

Prevalence of Marine Mammal Tooth and Claw Abrasions on Adult
Anadromous Salmonids Returning to the Snake River

Jerrel R. Harmon,
Kenneth L. Thomas,
Kenneth W. McIntyre, and
Neil N. Paasch

Coastal Zone and Estuarine Studies Division
Northwest Fisheries Science Center
National Marine Fisheries Service
2725 Montlake Boulevard East
Seattle, WA 98112-2097

Abstract

During 1990, a relatively high prevalence of marine mammal tooth and claw abrasions was observed on adult anadromous salmonids returning to the Snake River. From 1990 through 1992, annual prevalence of these injuries ranged between 14.0 and 19.2% for spring/summer chinook salmon (Oncorhynchus tshawytscha) and between 5.6 and 14.2% for steelhead (O. mykiss). Open wounds were observed on about one-third of the fish with abrasions. Although these results suggest that predation by pinnipeds may be an important mortality factor for Snake River spring/summer chinook salmon, further research is needed to accurately define the magnitude of the predation.

From 1968 to the present, the National Marine Fisheries Service (NMFS) has conducted research to evaluate transportation of juvenile anadromous salmonids around hydroelectric dams on the Columbia and Snake Rivers. The research involves marking large numbers of smolts with freeze brands and coded-wire tags (CWT) at upstream dams and releasing them back to the river or transporting them for release below dams in the lower Columbia River. Marked fish are subsequently examined as adults returning to the marking site (Ebel et al. 1973).

To recover returning adults, NMFS operates a collection facility in the fish ladder at Lower Granite Dam on the Snake River, approximately 695 km upstream from the mouth of the Columbia River. A detection system at the adult collection facility automatically separates fish with CWTs from the population of adults ascending the fish ladder (Durkin et al. 1969). The annual proportion of adults with CWTs in the population passing the dam ranges from 7.0 to 9.9%.

In 1990, we first observed a relatively high prevalence of tooth and, presumably, claw abrasions on adult spring/summer chinook salmon (Oncorhynchus tshawytscha) returning to Lower Granite Dam. The injuries were consistent with those caused by pinnipeds (R. DeLong, National Marine Mammal Laboratory, personal communication). Accordingly, we began close monitoring of injury prevalence among sampled fish. Although not quantitatively evaluated prior to 1990, these types of abrasions were rarely observed then. We observed and documented the prevalence of

three basic types of injuries: 1) loss of scales in the form of scratches on the flanks, presumably made when a seal attempted to seize or strike a fish with its front flippers; 2) loss of scales in the form of arched scratches, presumably made by the seal's canine teeth when a fish attempted to escape (Figure 1); and 3) open wounds of varying severity, presumably created when the canine teeth fully penetrated the skin (Figure 2). The tooth abrasions were most often seen on both sides of the lower abdomen.

In 1990, we observed abrasions on 19.2% of the adult spring/summer chinook salmon, with open wounds of varying severity noted on about one-third of the fish with abrasions (Table 1). For steelhead (*O. mykiss*), the prevalence of these wounds was somewhat lower, at 14.2%, with open wounds also occurring on nearly one-third of the fish with abrasions. In 1991 and 1992, the prevalence of wounds on both species was lower, dropping to 14.0% in both years for spring/summer chinook salmon, and to 6.8 and 5.6%, respectively, for steelhead. Open wounds continued to occur on approximately one-third of the fish with abrasions.

Populations of Pacific harbor seals (*Phoca vitulina richardsi*), California sea lions (*Zalophus californianus*), and Northern (Steller) sea lions (*Eumetopias jubatus*) have increased dramatically in recent years. These marine mammals have been protected in British Columbia since 1970 and in the United States since 1972 (Olesiuk et al. 1990). Olesiuk et al. (1990)

estimated that harbor seals have increased at an annual rate of up to 12.5% in British Columbia and other areas of the northeast Pacific.

We do not know what percentage of the total population of anadromous salmonids entering the Columbia River is lost to marine mammals directly or what part is injured and drop out of the population prior to arrival at Lower Granite Dam. However, based upon our observations, which were made several weeks or months after the attacks occurred, substantial direct and indirect mortalities might result from these encounters. Although most of the marks that we observed appeared to result from harbor seals (based on wound size), sea lions may also kill adult salmonids. With larger size and greater strength, sea lions may simply be more efficient predators and thus leave fewer injured survivors. Further research is needed to determine whether pinniped predation is an important mortality factor for Snake River spring/summer chinook salmon.

Acknowledgement

The U.S. Army Corps of Engineers provided some of the funding under which these data were gathered.

References

- Durkin, J. T., W. J. Ebel, and J. R. Smith. 1969. A device to detect magnetized wire tags in migrating adult coho salmon. *Journal of the Fisheries Research Board of Canada* 26:3083-3088.
- Ebel, W. J., D. L. Park, and R. C. Johnson. 1973. Effects of transportation on survival and homing of Snake River chinook salmon and steelhead trout. *Fishery Bulletin, U.S.* 71:549-563.
- Olesiuk, P. F., M. A. Bigg, and G. M. Ellis. 1990. Recent trends in the abundance of harbour seals, Phoca vitulina, in British Columbia. *Canadian Journal of Fisheries and Aquatic Science* 47:992-1003.

Figure 1.--Typical abrasions in the form of arched scratches presumably created when the fish attempted to escape the canine teeth of a harbor seal. These marks caused a loss of scales only.

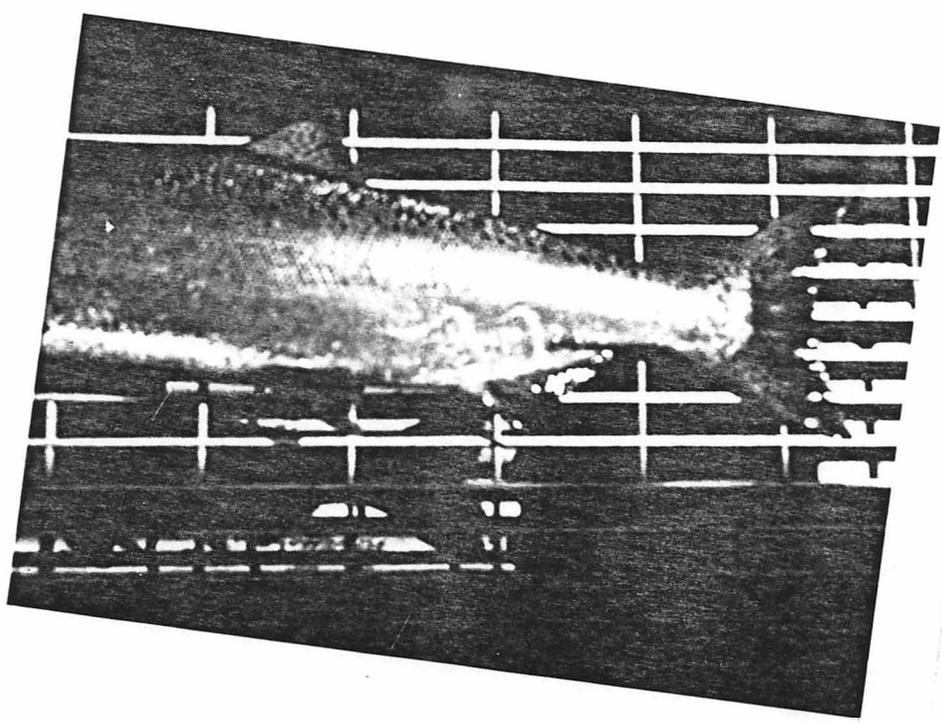


Figure 2.--A large, open wound on the opposite side of the same fish shown in Figure 1.

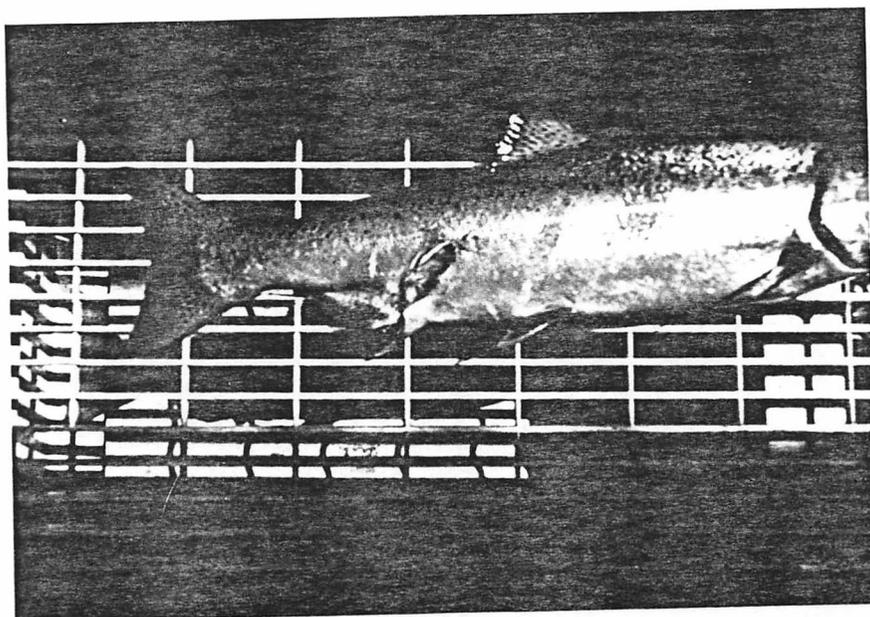


Table 1.--Prevalence of marine mammal teeth and claw abrasions on adult spring/summer chinook salmon and steelhead at Lower Granite Dam on the Snake River from 1990 through 1992.

Year	Adults passing the dam	CWT sample size (%)	Sampled fish with abrasions (%)	Sampled fish with open wounds (%)
<u>Spring/summer chinook salmon</u>				
1990	22,759	7.6	19.2	6.4
1991	12,590	10.5	14.0	6.6
1992	25,219	13.6	14.0	5.1
<u>Steelhead</u>				
1990	56,979	6.9	14.2	4.2
1991	99,022	6.5	6.8	2.5
1992	115,671	9.1	5.6	1.3