Ecology and the Marine Environment

Where Have the Steller’s Sea Lions Gone?

Steller’s sea lions (*Eumetopias jubatus*) were once abundant from the North Pacific coast of California to Japan, with an estimated 70% of them living in Alaskan waters. Since the 1970s the population has dropped to fewer than 70,000 animals, and during the same period fur seal and sea otter populations have also mysteriously declined in the region. Marine scientists have long debated the cause of the declines in these populations. Some suggest overfishing of the marine mammals’ prey, whereas others suggest that climate change, predators, disease, or poaching may be the culprit.

In 2000, biologists working for the federal government concluded that commercial fishers who fished for bottom fishes, such as Pollock, were the main threat to sea lion populations because they removed too much of the animals’ food source. The proponents of the overfishing theory suggested that commercial-catch restrictions would ensure that the sea lions have sufficient prey. As a result, major catch restrictions were placed on Alaska’s $1 billion fishery. Because the Alaskan waters are one of the world’s most valuable fisheries, this action gained the attention of members of Congress, who asked a committee of marine scientists to look into the problem. In the committee’s preliminary report, issued in December 2002, Dr. Robert Paine of the University of Washington stated that fishing is probably not the major reason for the population decline, but this is not to say that commercial fishing is not a significant problem. To investigate the problem further, Alaskan legislators and other members of Congress ordered a study to be done by the National Academies of Science to determine if overfishing was really the problem. In response, the National Academies of Science have recommended that the U.S. government embark on a major ecological experiment by running a 10-year test in Alaskan water to see if commercial fishing is indeed a threat to the Steller’s sea lion population. The experiment’s design calls for setting up four experimental zones in Alaskan waters, each containing a breeding colony of Steller’s sea lions. Fishing would be banned for up to 50 nautical miles around two of the colonies but permitted near the other two. Biologist would then monitor and compare trends in the sea lion populations.

If, As Dr. Paine suggests, overfishing is not the major villain in this drama, then what is? Several major reviews of sea lions and their habitats indicate that the animals have plenty of food. This observation prompted Dr. Alan Springer of the University of Alaska in Fairbanks to ask if excess predation might be the cause of the population decline. Using data that were collected by the International Whaling Commission, Springer and his associates hypothesized that whalers had effectively eliminated fin, sei, and sperm whales from Alaskan waters by 1970. Interestingly, this coincides with the beginning of the population declines of the smaller marine mammals, including Steller’s sea lions. Springer and his associates think that a shift in the diet of killer whales may be to blame not only for the decline in sea lion populations but also the populations of fur seals and sea otters.

Killer whales feed on a wide variety of prey, including the great whales. Although biologists debate how often large whales are eaten by killer whales, they do agree that killer whales are the most significant natural predators of great whales with the exception of humans. According to data collected over the years, the Alaskan harbor seal population crashed in the 1970s, and then the populations of fur seals and Steller’s sea lions began their precipitous decline in the 1980s. Sea otter populations crashed during the 1990s. Springer thinks these trends indicated predation by killer whales. He suggests that a decline in great whales forced the killer whales to start feeding on the fat harbor seals. As that prey became scarce, they shifted to eating the smaller fur seals and the more aggressive Steller’s sea lions. As these populations dwindled, the orcas started feeding on the much smaller sea otters. The decline in the sea otter population has led to an increase in the number of sea urchins, one of the sea otter’s favorite foods. This in turn has placed more pressure on the kelp forest habitats, because sea urchins graze on young kelps.

Springer and his colleagues estimated how many seals, sea lions, and sea otters have died in the last 30 years, and by calculating how many small marine mammals it would take to feed a killer whale, they were able to show that the population crashes could have been caused by a shift in the killer whale diet of less than 1%.

Dr. Andrew Trites of the University of British Columbia in Vancouver, however, questions these results. He points out that computer models of marine ecosystems show no significant impact on pinniped populations when great whales are removed. Dr. Springer and other researchers in the field admit that solving the mystery of the declining populations will not be easy. Perhaps the new initiative by the National Academies of Science will shed light on the problem and suggest solutions.

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Where Have the Steller’s Sea Lions Gone?

1. What percentage of Steller’s sea lions live in Alaskan waters?
2. What are some of the hypotheses about why the populations are declining?
3. In 2000 what was concluded about the cause for the sea lion decline?

1. Some scientists disagree with this conclusion – what is Dr. Springer suggesting the cause for the decline is?
2. Springer concluded that a shift in killer whale diet of less than what percentage could have caused the decline?
3. What group is conducting the 10 year experiment to determine if fishing is the cause of the decline?
4. What do you think they cause is – based on this paper?