Revised 12/15/98

HARBOR SEAL (*Phoca vitulina richardsi*): Oregon & Washington Coast Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Harbor seals inhabit coastal and estuarine waters off Baja California, north along the western coasts of the continental U. S., British Columbia, and Southeast Alaska, west through the Gulf of Alaska and Aleutian Islands, and in the Bering Sea north to Cape Newenham and the Pribilof Islands. They haul out on rocks, reefs, beaches, and drifting glacial ice, and feed in marine, estuarine, and occasionally fresh waters. Harbor seals generally are non-migratory, with local movements associated with such factors as tides, weather, season, food availability, and reproduction (Scheffer and Slipp 1944, Fisher 1952, Bigg 1969, Bigg 1981). Harbor seals do not make extensive pelagic migrations though some long distance movement of tagged animals in Alaska (174 km) and along the U. S. west coast (up to 550 km) have been recorded (Pitcher and McAllister 1981, Brown and Mate 1983, Herder 1986). Harbor seals have also displayed strong fidelity for haul out sites (Pitcher and Calkins 1979, Pitcher and McAllister 1981).

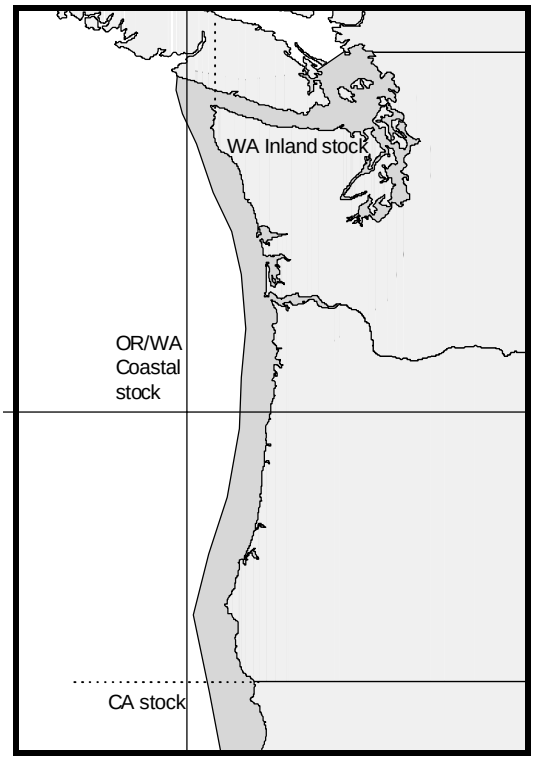

Figure 1. Approximate distribution of harbor seals in the U.S. Pacific Northwest (shaded area). Stock boundaries separating the three stocks are shown.

For management purposes, differences in mean pupping date (Temte 1986), movement patterns (Jeffries 1985, Brown 1988), pollutant loads (Calambokidis et al. 1985) and fishery interactions have led to the recognition of 3 separate harbor seal stocks along the west coast of the continental U. S. (Boveng 1988): 1) inland waters of Washington state (including the Hood Canal, Puget Sound, and Strait of Juan de Fuca out to Cape Flattery), 2) outer coast of Oregon and Washington, and 3) California (see Fig. 1). Recent genetic analyses provide additional support for this stock structure (Huber et al. 1994, Burg 1996, Lamont et al. 1996). Samples from Washington, Oregon, and California demonstrate a high level of genetic diversity and indicate that the harbor seals of inland Washington possess unique haplotypes not found in seals from the coasts of Washington, Oregon, and California (Lamont et al. 1996). This report considers only the Oregon and Washington Coast stock. Three harbor seal stocks are also recognized in the inland and coastal waters of Alaska, including the Southeast Alaska, Gulf of Alaska, and Bering Sea stocks. The three Alaska harbor seal stocks are reported separately in the Stock Assessment Reports for the Alaska Region.

POPULATION SIZE

Aerial surveys of harbor seals in Oregon and Washington were conducted by personnel from the National Marine Mammal Laboratory (NMML) and the Oregon and Washington Departments of Fish and Wildlife (ODF&W and WDF&W) during the 1996 pupping season. Total numbers of hauled-out seals (including pups) were counted during these surveys. In 1996, the mean count of harbor seals occurring along the Washington coast was 10,685 (CV=0.011) animals (Jeffries et al. 1997). In 1996, the mean count of harbor seals occurring along the Oregon coast and in the Columbia River was 6,421 (CV=0.042) animals (Brown 1997, Jeffries et al. 1997). Combining these counts results in 17,106 (CV=0.017) harbor seals in the Oregon and Washington Coast stock.

Radio-tagging studies conducted at 6 locations (3 Washington inland waters sites and 3 Oregon and Washington coastal sites) collected information on haulout pattern from 63 harbor seals in 1991 and 61 harbor seals in 1992. Data from coastal and inland sites were not significantly different and were thus pooled, resulting in a

correction factor of 1.53 (CV=0.065) to account for animals in the water which are missed during the aerial surveys (Huber 1995). Utilizing this correction factor results in a population estimate of 26,172 (17,106 x 1.53; CV=0.067) for the Oregon and Washington Coast stock of harbor seals in 1996 (Jeffries et al. 1997).

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): $N_{MIN} = N/\exp(0.842*[\ln(1+[CV(N)]^2)]^{½})$. Using the population estimate (N) of 26,172 and its associated CV(N) of 0.067, N_{MIN} for this stock is 24,733.

Current Population Trend

Historical levels of harbor seal abundance in Oregon and Washington are unknown. The population apparently decreased during the 1940s and 1950s due to bounty hunting. Approximately 17,133 harbor seals were killed in Washington by bounty hunters between 1943 and 1960 (Newby 1973). More than 3,800 harbor seals were killed in Oregon between 1925 and 1972 by a state-hired seal hunter, as well as bounty hunters (Pearson 1968). The population remained relatively low during the 1960s, but since the termination of the harbor seal bounty program and protection provided by the Marine Mammal Protection Act (MMPA) harbor seal counts for this stock have increased from 6,389 in 1977 to 17,106 in 1996 (H. Huber unpubl. data, S. Jeffries unpubl. data, R. Brown unpubl. data).

Between 1983 and 1996, the annual rate of increase for this stock was 4%, with the peak count of 18,667 seals occurring in 1992. Since 1991, however, this stock has declined 1.6% (t=3.25; p=0.083) annually (Jeffries et al. 1997), which may indicate that this population has exceeded equilibrium levels. Analyzing only the Oregon data (average annual rate of increase was 0.3% from 1988-96) indicates that the Oregon segment of the stock may be approaching equilibrium (Brown 1997). It is possible that the lower total counts for the population as a whole may have resulted from changes in haulout behavior. Increased disturbance, reduced food availability necessitating longer foraging periods, or other unknown reasons may have caused a larger number of seals to be in the water during the surveys (Jeffries et al. 1997).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

From 1978 to 1993, counts of harbor seals throughout Washington state increased at an annual rate of 7.68% (Huber 1995). The Oregon and Washington Coast harbor seal stock increased at an annual rate of 11% from 1977-82, and then at 5.5% from 1983-1992 (H. Huber unpubl. data, S. Jeffries unpubl. data, R. Brown unpubl. data). Because the population was not at a very low level, the observed rates of increase will underestimate the maximum net productivity (R_{MAX}), although the 11% rate may be a reasonable approximation for this stock of harbor seals. However, until additional data become available, the pinniped maximum theoretical net productivity rate (R_{MAX}) of 12% will be employed for this harbor seal stock (Wade and Angliss 1997).

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 re-authorized 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: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 1.0, the value for stocks thought to be within OSP (Wade and Angliss 1997). Thus, for the Oregon and Washington Coast stock of harbor seals, PBR = 1,484 animals (24,733 x 0.06 x 1.0).

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

With the exception of 1994, NMFS observers monitored the northern Washington marine set gillnet fishery during 1990-1996 (Gearin et al. 1994; P. Gearin, unpubl. data). For the entire fishery, observer coverage ranged from approximately 47-87% during those years. Fishing effort is conducted within the range of both stocks of harbor seals (Oregon/Washington Coast and Inland Washington stocks) occurring in Washington State waters. Some of the animals taken in the inland waters portion of the fishery (see stock assessment report for the Inland Washington stock for details) may have been animals from the coastal stock. Similarly, some of the animals taken in the coastal portion of the fishery may have been from the inland stock. For the purposes of this stock assessment report, the animals taken in the inland portion of the fishery are assumed to have belonged to the Inland Washington stock and the animals taken in the coastal portion of the fishery are assumed to have belonged to the Oregon/Washington Coast stock. However,

as noted, some movement of animals between Washington's coastal and inland waters is likely, although data from tagging studies have not shown movement of harbor seals between the two locations (Huber 1995). Accordingly, Table 1 includes data only from that portion of the northern Washington marine set gillnet fishery occurring within the range of the Oregon and Washington Coast stock (those waters south and west of Cape Flattery). Data from 1990-96 are included in the table, although the mean estimated annual mortality is calculated using only the most recent 5 years for which data are available. No fishing effort occurred in the coastal portion of the fishery in 1993 and, as noted above, no observer program occurred in 1994. The mean estimated mortality for this fishery is 5.6 (CV=.33) harbor seals per year from this stock.

The WA/OR/CA groundfish trawl fishery (Pacific whiting component) was monitored for incidental take during 1990-96. The only harbor seal mortality occurred in 1996, a year in which observer coverage (based on observed tons) was 65%. The observed mortality occurred during an unmonitored haul and therefore was not used to estimate mortality for the entire fishery. Although coverage was 65%, observers monitored 100% of the vessels during the fishery. As a result, the reported mortality is thought to be the only harbor seal mortality in that fishery. The mean estimated mortality from 1992-96 for this fishery is 0.2 (CV=1.0) harbor seals per year from this stock.

Table 1. Summary of incidental mortality of harbor seals (Oregon and Washington Coast stock) due to commercial fisheries from 1990 through 1996 and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate from self-reported fisheries information. Data from 1992 to 1996 (or the most recent 5 years of available data) are used in the mortality calculation when more than 5 years of data are provided for a particular fishery. n/a indicates that data are not available.

Fishery name	Years	Data type	Range of observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Northern WA marine set gillnet	90-96	obs data	68-100%	5, 7, 0, n/a, n/a, 3, 9	6, 10, 0, n/a, n/a, 3, 9	5.6 (CV=.33)
WA/OR/CA groundfish trawl (Pacific whiting component)	90-96	obs data	44-72%	0, 0, 0, 0, 0, 0, 1	0, 0, 0, 0, 0, 0, 1	0.2 (CV=1.0)
WA/OR lower Columbia River drift gillnet	91-93	obs data	5-27%	9, 15, 1	233, 192, n/a	n/a (see text)
WA Grays Harbor salmon drift gillnet	91-93	obs data	4-5%	0, 1, 1	0, 10, 10	6.7 (CV=.50)
WA Willapa Bay drift gillnet	91-93	obs data	1-3%	0, 0, 0	0, 0, 0	0
Observer program total						12.5 (CV=.31)
				Reported mortalities		
WA Willapa Bay drift gillnet	90-96	self reports	n/a	0, 0, 6, 8, n/a, n/a, n/a	n/a	[≥3.5]
WA/OR salmon net pens	90-96	self reports	n/a	0, 2, 0, 0, n/a, n/a, n/a	n/a	[≥0.5]
Minimum total annual mortality						≥16.5 (CV=.31)

The Washington and Oregon Lower Columbia River drift gillnet fishery was monitored during 1991-93 (Brown and Jeffries 1993, Matteson et al. 1993, Matteson and Langton 1994a). In 1991, observers recorded 9 harbor seal mortalities incidental to the fishery, resulting in an extrapolated estimated total kill of 233 seals (CV=0.37). The observed effort was 2,582 sets, representing an observer coverage of 4.7%. In 1992, 15 harbor seal mortalities incidental to the fishery were observed, resulting in an extrapolated estimated total kill of 192 seals (CV=0.32). The observed effort was 1,545 sets, representing an observer coverage of 27.2%. In 1993, 1 harbor seal mortality was observed incidental to the fishery. The observed effort was 518 sets, representing an observer coverage of 4.6%. Due

to the reduced sampling regime, the mortality was not extrapolated to estimate total kill for the fishery in 1993. Using only the 1991-92 data, the mean estimated mortality for this fishery is 213 (CV=0.10) harbor seals per year. However, fishing effort has been dramatically reduced since the 1991-92 fishing seasons. For instance, during 1994 the fishery was open for only 3 days and in 1995 there was no fishery. Therefore, the large mortality estimate based on the 1991-92 data is no longer applicable and a reliable estimate for this fishery is not available.

The Washington Grays Harbor salmon drift gillnet fishery was also monitored from 1991-93 (Herczeg et al. 1992a, Matteson and Molinaar 1992, Matteson et al. 1993a, Matteson and Langton 1994b, Matteson and Langton 1994c). During the 3-year period, 98, 307 and 241 sets were monitored, representing approximately 4-5% observer coverage in each year. No mortalities were recorded in 1991. In 1992 observers recorded 1 harbor seal mortality incidental to the fishery, resulting in an extrapolated estimated total kill of 10 seals (CV=1.0). In 1993 observers recorded 1 harbor seal mortality incidental to the fishery, though a total kill was not extrapolated. Similar observer coverage in 1992 and 1993 (4.2% and 4.4%, respectively) suggests that is 10 also a reasonable estimate of the total kill in 1993. Thus, the mean estimated mortality for this fishery from 1991-93 is 6.7 (CV=0.50) harbor seals per year (Table 1). No observer data are available for this fishery after 1993. Combining the estimates from the northern Washington marine set gillnet (5.6), WA/OR/CA groundfish trawl (0.2), and Washington Grays Harbor salmon drift gillnet (6.7) fisheries results in an estimated mean mortality rate in observed fisheries of 12.5 harbor seal per year from this stock.

The Washington Willapa Bay drift gillnet fishery was also monitored at low levels of observer coverage from 1991-93 (Herczeg et al. 1992a, 1992b, Matteson and Molinaar 1992, Matteson et al. 1993b, Matteson and Langton 1994c, Matteson and Langton 1994d). In those years, 752, 576, and 452 sets were observed representing approximately 2.5%, 1.4% and 3.1% observer coverage, respectively. No harbor seal mortalities were reported by observers. However, because mortalities were self-reported by fishers in 1992 and 1993, the low level of observer coverage failed to document harbor seal mortalities which had apparently occurred. Due to the low level of observer coverage for this fishery, the self-reported fishery mortalities have been included in Table 1 and represent a minimum mortality estimate resulting from that fishery (3.5 harbor seals per year).

An additional source of information on the number of harbor seals killed or injured incidental to commercial fishery operations is the self-reported fisheries information required of vessel operators by the MMPA. During the period between 1990 and 1996, fisher self-reports from 2 unobserved fisheries (Table 1) resulted in an annual mean of 4 harbor seal mortalities from interactions with commercial fishing gear. However, because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994), these are considered to be minimum estimates. Self-reported fisheries data are not available for 1994 and 1995, and considered unreliable for 1996 (see Appendix 4 of Hill and DeMaster, in press).

Other Mortality

Strandings of harbor seals resulting from collisions with boats, from gunshot injuries, or entangled in line unrelated to fisheries are another source of mortality data. During the 5-year period from 1992 to 1996 the only human-related harbor seal strandings of animals from this stock occurred in 1993 (5 animals) and 1994 (4 animals), resulting in an estimated annual mortality of 1.6 harbor seals (rounded to 2) from this stock during 1992-96. This estimate is considered a minimum because not all stranded animals are found, reported, or examined for cause of death (via necropsy by trained personnel).

Subsistence Harvests by Northwest Treaty Indian Tribes

Several Northwest Indian tribes have developed, or are in the process of developing, regulations for ceremonial and subsistence harvests of harbor seals and for the incidental take of marine mammals during tribal fisheries. The tribes have agreed to cooperate with NMFS in gathering and submitting data on takes of marine mammals.

STATUS OF STOCK

Harbor seals are not considered as “depleted” under the MMPA or listed as “threatened “ or “endangered” under the Endangered Species Act. Based on currently available data, the level of human-caused mortality and serious injury (17+2=19) does not exceed the PBR (1,484). Therefore, the Oregon and Washington Coast stock of harbor seals is not classified as a strategic stock. The minimum total fishery mortality and serious injury for this stock (17; based on observer data (13) and self-reported fisheries information (4) where observer data were not available or failed to detect harbor seal mortality) is also less than 10% of the calculated PBR and, therefore, can be considered to be

insignificant and approaching zero mortality and serious injury rate. The stock size increased until 1992, but has declined in recent years. Evidence indicates this stock is likely within OSP (Jeffries et al. 1997), although quantitative analyses in support of this have not yet been completed.

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