

McPherson

ABUNDANCE OF PACIFIC HARBOR SEALS
(Phoca vitulina richardsi)
IN OREGON: 1977-1996



Oregon Department of Fish and Wildlife
Wildlife Diversity Program

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ABSTRACT

Aerial photographic surveys of harbor seals (Phoca vitulina richardsi) were conducted along the Oregon coast from 1977-1996. These abundance trend surveys were conducted during the spring and early summer reproductive period (May-June). Statewide counts of seals ranged from 2,224 adults and juveniles in 1977 to 5,322 in 1996. A maximum count of 5,610 occurred in 1992. By applying a correction factor to counts of all animals (including pups) it was estimated that just under 10,000 harbor seals occurred along the Oregon coast in May 1996. Over the entire survey period harbor seal numbers increased at an average annual rate of 4.5%. During the years 1982-1992, seal counts increased at a rate of 5.0% per year, while counts from 1988 to 1996 increased at only 0.3% per year. The recent slowing in the rate of growth suggests that harbor seals in Oregon may be approaching an abundance level that is in balance with the supporting coastal environment. However, several more years of surveys should be conducted to confirm the status of this species in Oregon.

ACKNOWLEDGMENTS

Many people contributed over the years to compiling the data set presented here. Since 1990, Susan Riemer shared the responsibility of conducting surveys and led the activities of counting seals and tabulating data. For several years prior to that, Janet Stein assisted in conducting surveys, counting from photos, and summarizing data. Others that contributed greatly to this work over a twenty year period include Jim Harvey, Bruce Mate, and Steve Jeffries. Harriet Huber led efforts to develop new correction factors for abundance estimates during the 1992 survey period. Additional guidance and support were provided by Bob DeLong, Joe Scordino, Dale Snow and Neal Coenen. Steve Kohlmann and Rebecca Goggans reviewed this report and provided helpful comments. The USFWS Coastal Refuges Office in Newport permitted overflights of Oregon refuge islands for the purposes of photographing seals. Funding for this work came from numerous sources including Oregon Department of Fish and Wildlife and National Marine Fisheries Service (Northwest Region Office and National Marine Mammal Laboratory).

INTRODUCTION AND METHODS

The Oregon Department of Fish and Wildlife (ODFW) began systematic surveys of pinniped (seal and sea lion) distribution and abundance along the Oregon coast in 1984. These surveys focused on the most commonly occurring pinnipeds in Oregon, the Pacific harbor seal (*Phoca vitulina richardsi*), the California sea lions (*Zalophus californianus*), and the Steller sea lion (*Eumetopias jubatus*). From 1977 to 1983, additional pinniped surveys funded by ODFW were conducted by Oregon State University staff (including the author of this report). In this report, the count data collected during these surveys were used to describe trends in population abundance of Pacific harbor seals in Oregon coastal waters. Results from surveys of the two sea lion species in Oregon will be presented in separate reports.

The survey methods used here were similar to those used to count harbor seals in other areas from California to Alaska (Johnson and Jeffries 1983, Brown 1988; Pitcher 1989, Harvey et al. 1990, Huber et al. 1992, Hanan 1996)). Most surveys were flown in a single-engine, high-wing aircraft (Cessna 172 or 182) at altitudes of between 600 and 1,000 feet. Data collected during surveys included date, time, location, and an estimate of the number of harbor seals, and the number of photographs taken at each site.

At least two days were required to complete a single statewide survey: from the California-Oregon border to and including the lower 50 miles of the Columbia River estuary. Surveys were conducted on consecutive days when weather permitted, although coverage of the entire coast sometimes required 3-4 days to complete. Surveys were scheduled to occur from two hours before to two hours after slack low tide when the largest number of animals were expected to be hauled out on land. These statewide surveys for harbor seal abundance and population trends were conducted during the reproductive period, from

mid-May through mid-June, when the maximum number of newborn pups were expected to be observed.

Photographs of animals at each site were taken using a hand-held 35 mm SLR camera, a 70-210 mm zoom lens, and high speed (400 ASA) color slide film. These photographs were projected onto a white surface and the image of each animal was marked with a pen to prevent over or under counting. If the photo images were of poor quality or were missing, field estimates for the number of animals at those locations were used. Counts made in this manner constitute the abundance data reported here. A correction factor for estimating the total Oregon harbor seal population, by accounting for seals in the water and not photographed during surveys, was developed by radio-tagging studies conducted at two locations in Oregon in 1992 (Huber et al. 1992; Huber 1995). This correction factor was applied to the 1996 statewide count presented in this report to provide a more recent estimate of total harbor seal abundance in Oregon.

The annual rate of increase in harbor seal numbers for different periods between 1977 and 1996 was determined by a linear regression of the natural logarithm of the number counted each year over the chosen time period. The slope of this regression line was the instantaneous rate of increase, r , which was converted to an average annual rate of increase, R , by the function e^r . The significance of the observed trends in abundance were determined by an ANOVA (F) test. The count data were also fitted to a second order polynomial equation to more accurately describe the overall observed trend in harbor seal counts.

RESULTS AND DISCUSSION

Accurate counts of harbor seal pups were often difficult to make on rocky substrates and as a result pup counts could vary greatly between survey years. For this reason, non-pup counts (adults and juveniles) were used for analysis of trends in harbor seal abundance. Annual trend counts of harbor seals in Oregon from ranged from 2,224 adult and juvenile seals counted in 1977 to 5,322 counted in 1996 (Figure 1). A maximum count of 5,610 non-pups occurred in June 1992.

In general, statewide counts of harbor seals increased over this period. A simple linear regression fitted to the annual count data and an analysis of variance test demonstrated a significant increasing trend ($F=71.77$; $p=0.0001$; 17 df; $r^2=0.82$) at an average annual rate of 4.5% (Figure 2). The number of harbor seals observed in the mid-1990's was roughly two and one-half times that seen in the mid-1970's.

Statewide harbor seal counts appeared to have increased at a much slower rate in the years following 1988. A linear regression of counts from 1982 to the peak count obtained in 1992 (counts prior to 1982 were often not collected under the same survey protocol) showed a significant increasing trend ($F=37.55$; $p=0.0002$; 17 df; $r^2=0.81$) at an average annual rate of 5.0% (Figure 3). A linear regression of counts from 1988 to 1996 (Figure 4), where the observable upward trend in counts appears to be minimal (Figure 1), revealed a trend in abundance not significantly different from zero ($F=0.051$; $p=0.8275$; 8 df; $r^2=0.007$), with an average annual rate of increase of 0.3% .

A second order polynomial regression of counts against all survey years (1977-1996) resulted in a reasonable fit to the entire data series with an $r^2=0.90$ (Figure 5), suggesting that statewide harbor seal counts may be approaching an equilibrium level.

Application of a correction factor of 1.53, to account for seals in the water and missed during surveys (Huber 1995), resulted in a total estimated abundance of harbor seals in Oregon during the 1996 reproductive season of 9,824 (1.53 x 6,421 adults, juveniles and pups). This value is within the range of estimates (9,466 to 12,237) previously developed for Oregon harbor seal abundance in 1992 (Huber et al. 1992).

This analysis of trends in harbor seal counts in Oregon indicated that the rate of increase in abundance observed from the mid-1970's through the mid-1980's did not continue into the mid-1990's. It is possible that certain density dependent factors have begun to influence reproduction and/or survival of harbor seals residing in Oregon waters. Additional analyses will be performed to examine that possibility following the addition of 1997 survey data to the count series. It is recommended that annual trend surveys for harbor seals continue over at least the next several years in order to confirm the apparent slowing in population growth of harbor seals in Oregon.

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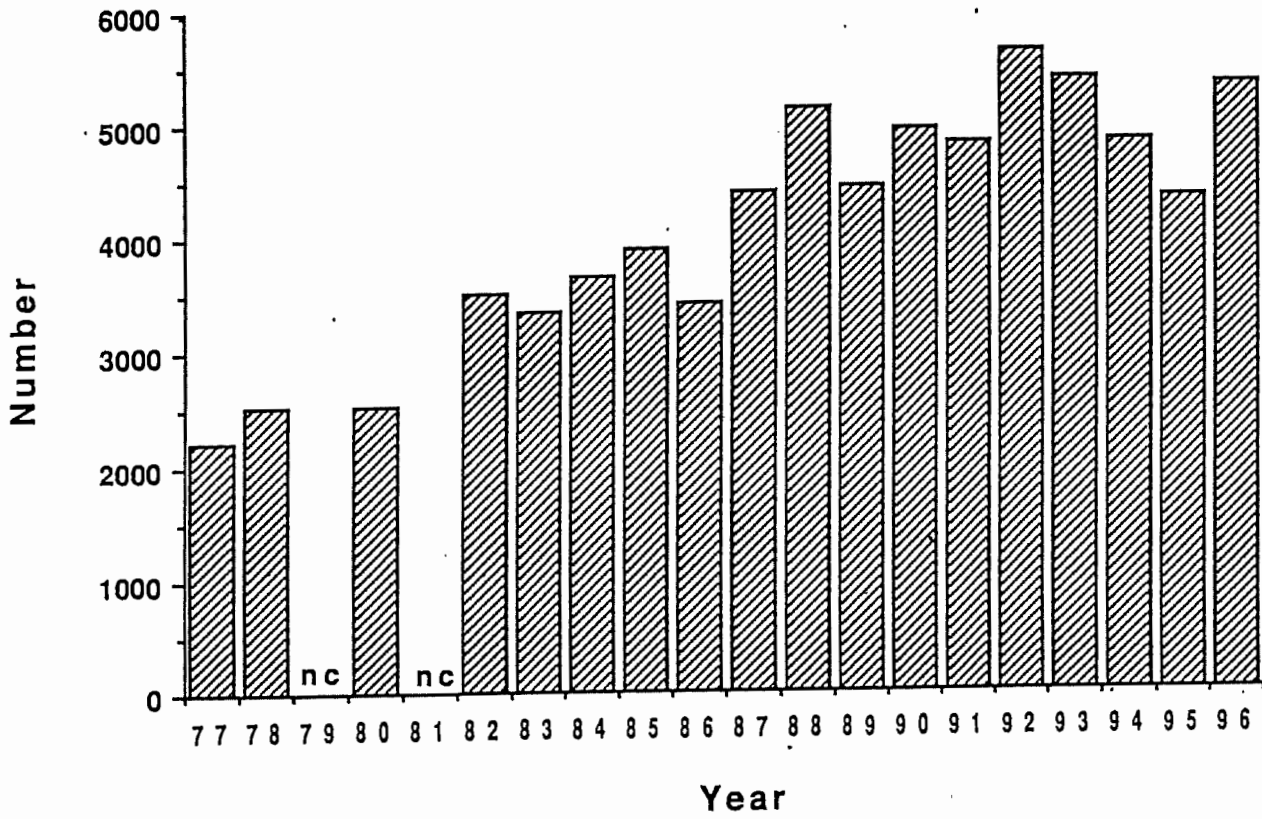


Figure 1. Annual trend counts (May-June) of harbor seals in Oregon, 1977-1996 (nc = no count).

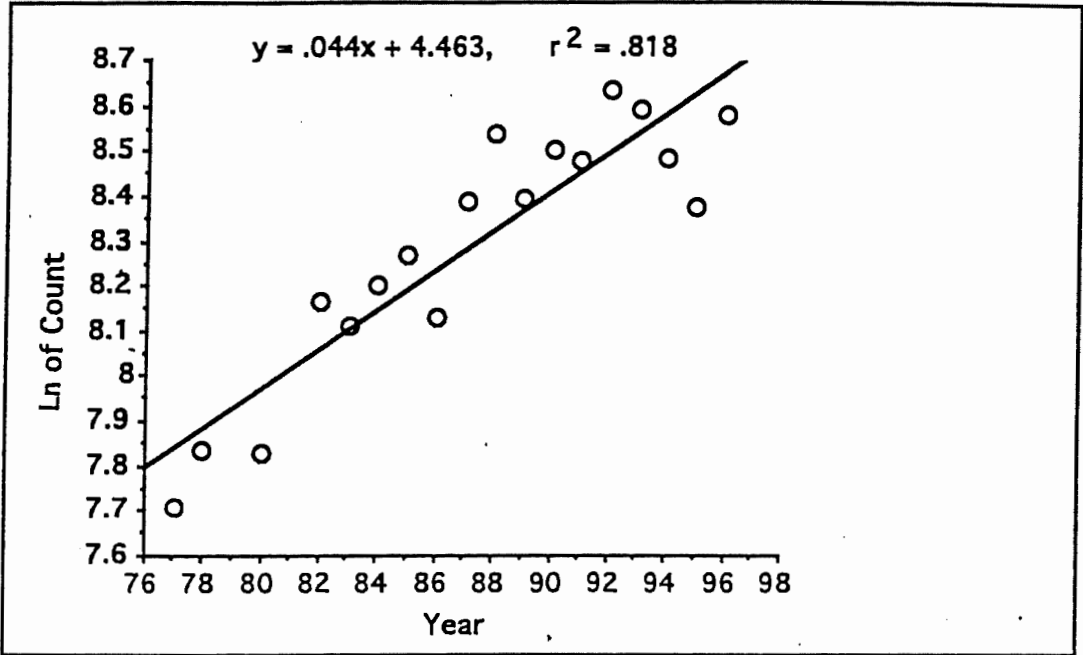


Figure 2. Linear regression of annual harbor seal trend counts against year, 1977-1996.

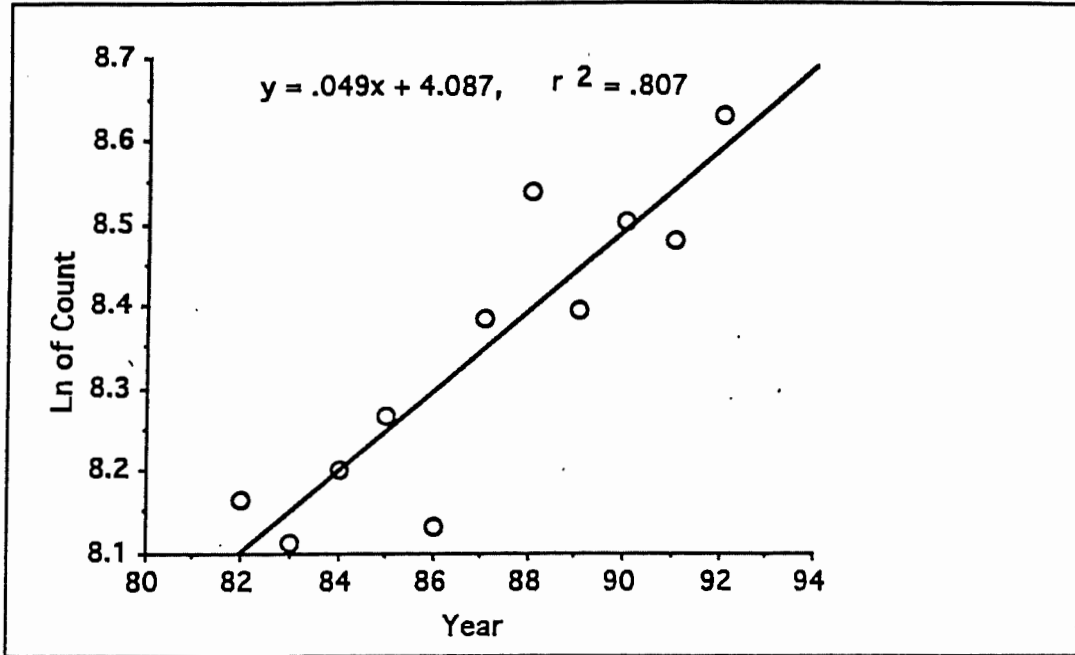


Figure 3. Linear regression of annual harbor seal trend counts against year, 1982-1992.

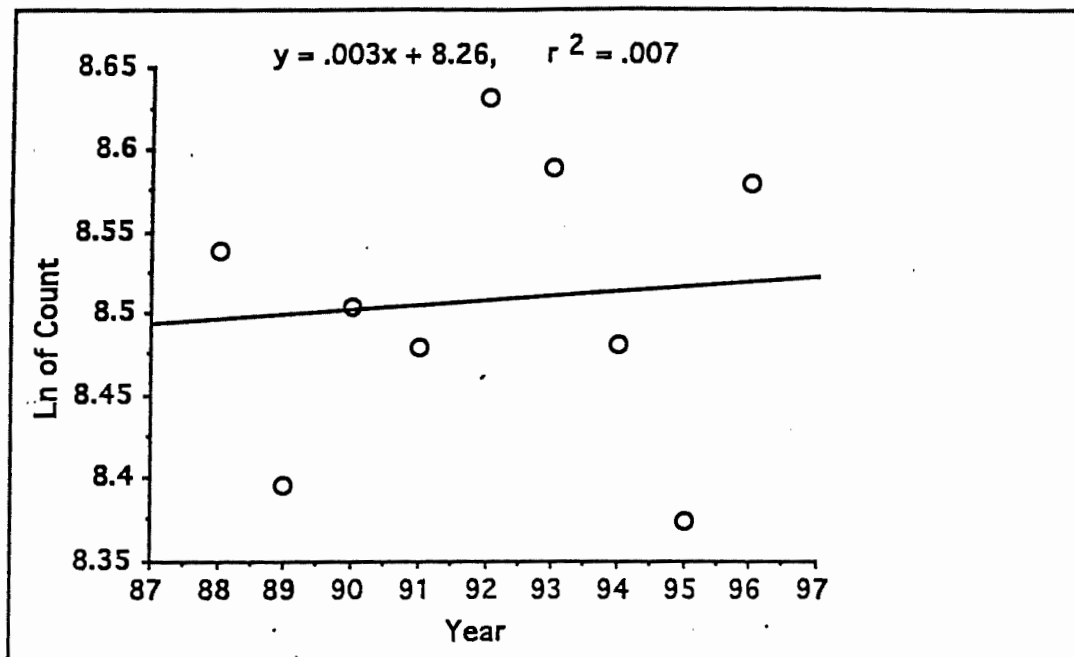


Figure 4. Linear regression of annual harbor seal trend counts against year, 1988-1996.

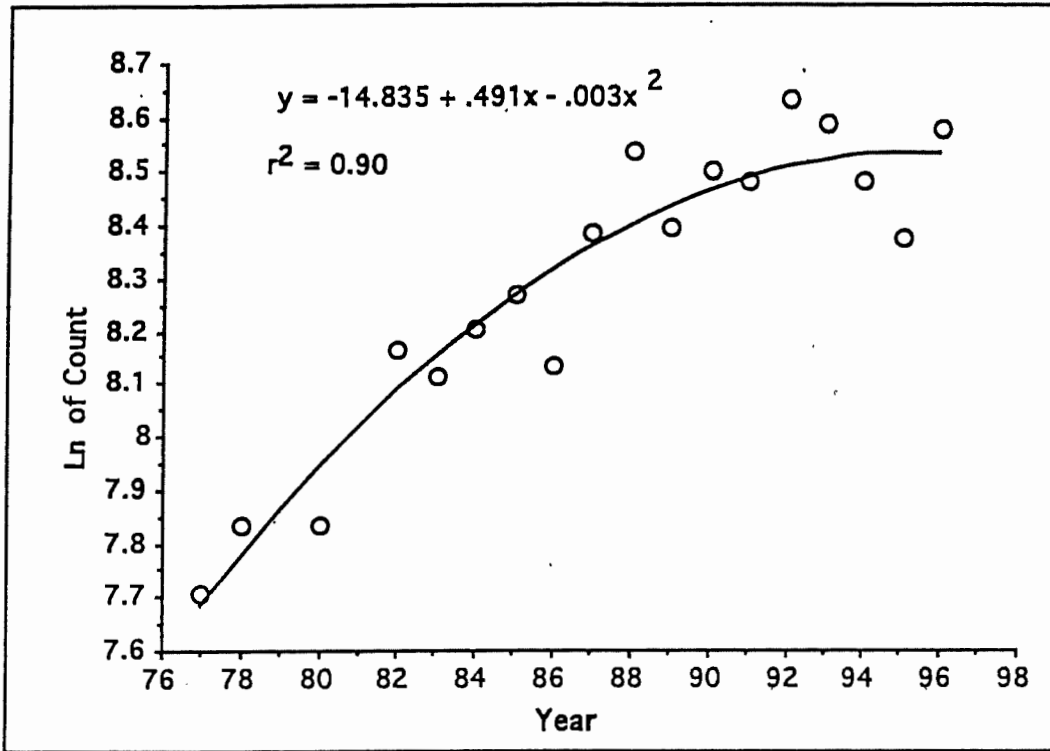


Figure 5. Second order polynomial regression of annual harbor seal trend counts, 1977-1996