

Aerial Population Survey

Age: 8-12

It is impossible to know exactly how many Steller sea lions are in the ocean. Luckily for researchers, the sea lions converge every summer on shore to birth, mate, and rear newborn pups. This provides a fantastic opportunity to count how many are on shore every year, and how many pups, adults, and juveniles (teenagers) are in the population!

How do researchers get these pictures?

Researchers fly over Steller sea lion rookeries (where most of the pups are born) and haul-out sites on planes! Cameras mounted to the belly of the plane take high-resolution images of the sites. At the end of the survey, scientists count every sea lion in the 1000s of high-resolution images that were taken. These counts do not represent the entire Steller sea lion population, as some are at sea when the images are taken, but when compared across years, the counts allow researchers to track population trends.



Photo: NOAA Fisheries

What are the benefits of performing aerial surveys?

This technique is able to provide robust, cost-effective estimates, with good precision.

Calculations to estimate true population size

Most methods of surveying animals do not result in counts or captures of all animals present on an area. This means that you are not seeing 100% of the animals, so the probability of seeing an animal will be less than one. If there are animals out at sea, you won't see them in the aerial survey, and your count will be less than the actual population size.

To translate a count resulting from any survey method into an estimate of population size, we must estimate the proportion of animals counted (B) and then divide our count by B .

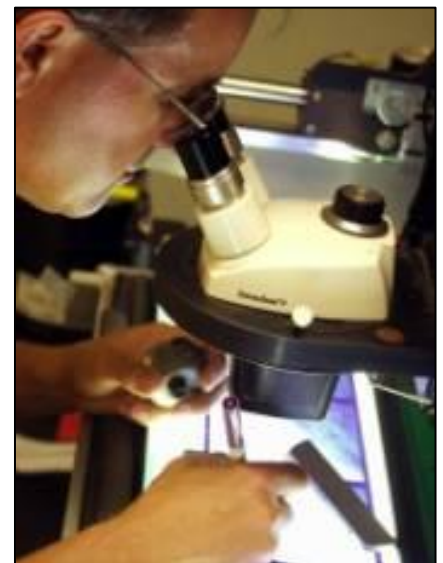


Photo: NOAA Fisheries

Estimate of true population size = Count/B

Ex. If we counted 20 birds during a survey and we know that we only see 25% of the total number of birds actually present, then $N = 20/0.25 = 80$ birds.

A problem with aerial surveys is that often, time and money are always limited, meaning that an entire area of interest cannot usually be sampled. Therefore, sample areas must be selected that represent a part of the total area of interest.

Estimate of population size of entire area = Count/fraction of total area of interest

Ex. If 50 elk were observed on sample plots representing 10% of the total census zone, then the estimate of population size of the entire area is $50/0.10 = 500$.

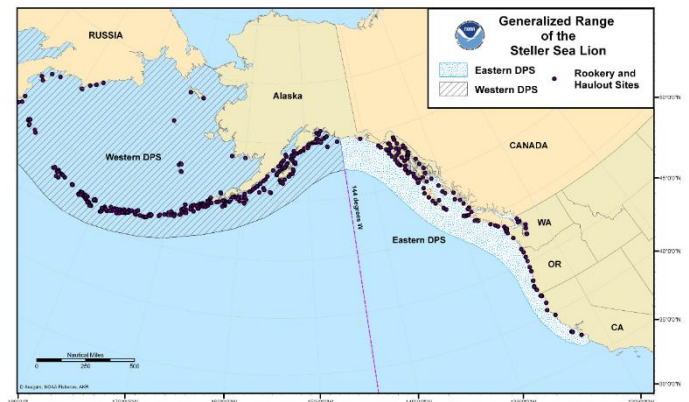
Definitions

Observability or sightability: probability of seeing or catching an animal.

Census zone: the whole area in which the animals are estimated to be, usually divided up into sample units.

Sample zones or units: the part of the census zone that is searched and counted.

Photo: NOAA Fisheries



Exercise

Look at the aerial photographs, beginning with photo 1, and count or estimate how many sea lions are present in these areas. What is your best guess at the sea lion population from these photos? What was difficult about counting sea lions using this process? What are some benefits you can think of?

Review the typical range of sea lions off the coast of Seattle and Vancouver Island. Is our estimate/count correct? Does it account for all sea lions? Does it account for all sea lions in these specific areas? Brainstorm solutions for these problems. What other ways could population analysis be performed?

How are these findings useful? Why do researchers spend their time and resources to perform aerial surveys?

Photo 1.



Photo: <https://seagrant.uaf.edu>

Photo 2.



Photo 3.



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