NORTHERN SEA OTTER (*Enhydra lutris kenyoni)*: Southwest Alaska Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Sea otters occur in nearshore coastal waters of the U.S. along the North Pacific Rim from the Aleutian Islands to California. The species is most commonly observed within the 40-meter depth contour since animals require frequent access to benthic foraging habitat in subtidal and intertidal zones (Reidman and Estes 1990). Sea otters in Alaska are not migratory and generally do not disperse over long distances, although movements of tens of kilometers are normal (Garshelis and Garshelis 1984). Individuals are capable of longer distance movements of over 100 km (Garshelis *et al.* 1984); however, movements of sea otters are likely limited by geographic barriers, high energy requirements of animals, and social behavior.

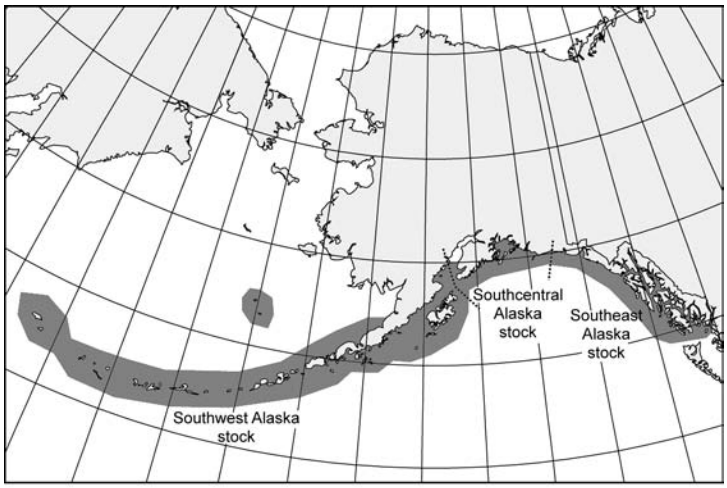

Figure 1. Approximate distribution of northern sea otters in Alaska waters (shaded area)

Applying the phylogeographic approach of Dizon *et al.* (1992), Gorbics and Bodkin (2001) identified three sea otter stocks in Alaska: southeast, southcentral, and southwest. The ranges of these stocks are defined as follows: (1) Southeast Alaska stock extends from Dixon Entrance to Cape Yakataga; (2) Southcentral Alaska stock extends from Cape Yakataga to Cook Inlet including Prince William Sound, the Kenai Peninsula coast, and Kachemak Bay; and (3) Southwest Alaska stock includes the Alaska Peninsula and Bristol Bay coasts, and the Aleutian, Barren, Kodiak, and Pribilof Islands (Figure 1).

POPULATION SIZE

Historically, sea otters occurred across the North Pacific Rim, ranging from Hokkaido, Japan, through the Kuril Islands, the Kamchatka Peninsula, the Commander Islands, the Aleutian Islands, peninsular and south coastal Alaska and south to Baja California, Mexico (Kenyon 1969). In the early 1700s, the worldwide population was estimated to be between 150,000 (Kenyon 1969) and 300,000 individuals (Johnson 1982). Prior to large-scale commercial exploitation, indigenous people of the North Pacific hunted sea otters. Although it appears that harvests periodically led to local reductions of sea otters (Simenstad *et al.* 1978), the species remained abundant throughout its range until the mid-1700s. Following the arrival in Alaska of Russian explorers in 1741, extensive commercial harvest of sea otters over the next 150 years resulted in the near extirpation of the species. When sea otters were afforded protection by the International Fur Seal Treaty in 1911, probably fewer than 2,000 animals remained in 13 remnant colonies (Kenyon 1969). Population regrowth began following legal protection and sea otters have since recolonized much of their historic range in Alaska.

Aerial surveys along the shoreline of the Aleutian Islands in April 2000 produced a count of 2,442 sea otters in the nearshore waters (Doroff *et al.* 2003). Comparison of aerial and skiff survey counts at 6 islands in 2000 was used to calculate a correction factor of 3.58 for this aerial survey, which resulted in an adjusted population estimate of 8,742 (CV= 0.215) sea otters (Doroff *et al.* 2003).

In May 2000, a survey of offshore areas along the north Alaska Peninsula from Unimak Island to Cape Seniavin produced an abundance estimate of 4,728 (CV= 0.326) sea otters (Burn and Doroff 2005). A similar survey of offshore areas along the south Alaska Peninsula from False Pass to Pavlov Bay conducted in summer 2001 resulted in a population estimate of 1,005 (CV= 0.811) animals (Burn and Doroff 2005). Although a correction factor to account for sightability was not calculated during this survey, Evans *et al.* (1997) used a similar twin-engine aircraft flying at the same altitude and air speed to calculate a correction factor of 2.38 (CV = 0.087). Using this correction factor produced adjusted estimates of 11,253 (CV = 0.337) and 2,392 (CV = 0.816) for the north and south Alaska Peninsula offshore areas, respectively.

In 2001, aerial surveys along the shoreline of the south Alaska Peninsula from Seal Cape to Cape Douglas recorded 2,190 sea otters (Burn and Doroff 2005). Additional aerial surveys of the south Alaska Peninsula island

groups (Sanak, Caton, and Deer Islands, and the Shumagin and Pavlov island groups) and a survey of Unimak Island, recorded 405 otters for the south Alaska Peninsula island groups and 42 animals for Unimak Island. Applying the same correction factor of 2.38 from Evans *et al.* (1997) produced adjusted estimates of 5,212 (CV = 0.087), 964 (CV = 0.087) and 100 (CV = 0.087) for the south Alaska Peninsula shoreline, south Alaska Peninsula islands, and Unimak Island, respectively.

An aerial survey of the Kodiak Archipelago conducted in 2004 produced an adjusted population estimate of 11,005 (CV = 0.228) sea otters (Doroff *et al.* in prep.). The methods used in this survey follow those of Bodkin and Udevitz (1999) which include the calculation of a survey-specific correction factor for animals undetected by observers.

Finally, an aerial survey of Kamishak Bay conducted in June 2002 produced an adjusted population estimate of 6,918 (CV = 0.147) sea otters (Bodkin *et al.* 2003). Similar to the Kodiak archipelago, this survey also used the methods of Bodkin and Udevitz (1999).

The most recent abundance estimates for survey areas within the southwest Alaska stock are presented in Table 1. Combining the adjusted estimates for these areas results in a total estimate of 47,676 sea otters for the southwest Alaska stock.

Table 1. Population estimates for the Southwest Alaska stock of northern sea otters. Previous stock assessment report (SAR) total is from August 2002.

Survey Area	Year	Unadjusted Estimate	Adjusted Estimate	CV	N_{min}	Reference
Aleutian Islands	2000	2,442	8,742	0.215	7,309	Doroff *et al.* (2003)
North Alaska Peninsula	2000	4,728	11,253	0.337	8,535	Burn and Doroff (2005)
South Alaska Peninsula - Offshore	2001	1,005	2,392	0.816	1,311	Burn and Doroff (2005)
South Alaska Peninsula - Shoreline	2001	2,190	5,212	0.087	4,845	Burn and Doroff (2005)
South Alaska Peninsula - Islands	2001	405	964	0.087	896	Burn and Doroff (2005)
Unimak Island	2001	42	100	0.087	93	USFWS Unpublished data
Kodiak Archipelago	2004		11,005	0.194	9,361	Doroff *et al.* (in prep.)
Kamishak Bay	2002		6,918	0.315	5,340	Bodkin *et al.* (2003)
Current Total			**47,676**		**38,703**	
Previous SAR Total			41,474		33,203	

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated using Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842 \times [\ln(1+[CV(N)]^2)]^{½})$. The N_{MIN} for each survey area is presented in Table 1. The estimated N_{MIN} for the entire southwest Alaska stock is 38,703.

Current Population Trend

In spring 2000, U.S. Fish and Wildlife Service (Service) repeated an aerial survey that had previously been conducted in 1992 and observed widespread declines throughout the Aleutian Islands, with the greatest decreases occurring in the central Aleutians. The uncorrected count for the area was 2,442 animals, indicating that sea otter populations had declined 70% since 1992 (Doroff *et al.* 2003). Burn *et al.* (2003) estimated that the sea otter population in the Aleutians in 2000 may have been reduced to less than 10% of the carrying capacity for this area.

With the exception of the Kodiak archipelago, there have been no new large-scale abundance surveys for sea otters in southwest Alaska since the previous stock assessment report of August 2002; however, additional skiff and aerial surveys conducted from 2003 to 2005 show that sea otter abundance has continued to decline in the western and central Aleutians (63%) and the eastern Aleutians (48%;) (Estes *et al.* 2005, USFWS unpublished data).

Aerial surveys in other portions of southwest Alaska also show further evidence of population declines. Sea otter counts in the Shumagin Islands area south of the Alaska Peninsula showed an additional 33% decline between 2001 and 2004, and counts at Sutwik Island declined by 68% over the same time period (USFWS unpublished data). Unlike the Aleutian Islands and portions of the Alaska Peninsula, the population trend in the Kodiak archipelago does not appear to have undergone a significant population decline over the past 20 years (Doroff *et al.* in prep.). Other portions of the southwest Alaska stock, such as the Alaska Peninsula coast from Castle Cape to Cape Douglas and Kamishak Bay in lower western Cook Inlet, also show no signs of population declines similar to those observed in the Aleutian and Shumagin Islands areas.

The estimated population size for the southwest Alaska stock is slightly higher than in the previous stock assessment report, primarily due to a higher population estimate for the Kodiak archipelago in 2004. However, the overall sea otter population in southwest Alaska has declined by more than 50% since the mid-1980s. Thus, the overall population trend for the southwest Alaska stock is believed to be declining.

MAXIMUM NET PRODUCTIVITY RATE

Estes (1990) estimated a population growth rate of 17 to 20% per year for four northern sea otter populations expanding into unoccupied habitat. Although maximum productivity rates have not been measured through much of the sea otter's range in Alaska, in the absence of more detailed information, the rate of 20% calculated by Estes (1990) is considered the best available estimate of R_{MAX}. There is insufficient information available to estimate the current net productivity rate for this population stock.

POTENTIAL BIOLOGICAL REMOVAL

Under the Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5\ R_{MAX} \times F_R$. In August 2005, sea otters in southwest Alaska were listed as a threatened distinct population segment (DPS) under the Endangered Species Act (70 FR 46366; August 9, 2005). Although Wade and Angliss (1997) provide a default recovery factor (F_R) of 0.5 as a guideline for threatened species, a lower value may be considered appropriate in the case of a declining population. Therefore, for the southwest Alaska stock, which has been experiencing a continual decline, we are taking a more conservative approach and have set the recovery factor at the default value for an endangered species (0.1). The calculated PBR for this stock would be 38,703 x 0.5 (0.2) x 0.1 which yields 387 sea otters per year.

ANNUAL HUMAN CAUSED MORTALITY

Fisheries Information

A complete list of fisheries and marine mammal interactions is published annually by NOAA-Fisheries, the most recent of which was published on November 27, 2007 (72 FR 66048). Numerous fisheries exist within the range of the southwest Alaska stock of northern sea otters, with the only one identified as interacting with this stock being the Kodiak salmon set gillnet, with an estimated 188 vessels and/or persons participating in the fishery. Additional salmon set gillnet fisheries occur in Bristol Bay (1,104 participants) and the Alaska Peninsula/Aleutian Islands (116 participants). Although no interactions with salmon drift gillnets have been identified for this stock, they have been observed in Prince William Sound within the southcentral Alaska stock. Salmon drift gillnet fisheries occur in Bristol Bay (1,903 vessels), and the Alaska Peninsula/Aleutian Islands (164 vessels). Although both salmon set and gillnet fisheries also occur in Cook Inlet, most of the effort in fisheries occurs north of the range of the southwest Alaska population stock. Available information suggests that fisheries using other types of gear, such as trawl, longline, pot, and purse seine, appear to be less likely to have interactions with sea otters due to either the areas where such fisheries operate, or the specific gear used, or both.

The estimated level of incidental mortality and serious injury of this stock can be estimated from fishery observer programs that monitor a portion of commercial fisheries in Alaska and report injury and mortality of marine mammals incidental to those operations. Observer data were summarized from 1989-2006 by Perez (2003, 2006, 2007) for Bering Sea, Aleutian Islands, and Gulf of Alaska trawl, longline, and pot groundfish fisheries. During this period, no

sea otters were taken in any trawl or longline fisheries. In 1992, a total of eight sea otters were observed caught in the Pacific cod pot fishery in the Aleutian islands. Observer records indicate that those takes occurred in nearshore waters that had been closed to fishing, which explains why no additional take of sea otters was observed in pot fisheries through 2006 (Perez 2006, Perez 2007).

NOAA-Fisheries conducted a marine mammal observer program for the Kodiak salmon set net fishery during the 2002 and 2005 fishing seasons. This fishery has a seasonal component, occurring only during the summer months. In 2002, 4 entanglement events were observed in this fishery (Manly *et al.* 2003). Two of these events required intervention to untangle the otter from the net, and the other two were able to escape by themselves. In none of these instances was there any sign of external injuries. The sea otter bycatch in this fishery was estimated as 62 otters during the 2002 fishing season. Assuming from this sample that half of these otters would be capable of escaping from the nets by themselves, an estimated 31 otters would require assistance from the fishermen. Of the two observed entanglement incidents, no serious injury was observed, but given the small sample size, it is reasonable to assume that some of these otters may suffer injury as a result of entanglement. In fact, there was one self report of an otter killed during the 2002 fishing season. Results from the 2005 Kodiak salmon set net fishery indicate entanglement of one otter that subsequently released itself from the net, although it was not clear if this was a sea otter or river otter (Manly 2007). Assuming that this animal was a sea otter, the total bycatch in this fishery would be estimated at 28 animals during the 2005 season. Based on these results, it would appear that although entanglement of sea otters does occur in this fishery, the rate of mortality or serious injury is low. Considering the rates of entanglement for 2002 and 2005, we estimate that fewer than 10 sea otters per year from an estimated population size of 11,000 in the Kodiak archipelago could be killed or seriously injured as a result of entanglements.

An additional source of information on the number of sea otters killed or injured incidental to commercial fishery operations in Alaska are fisher self-reports required of vessel-owners by NOAA-Fisheries. In 1997, fisher self-reports indicated one sea otter caught in the Bering Sea and Aleutian Island groundfish trawl fishery; however, it is unclear if the animal was alive when caught. Credle *et al.* (1994) considered fisher self-reports to be a minimum estimate of incidental take as these data are most likely negatively biased. The estimated level of incidental mortality and serious injury associated with Alaska trawl, longline, and pot groundfish fisheries averages less than one animal per year. Given this extremely low level, no seasonal or area differences in mortality or serious injury in this fishery are known to exist.

The total fishery mortality and serious injury rate (less than 10 animals per year) for the southwest Alaska stock of the northern sea otter can be considered insignificant and approaching a zero mortality and serious injury rate (i.e., less than 10% of PBR).

Oil Spills

Activities associated with exploration, development, and transport of oil and gas resources can adversely impact sea otters and nearshore coastal ecosystems in Alaska. Sea otters rely on air trapped in their fur for warmth and buoyancy. Contamination with oil drastically reduces the insulative value of the pelage, and consequently sea otters are among the marine mammals most likely to be detrimentally affected by contact with oil. It is believed that sea otters can survive low levels of oil contamination (less than 10% of body surface), but that greater levels (more than 25%) will lead to death (Costa and Kooyman 1981, Siniff *et al.* 1982). Vulnerability of sea otters to oiling was demonstrated by the 1989 *Exxon Valdez* oil spill in Prince William Sound. Estimates of mortality for the Prince William Sound area vary from 750 (range 600-1,000) (Garshelis 1997) to 2,650 (range 500 - 5,000) (Garrott *et al.* 1993) otters. Statewide, 3,905 sea otters (range 1,904 - 11,257) were estimated to have died in Alaska as a result of the spill (DeGange *et al.* 1994). At present, abundance of sea otters in some oiled areas of Prince William Sound remains below pre-spill estimates, and evidence from ongoing studies suggests that sea otters and the nearshore ecosystem have not yet fully recovered from the 1989 oil spill (Bodkin *et al.* 2002, Stephensen *et al.* 2001). Other areas outside of Prince William Sound that were affected by the spill have not been intensively studied for long-term impacts.

Within the proximity of the Southwest Alaska sea otter stock, oil and gas development and production occurs only in Cook Inlet. In addition to existing offshore platforms, there was a Federal lease sale in Cook Inlet in 2004 but no tracts were purchased. The Minerals Management Service is currently preparing a draft Environmental Impact Statement for a proposed lease sale in the North Aleutian Basin area in Bristol Bay. Although the amount of oil transported in southwest Alaska is relatively small, the *Exxon Valdez* oil spill demonstrated that spilled oil can travel long distances and take large numbers of sea otters far from the point of initial release. While the catastrophic release of oil has the potential to take large numbers of sea otters, there is no evidence that other effects (such as disturbance)

associated with routine oil and gas development and transport have had a direct impact on the Southwest Alaska sea otter stock.

Information on oil spills compiled by the Alaska Department of Environmental Conservation from 2002-2006 indicate that there were no reported spills of crude oil in southwest Alaska. In addition to spills that may occur in association with the development, production, and transport of crude oil, each year numerous spills of non-crude oil products in the marine environment occur from ships and shore facilities throughout southwest Alaska. During that same time period, there was an average of 119 spills occur each year, ranging in size from less than 1 and up to 321,000 gallons. The vast majority of these spills are small, with a median size of 5 gallons, and there is no indication that these small-scale spills have an impact on the southwest Alaska stock of northern sea otters.

The one notable exception during this period was the grounding of the freighter *Selendang Ayu*, which spilled 321,000 gallons of non-crude oil and caused at least two sea otter mortalities in late 2004 and early 2005 (USFWS unpublished data). Each year, thousands of vessels of varying size traverse the North Pacific great circle route between North America and Asia. This route passes through Unimak Pass to the east, and near Buldir Island to the west. The National Academy of Science is in the process of designing a risk assessment for the Aleutian Islands area.

Subsistence/Native Harvest Information

The MMPA exempted Native Alaskans from the prohibition on hunting marine mammals, provided such taking was not wasteful. Alaska Natives are legally permitted to take sea otters for subsistence use or for creating and selling authentic handicrafts or clothing. In addition, Section 10(e) of the ESA allows for subsistence harvest of listed species. Data for subsistence harvest of sea otters in Southwest Alaska are collected by a mandatory Marking, Tagging and Reporting Program administered by the Service since 1988. Figure 2 provides a summary of harvest information for the Southwest stock from 1989 through 2006. The mean reported annual subsistence take during the past five complete calendar years (2002-2006) was 91 animals. Reported age composition during this period was 87% adults, 9% subadults, and 4% pups. Sex composition during the past five years was 73% males, 23% females, and 4% unknown sex. The majority of this harvest (81%) comes from the Kodiak archipelago; areas within the stock that show signs of continued population declines have little to no record of subsistence harvest.

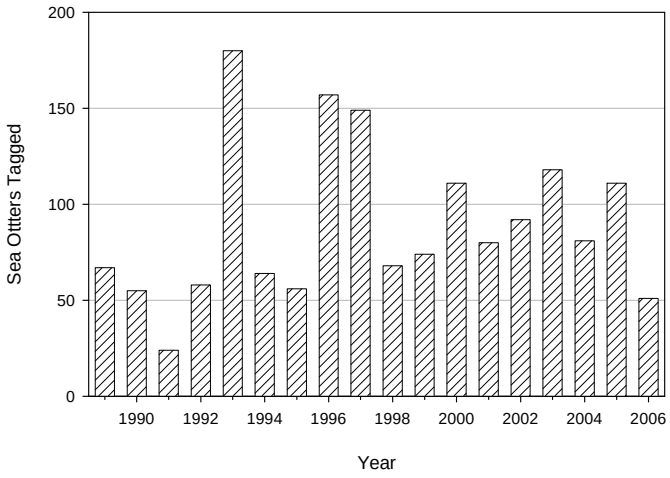

Figure 2. Reported subsistence harvest of northern sea otters from the southwest Alaska stock, 1989-2006.

Research and Public Display

In the past five years, no sea otters were removed from the southwest Alaska stock for public display. During this period, a total of 98 otters were live-captured and released for research purposes from this stock. Most of these captures occurred in the Kodiak archipelago, with the remainder in the Aleutian and Shumagin islands areas. There were no reported injuries and/or mortalities related to these activities.

Other Factors

In August 2006, the Working Group on Marine Mammal Unusual Mortality Events reviewed information provided by the Service and declared that a dramatic increase in sea otter strandings since 2002 constitutes an Unusual Mortality Event (UME) in accordance with Section 404 of the MMPA. The disease that typifies this UME is caused by a *Streptococcus infantarius* infection and has been observed over a broad geographic range in Alaska, including a few cases from southwest Alaska; however, the majority of cases have come from Kachemak Bay in the southcentral Alaska stock. It is not clear if the observed stranding pattern is representative of overall sea otter mortality, or an artifact of having a well-developed stranding network in the Kachemak Bay area. The Service will continue to work with the NOAA-Fisheries and Alaska SeaLife Center to develop the infrastructure for a statewide marine mammal stranding network in Alaska.

STATUS OF STOCK

On August 9, 2005, the southwest Alaska distinct population segment of the northern sea otter was listed as "threatened" under the ESA, and is, therefore, classified as a strategic stock under the MMPA.

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