Revised: April 2014

NORTHERN SEA OTTER (*Enhydra lutris kenyoni*):

Southcentral 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 (approximately 12.2 feet [ft]) depth contour because the animals require frequent access to benthic foraging habitat in subtidal and intertidal zones (Reidman and Estes 1990). Sea otters are not migratory and generally do not disperse over long distances, although movements of tens of kilometers (km) (tens of miles [mi]) are common (Garshelis and Garshelis 1984). Annual home range sizes of adult sea otters are relatively small, with male territories ranging from 4 to 11 square kilometers (km^2) (approximately 10.5 to 28.5 square miles[mi^2]) and adult female home ranges from a few to 24 km^2 (approximately 62 mi^2) (Garshelis and Garshelis 1984; Ralls *et al*. 1988; Jameson 1989). Due to their benthic foraging, sea otter distribution is largely limited by their ability to dive to the sea floor (Bodkin *et al*. 2004).

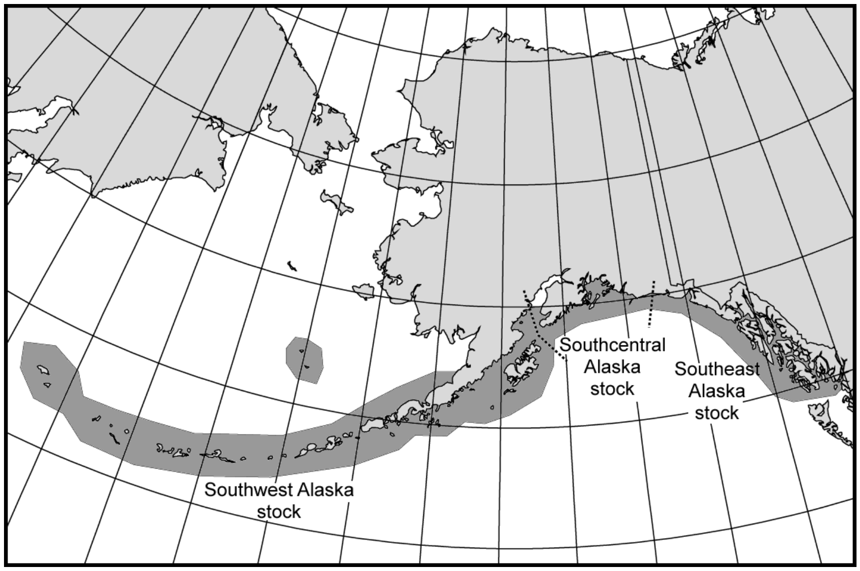

Figure 1. Approximate distribution and stock boundaries of northern sea otters in Alaska waters (shaded area).

The spatial scale at which sea otter populations are managed remains an important, although largely unexplored issue (Bodkin and Ballachey 2010) deserving further study. Bodkin and Ballachey (2010) used models of sea otter mortality to show that range-wide reductions and extirpations during the commercial fur trade of the 18th and 19th centuries occurred not simply because of excessive harvest, but because the harvest was not allocated proportional to the abundance and distribution of sea otters. This process of serial depletion was facilitated by the relatively sedentary nature of sea otters. To reduce the risk of overexploitation, sea otters must be managed on a spatial scale compatible with their well-known behavioral and reproductive biology (Bodkin and Monson 2002), incorporating traits such as home range and movements. These proposed scales for management are much smaller than the currently recognized stocks.

Gorbics and Bodkin (2001) applied the phylogeographic approach of Dizon *et al.* (1992) and used the best available data at the time to identify 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). This stock assessment report is focused on the Southcentral stock of sea otters in Alaska.

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 peoples of the North Pacific hunted sea otters. Although it appears that harvests may have 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 thirteen remnant colonies (Kenyon 1969). Population recovery began following legal protection. As part of efforts to re-establish sea otters in portions of their historical range, otters from Amchitka Island and Prince William Sound were translocated to other areas in the

1960s and 1970s, including to southeast Alaska (Jameson *et al.* 1982). Sea otters have since recolonized much of their historical range in Alaska.

The most recent abundance estimates for survey areas within the Southcentral Alaska stock are presented in Table 1. Estimates for Kenai Fjords and Kachemak Bay have been updated since the previous stock assessment report. In 2008, an aerial survey using the methods described in Bodkin and Udevitz (1999) was conducted within Kachemak Bay, resulting in an estimate of 3,596 sea otters (CV = 0.50; USFWS unpublished data). This method included a survey-specific correction factor to account for undetected animals. A 2010 aerial survey using the Bodkin-Udevitz method in Kenai Fjords National Park resulted in an estimate of 1,322 sea otters (CV = 0.37; Coletti *et al*. 2011). Eastern lower Cook Inlet was surveyed as part of a larger area in 2002, yielding an estimate of 962 sea otters (CV = 0.54; Bodkin *et al*. 2003b) for the areas not covered in 2008 and 2010.

In 2003, an aerial survey of Prince William Sound resulted in an abundance estimate of 11,989 sea otters (CV = 0.18; Bodkin *et al.* 2003a). Finally, an aerial survey of the northern Gulf of Alaska coastline flown in 2000 provided a minimum uncorrected count of 198 sea otters between Cape Hinchinbrook and Cape Yakataga (USGS unpublished data). Applying a correction factor of 2.16 (CV = 0.38) for this observer conducting sea otter aerial surveys produces an adjusted estimate of 428 (CV = 0.38).

The most recent population estimates for survey areas within the Southcentral Alaska stock are presented in Table 1. Combining the adjusted estimates for these areas results in a total estimate of 18,297 sea otters for the Southcentral Alaska stock.

Table 1. Population estimates for the Southcentral Alaska stock of northern sea otters. The previous stock assessment report (SAR) total is from 2008.

Survey Area	Year	Unadjusted Estimate	Adjusted Estimate	CV	N_{MIN}	Reference
Cook Inlet, Kachemak Bay excluded	2002		962	0.54	629	Bodkin *et al.* (2003b)
Kachemak Bay	2008		3,596	0.50	2,416	USFWS unpublished data
Kenai Fjords	2010		1,322	0.37	978	Coletti *et al.* (2011)
Prince William Sound	2003		11,989	0.18	10,324	Bodkin *et al.* (2003a)
North Gulf of Alaska	2000	198	428	0.38	314	USGS unpublished data
Current Total			**18,297**		**14,661**	
Previous SAR Total			15,090		12,774	

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated using Equation 1 from the Potential Biological Removal 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 Southcentral Alaska stock is 14,661 sea otters.

Current Population Trend

All surveys analyzed for trends in abundance used methods described in Bodkin and Udevitz (1999), including use of a survey-specific correction factor to account for undetected animals, with the exception of the survey in the North Gulf of Alaska. Aerial surveys in Kachemak Bay in 2002, 2007, and 2008, indicated that the population is increasing, with an estimated annual rate of increase between 2002 and 2008 of 26% per year (USGS unpublished data, USFWS unpublished data). This rate slightly exceeds the estimated maximum productivity rates (R_{MAX}) for the species (see below). Immigration from other areas (Cook Inlet, Kenai Fjords) may have contributed to the observed increase in sea otter numbers in Kachemak Bay.

Aerial surveys in Kenai Fjords National Park in 2002, 2007, and 2010, had relatively high standard errors, but indicated overall that the population is stable and may be increasing (Coletti *et al.* 2011). Annual aerial surveys of sea otter abundance in western Prince William Sound from 1993 to 2009 (except for 2001 and 2006) identified a significant increase in abundance between 2001 and 2009 at this scale, with an average annual rate of increase from 1993 to 2009 of 2.6% (Bodkin *et al.* 2011). This trend is interpreted as strong evidence of a trajectory toward recovery of sea otter populations in Prince William Sound affected by the 1989 *Exxon Valdez* oil spill (Bodkin *et al.* 2011). Our best assessment is that the overall trend in abundance for this stock appears to be increasing at this time.

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 (R_{MAX}) have not been measured throughout 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 maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimal sustainable population.* Potential biological removal is the product of the minimum population estimate (N_{MIN}), one-half the maximum theoretical net productivity rate, and a recovery factor (F_R): PBR = N_{MIN} x 0.5 R_{MAX} x F_R. The recovery factor for this stock is 1.0 (Wade and Angliss 1997) as population levels have remained stable with a known human take. Thus, for the Southcentral stock of sea otters, PBR = 1,466 animals (14,661 x 0.5 (0.2) x 1.0).

ANNUAL HUMAN CAUSED MORTALITY

Fisheries Information

A complete list of fisheries and marine mammal interactions is published annually by the National Oceanic and Atmospheric Administration (NOAA) Fisheries, the most recent of which was published on August 29, 2013 (78 FR 53336). Numerous fisheries exist within the range of the Southcentral Alaska stock of northern sea otters. Two have been identified as interacting with this stock, the Prince William Sound drift gillnet fishery with an estimated 537 vessels and/or persons participating, and the Cook Inlet salmon set gillnet fishery, with an estimated 738 participants. Additional salmon drift gillnet fisheries occur in Cook Inlet, with 589 vessels; however, with the exception of Kachemak Bay, all of the fishing effort involving salmon drift and set gillnet fisheries in Cook Inlet occurs north of the range of sea otters from the Southcentral

Alaska stock (Manly 2006). Additional salmon set gillnet fisheries occur in Prince William Sound (30 participants).

While much of the salmon set gillnet effort in Cook Inlet occurs north of the range of sea otters, interactions between sea otters and fisheries are reported from the Kachemak Bay region. In July 2009, five sea otters with slashed throats were found dead on a Seldovia beach. They were believed to have been killed after being captured in a set gillnet. In July 2011, a female and pup were successfully released from a set gillnet in the Homer area. Interactions with set gillnet gear also have been observed in the Kodiak and Prince William Sound areas within the ranges of the Southwest and Southcentral Alaska stocks. Available information suggests that fisheries using other types of gear, including trawl, longline, and purse seine, appear to be less likely to have interactions with northern sea otters due to either the areas where such fisheries operate, or the specific gear used, or both.

Although commercial fisheries in Alaska have observer programs that monitor and report injury and mortality of marine mammals incidental to their operations, a reliable estimate of the levels of commercial fisheries incidental mortality and serious injury relative to the Southcentral sea otter stock cannot be made because observer coverage is not sufficient and data are not collected consistently over time. No incidents of sea otter incidental take have been observed in trawl, longline, or pot groundfish fisheries in southcentral Alaska from 1989 to 2010 (NOAA unpublished data). Sea otters are known to interact with pot fisheries in California, however, and it is possible that observer effort for pot fisheries in Alaska has been too low to detect sea otter bycatch (Hatfield *et al.* 2011). In addition to the fisheries listed above, observers monitored the Cook Inlet set gillnet and drift gillnet fisheries from 1999 to 2000 (Manly 2006). The observer coverage during both years was approximately 2 to 5%. No mortalities or injuries of sea otters were reported by fisheries observers for the Cook Inlet set gillnet and drift gillnet fisheries for this period. On several occasions, sea otters were observed within 10 meters (approximately 33 ft) of gillnet gear, but did not become entangled. No other fisheries operating in the region of the Southcentral Alaska stock were monitored by observer programs from 1992 through 2010. Prior to the implementation of the NOAA Fisheries observer program, studies were conducted on sea otter interactions with the drift net fisheries in western Prince William Sound from 1988 to 1990, and no mortalities were observed (Wynne 1990, Wynne *et al.* 1991).

An additional source of information on the number of sea otters killed or injured incidental to commercial fishery operations in Alaska is found in fisher self-reports required of vessel owners by NOAA Fisheries. In 1990, fisher self-report records show one mortality and four injuries due to gear interaction, and three injuries due to deterrence in the Prince William Sound drift gillnet fishery. Self-reports were not available for 1994 and 1995. Credle *et al.* (1994) considered fisher self-reports to be a minimum estimate of incidental take as these data are most likely negatively biased.

In summary, between 2006 and 2010, there were five records of incidental take of sea otters by commercial fisheries within the range of the Southcentral stock, and, therefore, the estimated mean annual mortality and serious injury reported for the 5-year period from 2006 to 2010 is one. Observer coverage for fisheries within the range of the Southcentral stock of sea otters has been absent in some fisheries and low in others, particularly with respect to the set and drift gillnet fisheries that are recognized as interacting with this stock, and current estimates of sea otter bycatch are not available. Self-reporting is not sufficiently reliable to replace observer effort. Additionally, assessment of injury and mortality in sea otters that interact with fisheries is difficult. Information is, therefore, insufficient to determine whether or not the total fishery mortality and serious injury for the Southcentral Alaska stock of the northern sea otter is insignificant and is approaching a zero mortality and serious injury rate.

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 (<10% of body surface), but that greater levels (>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. Total estimates of mortality for the Prince William Sound area vary from 750 (range 600 to 1,000; Garshelis 1997) to 2,650 otters (range 500 to 5,000; Garrot *et al.* 1993). Statewide, it is estimated that 3,905 sea otters (range 1,904 to 11,257) died in Alaska as a result of the spill (DeGange *et al.*1994). At present, although abundance of sea otters in some oiled areas of Prince William Sound remains below pre-spill estimates, evidence from ongoing studies suggests that sea otters numbers are increasing, a trend interpreted as evidence of a trajectory toward recovery of spill-affected sea otter populations in western Prince William Sound (Bodkin *et al.* 2002, Stephensen *et al.* 2001, Bodkin *et al.* 2011, Monson *et al.* 2011).

Within the range of the Southcentral Alaska sea otter stock, oil and gas development and production occurs only in Cook Inlet. As of 2011, 16 offshore oil platforms operated in Cook Inlet, and two more are slated to begin operations in 2012. A Federal lease sale in Cook Inlet may be held in 2012 to 2017, if industry interest is sufficient. Tankering of North Slope crude oil occurs regularly through the waters of Prince William Sound with no major oil spills since the *Exxon Valdez*. 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 Southcentral Alaska sea otter stock.

Information on oil spills compiled by the Alaska Department of Environmental Conservation from 2006 to 2010 indicates that an average of four spills of crude oil occurred each year in the marine environment within the range of the Southcentral Alaska stock of sea otters. Crude oil spills ranged in size from less than 4 liters to 760 liters (approximately 1 gallon to 200 gallons), with a mean size of about 41.8 liters (approximately 11 gallons). In addition to spills directly associated 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 Southcentral Alaska. During the same time period and area, there was an average of about 62 spills of non-crude oil per year, ranging in size from less than 4 to 24,320 liters (approximately 1 to 6,400 gallons). The majority of the non-crude oil spills were small, with a mean size of about 380 liters (100 gallons) and a median size of 4 liters (approximately one gallon). There is no indication that these small-scale spills have an impact on the Southcentral Alaska stock of northern sea otters.

Subsistence/Native Harvest Information

The MMPA exempts Alaska Natives from the prohibition on take of marine mammals, provided such taking is not wasteful and is done for subsistence use or for creating and selling authentic handicrafts or clothing. According to the U.S. Fish and Wildlife Service's (Service) Law Enforcement records from 2006 to 2010, individuals were prosecuted for unlawful possession, transport, or sale of 14 sea otter hides or skulls taken within the range of the Southcentral Alaska stock. Data for subsistence harvest of sea otters in southcentral Alaska are collected by a mandatory Marking, Tagging and Reporting Program administered by the Service since 1988. Figure 2 provides a summary of subsistence harvest information for the Southcentral stock from 1989 to 2010. The mean reported annual subsistence take during the past five complete calendar years (2006 to 2010) was 293 animals. Reported age composition during this period was 93% adults, 6% subadults, and 1% pups. Sex composition during the past five years was 72% males, 23% females, and 5% of unknown sex. The majority of the harvest over the past five years has occurred in northern and eastern Prince William Sound.

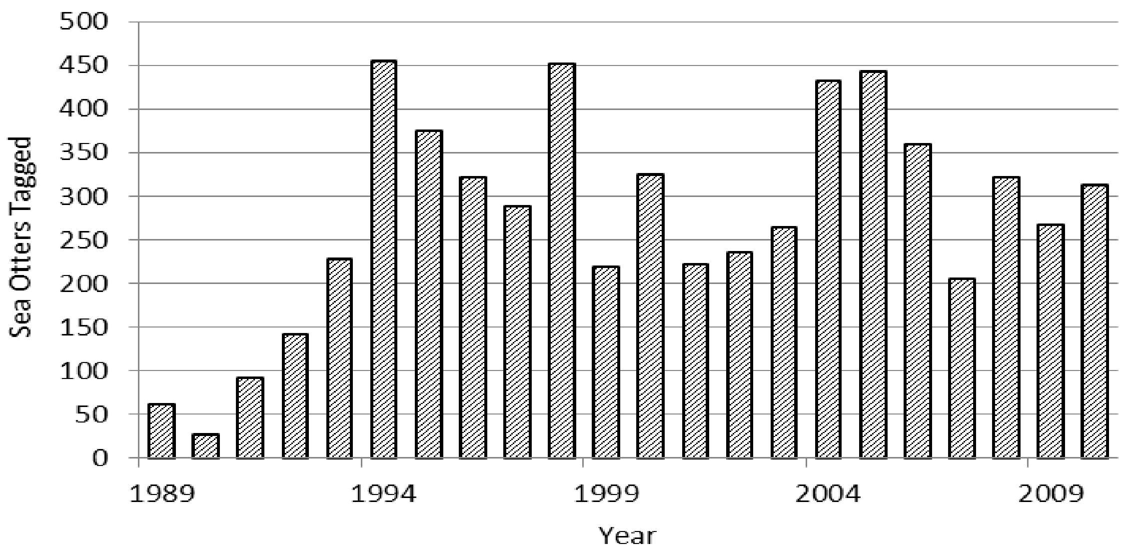

Figure 2. Reported subsistence harvest of northern sea otters from the Southcentral Alaska stock, 1989 to 2010.

Research and Public Display

During 2006 to 2010, four orphaned sea otter pups from the Southcentral Alaska stock were captured, rehabilitated, and placed for public display. During the same time period, 142 sea otters were captured and released for scientific research in Prince William Sound. 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 constituted an Unusual Mortality Event (UME) in accordance with Section 404 of the MMPA. The disease complex that typifies this UME is caused by a *Streptococcus infantarius* infection and has been observed over a broad geographic range in Alaska, with the majority of cases identified from Kachemak Bay in the Southcentral Alaska stock. The dramatic increase of sea otter strandings in Kachemak Bay is now thought to be due to a rapidly increasing otter population in the bay combined with more community effort to report strandings. Testing and analysis are still being conducted to pinpoint the cause of this leading source of mortality. However, it is thought that the *Streptococcus infantarius* infection may be the result of immunosuppression due to an emerging virus in the Alaska population. At this time it is unclear what impact this has had, or will have, on the population.

Since 2002, the Service has undertaken a health and disease study of northern sea otters from all three Alaskan stocks. On average, the Service conducts about 100 necropsies a year on sea otter carcasses to determine cause of death, disease incidence, and status of general health parameters. Boat strike is a recurring cause of death across all three stocks. However, it has been determined in most of these cases that although trauma was the ultimate cause of death, there was a contributing factor, such as disease or biotoxin exposure, which incapacitated the animal and made it more vulnerable to boat strike.

STATUS OF STOCK

The known level of direct human-caused mortality within the Southcentral Alaska stock does not exceed the PBR level, and the Southcentral Alaska stock is neither listed as “depleted” under the MMPA nor listed as “threatened” or “endangered” under the U. S. Endangered Species Act of 1973, as amended. The known level of direct human-caused mortality is 293 otters per year. It would require an annual rate of fisheries-associated mortality and serious injury of over 1,170 otters per year for the total amount of direct human-caused mortality to exceed PBR for this stock. Despite uncertainties regarding fisheries mortality and serious injury, we believe that it is unlikely this level of take is occurring at present. Therefore, the Southcentral Alaska stock of the northern sea otter is classified as non-strategic. In addition, although the Service does not currently know the OSP for this stock, based on the known population level and our estimate of growth and considering the known level of human-caused mortality, we have determined that this stock is increasing and that human-caused mortality and serious injury is not likely to cause the stock to be reduced or to decrease its growth rate. Therefore, we would not expect the current level of human-caused mortality and serious injury to cause this stock to be reduced below its plausible OSP.

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