuevo video in English (or Spanish) by clicking on one of the links above under Materials.

7. Pass out the adaptation worksheet and break into groups of three or four. The worksheet guides students in exploring adaptations that might be useful to mammals in a marine environment. Read the directions to students and help with any questions they have.

    a. **Column 1** of the worksheet asks students to list the artificial adaptations (equipment) that snorklers and scuba divers use when they go into the ocean. (Many English learners will recognize the equipment used by snorklers and scuba divers, but will not know the English words for them.)

    b. **Column 2** asks students to describe how the equipment helps in the water.

    c. **Column 3** asks students to suggest a biological adaptation that could serve the same function as the piece of equipment they listed in column 2.

    d. **Column 4** asks students to explain how the adaptation might make life more difficult on land.
        i. Students can easily develop the misconception that freewill or intention is somehow responsible for evolutionary adaptations. Stress that the adaptive changes that take place are due to random changes in the genes of the animals and have nothing to do with what an animal wants. Changes that make it easier for an animal to survive and reproduce stay in a population. Negative changes are removed due to death or the survival of fewer offspring. Animals don't have the luxury of making a list of beneficial adaptations like the students are doing in this exercise. Have students print or send digital worksheets, or collect paper worksheets from groups.

Assessment

- Pre and Post Assessment sheet and the group worksheets.

Optional Culmination Projects

- Have students choose their own research project and present a 3-minute video on a topic related to Elephant Seals.
- Students create and share an Elephant Seal quiz or model using GoogleForms, or an app like Quizlet and Sketchbook.
- Create a classroom gallery to share with the teacher, parents, California State Park Interpreters, community library, or in an online classroom website.

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