

Northern Elephant Seals: Increasing Population, Decreasing Biodiversity

By Dana Handy, May 24 2013



The male elephant seals are known to have aggressive, bloody battles with each other to obtain dominance during mating season. They use their elephant-like noses to make a loud trumpet noise that attracts mates. Photo: NOAA

In nature, a population recovery is not always what it seems, as the story of the Northern Elephant seal attests. This species, so named because the large male seal's nose resembles that of an elephant trunk, is a unique marine mammal that spends more than 85% of its life in the North Pacific Ocean (from Baja, Mexico to the Gulf of Alaska) save for a limited amount of time on land for breeding and molting purposes. For much of the year, elephant seals exist in far offshore waters, and commonly swim to depths of more than 5,000 feet below the ocean's surface (Marine Mammal Center 2013). These animals can stay underwater for over an hour at a time, coming up to the surface only for a few minutes of rest before disappearing underwater again. Throughout the Nineteenth Century, hunters harvested the Northern elephant seal for its blubber to make oil, and the blubber of one adult male elephant seal could produce up to 25 gallons of oil (West 2013), which made them highly sought after by whalers and seal hunters. By the late 1880's, the seals were considered functionally extinct due to excessive harvesting. Not until roughly 40 years later, when the Mexican government designated Guadalupe Island as a biological reserve (i.e., marine protected area) did these animals have an opportunity to recover. With a natural population of less than 100 individuals, seals from Guadalupe Island and other nearby regions were able to remarkably expand to new areas and have since made a 'full' recovery, at least in terms of population size. The northern elephant seal population continues to increase 6% per year, with ~127,000 northern elephant seals living today (Brownell et al. 2000).

While the story of the Northern elephant seal in Guadalupe Island is a success story by some accounts, it is also a tale of misfortune in that the over-harvesting of individuals resulted in a drastic reduction in genetic diversity for the species as a whole. When the effective breeding population reached a low point of 20-100 individuals, it underwent what is known as a population bottleneck, which occurs when a population experiences a catastrophic event (due to natural disaster, overharvesting, or habitat loss) that results in the survival of only a small number of individuals, who represent only a fraction of the genetic diversity that was present in the original population. These few individuals then interbreed and pass on their genes to their offspring. Unfortunately, inbreeding and lack of genetic diversity often result in higher incidence of harmful mutations due to a disproportionate distribution of alleles (i.e., alternate forms of the same gene) (Hoelzel et al. 2002, Garza et al. 2000).

The change in the frequency of a specific allele is cause for concern in animal populations since the lack of genetic variation increases an individual's susceptibility to developmental deformities, immunity to disease, and may even impact survival in their natural habitat. Amongst Northern elephant seals, genetic drift is a concern since each of the 127,000 individuals is descended from same 20-100 seals. The successful repopulation of the elephant seal is misleading because, although they recovered from the brink of extinction, the genetic diversity loss that occurred is detrimental to the health of the species in the future. Currently, the future of Northern elephant seals is uncertain and researchers lack the ability to determine what will happen to the population in the face of environmental stresses such as pollution, disease, or coastal development.

About the author: Dana Handy is a sophomore majoring in Environmental Studies at the University of Southern California.

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Post-Reading Questions

Define the following terms:

1. Population:
2. Biodiversity:
3. Extinct:
4. Allele:

Respond to the Following questions in complete sentences according to the article:

5. Describe the life of an elephant seal, where do they live?
6. Why did the elephant seal population become so drastically reduced?
7. What was the first step to helping the elephant seal population recover?
8. Approximately how large is the population of elephant seal according to this article?
9. What kinds of events/circumstances create a population bottleneck?
10. Why can a bottleneck effect be genetically disastrous for a species?
11. What is the future for the elephant seal population?