Status of Alaska Sea Otter Populations and Developing Conflicts With Fisheries

Ancel M. Johnson
U.S. Fish and Wildlife Service
Denver Wildlife Research Center
Anchorage, Alaska

Introduction

Although sea otters (*Enhydra lutris*) have been a relatively insignificant resource in Alaska during the twentieth century, the situation is changing. Remnant populations that recolonized most of their historic range are becoming recognized as a potentially valuable economic resource and as a competitor with some important shellfish fisheries. It is appropriate that sea otters should again become an important Alaskan resource because they were so significant in the initial exploration and settlement of Alaska by non-natives. In this paper I review changes in distribution and population abundance since 1740, recent changes in human attitudes toward sea otters, and review our understanding of the biological characteristics of sea otters that are particularly important to managing populations.

Pre-1911 Populations

An era of intensive fur hunting and exploration began soon after crew members that survived Bering's famous last voyage to North America returned to Kamchatka. By the end of the era, sea otter populations were greatly reduced and the west coast of North America was no longer uncharted wilderness. Because the history of this early fur trade and the fate of the sea otter populations have been described by a number of authors, I will only briefly summarize them here. Lensink (1960) estimated that during the 126 years of Russian occupation of Alaska (1741–1867) about 800,000 sea otters were taken by all nationalities. During this period, exploitation was initially uncontrolled; but by the early nineteenth century it was apparent to managers of the Russian-American Company, which had been given exclusive hunting rights, that the taking had to be regulated or the resource would be eliminated. Apparently, hunting was regulated some time after 1820. Hooper (1897) stated that the native hunters were held to strict quotas allotted to the various hunting districts during this period and the take recorded by the Russian-American Company suggests harvests were regulated to obtain a sustained yield. The annual take varied from a few hundred to about 2,000 from the 1840s through 1865. During this period of controlled hunting, sea otter populations apparently partially recovered.

Another period of uncontrolled hunting began with the purchase of Alaska by the United States. This time uncontrolled hunting continued until sea otters had been eliminated from all but a few remote areas. The number of otters taken for the four decades between 1871 and 1910 was 40,283, 47,842, 6,467, and 572, respectively (Lensink 1962), clearly indicating that the sea otter population was greatly reduced and that hunting was no longer profitable. Kenyon (1969) concluded that in 1911 there were remnant populations of sea otters in seven areas of

Alaska, scattered throughout most of the sea otter's range in Alaska. Only the coast to the east and south of Prince William Sound was without colonies. It is likely that otter populations remaining in 1911 consisted of widely scattered animals with larger groups in the seven specific areas identified by Kenyon. The total number of otters in 1911 is not known, but probably no more than several hundred remained.

There is no way to develop a reliable estimate of the total number of sea otters in Alaska before exploitation. Kenyon (1969) concluded that the number was probably no more than 100,000 to 150,000, but could have been as high as 637,500. Kenyon's lower figure was based on the assumption that there were 30,000 otters in the late 1960s occupying about one-fifth of the total range. Based on additional surveys, it appears that Kenyon's estimate of 30,000 was low. Schneider (1978) estimated 100,000 to 120,000 otters in 1972 with probably one-half or more of the range reoccupied. Therefore, I conclude that the population in 1740 was probably somewhat greater than 200,000.

Post-1911 Population

Very little information was accumulated on sea otter populations until the 1930s. By then reports of sea otter sightings were becoming frequent. Population surveys began in the Rat Islands in the Aleutian Chain in the early 1930s (Eyerdam 1933) and by the early 1960s much additional information had accumulated. Lensink (1962) and Kenyon (1969) summarized these data, which show that sea otter populations had responded well to protection and had increased to about 40,000; populations in the central Aleutians showed signs of being at carrying capacity. At the time, the only large segment of the historic range that did not contain otters was southeast Alaska. From 1964 through 1972 the State of Alaska translocated otters to southeast Alaska (Schneider 1978) and surveys there in 1975 indicated that reproducing colonies had become established in four areas (Jameson et al., 1982).

Since 1972, when the Marine Mammal Protection Act took management authority from the States, there has been no complete survey of the sea otter range. Limited information from studies in specific areas and from other sightings of sea otters supports the conclusion that sea otters are increasing in recently occupied areas, that there are some sea otters in all of the historic Alaskan range, and, except for southeast Alaska, populations are likely to be at or near carrying capacity within the decade. The populations in southeast Alaska probably total about 1,000 now and can be expected to increase several fold, probably not reaching maximum levels for several decades.

Lensink (1960) noted that counts of the Amchitka Island population indicated an annual increase of about 19 percent during the early stages of recovery, and this later decreased to near 5 percent. Assuming that the aggregate of all existing populations, in various stages of recovery, are increasing at a rate well below the highest level estimated for the Amchitka Island population, a reasonable estimate of the annual rate of increase for the entire population is probably near the lowest level, about 5 percent. Assuming further that Schneider's estimate of 100,000 to 120,000 was correct for the early 1970s, then the present population numbers 150,000 and 200,000 animals.

Biology

Knowledge of sea otters was recently summarized by Estes (1980). I will descirbe only those biological attributes and ecological relationships that are of obvious importance to management; namely, movement, segregation, vital statistics, feeding habits, and ecological effects of feeding.

Movements of sea otters are poorly understood. Observations of expanding populations have shown that large numbers of otters will move from an island with a high density to an adjacent island with few or no otters (Kenyon 1969, Lensink 1962). We do not know if similar "mass" movements will occur between islands or areas with approximately equal densities of otters when the entire range is occupied. Based on 29 recoveries of tagged otters, Kenyon tentatively concluded that the home range of the sea otter during at least a 3-year period may include about 5 to 10 miles (8–16 km) of coastline and that males have a larger home range than females. In Prince William Sound, Alaska, I observed that tagged adult females may limit their movements to a small area of 3 or 4 km^2 (1.2–1.5 square miles) for several days, but, within a season, regularly move their area of use several kilometers so that their seasonal or yearly range includes several square kilometers. Adult males show a similar pattern, except seasonally, some males may move their daily area of use by as much as 88 km (54.7 miles). The long movements of adult males have been from territories occupied during the peak of the mating season to "male areas" used during the remainder of the year. Limited data suggest that young males also move to male areas after they become independent at 6 to 12 months of age. No data exist showing movements of individual young females, and limited observations suggest that they remain near the area where reared. Sea otter populations are not migratory.

Another attribute of sea otters that is important to management planning is the tendency of the sexes to segregate (Kenyon 1969, Schneider 1978). The tendency to segregate, in combination with their gregarious habits, results in the formation of pods that may contain several hundred otters. Females are rarely found in these males pods. The area used by these pods is predictable, although the pods may move a few kilometers and change in size seasonally. The greatest changes in these male pods have been observed at the periphery of the range (Kenyon 1969, Lensink 1962, Johnson, unpubl. data). Apparently, the male areas show the least change in well-established populations.

Although we have general knowledge of natality and mortality, we do not have data showing age specific rates. Females give birth to their first pup when three to five years old (Schneider 1972). Based on the condition of ovaries and uterine horns of a large collection of female otters, Schneider concluded the typical reproductive cycle of females was two years. However, observations of marked females and a small collection of females in Prince William Sound suggest that most females there have an annual reproductive cycle, and Loughlin et al. (1981) reported two tagged females in California had annual cycles. Observations of females in aquaria show that they are capable of an annual cycle. The length of the reproductive cycle may be related to population status; females in populations at or near maximum levels may have a two-year cycle, as indicated by Schneider's data, and those below that level have a high percentage of females with an annual cycle.

Little is known of the magnitude or specific causes of natural mortality. Mortality appears to be low in populations that are becoming established and increases as populations reach a maximum level. The increase is primarily of young animals and apparently is related to decreased food quality and availability (Kenyon 1969). In Alaska the loss of sea otters to predators appears to be insignificant.

Feeding habits of sea otters are well known (Estes et al. 1981). Although otters take numerous species for food, only a few groups of species appear to be of major importance. These include clams, mussels, crabs, sea urchins, and in some areas slow-moving fishes.

Of particular importance to management are the ecological effects of sea otter foraging on nearshore communities. In the absence of sea otters, dense mature populations of several otter prey species developed. Most noticeable of these are the sea urchin populations in the Aleutians and clam and mussel populations in several areas. Estes and Palmisano (1974), Estes et al. (1978), and Dayton (1975) noted that, where sea otter populations had become reestablished in the Aleutians, the size and abundance of sea urchins were reduced, macroalgal assemblages were robust, and nearshore fishes relatively more abundant than in areas without sea otters. The depressing effect of sea otter foraging on abalone (*Haliotis* spp.) and pismo clam (*Tivela stultorum*) populations in California is also well documented (Lowry and Pearse 1973, Miller 1974, and Miller et al. 1975).

Developing Sea Otter-Fishery Conflicts

Until recently, sea otters have been absent or at low levels in the vicinity of human populations in Alaska. This situation is now changing, and the impacts of sea otters on some shellfish populations are becoming of concern to human residents in several areas.

In addition, people are aware that the sea otter is now well established in most of its historic range in Alaska and that they are a resource of potentially significant economic yield. This is particularly important to people living in remote regions where economic opportunities are limited. The combination of perceiving sea otters as a competitor and not being able to take them for their pelts is causing an increasing feeling of resentment and animosity toward sea otters and resource management agencies.

How significant is the competition between sea otters and human users for shellfish resources? Major sea otter prey species that are frequently taken by humans include butter clams (*Saxidomus giganteus*), little neck clams (*Protothaca* spp.), soft shell clams (*Mya* spp.), razor clams (*Siliqua patula*), and dungeness crabs (*Cancer magister*). Other prey species occasionally taken by humans include *Spisula* spp., *Macoma* spp., *Clinocardium* spp., *Tresus capax*, and sea urchins. Small tanner crabs, *Chionoecetes* spp., and king crabs, *Paralithodes* spp., are taken by sea otters and are of primary importance to the crab fishery in Alaska. Abalone are a preferred prey of sea otters, but are taken by humans in significant numbers only in southeast Alaska. Small scallops are taken by sea otters but it is not known if otters compete with humans for these. Of the species listed, it is likely that sea otters have or will reduce the availability of butter clams, little neck clams, razor clams, and abalone. It is clear from studies in California that sea otters have greatly reduced the size and availability of similar species occurring

there (Miller 1974, and Miller et al. 1975). Also it appears likely that sea otters will reduce the availability of dungeness crabs, although the actual effect of sea otters on crab populations has not been clearly demonstrated.

The intensity and importance of competition between sea otters and human users varies by area. In many areas of Alaska, several species of clams and dungeness crabs are taken for commercial, recreational, and subsistence use. In southeast Alaska, abalone are taken commercially and locally for recreational and subsistence use. The edible mussel *(Mytilus edulis)* and sea urchins common throughout the sea otter range in Alaska are primary prey species, but are taken infrequently by humans. Residents of Atka Island and the southern Kenai Peninsula consider sea otters competitors for food resources. The importance of the competition is difficult to evaluate. In many areas of Alaska, dense beds of large old clams (mature populations) developed during the long period when sea otters were absent. These clam beds are considered of great value to local residents and in a few remote areas are a significant food source. In some areas, such as Prince William Sound, clamming and crabbing are important subsistence and recreational activities, and commercial crabbing for dungeness crabs is economically important. In 1981, two years after large numbers of sea otters began using the area immediately around Cordova in northeast Prince William Sound, this area was closed to all taking of clams and crabs to protect low stocks. In southeast Alaska, the commercial abalone fishery has increased dramatically in the recent past, and, although the yield is a relatively small 200,000 to 300,000 pounds (90,720–136,080 kg) per year, it is economically important to local communities (Balog 1980, Timothy Koeneman, Alaska Dep. of Fish and Game, pers. comm.).

In addition to being competitors, sea otters are also a minor nuisance to fishermen because they occasionally become entangled in nets. Matkin and Fay (1980) estimated that about 70 otters became entangled in nets in Prince William Sound and Copper River Delta salmon fisheries during the 1978 season. Most of these were released and probably cause only minor net damage.

Discussion

In the previous section, the adverse effects of increasing sea otter populations were discussed; however, it should not be inferred that these are the only effects of the increased populations. Sea otters now occur in several readily accessible areas, and public viewing and photography are becoming important. As the opportunity to observe and photograph sea otters increases and the opportunities for observing sea otters become more widely known, this use will certainly increase. Nevertheless, the adverse affects are real and will also increase.

In the late 1960s and early 1970s the State of Alaska was in the initial phase of developing management of sea otters. These efforts were stopped by passage of the Marine Mammal Protection Act of 1972. By 1972 the State had conducted several surveys of the sea otters' range; it had taken about 2,000 sea otters in an experimental harvest, accumulating substantial biological data from these collections. It also had established reproducing sea otter populations in southeast Alaska and had assisted Oregon and Washington and British Columbia with translocations. Since 1972, the Fish and Wildlife Service has continued support of sea otter studies begun in the mid 1950s, but there has been no significant progress on management development.

Our knowledge of sea otters, although still lacking in several important areas, is sufficient to suggest that a rather wide range of population management objectives are attainable. These objectives can include maintaining populations at naturally occurring maximum levels in areas where recreational use (observing and photography) are high; allowing a sustained yield for pelts where economic use is desired; and reducing populations in areas where competition for shellfish resources is unacceptably high. Additional knowledge of dispersal and movements is required to precisely predict the size of the area of influence of management actions. However, based on our present knowledge, all of these objectives are attainable within Alaska. This is not to imply that two substantially different management objectives could be attained in two adjacent areas.

The sea otter appears to be one of the most manageable of the marine mammals. Because sea otters are not migratory, meaningful management units can be delineated; sea otters are relatively easy to count; sea otters are at or near carrying capacity in parts of their range; they are partially segregated by sex and can be live captured in nets, making it possible to have highly selective taking by sex. Further, they float when killed, greatly reducing chances of hunting loss. Comparing these attributes with those of other marine mammals suggests sea otter populations could be managed relatively easily.

Of most concern now is the obvious change in human attitudes toward sea otters and managing agencies. For example, when I began studying sea otters in Prince William Sound in 1975, not one of the many persons with whom I spoke expressed animosity toward sea otters; most were pleased that the sea otter population was increasing. Since then, sea otters have moved into the important clamming and crabbing areas of northeastern Prince William Sound. During the past two years, local residents have reported decreased availability of clams and dungeness crabs, and sea otters are blamed for the decrease. Many people express hostility toward sea otters openly and talk about "taking matters into their own hands," i.e., shooting otters. To add to the problem, the sea otter population in the Sound is apparently nearing maximum level, and increased natural mortality is evident from the increased number of sea otter carcasses found on the beaches. The result is that there is a growing animosity toward sea otters and resentment of managing agencies that do not allow taking of an economically valuable resource. I believe an active management program would greatly improve this undesirable situation.

References Cited

Balog, J. 1980. Fishing with a pry bar: Southeastern's Pinto Abalone. Alaska Magazine, August 1980: 32–35.

Dayton, P. K. 1975. Experimental studies of algal canopy interactions in a sea otter-dominated kelp community at Amchitka Island, Alaska. Fish. Bull. 73: 230–237.

Estes, J. A. 1980. Enhydra lutris. Mammalian Species No. 133. Amer. Soc. of Mammal. Pp. 1–8.

Estes, J. A., R. Jameson, and A. M. Johnson. 1981. Food selection and some foraging tactics of sea otters. Pages 606–641 *in* J. A. Chapman and D. Pursley, eds. Worldwide Furbearer Conference Proceedings, Vol. 1. Univ. of Maryland Press, College Park.

Estes, J. A., and J. F. Palmisano. 1974. Sea otters: their role in structuring nearshore communities. Science 185: 1058–1060.

Estes, J. A., N. S. Smith, and J. F. Palmisano. 1978. Sea otter predation and community organization in the western Aleutian Islands, Alaska. Ecology 59: 822–833.

Eyerdam, W. J. 1933. Sea otters in the Aleutian Islands. J. Mammal. 14(1): 70–71.

Hooper, C. L. 1897. A report on the sea otter banks of Alaska. Doc. No. 1977. U.S. Treas. Dep. Washington, D.C.

Jameson, R. J., K. W. Kenyon, A. M. Johnson, and H. M. Wight. 1982. History and status of translocated sea otter populations in North America. Wildl. Soc. Bull. In press.

Kenyon, K. W. 1969. The sea otter in the eastern Pacific ocean. N. Amer. Fauna 68: 1–352.

Lensink, C. J. 1960. Status and distribution of sea otters in Alaska. J. Mammal. 41: 172–182.

_____. 1962. The history and status of sea otters in Alaska. Unpubl. Ph.D. Dissert. Purdue Univ., Lafayette, Ind. 186 pp.

Louglin, T. R., J. A. Ames, and J. E. Vandevere. 1981. Annual reproduction, dependency period, and apparent gestation period in two California sea otters, *Enhydra lutris*. Fish. Bull. 79(2): 347–349.

Lowry, L. F. and J. S. Pearse. 1973. Abalones and sea urchins in an area inhabited by sea otters. Mar. Biol. 23: 213–219.

Matkin, C. D. and F. H. Fay. 1980. Marine mammal-fishery interactions on the Copper River and in Prince William Sound, Alaska, 1978. Marine Mammal Commission, Final Report No. MMC-78/07, Washington, D.C. Pp. 1–71, i–vii.

Miller, D. J. 1974. The sea otter, *Enhydra lutris,* its life history, taxonomic status, and some ecological relationships. Mar. Res. Leaflet 7. California Dep. Fish and Game, Sacramento. 13 pp.

_____, J. E. Hardwick, and W. A. Dahlstrom. 1975. Pismo clams and sea otters. Mar. Tech. Rep. 31. California Dep. Fish and Game, Sacramento. 49 pp.

Schneider, K. B. 1972. Reproduction in the female sea otter. Proj. Prog. Rep., Fed. Aid in Wildl. Restoration, Proj. W-17-4. Alaska Dep. Fish and Game, Juneau. 36 pp.

_____. 1978. Sex and age segregation of sea otters. Final Rep., Fed. Aid in Wildl. Restoration, Proj. W-17-4 through W-17-8. Alaska Dep. Fish and Game, Juneau. 45 pp.

Swicegood, Lcdr. S. P. 1936. Amchitka sea otter survey expedition. Unpubl. memo to Commanding Officer, U.S. Coast Guard Cutter *Chelan,* 31 Aug. 1936. USFWS. files, Anchorage, Ak. 5 pp.