Revised 12/15/98

HARBOR PORPOISE (*Phocoena phocoena*): Oregon & Washington Coast Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the eastern North Pacific Ocean, the harbor porpoise ranges from Point Barrow, along the Alaskan coast, and down the west coast of North America to Point Conception, California (Gaskin 1984). Harbor porpoises primarily frequent coastal waters. Harbor porpoises are known to occur year-round in the inland trans-boundary area of Washington and British Columbia, Canada (Osborne et al. 1988) and along the Oregon/Washington coast (Barlow 1988, Barlow et al. 1988, Green et al. 1992). Aerial survey data from coastal Oregon and Washington, collected during all seasons, suggests that harbor porpoise distribution varies by depth (Green et al. 1992). Although distinct seasonal changes in abundance along the west coast have been noted and attributed to possible shifts in distribution to deeper offshore waters during late winter (Barlow 1988, Dohl et al. 1983), harbor porpoise have also been conspicuously absent in offshore areas in late November (B. Taylor, pers. comm.) leaving a gap in the current understanding of their movements.

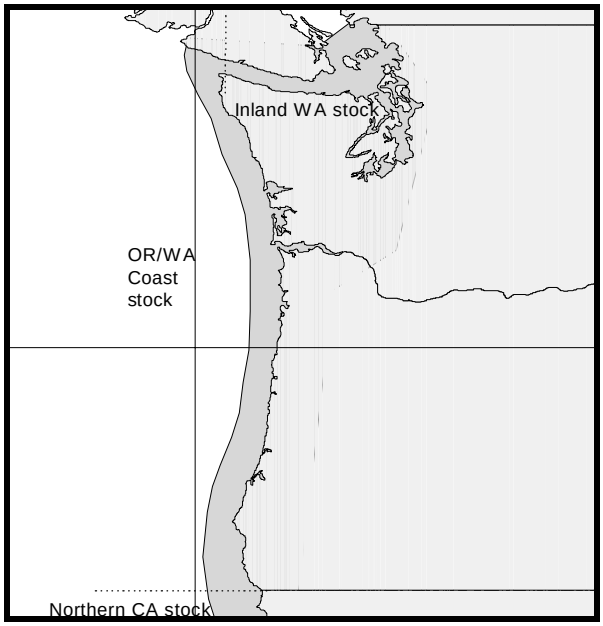

Figure 1. Approximate distribution of harbor porpoise in the U.S. Pacific Northwest (shaded area). Stock boundaries separating the stocks are shown.

Stock discreteness in the eastern North Pacific was analyzed using mitochondrial DNA from samples collected along the west coast (Rosel 1992) and is summarized in Osmek et al. (1994). Two distinct mtDNA groupings or clades exist. One clade is present in California, Washington, British Columbia and Alaska (no samples were available from Oregon), while the other is found only in California and Washington. Although these two clades are not geographically distinct by latitude, the results may indicate a low mixing rate for harbor porpoise along the west coast of North America. Investigation of pollutant loads in harbor porpoise ranging from California to the Canadian border also suggests restricted harbor porpoise movements (Calambokidis and Barlow 1991). Further genetic testing of the same data mentioned above along with additional samples found significant genetic differences for 4 of the 6 pair-wise comparisons between the four areas investigated: California, Washington, British Columbia, and Alaska (Rosel et al. 1995). These results demonstrate that harbor porpoise along the west coast of North America are not panmictic or migratory, and that movement is sufficiently restricted to evolve genetic differences. This is consistent with low movement suggested by genetic analysis of harbor porpoise specimens from the North Atlantic, where numerous stocks have been delineated with clinal differences over areas as small as the waters surrounding the British Isles.

Using the 1990-91 aerial survey data of Calambokidis et al. (1993b) for water depths < 50 fathoms, Osmek et al. (1996) found significant differences in harbor porpoise mean densities ($z=5.9$, $p<0.01$) between the waters of coastal Oregon/Washington and inland Washington/southern British Columbia, Canada (i.e., Strait of Juan de Fuca/San Juan Islands). Although differences in density exist between coastal Oregon/Washington and inland Washington, a specific stock boundary line cannot be identified based upon biological or genetic differences. However, because harbor porpoise movements and rates of intermixing within the northeast Pacific are restricted, there has been a significant decline in harbor porpoise sightings within southern Puget Sound since the 1940's, and following a risk averse management strategy, two stocks are recognized to occur in Oregon and Washington waters (the Oregon/Washington Coast stock and the Inland Washington stock), with the boundary at Cape Flattery. In the future, biological evidence for delineating stocks may come from the analysis of environmental pollutants in tissues, from seasonal movements of individual harbor porpoises, or new genetic analytical methods.

In their assessment of California harbor porpoise, Barlow and Hanan (1995) recommended two stocks be recognized in California, with the stock boundary at the Russian River. Based on the above information 4 separate

harbor porpoise stocks are recognized to occur along the west coast of the continental U. S. (see Fig. 1): 1) the Inland Washington stock, 2) the Oregon/Washington Coast stock, 3) the Northern California stock, and 4) the Central California stock. This report considers only the Oregon/Washington Coast stock. Three harbor porpoise stocks are also recognized in the inland and coastal waters of Alaska, including the Southeast Alaska, Gulf of Alaska, and Bering Sea stocks and are considered separately in the Stock Assessment Reports for the Alaska Region. The harbor porpoise occurring in British Columbia have not been included in any stock assessment report from either the Alaska or Pacific (Oregon/Washington) Regions.

POPULATION SIZE

Aerial surveys of the Washington coast, and parts of the southwest Strait of Juan de Fuca, were conducted during summer 1990 (Calambokidis et al. 1991) by flying a saw-tooth design at an altitude of 183 m (600 feet), and speeds of 185 km/hr (100 knots), from shore out to the 50 fathom isobath. During 1991, surveys using the same 1990 methodology, were flown over the marine waters of coastal Oregon and Washington, as well as inland waters of Washington (Calambokidis et al. 1992). Because the 1990-91 surveys both covered coastal Washington and portions of the western Strait of Juan de Fuca, these data were pooled and used to calculate abundance estimates (Calambokidis et al. 1993b) following the methods described by Buckland et al. (1993). Only effort and sightings made during excellent sighting conditions (Beaufort levels of 2 or less and cloud cover of less than 25%) were used. A single estimate of f(0) and of group size was calculated using data from all regions in both years. The correction factor [1/g(0)] of 3.1 and its associated variance (g(0)=0.324, var=0.003) was used to adjust the 1990-91 harbor porpoise sighting data for groups missed by aerial observers (Calambokidis et al. 1993a). The best corrected estimate of abundance for harbor porpoises in coastal Oregon and Washington waters is 26,175 (CV=0.206). This estimate includes animals along the US/Canadian boundary waters and a portion of the southern coastal waters of British Columbia along the Strait of Juan de Fuca.

An aerial survey for harbor porpoise covering the coasts of Oregon, Washington, and southern British Columbia was conducted during August and September of 1997. Results from this survey will be incorporated into the 1999 revision of this stock assessment.

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 26,175 and its associated CV(N) of 0.206, N_{MIN} for the Oregon/Washington Coast stock of harbor porpoise is 22,046.

Current Population Trend

There are no reliable data on population trends of harbor porpoises for coastal Oregon, Washington or British Columbia waters.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently not available for harbor porpoises. Therefore, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate (R_{MAX}) of 4% (Wade and Angliss 1997) be employed for the Oregon/Washington Coast harbor porpoise stock.

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 0.5, the value for a cetacean stock with an unknown population status (Wade and Angliss 1997). Thus, for Oregon/Washington Coast stock of harbor porpoise, PBR = 220 animals (22,046 x 0.02 x 0.5).

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Within the EEZ boundaries of coastal Oregon and Washington, human-caused (fishery) mortalities of harbor

porpoises are presently known to occur only in the northern Washington marine set gillnet fishery. During 1991-93 the WA/OR Lower Columbia River, WA Grays Harbor, and WA Willapa Bay drift gillnet fisheries were monitored at observer coverages of approximately 12%, 4% and 2%, respectively. There were no observed harbor porpoise mortalities in these fisheries.

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 area fished, observer coverage ranged from approximately 47-87% during those years. Fishing effort is conducted within the range of both harbor porpoise stocks (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. Some movement of harbor porpoises between Washington's coastal and inland waters is likely, but it is currently not possible to quantify the extent of such movements. 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). No fishing effort occurred in the coastal portion of the fishery in 1993 and, as noted above, no observer program occurred in 1994. Data from 1990 to 1996 are included in the Table 1, although the mean estimated annual mortality is calculated using the most recent 5 years of available data. The mean estimated mortality for this fishery is 16.6 (CV=0.28) harbor porpoises per year from this stock.

The 1995-96 data for the northern Washington marine set gillnet fishery were collected as part of an experiment, conducted in cooperation with the Makah Tribe, designed to explore the merits of using acoustic alarms to reduce bycatch of harbor porpoise in salmon gillnets. Results indicate that the nets equipped with acoustic alarms had significantly lower entanglement rates, as only 2 of the 49 mortalities occurred in alarmed nets (Gearin et al. 1996, Laake et al. 1997). Harbor porpoise were displaced by an acoustic buffer around the net, but it is unclear whether the porpoise were repelled by the alarms or whether it was their prey that were repelled (Kraus et al. 1997, Laake et al. 1998). Because this fishery is likely to have acoustic devices on all nets in the future, the mean mortality estimated from non-alarmed nets may not be applicable.

Table 1. Summary of incidental mortality of harbor porpoises (Oregon and Washington Coast stock) due to commercial fisheries from 1990 through 1996 and calculation of the mean annual mortality rate. 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%	13, 13, 0, n/a, n/a, 20, 29	16, 18, 0, n/a, n/a, 20, 29	16.6 (CV= 0.28)
Observer program total						16.6
Estimated total annual mortality						16.6 (CV=0.28)

An additional source of information on the number of harbor porpoises 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, there were no fisher self-reports of harbor porpoise mortalities from any fisheries operating within the range of the Oregon/Washington Coast stock. 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 in Hill and DeMaster, in press).

There have been no fishery-related strandings of harbor porpoise from this stock dating back to at least 1990.

STATUS OF STOCK

Harbor porpoise are not considered as "depleted" under the MMPA or listed as "threatened " or "endangered"

under the Endangered Species Act. Based on the currently available data, the level of human-caused mortality and serious injury (17) does not exceed the PBR (220). Therefore, the Oregon/Washington Coast stock of harbor porpoise is not classified as strategic. The total fishery mortality and serious injury for this stock (17; based on observer data) is not known to exceed 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to OSP and population trends are unknown.

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