

CONTRIBUTION OF MARKED 1975-BROOD
SNAKE RIVER FALL CHINOOK SALMON, ONCORHYNCHUS TSHAWYTSCHA,
TO PACIFIC COAST AND COLUMBIA RIVER FISHERIES

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ABSTRACT

Harvest information on a unique stock of Snake River fall chinook salmon is presented in response to management information needs outlined in the Columbia River Basin Fish and Wildlife Program. Data from fish marked with coded wire tags were examined to determine the contribution of marked 1975-brood Snake River fall chinook salmon, Oncorhynchus tshawytscha, to Pacific coast and Columbia River salmon fisheries. Of 50,400 marked fish released, 180 were recovered by fisheries samplers from 1977 through 1980. Based on these recoveries, the estimated contribution to combined ocean and Columbia River salmon fisheries was 667 fish (13.2 fish caught/1,000 released). Four user groups accounted for 93% of the estimated catch as follows: Canadian troll fishery, 38%; Alaskan troll fishery, 26%; Columbia River treaty Indian set-net fishery, 20%; and Columbia River drift-net fishery, 9%.

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Snake River fall chinook salmon, Oncorhynchus tshawytscha, are a genetically distinct stock (Utter et al.^{1/}) of upriver salmon that spawn in free-flowing sections of the mainstream Snake River and in lower reaches of major tributaries. Range and abundance of the stock have been severely reduced due to loss of habitat and other harmful effects of hydroelectric development. Raymond (1979) ascribed losses of Snake River juvenile downstream migrants from 1966 to 1975 to turbine passage, predation, delays of migration, and exposure to water supersaturated with atmospheric gas. Other researchers have found that dams delay upstream migration of returning adults (French and Wahle 1966) and cause significant adult mortality (Chaney and Perry^{2/}).

Estimates of fall chinook salmon returns developed by Irving and Bjornn^{3/} illustrate progressive declines in the Snake River stock. Average annual returns (escapement plus catch in Columbia River fisheries) were estimated at 58,700 from 1944 to 1953, 25,300 from 1954 to 1973, and 3,400 from 1974 to 1980. Production rates from 1974 to 1978 averaged less than one returning adult per spawner, a level insufficient to maintain the run.

The Columbia River Basin Fish and Wildlife Program (1984) developed by the Northwest Power Planning Council is committed to maintaining existing genetic stock diversity and to restoring natural propagation of wild salmonid stocks wherever possible within the Columbia River system. The program recognizes the importance of harvest management to these efforts. This report presents harvest data for the first group of Snake River fall chinook salmon to be marked with coded wire tags (Jefferts et al. 1963). These fish were originally marked to assess homing behavior of artificially imprinted and transported juvenile fall chinook salmon.

STUDY AREA AND METHODS

Columbia River system study locations are shown in Figure 1. Fall chinook salmon used in the study were reared at Little Goose Dam by National Marine Fisheries Service (NMFS) personnel and were the progeny of wild fish trapped from the fishway at the same location. Heated river water was used for incubation of the eggs and initial rearing of fry. Diet throughout rearing was Oregon moist pellets.

In early June, we marked the fall chinook salmon by injecting coded wire tags, freeze branding, and removing adipose fins. Following truck transport, releases of the juvenile fish were made into the tailrace at Bonneville Dam on 10 June and 2 July 1976. The load of 10 June contained 48,100 fish at 130 fish/kg (59 fish/lb). The second load contained 2,300 smaller fish that had been held for extended rearing.

Marked fall chinook salmon from our release group were recovered in later years by fisheries personnel sampling Pacific coast and Columbia River fisheries. To estimate catch, we multiplied observed recoveries by the ratio of fish caught:fish sampled for the area and time strata of each recovery. Expansions were not made for recoveries which were voluntary (9), returned with insufficient data (30), or for which catch:sample ratios exceeded 20:1 (1).

Fall chinook salmon marked for the study were expected to return to the Columbia River system from 1977 to 1980. During these years, NMFS personnel monitored fall chinook salmon returns at fishway traps located at Bonneville, McNary, and Lower Granite Dams. We also examined tag recovery data from hatcheries, stream surveys, and upriver fall chinook salmon egg bank programs (brood stock for these programs were trapped at Bonneville and Ice Harbor Dams).

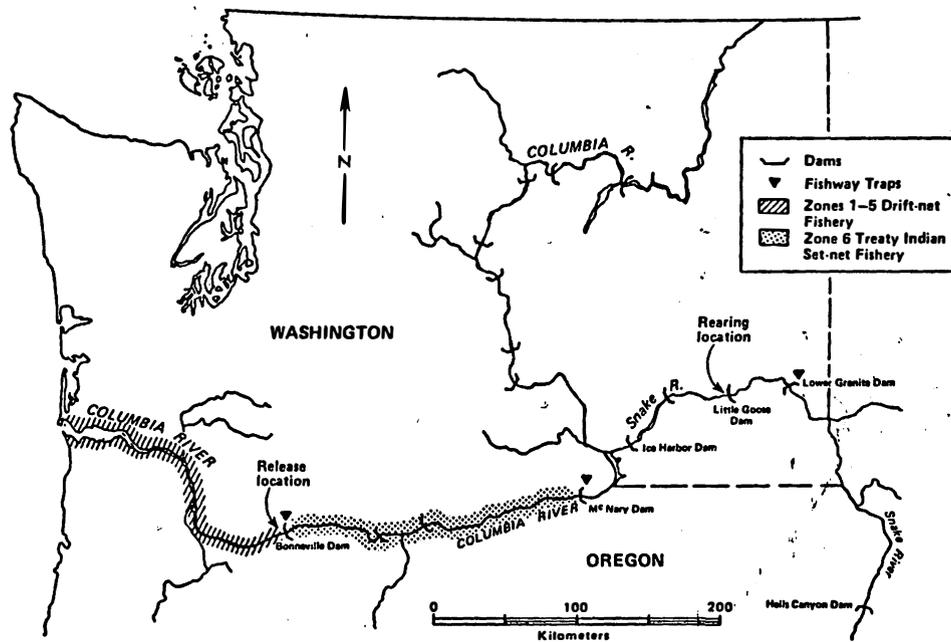


Figure 1.--Columbia River system study area.

RESULTS

Contribution to Pacific Coast Fisheries

Of 50,400 marked 1975-brood Snake River fall chinook salmon released for the study, a total of 131 were recovered by sampling Pacific coast salmon fisheries. Based on these recoveries, we estimated a total ocean catch of 480 marked fish, or 9.5 fish caught/1,000 released (Table 1). About 95% of the estimated catch were in troll fisheries distributed as follows: Canada, 254; Alaska, 176; Washington, 13; and Oregon, 11. The remaining 5% of the estimated catch were by Canadian net fisheries, 13; Washington sport fisheries, 8; and Canadian sport fisheries, 1.

Marked 1975-brood Snake River fall chinook salmon contributed to Pacific coast salmon fisheries as 2-, 3-, 4-, and 5-yr-old fish. Of the total estimated catch of marked fish in Pacific coast fisheries, the contribution percentages by each age group were: 2-yr-old, 2%; 3-yr-old, 43%; 4-yr-old, 46%; and 5-yr-old, 9%.

Columbia River Recoveries

Columbia River gill-net fishermen caught an estimated 187 marked fall chinook salmon, or 3.7 fish caught/1,000 released (Table 1). The commercial gill-net catch was taken in the drift-net fishery below Bonneville Dam (Zones 1-5) and in the Zone 6 treaty Indian set-net fishery (Fig. 1). Tribal fishermen caught 70% of the estimated in-river catch.

Returning marked fall chinook salmon were recovered at only two river locations other than commercial fisheries. Three marked fish were identified at Bonneville Dam in 1979--one at the NMFS fishway trap and two from a group of 706 upriver fall chinook salmon captured for brood stock by the Oregon

Department of Fish and Wildlife. Two marked fish were recovered (one in 1979 and one in 1980) from brood stock collected at Ice Harbor Dam for the Snake River fall chinook salmon egg bank program.

DISCUSSION

Although overall contribution and relative exploitation by the various fisheries may not be precisely indicated by study data, it is clear that Snake River fall chinook salmon are significantly exploited by Canadian and Alaskan troll fisheries (38 and 26%, respectively, of total estimated catch). The timing and location of tag recoveries suggest northerly migration of the marked Snake River fall chinook salmon, initially to feeding areas off British Columbia and then to southeast Alaskan waters. Availability to coastal fisheries of Washington and Oregon was minimal. The combined catch estimates for coastal fisheries of both states was only 7% of the total estimated Pacific coast catch of marked test fish.

Snake River fall chinook salmon marked for the study contributed to both the Columbia River treaty Indian fishery in Columbia River Zone 6 and to the lower Columbia River fishery in Zones 1-5 (20 and 9%, respectively, of total estimated catch). Two tag recoveries from brood stock collected at Ice Harbor Dam represent the only observed Snake River return of fish marked for the study. It is doubtful that extreme exploitation by fisheries resulted in the observed low escapement. More likely, the homing imprint method being tested was ineffective, and most returning test fish stopped their upstream migration before reaching the Snake River or chose other tributaries. Few Columbia River hatcheries were collecting brood stock throughout the September-December return of upriver fall chinook salmon. Stream surveys for this stock were also

very limited from 1977 to 1980. Considering these facts, it is possible that several hundred stray fish could have been present but undetected in the Columbia River system.

ACKNOWLEDGMENTS

We wish to recognize the essential contribution of personnel working in the tag recovery programs of Alaska, Canada, Oregon, and Washington. Facilities for fish rearing and marking at Little Goose Dam were provided by the U.S. Army Corps of Engineers.

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FOOTNOTES

- 1/ Utter, F. M., W. J. Ebel, G. B. Milner, and D. J. Teel. 1982. Population structures of fall chinook salmon, Oncorhynchus tshawytscha, of the mid-Columbia and Snake Rivers. NWAFC Processed Report 82-10, 14 p. Northwest and Alaska Fisheries Center, National Marine Fisheries Service, NOAA, 2725 Montlake Blvd. E., Seattle, WA 98112.
- 2/ Chaney, E., and L. E. Perry. 1976. Columbia Basin salmon and steelhead analysis: Summary Report. Unpubl. rep., 74 p. Pacific Northwest Regional Commission, 700 E. Evergreen Blvd., Vancouver, WA 98661.
- 3/ Irving, J. S., and T. C. Bjornn. 1981. Status of Snake River fall chinook salmon in relation to the Endangered Species Act. Unpubl. rep., 55 p. Idaho Cooperative Fishery Research Unit, University of Idaho, Moscow, ID 83843.

Table 1.--Contribution of marked 1975-brood Snake River fall chinook salmon to Pacific coast and Columbia River fisheries, 1977-80.

Location 2 and fishery	Estimated and observed ^{a/} catch						Catch/1,000 released
	1977	1978	1979	1980	Total	Percent	
Canada^{b/}							
net	8(4)	5(2)	0	0	13	2.0	0.25
troll	0	177(33)	63(17)	14(1)	254	38.1	5.04
sport	0	1(1)	0	0	1	0.1	0.02
unknown	0	4(4)	0	0	4	0.6	0.08
Alaska^{c/}							
troll	0	12(6)	136(36)	28(18)	176	26.4	3.49
Washington^{c/}							
troll	0	4(1)	8(2)	0	12	1.8	0.24
Indian troll	0	1(1)	0	0	1	0.1	0.02
sport	0	4(1)	4(1)	0	8	1.2	0.16
Oregon^{c/}							
troll	0	0	11(3)	0	11	1.7	0.22
subtotal (Pacific coast fisheries)	8(4)	208(49)	222(59)	42(19)	480	72.0	9.52
Columbia River^{c/}							
Zones 1-5 (net)	0	16(3)	39(11)	2(1)	57	8.5	1.13
Zone 6 (net)	0	28(6)	102(28)	0	130	19.5	2.58
subtotal (Columbia River fisheries)	0	44(9)	141(39)	2(1)	187	28.0	3.71
Total	8(4)	252(58)	363(98)	44(20)	667	100.0	13.23

^{a/} Observed catch is given in parentheses.

^{b/} Catch estimates are based on data obtained from 1977-80 reports: "Basic data for the Canadian salmonids catch sampling and mark recovery program," Department of Fisheries and Oceans, Vancouver, B.C. V6E 2PP.

^{c/} Catch estimates are from data on file at Pacific Marine Fisheries Commission, Regional Mark Processing Center, 528 S.W. Mill St., Portland, OR 97201.

LIST OF FIGURES

Figure 1.—Columbia River system study area.

