

# Sea Otter

## History

Sea otters (*Enhydra lutris*) once ranged from extreme northern Japan through the Kuril Islands, southern Sakhalin Island, southern Kamchatka Peninsula, Commander Islands, Aleutian Islands, southern Alaska, British Columbia, Washington, Oregon and California, extending south to about the midpoint of the Pacific coast of Baja California, Mexico. Prior to 1741, human contact with sea otters was limited to native cultures through much of the range and to Spanish colonists in California and Mexico.

Commercial utilization of sea otters followed the Bering Expedition of 1741 to the mainland of southern Alaska and the Aleutian and Commander Islands. Reports of vast numbers of sea otters stimulated the fur trade and contributed to the eventual settlement and economic development of the west coast of North America by non-native people. Russian fur traders developed facilities at several locations on the North American coast, most notably at Kodiak Island and Sitka. The southernmost outpost, at Fort Ross, California, was established in 1812. Russian hunters worked at least as far south as the islands off Santa Barbara, but the Russian presence in California was contested by Spanish colonists. Spanish trade in sea otter pelts began in 1786 and was the most important industry in coastal California for several decades.

The early Russian otter traders utilized enslaved Aleut natives as hunters. The Aleuts worked from native canoes, hunting with spears and clubs. Later, American and European hunters entered the trade using firearms as primary tools of capture. By the 1840s, the sea otter population in California was greatly reduced as a result of overexploitation.

Sea otters were approaching extinction at the beginning of the twentieth century. Thirteen remnant populations,

totaling perhaps 1,000 to 2,000 individuals, survived in the North Pacific in 1911. Sea otters were widely regarded as extinct in California by 1900, but scientists and game wardens were aware of a surviving group near Point Sur in Monterey County as early as 1914. Rough population estimates in the early 1900s ranged from less than 50 to about 100 sea otters in California. Other remnant populations were known to exist in 1911 in Mexico, Canada, Alaska and Russia. The remnant populations in Mexico and Canada were thought to be extinct by 1920.

The International Fur Seal Treaty was signed in 1911 by Canada (for Great Britain), Japan, Russia and the United States. The Treaty recognized the serious overexploitation of northern fur seals and sea otters and provided full protection for both species. State law has prohibited take or possession of sea otters or their pelts in California since 1913. With the termination of the trade in sea otter pelts, the California sea otter population began to grow in numbers and range. State Highway 1 was opened between Monterey and San Simeon in 1937, traversing a coastal segment previously not accessible by automobile. Highway access led to the much-publicized "rediscovery" of California sea otters by the general public at Bixby Creek in 1938. The sea otter population numbered roughly 300 individuals at that time. The state of California provided additional protection for sea otters by creating the Sea Otter Game Refuge, extending along 100 miles of coastline from the Carmel River, near Monterey, to Santa Rosa Creek, near Cambria.

Between the late 1930s and the late 1970s, the California sea otter population grew at an average annual rate of about five percent, extending its range to more than 200 miles of coastline from Santa Cruz to Pismo Beach. Whether this growth occurred smoothly or in pulses is not known. In the early 1980s, a cessation of population growth was recognized, and some argued that the population was declining in numbers. Studies by federal and state agencies determined that the nearshore set-net fishery for halibut was causing significant mortality of sea otters as a result of incidental entanglement and drowning. Estimates of annual mortality in nets ranged as high as 80-100 animals, a rate perhaps sufficient to account for the cessation of population growth. Legislation by the state imposed restrictions on set-net activity, greatly reducing incidental take of sea otters in nets. By the middle 1980s, it was apparent that population growth had returned to levels previously observed. However, in the mid-1990s population growth again ceased and by 1999 numbers had declined by more than 10 percent over a four-year period. The spring 2000 sea otter count erased most of the decline of the previous four years and raised hopes that the population had resumed expansion.



Sea otter pup  
Credit: D. Varonjean

## Status of Biological Knowledge

The subspecific status of various populations of the sea otter has been in dispute for many years. The most recent studies, based on skull morphology and DNA, suggest the California population is a separate subspecies. It is possible, if not likely, that subspecific differences have been magnified by separation of northern and southern populations brought about by near extermination. Definition of the subspecies of sea otters will likely remain controversial.

While sea otters in California occur predominantly along rocky shores supporting forests of the large kelps, in the past decade it has become apparent that significant numbers can maintain themselves off sandy shores. Along the mainland coast, the kelps typically form extensive surface canopies in waters less than 80 feet in depth where the substratum is rock. Sea otters commonly form resting groups, known as rafts, particularly in kelp canopies. Rafts typically contain up to 10 individuals, but under certain circumstances may include more than 100 otters. Most sea otters remain within one mile of shore, but in some situations, such as in Monterey Bay, Estero Bay and off Pismo Beach, otters are regularly seen foraging and resting more than two miles offshore. Juvenile males tend to range farther offshore than other age/sex categories. Records from the fur trade suggest that sea otters once were abundant in the soft-bottom habitats of San Francisco Bay.

Adult male sea otters in California typically weigh 60 to 75 pounds, reaching a length of four to 4.5 feet. Adult females typically reach a weight of 40 to 55 pounds and a length of four feet. The largest sea otter recorded in California was a male weighing 92 pounds.

Sea otter pelage includes outer guard hairs and dense, fine underfur. Density of sea otter fur is higher than that of any other mammal. Sea otter pelage provides the primary thermoregulatory barrier between the animal and the chilling effects of seawater. Most other marine mammals rely on subcutaneous fat or blubber rather than pelage for thermal protection. The effectiveness of the pelage as a thermal barrier depends on frequent grooming and consequent cleanliness. Soiling of the fur largely eliminates the insulative qualities, resulting in rapid heat loss. Food volume equivalent to 25 percent or more of individual body weight must be consumed daily to maintain the high metabolic rate typical of sea otters.

Male sea otters reach functional sexual maturity at five to six years. In California, adult males establish and defend territories in areas of high female density, seasonally in some areas and year-round in others. Younger males typically are excluded from breeding areas by territorial males. Female sea otters become reproductively mature at three to five years of age. Mature females typically

come into estrus within a few days to a few weeks after weaning of pups. Gestation is four to six months and involves delayed implantation. After implantation, development to birth normally requires about four months. Virtually all births are single. Care of dependent pups is entirely maternal. The period of pup dependency averages six months in California, with a range of 4.5 to 9.5 months. Studies suggest that pre-weaning mortality rate for firstborn pups may exceed 50 percent. Survival of dependent pups improves with the experience of the mother. Most adult females produce one pup per year. In cases of premature death of dependent pups, females may come back into estrus and be reimpregnated within a few weeks after loss of the pup.

In California, rates of pup birth apparently peak in late winter, with a secondary peak in late summer or early fall. Some pupping occurs year round. Sea otters typically weigh four to five pounds at birth, and 20 to 30 pounds at weaning. In most sea otter populations, maximum longevity probably is in the range of 11 to 15 years. Captive animals are known to have lived as long as 28 years.

Known predators of sea otters include sharks, killer whales, eagles, coyotes and bears. While attack by white sharks probably occurs at a low rate throughout the California range, in areas north of Santa Cruz it accounts for a significant portion of the mortality. Predation generally is regarded as less important than food limitation in controlling the size of sea otter populations. Patterns of activity vary widely among sea otter populations and among individuals within sea otter populations. In California, most otters forage during morning hours, rest from late morning through mid-afternoon and resume foraging in late afternoon. Sometimes a third period of foraging occurs at night, between about 11 p.m. and 2 a.m. Juvenile females typically spend more time foraging than other age/sex categories, often feeding during hours when other otters are at rest.

In California, home ranges of adult males during the principal breeding season (summer and fall) have a mean coastline length of about a half mile and an area of about 100 acres. During winter the range approximately doubles for those individuals that remain in breeding territories. Long-distance movements among high-use areas range from 35 to 60 miles and often are seasonal. Males may remain within a high-use area for months at a time, but travel between such areas rarely requires more than a few days. Females follow the same general pattern as males, but high-use areas are typically 1.5 to two times larger for females than for males. Females also travel long distances in short periods, but such travel is much less frequent for females than for males. Substantial short-term movement of females among high-use areas often occurs in association with pupping. Juvenile males tend

to utilize larger areas and travel greater distances than other age/sex categories. Various studies have shown that sea otters are capable of homing from distances as great as 300 miles.

Sea otters generally feed on large-bodied, bottom dwelling invertebrates obtained during dives. They are able to dive to at least 320 feet, but most foraging dives in California are in waters less than 80 feet deep. Dive duration may be as long as four minutes, but more typically, is 50 to 80 seconds. Individual otters typically feed on a relatively few species of prey. At the population level, however, sea otters are dietary generalists. More than 160 species have been reported as sea otter prey. Composition of sea otter diet relates to patterns of population growth. In California, diet is predominantly sea urchins, abalones, large crabs and large clams when otters have recently reoccupied a foraging area. As the period of occupation increases, preferred prey decline in availability and the diet diversifies. In cases of occupation by sea otters for more than a few years, the most common prey in California are crabs and small snails. Other frequent prey include octopus, mussels and clams, and at least some otters eat large quantities of market squid when available. Sea otters are well known for their abilities in using stones as tools while foraging. Stones may be used as hammers to dislodge prey from the substrate during dives and may be used as anvils for breaking shells of prey during surface intervals. Fish are common prey for sea otters at certain locations in Alaska and Russia. Consumption of fish by sea otters is rare in California.

Sea otters have important effects on the character of nearshore biological communities. In a number of circumstances, it has been reported that otters substantially reduce prey abundance and individual size. The best-known cases involve species such as abalones and sea urchins that are sought in commercial or recreational fisheries. Such interactions have provided grist for intensive political discord for many years regarding approaches to management of sea otter populations. Such conflicts first arose in regard to the central California abalone fishery in the 1960s. More recent conflicts involve sea urchins, Dungeness crabs and several species of clams. Human over-harvesting of shellfish populations sometimes contributes to management difficulties and political controversies associated with conflicts of sea otters and shellfisheries.

The control of herbivorous invertebrates by sea otters allows secondary development of dense algal populations, including kelps, which may substantially alter the structure and dynamics of nearshore ecosystems. Proliferation of algae as a consequence of growing sea otter populations has been reported at a number of locations throughout the range of the species.

The 1989 *Exxon Valdez* oil spill (EVOS) in Prince William Sound demonstrated the potential vulnerability of sea otter populations to catastrophic oil spills. As many as 781 spill related sea otter carcasses were recovered after the spill. Total mortality of sea otters resulting from EVOS was much higher. Over 350 sea otters, mostly oiled, were captured alive after the spill, but survival was less than 50 percent despite intensive efforts to treat and rehabilitate oiled animals. Oiled sea otters died primarily from hypothermia resulting from matted pelage, toxic effects of oil fumes inhaled, oil ingested during futile grooming efforts, and from stress.

To deal with potentially catastrophic oil spills impacting sea otters in California, the California Department of Fish and Game's (DFG) Office of Spill Prevention and Response (OSPR) built and maintains the Marine Wildlife Veterinary Care and Research Center in Santa Cruz. This facility can provide care for up to 120 sea otters as well as oiled birds and other marine mammals if necessary. It is part of the larger Oiled Wildlife Care Network (OWCN) run by the Wildlife Health Center at the University of California, Davis, under funding from DFG-OSPR. Smaller numbers of oiled sea otters may also be cared for at the Monterey Bay Aquarium, the Marine Mammal Center and Sea World, which are affiliated with the OWCN and OSPR.

## Status of the Population

The sea otter population in California currently ranges along nearly 350 miles of coastline from approximately Half Moon Bay, San Mateo County to approximately Gaviota, Santa Barbara County. Determination of trends in the number of sea otters has been complicated by the variety of survey techniques used, differing in accuracy and precision. However, few would argue that since the late 1960s the population and range have more than doubled. In 1982, a standard survey method was adopted for assessments of the California population. The most recent count in California, in the spring of 2000, totaled 2,317 animals, 2,053 independent sea otters and 264 dependent pups.

Intensive investigation into the causes of sea otter mortality in California occurred throughout the 1990s and into 2000. Virtually every fresh dead sea otter received a detailed necropsy by a veterinary pathologist either from the National Wildlife Health Center or the DFG in partnership with the Veterinary Medical Teaching Hospital at the University of California, Davis. Several new disease agents and disease processes were described. Some of the more important diseases and parasites of sea otters in California include: 1) thorny headed worms of the genus *Proflicollis*, which when present in high numbers penetrate the gut wall causing peritonitis; 2) protozoal encephalitis; 3) bacterial septicemia; 4) biotoxin poisoning from certain "red

tide” organisms; and 5) San Joaquin Valley fever. The prevalence of some of these pathogens may be influenced by human activities within and adjacent to the marine environment of sea otters. If these diseases are new to the sea otter population then serious consequences may be in store. However, these may be old diseases recently discovered. The influence of contaminants, immune system function, and malnutrition on patterns of disease and overall mortality are being investigated. Diseases and parasites of sea otters in California appear to be largely different from those of Alaskan sea otters.

The cessation of population growth centered around 1982-1983 and 1997-1998, both strong El Niño years, suggests to some, that long term cyclic environmental changes resulting in ups and downs in prey availability may be responsible. Others argue that increases in disease and/or parasite infection rates are primarily responsible for population dips. Still others suspect that bycatch of otters in net and trap fisheries may be the major factor. It is likely that all of these play a role in regulating population size. If long-term, more or less permanent, human caused and/or natural environmental change is occurring, then predicting the future for sea otter populations, or any living resource, is troublesome.

## Current Management

Passage of the federal Marine Mammal Protection Act (MMPA) of 1972 provided new authority for protection of sea otters in all U.S. waters. With the passage of the MMPA, management authority for sea otters in California transferred from the state to the federal government. The managing agency is the United States Fish and Wildlife Service (FWS). Sea otters were conferred “threatened” status under the federal Endangered Species Act of 1973 (ESA) in 1977. The ESA directed the formation of a recovery team and the production of a recovery plan for California sea otters. A primary element of the plan, issued in 1982, was the establishment of a new colony of sea otters by translocation within California. The colony was to be well separated from the existing mainland range, thereby reducing the possibility that a single large oil spill or similar disaster could contaminate all the sea otters in California.

Between 1987 and 1990, 139 sea otters were translocated from the mainland range to San Nicolas Island (SNI), off southern California. The number of sea otters counted at SNI through most of the 1990s hovered around 15. The most recent survey of the island, in April 2000, found 23 sea otters (21 adult and two dependent pups). While over 50 sea otter pups are known to have been born at the SNI, the population strangely has remained small.

The status and future of the sea otter colony at SNI remain uncertain.

The federal law (Public Law 99-625) that authorized the translocation of sea otters to SNI also created a management zone (aka the no-otter zone) as a concession to the shellfish industry for fisheries expected to be lost due to sea otter foraging. This management zone includes all California waters south of Point Conception except for those surrounding SNI. All sea otters found in the management zone were to be captured by FWS in cooperation with DFG and returned either to SNI or the mainland range. Over 20 sea otters were captured in the management zone between 1990 and 1993 and returned to the mainland range. However, shortly after, two separate otters captured from the management zone and translocated back to the Monterey area, were found dead. The FWS judged that the deaths might have been due to the stress of capture, transport and relocation. This brought an end to the “containment program,” as it was called, because removals were to be by non-lethal means. Small numbers of otters remained in the management zone through 1997 with relatively little outcry from opponents of this outcome. Then in 1998, over 100 sea otters moved into the area south of Point Conception. Since that time the numbers counted in the management zone have seasonally vacillated from less than five to over 150. The count south of Point Conception in May 2000 was 79 sea otters. No action by FWS to remove sea otters from the management zone has occurred since 1993.

At this writing (June 2000) the FWS is being sued by the shellfish industry for failure to enforce the management zone as legally mandated by Public Law 99-625. Meanwhile, the Friends of the Sea Otter, a sea otter advocacy group, has vowed to sue the FWS if they attempt to enforce the management zone on the grounds that such action would violate the ESA.

The draft revised recovery plan for sea otters in California was made available for public review in the spring of 2000. The primary goal of the new Plan, like the old, is attainment of a sea otter population with sufficient numbers and range to eliminate the possibility of disasters such as the EVOS exposing all California sea otters to contamination and possible injury or death. Interestingly, the draft revised plan no longer views the process of translocation as a valuable tool to speed recovery, viewing natural expansion of the population to be the appropriate approach. According to the recovery team, it will require the average of three consecutive standardized spring counts to be 2,650 or greater for sea otters to be delisted under ESA (Friends of the Sea Otter is threatening to sue to increase this number).

If the sea otter population in California does increase to the level suggested for delisting, and should delisting

occur, it will still, in all likelihood, be accorded "depleted" status under the MMPA. Removal from depleted status requires the "optimum sustainable population" be attained which is generally regarded as 60 percent of the "carrying capacity." If the historical statewide population size of 14,000 is used, then the count of sea otters in California necessary for removal from depleted status under the MMPA is 8,400. Only after this sea otter population size and associated range size are achieved will real zonal management (separation of sea otter and shell-fishing areas), which would require lethal take, become a possibility. Unlimited expansion is the likely management option that will be pursued for the foreseeable future.

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