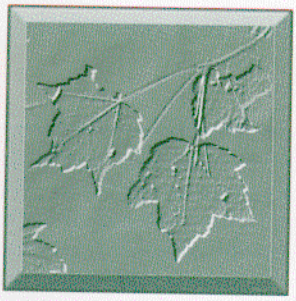

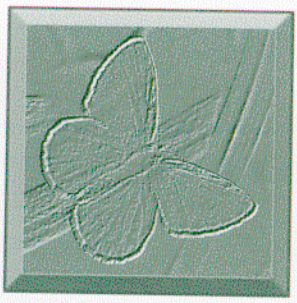

Our Living Resources

A Report to the Nation on the Distribution, Abundance, and Health of U.S. Plants, Animals, and Ecosystems

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Sea Otters in the North Pacific Ocean

by
James L. Bodkin
Ronald J. Jameson
James A. Estes
National Biological Service

About 250 years ago sea otters (*Enhydra lutris*) were distributed continuously from central Baja California, north and west along the Pacific Rim to Kamchatka Peninsula in Russia, and south along the Kuril Islands to northern Japan (Kenyon 1969; Fig. 1a). Several hundred thousand sea otters may have occurred in the north Pacific region when commercial hunting began in the 18th century (Riedman and Estes 1990).

At least two attributes of the sea otter have influenced humans likely for as long as they have resided together along the coast of the north Pacific Ocean. First, sea otters rely on a dense fur, among the finest in the world, for insulation in the cold waters of the Pacific Ocean. The demand for sea otter fur led to their near extinction in the 19th century. The fur harvest, begun about 1740 and halted by international treaty in 1911, left surviving colonies, each likely numbering less than a few hundred animals, in California, south-central Alaska, and the Aleutian, Medny, and Kuril Islands (Fig. 1a). These individuals provided the nucleus for the recovery of the species. Today more than 100,000 sea otters occur throughout about 75% of their original range (Fig. 1b). Immigration has resulted in near-complete occupation of the Aleutian and Kuril archipelagos and the Alaska Peninsula. Successful translocations have resulted in viable populations in southeast Alaska, Washington, and British Columbia. Large amounts of unoccupied habitat remain along the coasts of Russia, Canada, the United States, and Mexico.

The second potential source of conflict

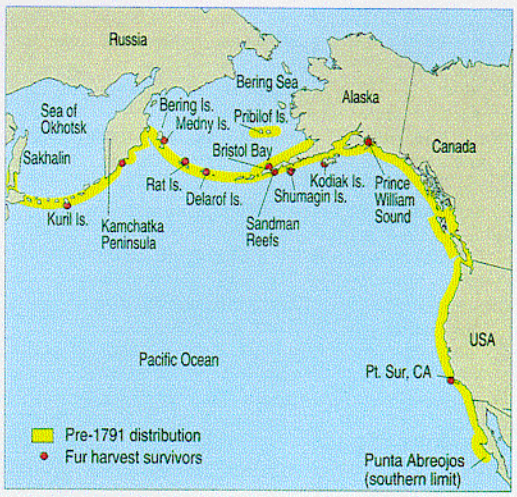

Fig. 1a. Distribution of sea otters before fur harvest began in 1741 and populations that survived the harvest, providing the nucleus for recovery of the species. Width of shaded area is not relative to sea otter habitat.

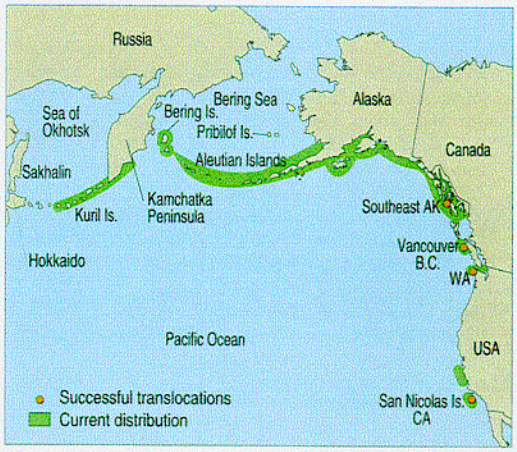

Fig. 1b. Current distribution of sea otters including locations of successful translocations.

between sea otters and humans is that sea otters prey on and often limit some benthic invertebrate populations. Because some of these invertebrates are also used by humans (Estes and VanBlaricom 1985), human perceptions about the effects of sea otter foraging on invertebrates sometimes differ. By limiting populations of herbivorous invertebrates (e.g., sea urchins [Echinoidea]) otters help maintain the integrity of kelp forest communities. At the same time, sea otter predation on other marine invertebrates can lead to direct competition with humans for resources. These interactions add complex dimensions to the conservation and management of sea otters, in large part because of wide-ranging social, ecological, and economic consequences of sea otter foraging.

Long-term data on abundance and distribution are available for relatively few sea otter populations. Here we summarize such data from three populations: Bering Island, Russia; Prince William Sound, Alaska; and Olympic Peninsula, Washington. The Bering Island population resulted from natural emigration and represents complete recovery. Prince William Sound represents near recovery of a remnant population, whereas the Washington population was established via translocations from Alaska and is just beginning to recover. We will compare growth rates and current status among these populations. Because of its unique status and growth characteristics, the California sea otter is not treated in this article.

Population Surveys

Annual skiff surveys were conducted at Bering Island from 1979 to 1993 (except 1990; Burdin et al. in press). Surveys from skiffs, airplanes, and helicopters were conducted in 1950, 1959, 1972, and 1984-85 in Prince William Sound (Johnson 1987; Irons et al. 1988). In Washington, skiff surveys augmented with ground counts were conducted from 1977 through 1987, and aerial surveys augmented with ground counts were conducted from 1989 to 1993 (Jameson et al. 1986; Jameson 1993). Instantaneous growth rates were calculated by regressing the natural logs of survey counts over time.

Population Status

Bering Island

Bering Island was recolonized by sea otters from nearby Medny Island about 1970. Growth occurred by progressive expansion around the island, with complete occupation of available habitat by 1983. The abundance of sea otters increased at an average of 22% per year, from 500 sea otters in 1979 to an estimated 3,835 in 1990 (Fig. 2). More than 20% of the population died at Bering Island during the winter of 1990-91 (Burdin et al. in press), suggesting that the number of sea otters exceeded available food resources. Little opportunity exists for emigration as the nearest unoccupied habitat is several hundred kilometers from Bering Island.

Prince William Sound

Although no surveys were conducted before 1959, at least 150 sea otters were observed in southwestern Prince William Sound in 1951 (Lensink 1962). Sea otters had spread throughout all available habitat in the sound by 1985, although growth was still apparent in the eastern part of the region (Johnson 1987). The overall growth rate in Prince William Sound between 1911 and 1985 was on average about 8% per year (Fig. 2). No density-dependent mortality event, such as observed at Bering Island, has been documented for Prince William Sound. Limited unoccupied habitat that could provide space for dispersing animals is still available both to the east and west of Prince William Sound.

Washington

In 1969 and 1970, 59 sea otters were released along the outer coast of Washington. Mortality was high, with 16 carcasses recovered after the first release (Jameson et al. 1982). Between 1977 and 1993, the population grew at an average of about 20% per year. Between 1989 and 1993, however, the average annual growth rate has been lower (12%). Unoccupied habitat currently occurs north, south, and within the present range, and continued growth is likely.

Predicted Trends

Sea otters illustrate the healthy recovery of a species following protection and active management. Rates of increase in most populations with unoccupied habitat available to them have been 17%-20% per year (Estes 1990a). As unoccupied habitats become limiting, however, density-dependent mechanisms may dramatically reduce sea otter abundance. As geographically separate populations reach equilibrium densities or as populations become so large as to create long dispersal distances to unoccupied habitats, we anticipate declining growth rates, increased mortality, and numbers of otters stabilizing near an equilibrium density. The observed trend in virtually all persisting populations since 1911 has been one of growth, with declines observed only as populations exceeded available resources (Estes 1990a, 1990b). Continued growth is expected, particularly in Washington and southeast Alaska and along the Kamchatka Peninsula.

The long-term exponential growth in many sea otter populations has allowed us to describe the process of sea otter recovery. However, as populations attain equilibrium densities and growth rates decline, evaluation of future trends will become more difficult. In addition, possible short-term changes, such as those resulting from human impacts, may remain difficult to detect. Thus, describing future population trends will require improved population- or individual-based assessment models.

At least two issues are currently relevant to sea otter conservation and management. One is competition between sea otters and humans for shellfish resources. As otters continue to reoccupy former habitat, the commercial, recreational, and subsistence harvest of species such as crabs (Crustacea), clams (Bivalvia), abalone (Gastropoda), and urchins, can be expected to decline.

Another current issue is the extent of the legal and illegal harvest for sea otter fur. Both the legal harvest by Alaska Natives and an illegal harvest in Russia have recently increased (A. Burdin, Russian Academy of Science, personal communication). Reasonable harvest guidelines and adequate inventory and monitoring programs should be established in areas with harvested populations.

Neither of these conservation issues currently appears to be precluding the continued growth of sea otter populations, but the potential to overharvest this species has been well demonstrated. Conservative management should ensure continued growth through complete recovery.

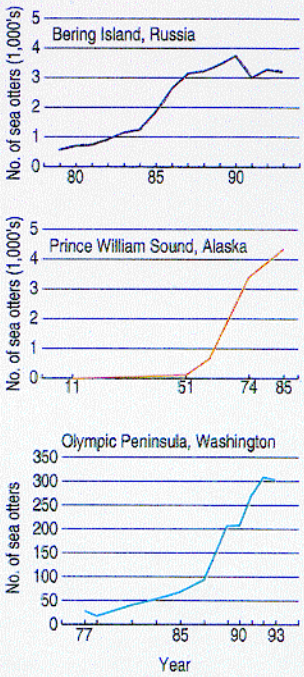

Fig. 2. Growth patterns observed in three sea otter populations in the north Pacific resulting from natural range expansion (Bering Island and Prince William Sound) or translocation (Washington).

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Courtesy NBS

Sea otter (*Enhydra lutris*).

For further information:

James L. Bodkin
National Biological Service
Alaska Science Center
1011 E. Tudor Rd.
Anchorage, AK 99503

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