

The Case of the Missing Steller Sea Lions

Grade: 9-12

Subject: Science

Duration: One - two lessons

Objectives

It is expected that students will:

- Analyze the various roles organisms play in food webs, populations, communities and ecosystems
- Assess the requirements for sustaining healthy local ecosystems
- Evaluate human impacts on local ecosystems
- Plan appropriate procedures to test hypotheses

Background information is available in the sea lion section of the *Conservation in Action* website.

<http://www.vanaqua.org/conservationinaction>

Overview and Background

Over 85% of the world's Steller sea lions have vanished and no one knows why. Scientists are investigating many possible explanations for the decline, including a change in their food and nutrition. This important issue gives students the opportunity to learn how hypotheses are applied to conservation research in the real world and try their hand at developing hypotheses of their own.

Procedures

Students:

1. Use the *Conservation in Action* website and other sources to learn as much as you can about Steller sea lions, what they need to survive and their role in the Northwest Pacific ecosystem. Watch the Steller sea lion research videos on the *Conservation in Action* website.
2. Discuss the following challenges in small groups (be creative). As a scientist, how would you:
 - learn about sea lion behaviour underwater?
 - observe sea lions in the wild without disturbing them?
 - learn what sea lions eat?
 - test a sea lion population for disease?
 - track individual sea lions?
3. Brainstorm a list of possible causes for a major change of abundance in the Steller sea lion population in the North Pacific.
4. Complete the *Mystery of the Disappearing Steller Sea Lions* worksheet and develop your own testable hypothesis to explain the Steller sea lion decline.

Materials and Resources

- Computer and Internet connection
- *Mystery of the Disappearing Steller Sea Lions* worksheet
- *Hypotheses for the Decline of the Steller Sea Lion Population*

Extensions

Learn more about current Steller sea lion research: review the *Hypotheses for the Decline of the Steller Sea Lion Population* document and read the *North Pacific Universities Marine Mammal Research Consortium* website (<http://www.marinemammal.org> - consortium; projects). Compare the scientists' hypotheses and experimental design to your own.

Evaluation

Use the following to assess student work:

Sample Criteria - Science Skills and Processes	
To what extent did the student:	
1. create a testable hypothesis that identifies variables	5 4 3 2 1 0
2. clearly outline a cause-and-effect relationship	5 4 3 2 1 0
3. demonstrate knowledge of the role of Steller sea lions in the ecosystem	5 4 3 2 1 0
4. provide a reasonable explanation for the population decline	5 4 3 2 1 0
5. generate an experimental design to test his/her hypothesis that identified all variables	5 4 3 2 1 0
6. make operational definitions	5 4 3 2 1 0
7. devise a test to be carried out	5 4 3 2 1 0
8. describe expected outcomes	5 4 3 2 1 0
9. critically evaluate his/her work and make suggestions for improvements	5 4 3 2 1 0

Mystery of the Disappearing Steller Sea Lions

Introduction

Over the past few decades, the numbers of seals, whales and sea birds in the North Pacific have been changing. In some regions of Alaska, Steller sea lion populations have decreased dramatically. Declines have also been reported in some sea bird, harbour seal and fur seal populations.

Such large-scale changes may be due to a number of factors, both natural and as a result of human activity. This ecosystem shift is also impacting people in coastal communities throughout the North Pacific.

Scientists are learning more about this issue by studying Steller sea lion populations in the North Pacific. In some studies, they are comparing and contrasting different groups of Steller sea lions, including:

- Steller sea lions in the Western Gulf of Alaska where the population has crashed
- Steller sea lions in Southeast Alaska where populations are healthy
- Steller sea lions trained by animal care staff at the Vancouver Aquarium

Assignment

1. List all the causes you can think of for the decline of Steller sea lions in the North Pacific. Consider both natural and human causes.
2. Select one possible cause and develop it into a testable hypothesis.
3. Design an experiment to test your hypothesis. Be innovative. Invent new technologies if you wish.
4. Describe the experimental results you would expect to observe if your hypothesis was true.
5. What are the strengths and weaknesses of your experimental design?

Hypotheses for the Decline of the Steller Sea Lion Population

Junk food hypothesis

The number and type of fish living in the North Pacific may be changing. Instead of eating their usual diet of nutrient-rich salmon and herring, Steller sea lions may now be eating less nourishing species, such as pollock and cod. As the amount of “health food” in the North Pacific decreases, Steller sea lions may be eating more “junk food” and they may not be getting the nutrition they need to keep healthy, have babies, or escape from danger.

Sea lion STDs

Diseases can kill Steller sea lions or make it difficult for them to have healthy babies. Some scientists have looked into whether there was a widespread sickness around the time that the Steller sea lion populations started declining. They’ve even considered sexually transmitted diseases spread by bulls with lots of mates!

Scared to death

Steller sea lions are easily scared away from rocky outcrops where they mate and raise their babies. Scientists are concerned that when boats travel near the rookeries, the sea lions panic and leave before the pups are ready to survive in the ocean.

Shooting and entanglement

At one point, scientists considered the possibility that the harvesting, entanglement and shooting of baby sea lions in 1960’s and the 1970’s may have led to the population decline.

Killer whale kibbles

Transient killer whales eat marine mammals. Some scientists believe that historical whaling removed the bigger whales from the food web, possibly forcing killer whales to start eating more sea lions instead. This theory is very controversial and many top marine mammal scientists are arguing fiercely over it.