Revised 5/1/03

SPERM WHALE (*Physeter macrocephalus*): North Pacific Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The sperm whale is one of the most widely distributed of any marine mammal species, perhaps only exceeded by the killer whale (Rice 1989). They feed primarily on medium-sized to large-sized squids but may also feed on large demersal and mesopelagic sharks, skates, and fishes (Gosho et al. 1984). In the North Pacific, sperm whales are distributed widely (Fig. 27), with the northernmost boundary extending from Cape Navarin (62°N) to the Pribilof Islands (Omura 1955). The shallowcontinental shelf apparently bars their movement into the north-eastern Bering Sea and Arctic Ocean (Rice 1989). Females and young sperm whales usually remain in tropical and temperate waters year-round, while males are thought to move north in the summer to feed in the Gulf of Alaska, Bering Sea, and waters around the Aleutian Islands. In the winter, sperm whales are typically distributed south of 40°N (Gosho et al. 1984). However, discovery tag data from the days of commercial whaling revealed a great deal of east-west movement between Alaska waters and the western North Pacific (Japan and the Bonin Islands), with little evidence of north-south movement in the eastern North Pacific. For example, of several hundred sperm whales tagged off San Francisco (CA), none were recovered north of 53° in the Gulf of Alaska despite large takes there (B. Taylor, pers. comm., National Marine Fisheries Service). Therefore, seasonal movement of sperm whales in the North Pacific is unclear at this time.

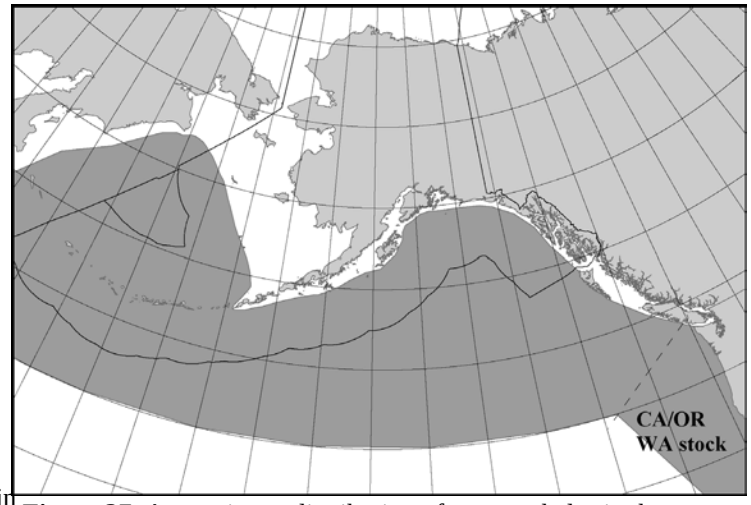

Figure 27. Approximate distribution of sperm whales in the eastern North Pacific (shaded area).

The following information was considered in classifying stock structure based on the Dizon et al. (1992) phylogeographic approach: 1) Distributional data: geographic distribution continuous though indicates three "somewhat" discrete population centers (i.e., Hawaii, west coast of the continental United States, and Alaska); 2) Population response data: unknown; 3) Phenotypic data: unknown; and 4) Genotypic data: unknown. For management purposes, the International Whaling Commission (IWC) recognizes two management units of sperm whales in the North Pacific (eastern and western). However, the IWC has not reviewed its sperm whale stock boundaries in recent years (Donovan 1991). Based on this limited information, and lacking additional data concerning population structure, sperm whales of the eastern North Pacific have been divided into three separate stocks as dictated by the U. S. waters in which they are found: 1) Alaska (North Pacific stock), 2) California/Oregon/Washington, and 3) Hawaii. The California/Oregon/Washington and Hawaii sperm whale stocks are reported separately in the Stock Assessment Reports for the Pacific Region.

POPULATION SIZE

Current and historic estimates for the abundance of sperm whales in the North Pacific are considered unreliable. Therefore, caution should be exercised in interpreting published estimates of abundance. The abundance of sperm whales in the North Pacific was reported to be 1,260,000 prior to exploitation, which by the late 1970s was estimated to have been reduced to 930,000 whales (Rice 1989). Confidence intervals for these estimates were not provided. These estimates include whales from the California/Oregon/Washington stock, for which a separate abundance estimate is currently available (see Stock Assessment Reports for the Pacific Region).

Although Kato and Miyashita (1998) believe their estimate to be upwardly biased, preliminary analysis indicates 102,112 (CV = 0.155) sperm whales in the western North Pacific. In the eastern temperate North Pacific a preliminary estimate indicates 39,200 (CV = 0.60) sperm whales (Barlow and Taylor, 1998). The number of sperm whales of the North Pacific occurring within Alaska waters is unknown. As the data used in estimating the abundance

of sperm whales in the entire North Pacific are well over 5 years old at this time and there are no available estimates for numbers of sperm whales in Alaska waters, a reliable estimate of abundance for the North Pacific stock is not available.

Minimum Population Estimate

At this time, it is not possible to produce a reliable estimate of minimum abundance for this stock, as a current estimate of abundance is not available.

Current Population Trend

Reliable information on trends in abundance for this stock are currently not available (Braham 1992).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is not currently available for the North Pacific stock of sperm whale. Hence, until additional data become available, it is recommended that the cetacean maximum net productivity rate (R_{MAX}) of 4% be employed for this stock at this time (Wade and Angliss 1997).

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: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.1, the value for cetacean stocks which are classified as endangered (Wade and Angliss 1997). However, because a reliable estimate of minimum abundance N_{MIN} is currently not available, the PBR for this stock is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Six different commercial fisheries operating within the range of the North Pacific stock of sperm whale were monitored for incidental take by fishery observers during 1990-01: Bering Sea (and Aleutian Islands) groundfish trawl, longline, and pot fisheries, and Gulf of Alaska groundfish trawl, longline, and pot fisheries. However, it appears that sperm whale interactions with longline fisheries operating in the Gulf of Alaska are known to occur and may be increasing in frequency (Hill and Mitchell 1998). NMFS observers aboard longline vessels targeting both sablefish and halibut have documented sperm whales feeding off the longline gear in the Gulf of Alaska. Fishery observers recorded several instances during 1995-97 in which sperm whales were deterred by fishermen (i.e., yelling at the whales or throwing seal bombs in the water). The first entanglement (not classified as a serious injury according to Angliss and DeMaster 1998) of a sperm whale in a Gulf of Alaska longline was documented in June of 1997 (Fishery Observer Program, unpubl. data, NMFS, AFSC, 7600 Sand Point Way NE, Seattle, WA 98115).

Table 25. Summary of incidental mortality of sperm whales due to commercial fisheries from 1997-01 and calculation of the mean annual mortality rate.

Fishery name	Years	Data type	Range of observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Gulf of Alaska groundfish longline	97-01	obs data	11-14%	0, 0, 0, 1, 0	0, 0, 0, 3, 0	0.4 (CV = 0.75)
Estimated total annual mortality						0.4 (CV = 0.75)

The total estimated mortality and serious injury incurred by this stock as a result of interactions with commercial fisheries is 0.4 (CV = 0.75).

An additional source of information on the number of sperm whales 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 2001, fisher self-reports from all Alaska fisheries indicated no mortalities of sperm whales from interactions with commercial fishing gear. Self-reported fisheries data are incomplete for 1994, not available for 1995, and considered unreliable or a minimum estimate after 1996 (see Appendix 7).

Therefore, the minimum estimated annual mortality rate incidental to commercial fisheries is 0.4. An estimate of the current population size is currently unavailable, thus, a PBR level cannot be calculated and it is unknown whether the human-caused mortality and serious injury level could be considered to be insignificant and approaching a zero mortality and serious injury rate.

Subsistence/Native Harvest Information

Sperm whales have never been reported to be taken by subsistence hunters (Rice 1989).

Other Mortality

The population of sperm whales in the Pacific was likely well below pre-whaling levels before modern whaling for them became especially intense in the late 1940s (Reeves and Whitehead 1997). A total of 258,000 sperm whales were reported to have been taken by commercial whalers operating in the North Pacific between 1947 and 1987 (C. Allison, pers. comm., International Whaling Commission, United Kingdom). This value underestimates the actual kill in the North Pacific as a result of under-reporting by U.S.S.R. pelagic whaling operations, which are estimated to have under-reported catches during 1949-71 by 60% (Brownell et al. 1998). In addition, new information suggests that Japanese land based whaling operations also under-reported sperm whale catches during the post-World War II era (Kasuya 1999). The Japanese officially stopped catching sperm whales in the North Pacific in 1988 (Reeves and Whitehead 1997).

STATUS OF STOCK

Sperm whales are listed as "endangered" under the Endangered Species Act of 1973, and therefore designated as "depleted" under the MMPA. As a result, this stock is classified as a strategic stock. However, on the basis of total abundance, current distribution, and regulatory measures that are currently in place, it is unlikely that this stock is in danger of extinction or threatened with becoming endangered in the foreseeable future (Braham 1992). Reliable estimates of the minimum population, population trends, PBR, and status of the stock relative to its Optimum Sustainable Population size are currently not available, although the estimated annual rate of human-caused mortality and serious injury seems minimal for this stock. There are no known habitat issues that are of particular concern for this stock.

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