

*Eumetopias jubatus*, more commonly known as the Steller Sea lion is found in the northern Pacific ocean. They are the largest of the sea lion family, which are different from true seals. Males are significantly larger than females and can be up to 11 feet long and weigh 2,500 pounds, whereas females are generally 7 to 9 feet long weighing up to 750 pounds. Steller Sea lions are carnivores and eat a variety of fish (including Walleye Pollock), shellfish and other invertebrates. The Steller Sea lion has been protected in US waters since the 1972 Marine Mammal Protection Act. However, from 1976 to 2000 the population declined by over 70%, from 65,000 to 19,000, with no obvious cause. Steller Sea Lions are now listed as an endangered species under the U.S. Endangered Species Act. Researchers are working hard to understand the complicated relationship the Steller Sea Lion has with its ecosystem. This research may explain the decline and help prevent further population shrinkage.

Why might we be interested in estimating the population for a species of Sea Lion? As an endangered species, the population is monitored to keep check on whether it is changing or not. If an endangered population is decreasing, the possibility of extinction becomes a greater concern. If we see that an endangered population is increasing, this may be considered a good sign that it is recovering. This has happened in the past, with the Bald Eagle and Grey whale, where careful monitoring of the population along with protection plans helped these endangered species populations recover. Because currently there is no known cause for the Steller sea lion population decline, effective plans have been difficult to establish. Regardless, it is important to track changes in population numbers so a record is available. This record can help scientists see the trend of the Steller population. The trend will either show that the population is increasing, decreasing or stable, over time. Researchers are currently trying to figure out if the Steller population decline is due to predation by Killer Whales, competition for food with human fisheries, other factors, or a combination of several things.

Steller sea lions are counted during their breeding season using aerial surveys. Aerial surveys are conducted every year, alternating between counting adults and juveniles one year, then new born pups the next. Planes fly over what are known as "haul outs," areas on land close to the ocean where sea lions come ashore to give birth, breed, rest and molt. Photographs of the haul-outs are taken from an altitude of 750 feet using specially designed cameras.

Sea Lions themselves are counted from the aerial pictures with the aid of computer software. In the photographs, scientists place a dot on each animal and the software counts the dots. The total population of Steller Sea lions is not actually estimated; instead yearly counts are used as an index of abundance, a record, and then used for trend analysis. A yearly trend is the pattern of change over a period of time measured in years. You may recall, a trend can tell us if a population is increasing or decreasing. The change in the number of sea lions at each haul out from one year to the next is found, and the overall population trend determined. Currently, Steller Sea Lion populations are still decreasing.

As with any animal population we wish to estimate, there are unique challenges created by the animal's habitat, and behavior. Weather conditions can present a serious challenge during the aerial counts. Most seal haul-outs tend to be along rocky cliffs, which are dangerous to planes due to how the wind behaves around these areas. Certain conditions keep the plane from even leaving the airport such as when it is foggy or there is low ceiling of clouds. Timing of when the sea lions haul out also presents a

challenge. Sea lions haul-out for only a few weeks each year, from the end of May to mid July, so there is only a narrow window when the aerial survey can be conducted.

The estimate must account for any sea lions that may be out at sea feeding during the time the aerial photographs are taken. To meet this challenge, researchers use a method called “mark and recapture” to determine what portion of Sea lions may be out at sea during aerial surveys. In this method a number of sea lions are captured and marked, either with numbered tags attached to their flippers, or ID numbers branded into their fur. Since the scientists know how many animals were tagged, they can then find out how many animals are on land during the aerial survey, any animals with tags not seen are assumed to be off-shore feeding. What they have found is that 30-40% of the population is out to sea during the survey, which is then taken into account when estimating and developing a population trend.