

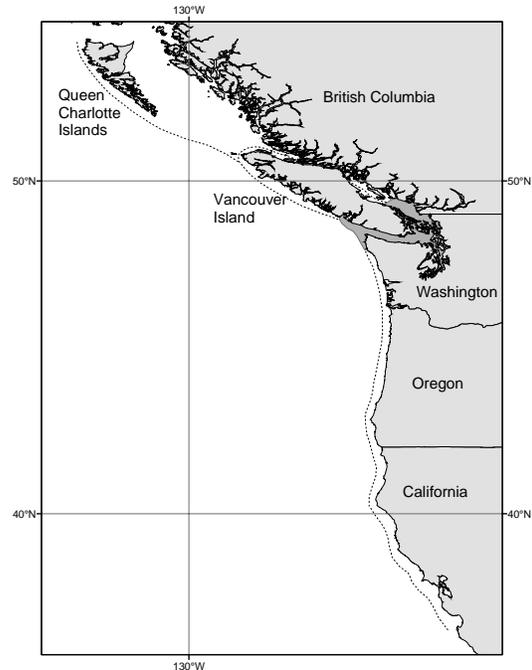
## **KILLER WHALE (*Orcinus orca*): Eastern North Pacific Southern Resident Stock**

### **STOCK DEFINITION AND GEOGRAPHIC RANGE**

Killer whales have been observed in all oceans and seas of the world (Leatherwood and Dahlheim 1978). Although reported from tropical and offshore waters, killer whales prefer the colder waters of both hemispheres, with greatest abundances found within 800 km of major continents (Mitchell 1975). Along the west coast of North America, killer whales occur along the entire Alaskan coast (Braham and Dahlheim 1982), in British Columbia and Washington inland waterways (Bigg et al. 1990), and along the outer coasts of Washington, Oregon, and California (Green et al. 1992; Barlow 1995, 1997; Forney et al. 1995). Seasonal and year-round occurrence has been noted for killer whales throughout Alaska (Braham and Dahlheim 1982) and in the intracoastal waterways of British Columbia and Washington State, where pods have been labeled as 'resident,' 'transient,' and 'offshore' (Bigg et al. 1990, Ford et al. 1994) based on aspects of morphology, ecology, genetics, and behavior (Ford and Fisher 1982, Baird and Stacey 1988, Baird et al. 1992, Hoelzel et al. 1998). Through examination of photographs of recognizable individuals and pods, movements of whales between geographical areas have been documented. For example, whales identified in Prince William Sound have been observed near Kodiak Island (Matkin et al. 1999) and whales identified in Southeast Alaska have been observed in Prince William Sound, British Columbia, and Puget Sound (Leatherwood et al. 1990, Dahlheim et al. 1997).

Studies on mtDNA restriction patterns provide evidence that the 'resident' and 'transient' types are genetically distinct (Stevens et al. 1989, Hoelzel 1991, Hoelzel and Dover 1991, Hoelzel et al. 1998). Analysis of 73 samples collected from eastern North Pacific killer whales from California to Alaska has demonstrated significant genetic differences among 'transient' whales from California through Alaska, 'resident' whales from the inland waters of Washington, and 'resident' whales ranging from British Columbia to the Aleutian Islands and Bering Sea (Hoelzel et al. 1998). Most sightings of the Eastern North Pacific Southern Resident stock of killer whales have occurred in the summer in inland waters of Washington and southern British Columbia. However, pods belonging to this stock have also been sighted in coastal waters off southern Vancouver Island and Washington (Bigg et al. 1990, Ford et al. 2000). The complete winter range of this stock is uncertain. Of the three pods comprising this stock, one (J1) is commonly sighted in inshore waters in winter, while the other two (K1 and L1) apparently spend more time offshore (Ford et al. 2000). Pods K1 and L1 are often seen entering the inland waters of Vancouver Island from the north—through Johnstone Strait—in the spring (Ford et al. 2000), suggesting that they may spend time along the entire outer coast of Vancouver Island during the winter. In May 2003, these pods were sighted off the northern end of the Queen Charlotte Islands, the furthest north they had ever previously been documented (J. Ford, pers. comm.). Off the Washington coast, Southern Resident killer whales have been sighted as far south as Grays Harbor (season unknown) (Bigg et al. 1990), and members of pods K1 and L1 were observed in Monterey Bay, California, in January 2000 and March 2003 (N. Black, pers. comm.).

Based on data regarding association patterns, acoustics, movements, genetic differences and potential fishery interactions, five killer whale stocks are recognized within the Pacific U.S. EEZ: 1) the Eastern North Pacific Northern Resident stock - occurring from British Columbia through Alaska, 2) the Eastern North Pacific Southern Resident stock - occurring mainly within the inland waters of Washington State and southern British Columbia (see



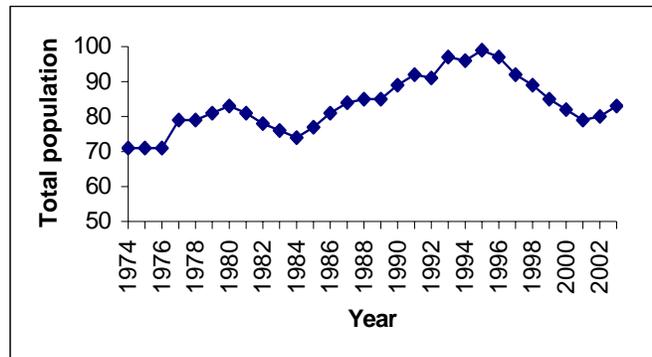
**Figure 1.** Approximate April-October distribution of the Eastern North Pacific Southern Resident killer whale stock (shaded area) and range of sightings (dotted line).

Fig. 1), 3) the Eastern North Pacific Transient stock - occurring from Alaska through California, 4) the Eastern North Pacific Offshore stock - occurring from Southeast Alaska through California, and 5) the Hawaiian stock. The Stock Assessment Reports for the Alaska Region contain information concerning the Eastern North Pacific Northern Resident and Eastern North Pacific Transient stocks.

## POPULATION SIZE

The Eastern North Pacific Southern Resident stock is a trans-boundary stock including killer whales in inland Washington and southern British Columbia waters. Photo-identification of individual whales through the years has resulted in a substantial understanding of this stock's structure, behaviors, and movements. In 1993, the three pods comprising this stock totaled 96 killer whales (Ford et al. 1994). The population increased to 99 whales in 1995, then declined to 79 whales in 2001 before increasing slightly to 83 whales in 2003 (Fig. 2; Ford et al. 2000; Center for Whale Research, unpubl. data). The 2001, 2002, and 2003 counts include a whale born in 1999 (L-98) that was listed as missing during the annual census in May and June 2001 but was subsequently discovered alone in an inlet off the west coast of Vancouver Island (J. Ford, pers. comm.). As of October 2003, L-98 has remained separate from L pod and it remains unclear whether it will rejoin L pod in the future, either on its own or through a proposed reintroduction effort.

For now, it will be included in the current population size. However, one new calf observed in the fall of 2003 will not be a part of the official census until seen in May/June 2004 (Center for Whale Research, unpubl. data).



**Figure 2.** Population of Eastern North Pacific Southern Resident stock of killer whales, 1974-2003. Each year's count includes animals first seen and first missed; a whale is considered first missed the year after it was last seen alive (Ford et al. 2000; Center for Whale Research, unpubl. data).

## Minimum Population Estimate

The abundance estimate for this stock of killer whales is a direct count of individually identifiable animals. It is thought that the entire population is censused every year. This estimate therefore serves as both a best estimate of abundance and a minimum estimate of abundance. Thus, the minimum population estimate ( $N_{MIN}$ ) for the Eastern North Pacific Southern Resident stock of killer whales is 83 animals.

## Current Population Trend

During the live-capture fishery that existed from 1967 to 1973, it is estimated that 47 killer whales, mostly immature, were taken out of this stock (Ford et al. 1994). The first complete census of this stock occurred in 1974. Between 1974 and 1993 the Southern Resident stock increased approximately 35%, from 71 to 96 individuals (Ford et al. 1994). This represents a net annual growth rate of 1.8% during those years. Since 1995, the population declined to 79 whales before increasing in 2002 and 2003 to a total of 83 whales (Ford et al. 2000; Center for Whale Research, unpubl. data).

## CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

A reliable estimate of the maximum net productivity rate is currently unavailable for this stock of killer whales. Studies of 'resident' killer whale pods in British Columbia and Washington waters resulted in estimated population growth rates of 2.92% and 2.54% over the period from 1973 to 1987 (Olesiuk et al. 1990, Brault and Caswell 1993). However, a population increases at the maximum growth rate ( $R_{MAX}$ ) only when the population is at extremely low levels; thus, the estimate of 2.92% may be an underestimate of  $R_{MAX}$ . Hence, until additional data become available, it is recommended that the cetacean maximum theoretical net productivity rate ( $R_{MAX}$ ) of 4% be employed for this stock (Wade and Angliss 1997).

## POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (83) times one-half the default maximum net growth rate for cetaceans ( $\frac{1}{2}$  of 4%) times a recovery factor of 0.5 (for a depleted stock, Wade and Angliss 1997), resulting in a PBR of 0.8 whales per year.

## HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

### Fisheries Information

NMFS observers have monitored the northern Washington marine set gillnet fishery since 1988 (Gearin et al. 1994, 2000; P. Gearin, unpubl. data). Observer coverage ranged from approximately 40 to 83% in the entire fishery (coastal + inland waters) between 1998 and 2002. There was no observer coverage in this fishery in 1999, 2001, or 2002. However, the total fishing effort was 4, 46, and 4.5 net days (respectively) in those years, it occurred only in inland waters, and no killer whale takes were reported. No killer whale mortalities have been recorded in this fishery since the inception of the observer program.

In 1993, as a pilot for future observer programs, NMFS in conjunction with the Washington Department of Fish and Wildlife (WDFW) monitored all non-treaty components of the Washington Puget Sound Region salmon gillnet fishery (Pierce et al. 1994). Observer coverage was 1.3% overall, ranging from 0.9% to 7.3% for the various components of the fishery. Encounters (whales within 10 m of a net) with killer whales were reported, but not quantified, though no entanglements occurred.

In 1994, NMFS and WDFW conducted an observer program during the Puget Sound non-treaty chum salmon gillnet fishery (areas 10/11 and 12/12B). A total of 230 sets were observed during 54 boat trips, representing approximately 11% observer coverage of the 500 fishing boat trips comprising the total effort in this fishery, as estimated from fish ticket landings (Erstad et al. 1996). No interactions with killer whales were observed during this fishery. The Puget Sound treaty chum salmon gillnet fishery in Hood Canal (areas 12, 12B, and 12C) and the Puget Sound treaty sockeye/chum gillnet fishery in the Strait of Juan de Fuca (areas 4B, 5, and 6C) were also monitored in 1994 at 2.2% (based on % of total catch observed) and approximately 7.5% (based on % of observed trips to total landings) observer coverage, respectively (NWIFC 1995). No interactions resulting in killer whale mortalities were reported in either treaty salmon gillnet fishery.

Also in 1994, NMFS, WDFW, and the Tribes conducted an observer program to examine seabird and marine mammal interactions with the Puget Sound treaty and non-treaty sockeye salmon gillnet fishery (areas 7 and 7A). During this fishery, observers monitored 2,205 sets, representing approximately 7% of the estimated number of sets in the fishery (Pierce et al. 1996). Killer whales were observed within 10 m of the gear during 10 observed sets (32 animals in all), though none were observed to have been entangled.

Killer whale takes in the Washington Puget Sound Region salmon drift gillnet fishery are unlikely to have increased since the fishery was last observed in 1994, due to reductions in the number of participating vessels and available fishing time (see details in Appendix 1). Fishing effort and catch have declined throughout all salmon fisheries in the region due to management efforts to recover ESA-listed salmonids.

An additional source of information on the number of killer 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 1994 and 2002, there were no fisher self-reports of killer whale mortalities from any fisheries operating within the range of this 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. Logbook data are available for part of 1989-1994, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-1995 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 in Angliss and Lodge 2002 for details).

Due to a lack of observer programs, there are few data concerning the mortality of marine mammals incidental to Canadian commercial fisheries. Since 1990, there have been no reported fishery-related strandings of killer whales in Canadian waters. However, in 1994 one killer whale was reported to have contacted a salmon gillnet but did not entangle (Guenther et al. 1995). Data regarding the level of killer whale mortality related to commercial fisheries in Canadian waters are not available, though the mortality level is thought to be minimal.

During this decade there have been no reported takes from this stock incidental to commercial fishing operations (D. Ellifrit, pers. comm.), no reports of interactions between killer whales and longline operations (as occurs in Alaskan waters; see Yano and Dahlheim 1995), no reports of stranded animals with net marks, and no photographs of individual whales carrying fishing gear. The total fishery mortality and serious injury for this stock is zero.

## Other Mortality

According to Northwest Marine Mammal Stranding Network records, maintained by the NMFS Northwest Region, no human-caused killer whale mortalities or serious injuries were reported from non-fisheries sources in 1998-2002.

## STATUS OF STOCK

NMFS received a petition from the Center for Biological Diversity and 10 co-petitioners on 2 May 2001 (an 11th co-petitioner was added on 16 July 2001) to list the Eastern North Pacific Southern Resident stock of killer whales as an “endangered” or “threatened” species under the Endangered Species Act (ESA) and to designate critical habitat for this stock under that Act. NMFS determined that the petition presented substantial scientific information indicating that a listing may be warranted thus was required to conduct an ESA status review of the stock (66 FR 42499, 13 August 2001). NMFS established a Biological Review Team (BRT) for this purpose and, in accordance with the BRT report (Krahn et al. 2002), determined that Southern Resident killer whales are not a “species” under the ESA and that a listing of “threatened” or “endangered” was not warranted (67 FR 44133, 1 July 2002). The BRT report (Krahn et al. 2002) identified potential risk factors that could influence this killer whale population, including: changes in prey availability, caused by fluctuations in environmental conditions (e.g., El Niño events); high levels of contaminants (Ross et al. 2000, Ylitalo et al. 2001); noise generated by whale-watching vessels; diseases and parasites; declines in stocks of salmon which are important prey; and catastrophes, such as oil spills and blooms of harmful algae. However, few quantitative data are available to determine which, if any, of these factors are likely to place the population in imminent danger of extinction. NMFS will continue to seek new information on the taxonomy, biology, and ecology of these whales, as well as potential threats to their continued existence, and will reassess their status under the ESA within 4 years (67 FR 44133, 1 July 2002). NMFS reviewed the status of the stock under the MMPA, determined that the stock is below its Optimum Sustainable Population (OSP), classified the stock as “depleted” under the MMPA, and announced its intention to prepare a Conservation Plan to reverse the decline and to promote recovery of the stock to OSP (68 FR 31980, 29 May 2003). Based on currently available data, the total fishery mortality and serious injury for this stock (0) is not known to exceed 10% of the calculated PBR (0.08) and, therefore, appears to be insignificant and approaching zero mortality and serious injury rate. The estimated annual level of human-caused mortality and serious injury of zero animals per year is not known to exceed the PBR (0.8). However, because the Eastern North Pacific Southern Resident killer whale stock has been designated as “depleted” under the MMPA, it is classified as a “strategic” stock.

In April 1999, Canada’s Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed resident killer whales in British Columbia as “threatened,” i.e., likely to become “endangered” if limiting factors are not reversed (Baird 1999). In November 2001, COSEWIC split the original listing for resident killer whales into two populations. The northern resident population was designated as “threatened” and the southern resident population was designated as “endangered,” i.e., facing imminent extirpation or extinction (COSEWIC 2003). In June 2000, the Washington Department of Fish and Wildlife (WDFW) designated killer whales in Washington State as a “state candidate species” (a species that the Department will review for possible listing as “state endangered, threatened, or sensitive”). In October 2003, WDFW released a draft status review which proposes that Southern Resident killer whales be added to the state’s endangered species list (WDFW 2003).

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