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SEA OTTER (*Enhydra lutris*): 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 m depth contour since animals require frequent access to 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 long distance movements of >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.

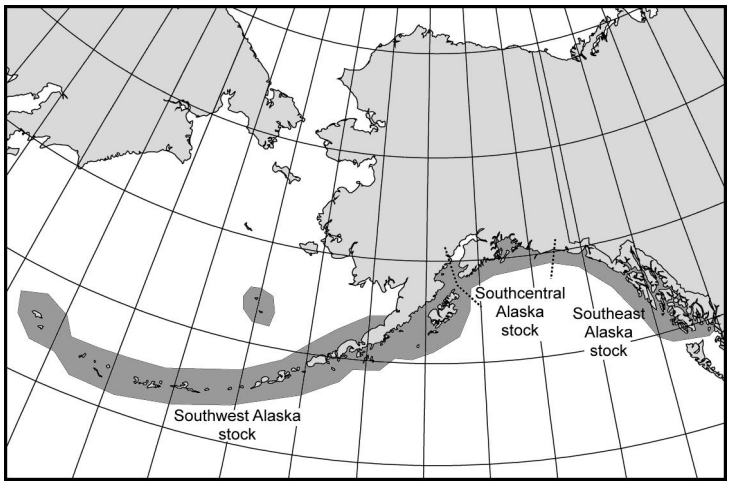

Figure 1. Approximate distribution of sea otters in Alaska waters (shaded area).

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 stock extends from Dixon Entrance to Cape Yakataga; (2) southcentral stock extends from Cape Yakataga to Cook Inlet including Prince William Sound, the Kenai peninsula coast, and Kachemak Bay; and (3) southwest stock which includes Alaska Peninsula and Bristol Bay coasts, the Aleutian, Barren, Kodiak, and Pribilof Islands (Fig. 1). The phylogeographic approach of stock identification, which considers four types of data, is presented in greater detail below.

1) Distributional data: geographic distribution is continuous from Kachemak Bay to Cape Suckling, at which point 125 miles of vacant coastal habitat between Cape Suckling and Yakutat Bay separates the southeast and southcentral Alaska stocks (Doroff and Gorbics 1998). Sea otters in Yakutat Bay and southeast Alaska are the result of a translocation of 412 animals from Prince William Sound and Amchitka in the late 1960s (Pitcher 1989; Reidman and Estes 1990). Prior to translocation, sea otters had been absent from these habitats since the beginning of the 20th century. Distribution is nearly continuous from Attu Island in the western Aleutians to the Alaska Peninsula, although distances of >200 km between island groups in the Aleutians may effectively limit exchange of individuals. Sea otters do not occur in upper Cook Inlet, and population densities are currently low between the Kenai peninsula and the Alaska Peninsula, which suggests discontinuity in distribution at the stock boundary. Physical features that may limit movements of otters between the Kenai and Alaska peninsulas include approximately 100 km of open water across Cook Inlet with a maximum water depth of 100 m, and 70 km of open water between the Kenai Peninsula and the Kodiak Archipelago with a maximum water depth of 200 m. However, the open water between Kenai and Kodiak is interrupted mid-way by the Barren Islands (Gorbics and Bodkin 2001).

Contaminant levels may also indicate geographic isolation of stocks. In general, tissues from sea otters in Alaska contain relatively low levels of contaminants; however, higher levels of heavy metals and trace elements were found in animals from southcentral Alaska, with the general trend among groups being southcentral>southwest>southeast (Comerci *et al.*, in prep.). Patterns of contamination are consistent with distribution of pollutants from anthropogenic sources in populated areas. High levels of PCBs in some otters from the Aleutian Islands (southwest Alaska) likely reflect local "point sources," such as military installations (Estes *et al.* 1997; Bacon *et al.* 1999).

2) Population response data: variation in growth rates and reproductive characteristics among populations likely reflect local differences in habitat and resource availability rather than intrinsic differences between geographically distinct units (Gorbics and Bodkin 2001) .

3) Phenotypic data: significant differences in sea otter skull sizes exist between southwest and southcentral Alaska (Gorbics and Bodkin, 2001).

4) Genotypic data: the three stocks exhibit substantial differences in both mitochondrial and nuclear DNA (Cronin *et al.* 1996; Bodkin *et al.* 1992, 1999, Larson *et al.* in prep.). Significant differences in frequencies of mtDNA haplotypes and genetic differences among geographic areas show sufficient variation to indicate restricted gene flow (Gorbics and Bodkin 2001). A recent analyses of mitochondrial and nuclear DNA by Cronin *et al.* (2002) corroborates the stock structure proposed by Gorbics and Bodkin (2001).

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 thirteen remnant colonies (Kenyon, 1969). Population regrowth began following legal protection, and sea otters have since recolonized much of their historic range in Alaska.

The most recent population estimates for the southcentral Alaska stock are presented in Table 1.

Table 1. Population estimates for the southcentral Alaska stock of sea otters.

Survey Area	Year	Unadjusted Estimate	Adjusted Estimate	CV	N_{min}	Reference
North Gulf of Alaska	1996	271	645	0.087	600	Doroff and Gorbics (1998)
Prince William Sound	1999		13,234	0.198	11,220	USGS Unpublished data
Cook Inlet/Kenai Fiords	2002		2,673	0.271	2,136	USGS Unpublished data
Total			16,552		13,955	

In 1999, a survey of Prince William Sound resulted in an abundance estimate of 13,234 (CV = 0.198) animals (USGS unpublished data). This survey followed methodology described in Bodkin and Udevitz (1999) and included a survey-specific correction factor to account for undetected animals.

The survey of lower Cook Inlet and the Kenai Fiords area conducted in June and August 2002 also followed the methodology of Bodkin and Udevitz (1999) with an abundance estimate of 2,673 (CV = 0.271) (USGS unpublished data).

Finally, two aerial surveys of the northern Gulf of Alaska coastline flown in 1995 and 1996 provided a minimum uncorrected count of 271 sea otters between Cape Hinchinbrook and Cape Yakataga (Doroff and Gorbics 1998). Applying a correction factor of 2.38 (CV = 0.087) for sea otter aerial surveys using a twin-engine aircraft (Evans *et al.* 1997) produces an adjusted estimate of 645 (CV = 0.087). Combining the adjusted estimates for these three areas results in a total estimate of 16,552 sea otters for the southcentral Alaska stock.

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 southcentral Alaska stock is 13,955 sea otters.

Current Population Trend

Although rates of population growth may vary among locations, the trend for this stock of sea otters is generally one of growth (Irons *et al.* 1988, Bodkin and Udevitz 1999). Since 1911, when sea otters were protected from commercial hunting, remnant populations in southcentral Alaska have recolonized much of their former range. Persisting populations in Alaska have generally exhibited trends of growth, with declines occurring only when populations exceed available resources (Estes 1990, Bodkin *et al.* 1995). The 1989 *Exxon Valdez* oil spill resulted in an estimated sea otter mortality in Prince William Sound ranging from 750 (range 600-1,000) (Garshelis 1997) to 2,650 (range 500 - 5,000) otters (Garrot *et al.* 1993). Since the spill, sea otters in western Prince William Sound have increased by approximately 750 animals (Bodkin *et al.*, in press). However, overall sea otter abundance in Prince William Sound has not increased appreciably since 1994. The current population estimate for Kenai Fiords and eastern Cook Inlet is slightly higher than the previous estimate from 1989 (2,673 vs. 2,330), which suggests slight growth in this area. The overall trend for this stock appears to be either stable or slightly increasing.

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. However, in areas where resources are limiting or where populations are approaching equilibrium density, slower rates of growth are expected (Estes, 1990, Bodkin *et al.* 1995). Maximum productivity rates have not been measured through much of the sea otter's range in Alaska. In the absence of more detailed information for maximum productivity rates throughout southcentral Alaska, the rate of 20% calculated by Estes (1990) is considered a reliable estimate of R_{MAX}.

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized 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: $PBR = N_{MIN} \times 0.5\ R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 1.0 (Wade and Anglis 1997) as population levels have increased or remained stable with a known human take. Thus for the southcentral stock of sea otters, PBR = 1,396 animals (13,955 x 0.5 (0.2) x1.0)

ANNUAL HUMAN CAUSED MORTALITY

Fisheries Information

Each year, fishery observers monitor a percentage of commercial fisheries in Alaska and report injury and mortality of marine mammals incidental to these operations. Fisheries observers monitored the Cook Inlet set gillnet and drift gillnet fisheries from 1999-2000. The observer coverage during both years was approximately 2-5%. 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 of the gillnet gear, but did not become entangled. No other fisheries operating in the region of the southcentral stock were monitored by observer programs from 1992 through 2000. From 1990 to 1991, fisheries observers in the southcentral Alaska region reported no mortalities or injuries of sea otters. Prior to the implementation of the NMFS observer program, studies were conducted on sea otter interactions with the drift net fisheries in western Prince William Sound from 1988 to1990 and no mortalities were observed (Wynne 1990, 1991).

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 NMFS. In 1990, fisher self-report records show 1 kill and 4 injuries due to gear interaction and 3 injuries due to deterrence in the Prince William Sound drift gillnet fishery. Self-reports were not available for 1994 and 1995. Between 1996 and 2000, there were no records of incidental take of sea otters by commercial fisheries in this region; thus, the estimated mean annual mortality reported for the 5-year period from 1996-2000 is zero. Credle *et al.* (1994) considered this to be a minimum estimate as fisher self-reports and logbook records (self-reports required during 1990-1994) are most likely negatively biased.

Based on the available data, sea otter abundance in the southcentral Alaska stock is not likely to be significantly affected by commercial fishery interaction at present. The total fishery mortality and serious injury is less than 10% of the calculated PBR (1,951) and, therefore, can be considered insignificant and approaching a zero mortality and serious injury rate (Wade and Angliss 1997). A complete list of fisheries and marine mammal interactions is published annually by NMFS [67 FR 2410].

Oil and Gas Development

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 600-1,000) (Garshelis 1997) to 2,650 (range 500 - 5,000) otters (Garrot *et al.* 1993). 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.*1994b). 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.*, in press, Stephensen *et al.* 2001).

In addition to tanker traffic in Prince William Sound, oil and gas development occurs in Cook Inlet. While the catastrophic release of oil has the potential to take large numbers of sea otters, there is no evidence that routine oil and gas development and transport have a direct impact on the southcentral Alaska sea otter stock.

Subsistence/Native Harvest Information

The Marine Mammal Protection Act of 1972 exempted Native Alaskans from the prohibition on hunting marine mammals. Alaska Natives are legally permitted to take sea otters for subsistence use or for creating and selling authentic handicrafts or clothing. Data for subsistence harvest of sea otters in southcentral Alaska were collected by a mandatory Marking, Tagging and Reporting Program implemented by USFWS since 1988. Fig. 2 provides a summary of harvest information for the southcentral stock from 1989-2000. The mean annual subsistence take during the past five years (1996-2000) was 297 animals. Age composition during this period was 93% adults,6% subadults, and 1% pups. Sex composition during the past five years was 81% males, 17% females and 2% of unknown sex.

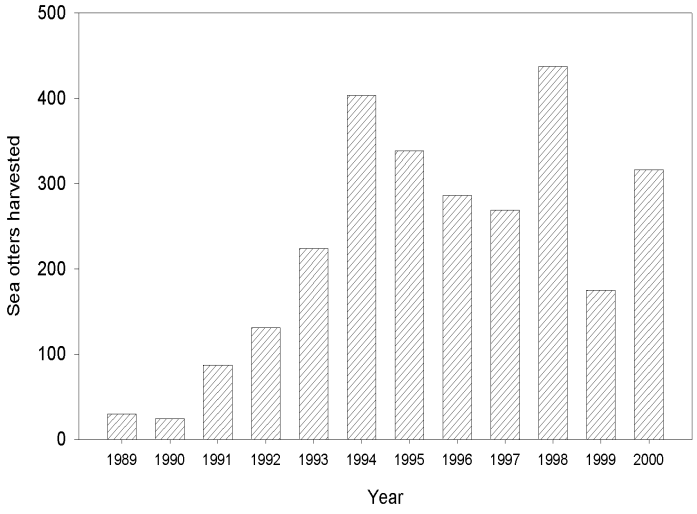

Figure 2. Estimated subsistence harvest of sea otters from the southcentral Alaska stock, 1989-2000.

Since 1997, the USFWS and the Alaska Sea Otter and Steller Sea Lion Commission (TASSC) have signed cooperative agreements authorized under Section 119 of the MMPA for the conservation and co-management of sea otters in Alaska. Each of the six TASSC regions has a regional management plan that includes harvest guidelines. Several villages have also developed local management plans that address sea otter harvests.

Research and Public Display

During the past five years there have been no live captures of sea otters for public display from the southcentral Alaska stock. Since 1996, 253 sea otters have been captured and released for scientific research in Prince William Sound. There have been no observed effects on sea otter populations in the southcentral Alaska stock from these activities.

STATUS OF STOCK

Sea otters in the southcentral Alaska stock are not listed as “depleted” under the MMPA or listed as “threatened” or “endangered” under the Endangered Species Act. Based on currently available data, the estimated minimum mortality

and serious injury incidental to commercial fisheries (0) is less than 10% of the calculated PBR, and therefore can be considered insignificant and approaching a zero mortality and serious injury rate. The estimated annual level of total human-caused mortality and serious injury over the 5-year period from 1996 through 2000 (297) does not exceed the PBR (1,396). As a result, the southcentral sea otter stock is classified as non-strategic. This classification is consistent with the recommendations of the Alaska Regional Scientific Review Group (DeMaster 1995). The status of this stock relative to its Optimum Sustainable Population size is unknown.

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