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Snake River Runs of Salmon and Steelhead Trout: Collection and Transportation Experiments at Little Goose Dam, 1971-74

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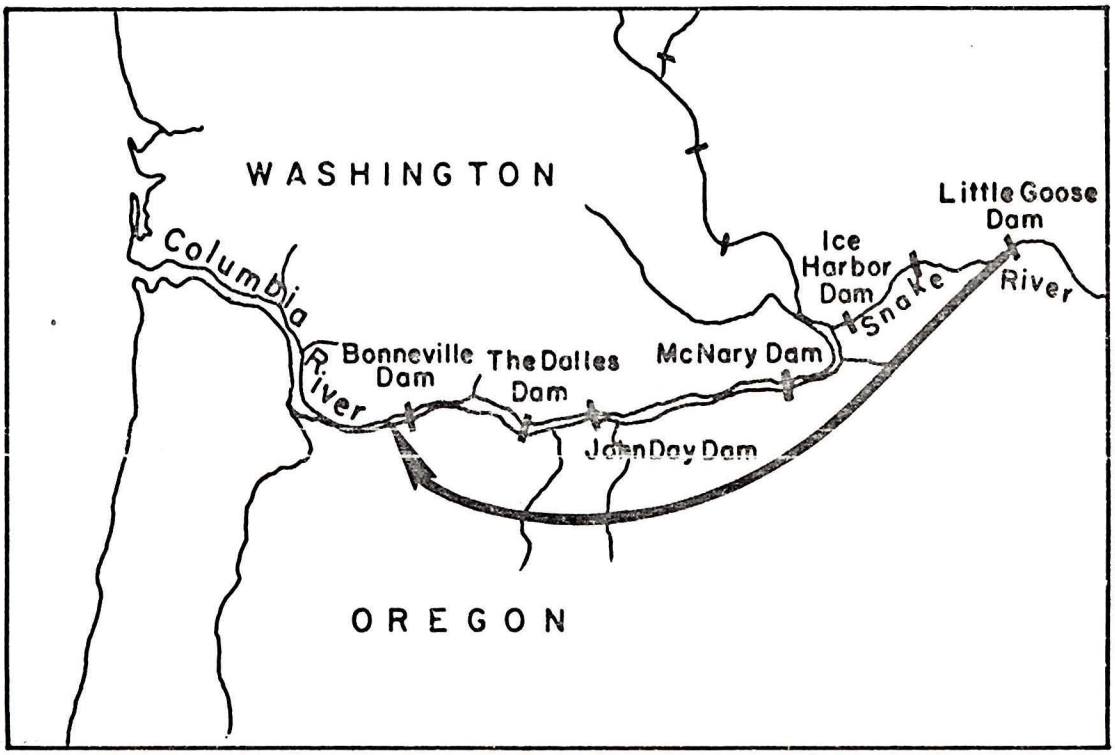
The National Marine Fisheries Service (NMFS) has been conducting transportation experiments since 1965 to find ways of reducing downstream losses of Snake River populations of juvenile chinook salmon, Oncorhynchus tshawytscha, and steelhead trout, Salmo gairdneri. Since 1970, we have been concentrating on an experiment where migrating juvenile salmon and steelhead trout are collected at Little Goose Dam (Fig. 1) and transported to two locations downstream from Bonneville Dam.

The experiment is designed to determine the effect of transportation on homing and survival. The data, summarized in Figures 2 (chinook) and 3 (steelhead) indicate that survival of both chinook and steelhead can be increased by collection and transportation. The percentage increase in survival varies from year to year depending on river conditions. During years when survival of natural migrants was very low we had correspondingly low survival of our control release and the percentage benefit from transport was greatest. For example, in 1973 survival estimates indicated an all time low survival rate for both juvenile chinook and steelhead migrants; transport/control ratios were the highest (22:1 for chinook; 23:1 for steelhead) recorded to date (October 20).

Analysis of the test-to-control ratios provides the best insight as to the benefit possible from the transportation system, but total percentage return obtained from the groups transported must also be examined to accurately assess the effectiveness of the system as it now operates. If both test and control groups are excessively stressed during the diversion, collection, marking, and transport operation, then percentage return will be abnormally low even though test-to-control



Transportation route from Little Goose Dam to Bonneville tailrace.

Figure 1

ratios are favorable. We therefore have been comparing percentage return of the transport groups with percentage returns achieved at Dworshak and Rapid River Hatcheries and with estimated percentage return of steelhead and chinook to Little Goose Dam.

Percentage returns from releases of steelhead at Dworshak were 0.25% in 1971 and 0.12% in 1972. Corresponding percentage returns of steelhead from those transports from Little Goose Dam in 1971 and 72 (Table 1) were 1.7 and 2.1%. Estimated percentage return from a mixture of wild and hatchery populations of juvenile steelhead passing Little Goose Dam in 1971 and 72 were 0.55 and 0.65, respectively. An obvious substantial increase in survival of steelhead is indicated by either test/control type analysis or percentage return comparisons.

Percentage returns of chinook to Rapid River Hatchery from juvenile releases in 1971 and 72 were 0.57 and 0.08, respectively. The corresponding percentage returns from juvenile chinook transported from Little Goose Dam were 0.61 and 0.045. Estimated percentage returns of mixture of wild and hatchery populations of juvenile chinook passing Little Goose Dam in 1971 and 72 were 1.1 and .8% (Table 2).

A definite benefit is shown by test/control type analysis and some benefit can be shown when percentage return data from transported groups are compared with only the Rapid River Hatchery returns for 1971, but no benefit is shown when transport returns are compared with estimated percentage returns to Little Goose Dam.

In summary, then, we believe sufficient data exist to recommend mass transport of steelhead from Little Goose Dam as soon as possible.

releases of smolts, 1971-73.

lease site and year xperimental group)	Number released	Number adults recaptured	Adult return in % of juveniles released Obsv ret	Est ret	(Dw) 3/	Transport benefit (year)
ttle Goose (control) (1971)	33,243	196	0.59	0.99	(0.25)	
nneville (transport) (1971)	80,906	814	1.01	1.70	(0.25)	(1971) 1.7:1
ttle Goose (control) (1972)	46,071	155 1/	0.34	0.61	(0.12)	
nneville (transport) (1972)	50,157	571 1/	1.14	2.05	(0.12)	(1972) 3.4:1
ttle Goose (control) (1973)	42,461	13 1/	0.03	2/		
nneville (transport) (1973)	63,452	445 1/	0.70	2/		(1973) 23:1

1/ Returns through October 15, 1974

2/ Only partial returns of 1-ocean fish are in at this time

3/ Percentage return of adults observed at Dworshak Hatchery, Idaho

Returns to Little Goose Dam of spring and summer chinook from control and transport releases of smolts, 1971-73.

lease site and year xperimental group)	Number released	Number adults recaptured	Adult return in % of juveniles released Obsv ret	Est Ret	(RR) 3/	Transport benefit (year)
ttle Goose (control) (1971)	20,674	47	0.23	0.37	(0.57)	
nneville (transport) (1971)	65,889	246	0.37	0.61	(0.57)	(1971) 1.6:1
ttle Goose (control) (1972)	57,213	15	0.03 1/		(0.08)	
nneville (transport) (1972)	106,405	48	0.05 1/		(0.08)	(1972) 1.73:1
ttle Goose (control) (1973)	88,170	2	0.00 2/			
nneville (transport) (1973)	141,364	63	0.04 2/			(1973) 22.0:1

1/ Incomplete data based on 2-ocean fish only.

2/ Incomplete data based on 1-ocean (jacks) only.

3/ Percentage return of adults observed at Rapid River Hatchery, Idaho

However, we are not satisfied with percentage return data of chinook returning to Little Goose Dam and, therefore, would reserve judgement on mass transport of chinook until the improved system installed at Lower Granite Dam is tested.

Juvenile loss data (Raymond, 1974[1]) and adult return data indicate that decisions regarding mass transportation of juvenile chinook and steelhead in the years 1975 - 78 may be critical in determining the ultimate survival of the Snake River populations. Careful examination of the predicted river flows and the results of ongoing transportation studies will provide the necessary data to determine the degree to which mass transport should be implemented during the given year. Adequate return data will not be available from groups transported from Lower Granite Dam until 1976 and 77. However, as I indicated earlier, sufficient data regarding effects of transport of steelhead from Little Goose Dam is available now and decisions can be made now.

1 Raymond, Howard L. Snake River runs of salmon and steelhead trout: trends in abundance of adults and downstream survival of juveniles. Manuscr. Northwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Seattle, Wash.