Revised: April 2014

NORTHERN SEA OTTER (*Enhydra lutris kenyoni*):

Southeast 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 (m) (approximately 12.2 feet) 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).

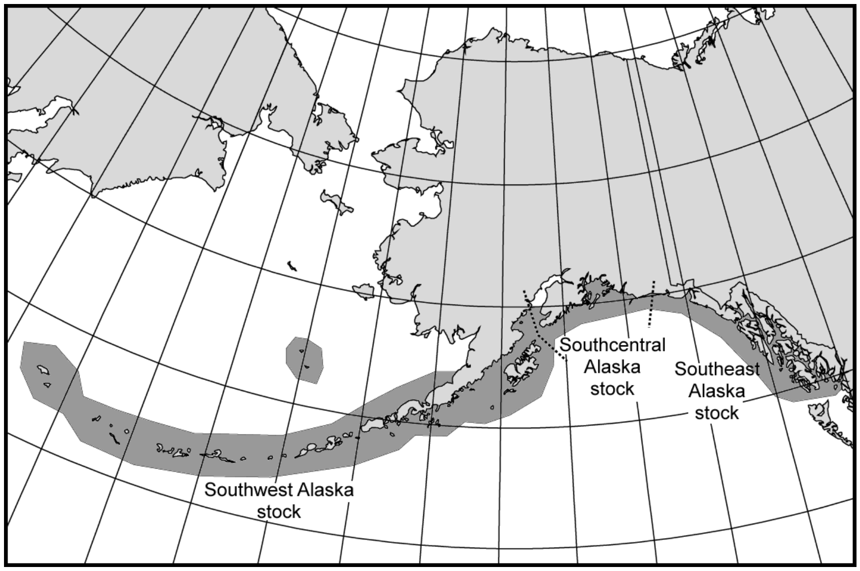

Figure 1. Approximate distribution and stock boundaries of northern sea otters in Alaska waters (shaded area).

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 Southeast 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).

Although population recovery began following legal protection, no remnant colonies of sea otters existed in Southeast Alaska. 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 (Jameson *et al.* 1982). These translocation efforts met with varying degrees of success. From 1965 to 1969, 412 otters (89% from Amchitka Island in southwest Alaska, and 11% from Prince William Sound in southcentral Alaska) were translocated to six sites in southeast Alaska (Jameson *et al.* 1982). In the first 20 years following translocation, these populations increased in numbers and expanded their range (Pitcher 1989).

Nearly all of the current population estimates for the Southeast Alaska stock were developed using the aerial survey methods of Bodkin and Udevitz (1999). The lone exception was a survey of the outer coastline from the western boundary of the stock at Cape Yakataga to Cape Spencer conducted by U.S. Geological Survey (USGS) in 2000. Thirty-two otters were estimated to be in that area (coefficient of variation [CV]=0.378). In 2005, the U.S. Fish and Wildlife Service (Service) surveyed Yakutat Bay (estimate number of otters [N]=1,582; CV=0.33; Gill and Burn 2007). In 2010, the Service surveyed the southern half (Kuiu and Kupreanof Islands south to the Canadian border) of Southeast Alaska (SSE) (N=12,873; CV=0.18; Gill and Burn unpublished data). The northern half (Admiralty and Baranof Islands north to Glacier Bay) of Southeast Alaska (NSE) was surveyed by the Service in 2011 (N=2,717; CV=0.22; Gill and Burn unpublished data). Glacier Bay (GB) National Park (NSE) was not included in the 2011 survey as USGS had separate plans to conduct replicate surveys in the Bay in 2012 to add to a long-term data set for the National Park (NP). The estimate from that 2012 survey is N=8,508; CV=0.20 (Esslinger *et al.* 2013). The most recent population estimates for the Southeast Alaska stock are presented in Table 1, which shows a total estimate of 25,712 sea otters for the stock.

Table 1. Abundance estimates for the Southeast Alaska stock of northern sea otters.

Survey Area	Year	Unadjusted count	Adjusted Estimate	CV	N_{MIN}	Reference
North Gulf of Alaska	2000	15	32	0.38	24	USGS unpublished data
Glacier Bay (NP)	2012		8,508	0.20	7,201	Esslinger, Bodkin, & Weitzman (2013)
Northern Southeast Alaska (NSE)	2011		2,717	0.22	2,270	Gill and Burn unpublished data
Southern Southeast Alaska (SSE)	2010		12,873	0.18	11,099	Gill and Burn unpublished data
Yakutat Bay	2005		1,582	0.33	1,203	Gill and Burn (2007)
Current Total			**25,712**		**21,798**	
2008 SAR Total			10,563		9,136	

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 entire Southeast Alaska stock is 21,798 sea otters.

Current Population Trend

The trend for this stock of sea otters has generally been one of growth (Pitcher 1989, Agler *et al.* 1995, Esslinger and Bodkin 2009). Comparing the current population estimate with that of the previous stock assessment reports suggests that this growth trend is continuing. The estimated population size (25,712) of this stock currently is more than double what was estimated in the previous (2008) stock assessment report (10,563). However, it is important to note that the population estimate published in the 2008 stock assessment report was based on survey data from 2002 and 2003. Therefore, we can only conclude that the Southeast population stock has doubled since 2003.

The 2010-2011 survey followed the same Bodkin and Udevitz (1999) methods as the 2002-2003 survey effort (Esslinger and Bodkin 2009) so results of those two surveys can be directly compared. In addition, all surveys in the GBNP time series followed the Bodkin and Udevitz (1999) method. The Service's 2010 survey of SSE showed an average annual increase of 12% per year over the last seven years and the Service's 2011 survey of NSE Alaska (minus GBNP) showed an average annual increase of 4% per year over the last nine years. The USGSs' survey of GBNP showed an average annual increase of 20% per year over the last six years. If we include the 2012 GBNP estimate with the estimate for the 2011 NSE Alaska the growth rate is about 14% per year in NSE Alaska which is in line with the growth rate for SSE Alaska. Hence, the northern and southern portions of Southeast Alaska appear to be growing at the same average annual rate; between 12-14% per year.

When compared to SSE, the sea otter population has also not appreciably expanded its range in NSE outside of GBNP since 2002 (Esslinger and Bodkin 2009, Gill and Burn unpublished data). However, otters have occupied appreciable new habitat in SSE since 2003 (Esslinger and Bodkin 2009, Gill and Burn unpublished data). There appear to be two major areas of expansion in SSE; otters have moved in large numbers along the northwest coast of Kuiu Island up into Keku Strait and then animals from this area have crossed Frederick Sound to the southern tip of Admiralty Island, and finally otters have expanded northward from the Barrier Islands through Tlevak Strait.

Sea otter abundance in Yakutat Bay has also increased, by an estimated 14.6% per year, over the last decade, likely through reproduction, although some amount of immigration cannot be ruled out (Gill and Burn 2007). During this process, otters appear to have expanded their range to include the western shores of Yakutat Bay.

Based on this information the current population trend for the Southeast Alaska stock is increasing.

MAXIMUM NET PRODUCTIVITY RATE

Estes (1990) estimated a population growth rate of 17 to 20% per year for northern sea otter populations expanding into unoccupied habitat in the Aleutian Islands, southeast Alaska, British Columbia, Washington State, and central California. Although maximum productivity rates (R_{MAX}) 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}. The Service’s 2010 survey of SSE and 2011 survey of NSE shows a current growth rate of 12% and 4% respectively per year (minus GBNP). The USGS’ 2012 survey of GBNP shows a current growth rate of 20% per year. Combining the data from NSE AK indicates that area is growing at a rate of 14% per year which compares to the rate of 12% per year in SSE AK. Consequently, we estimate the current net productivity rate for the entire Southeast Alaska population stock to be between 12-14% per year.

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 been stable or increasing with a known human take. Thus, for the Southeast stock of sea otters, PBR = 2,179 animals (21,798 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). Fisheries that have been known to interact with sea otters in the Southwest and Southcentral Alaska stocks do occur in Southeast Alaska, specifically the Southeast Alaska salmon drift gillnet (474 vessels) and the Yakutat salmon set gillnet (167 participants) fisheries. Sea otters are also known to interact with pot fisheries in California (Hatfield *et al*. 2011); in Southeast Alaska, there are 415 crab pot fishery participants and 274 shrimp pot participants. There are also 243 miscellaneous finfish pot fishery participants across the entire state (numbers are not available for specific areas). Available information suggests that fisheries using other types of gear, such as trawl, longline, and purse seine, are less likely to have interactions with sea otters across their entire range in Alaska due to either the areas where such fisheries operate (i.e., outside of sea otter habitat), the specific gear used (i.e., otters are not going to tangle or get trapped in a longline), 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 southeast sea otter stock cannot be made because observer coverage is not sufficient and data are not collected consistently over time. Of the observer programs in operation within the stock, no incidents of sea otter incidental take were observed in trawl, longline, or pot groundfish fisheries in Southeast Alaska from 1989 to 2010 (Perez 2003, Perez 2006, Perez 2007, Manly 2009, Bridget Mansfield 2011 personal communication). However, there has been no observer effort to document by-catch in the salmon set or drift gillnet fisheries or in the crab or shrimp pot fisheries in Southeast Alaska. Hatfield *et al*. (2011) contend that significant sea otter mortality from pot fishery by-catch might easily go undetected, even when seemingly high levels of observer effort exist.

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. From 1990 to 1993, self-reported fisheries data showed no sea otter kills or injuries in Southeast Alaska. Self-reports were incomplete for 1994 and not available for 1995 or 1996. Between 1997 and 2010, there were no records of incidental take of sea otters by commercial fisheries in this region. Credle *et al.* (1994) considered fisher self-reports to be a minimum estimate of incidental take as these data are most likely negatively biased. Indeed, anecdotal observations have been reported to the Service within the last five years suggesting that sea otters do interact with crab pots in Southeast Alaska. As sea otters reoccupy portions of their former habitat in Southeast Alaska, co-occurrence with pot fisheries will increase and so will the likelihood of mortalities or serious injury.

Information is insufficient to determine whether or not the total fishery mortality and serious injury for the Southeast 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 conserving body heat 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 caused by the spill for the Prince William Sound area vary from 750 (range 600-1,000) (Garshelis 1997) to 2,650 (range 500-5,000) (Garrot *et al.* 1993) otters. Statewide, it is estimated that 3,905 sea otters (range 1,904-11,257) died in Alaska as a result of the spill (DeGange *et al.* 1994), but none of these were from the Southeast Alaska stock.

There is currently no oil and gas development in Southeast Alaska. Tankers carrying oil south from the Trans-Alaska Pipeline typically travel offshore of Southeast Alaska. Information on oil spills compiled by the Alaska Department of Environmental Conservation from 2006 to 2010 indicates that there were no reported spills of crude oil in Southeast 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 Southeast Alaska. During that same time period, there was an average of 133 spills each year, ranging in size from less than 1 and up to 17,800 gallons (approximately 4 to 64,600 liters). The vast majority of these spills were small, with a mean size of 46 gallons (1,748 liters), and there is no indication that these small-scale spills have had an impact on the Southeast Alaska stock of northern sea otters at the population level.

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 Service's Law Enforcement records from 2006 to 2010, individuals were prosecuted for unlawful possession, transport, or sale of 208 sea otter hides or skulls taken within the range of the Southeast Alaska stock. During the same time period, there was one prosecution for unlawful take of a single sea otter hide. Data for subsistence harvest of sea otters in Southeast 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 Southeast stock from 1989 to 2010. The mean reported annual subsistence take during the past five complete calendar years (2006-2010) was 447 animals. This is an increase from the annual average of 322 sea otters hunted during the previous five-year period. Reported age composition from 2006 to 2010 was the same as the previous five years; 83% adults, 14% subadults, and 3% pups. Reported sex composition from 2006 to 2010 was also the same as the previous five years; 72% males, 27% females, and 1% of unknown sex.

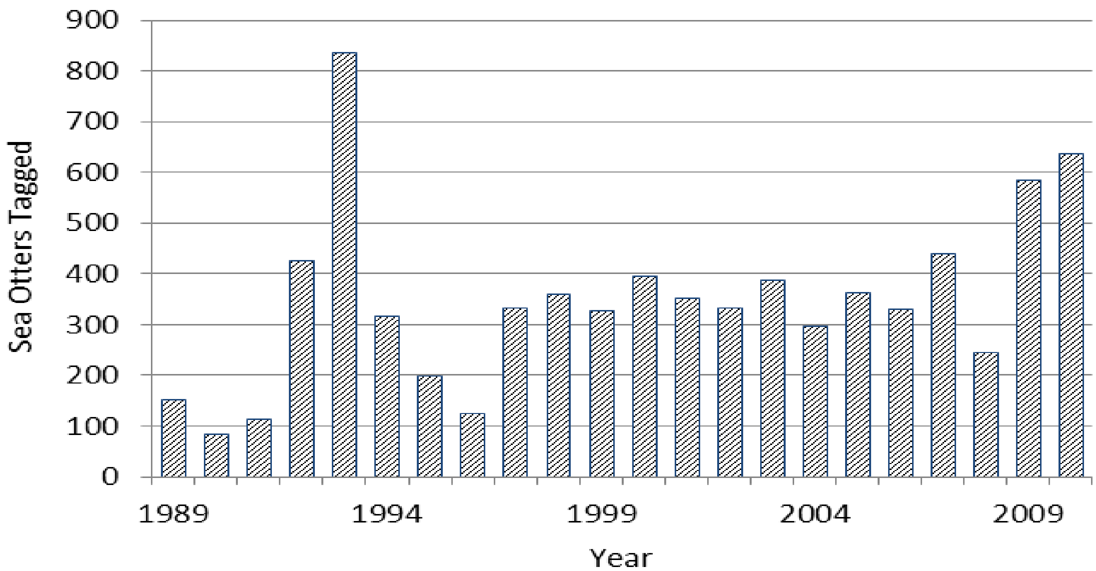

Figure 2. Reported subsistence harvest of northern sea otters from the Southeast Alaska stock, 1989 to 2010.

Research and Public Display

In the past five years, no sea otters were removed from the Southeast Alaska stock for public display. In 2011, 93 sea otters were captured and released for scientific research in the Southeast Alaska stock; the Service captured and released 31 sea otters in the Keku Strait region and the USGS captured and released 62 sea otters in Cross Sound and off of southern Baranof Island. There were no mortalities and serious injuries reported from either of these research efforts.

Other Factors

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.

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 in Kachemak Bay, in the Southcentral Alaska stock, since 2002 constituted 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 Southeast 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 NOAA Fisheries and the Alaska SeaLife Center to develop the infrastructure for a statewide marine mammal stranding network in Alaska.

STATUS OF STOCK

The known level of direct human-caused mortality within the Southeast Alaska stock does not exceed the PBR level, and the Southeast Alaska stock is neither listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act of 1973, as amended, nor is it likely to be listed as such in the foreseeable future. The known level of direct human-caused mortality is 447 otters per year. It would require an annual rate of human-caused mortality from additional hunting or fisheries interactions of 1,733 more otters per year for the total amount of direct human-caused mortality to exceed PBR for this stock. Despite uncertainties regarding fishery mortality, we believe that it is unlikely this level is occurring at present. Therefore, the Southeast 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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