Snake River Fall Chinook Salmon Broodstock Program, 1983

by
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ABSTRACT

The objective of the Snake River Fall Chinook Salmon Broodstock Program is to hatch eggs from upriver stocks, rear the fish to maturity and spawning, and use the eggs for restoration purposes in the Snake River. Approximately 15,000 eyed eggs for 1980- and 1981-brood Snake River fall chinook salmon were obtained each winter in 1980 and 1981. Approximately 13,000 "button-up" fry from the 1982 brood were received in March 1983.

Since August 1983, the mortality in the 1980-brood fish in marine net-pens has been unusually high. These losses are related to a systemic infection with a previously unreported fungal pathogen. Also responsible for considerable mortality are the approximately 25% maturing males in the population. As of 16 December 1983, 1,917 1980-brood Snake River fall chinook salmon, averaging 1,050 g, are being maintained in marine net-pens at the Manchester Marine Experimental Station, Manchester, Washington.

Currently, 4,090 1981-brood chinook salmon with an average weight of 200 g are in net-pens at Manchester. The new fungal disease has also been observed in these fish, but it is causing minimal mortality.

Approximately 6,000 1982-brood fish (15 g average weight) are currently at the Big Beef Creek Research Station, Seabeck, Washington, or have been acclimated to seawater. All the fish will be in marine net-pens at Manchester by May 1984.

CONTENTS

INTRODUCTION

The objective of the Snake River Fall Chinook Salmon Broodstock Program is to hatch eggs from upriver stocks and rear the fish to maturity and eventual spawning. The end product of the program will be the production of viable gametes for restoration purposes on the Snake River. Other benefits will result from the development of improved methods for growing healthy captive chinook salmon to maturity.

Throughout the production program, research is conducted in several areas of concern, e.g., disease diagnosis and control, nutrition, acclimation to seawater, and spawning strategies. During 1983, we had Snake River fall chinook salmon from 1980, 1981, and 1982 broods under production.

METHODS

Eyed eggs obtained from egg bank sources on the Columbia River are incubated and hatched at the Northwest and Alaska Fisheries Center, Seattle, Washington, or the University of Washington's Big Beef Creek Research Station, Seabeck, Washington. All water for incubation and rearing purposes is either dechlorinated City of Seattle water or ground water at Big Beef Creek.

Fish that reach the physiological state of smoltification and sufficient size are acclimated to full strength seawater (28 ppt) using intermediate salinities over several days. After transfer to the Manchester Marine Experimental Station, Manchester, Washington, brood fish are kept in 16-x 16-ft net-pens. While in the marine net-pens, brood fish are intraperitoneally injected with a vibrio vaccine-antibiotic mixture at

4- to 6-month intervals to control bacterial diseases. The fish are fed commercial feeds supplemented with chopped and/or whole fresh herring and frozen krill, Euphausia pacifica.

To determine if the herring supplementation was responsible for a fungal disease which caused excessive mortality in 1980-brood fish, a feeding trial was initiated. Two identical lots of healthy fall chinook salmon were transferred to two marine net-pens; one lot is being maintained entirely on a fresh frozen herring ration, and the control group is being fed a commercial OMP diet. Beginning in late February 1984, the fish will be examined monthly for the presence of the disease organism.

Recently, three additional efforts were initiated to combat the new fungal disease: (1) we are collaborating with marine pathologists at Battelle Marine Laboratories, Sequim, Washington, and U.S. Fish and Wildlife personnel to further identify the new organism and describe the pathogenesis of the disease; (2) trials were recently begun to test the efficacy of the antifungal drug Amphoteracin-B[1/] as a possible therapeutic measure; and (3) we are examining tissue samples taken from mature Snake River fall chinook salmon returning to the Tucannon Hatchery to determine if the disease is inherent in the Snake River fall chinook salmon.

Five different handling methods were tested with the 1980-brood 3-year-old maturing males to determine the optimum method of transferring maturing fish back to fresh water:

1/ Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

1. Direct transfer to fresh water.
2. Acclimation to fresh water for 5 days.
3. Direct transfer to fresh water with malachite green treatment every 16 days.
4. Direct transfer to fresh water with malachite green treatment and antibiotic injection every 16 days.
5. Direct transfer to fresh water with injection of antibiotics every 16 days.

RESULTS AND DISCUSSION

Only a small percentage of the Snake River fall chinook salmon smolted as 0-age fish; consequently, the prolonged freshwater culture period resulted in higher than expected mortality. Losses in fresh water have been primarily attributed to bacterial diseases and were treatable with chemotherapeutics. Losses in seawater from disease has been a continuing problem.

Since August 1983, the population of our oldest brood stock (1980) has been reduced from 4,707 fish to 1,917. Survival was excellent during the first 16 months in marine net-pens; however, during August 1983 mortality increased and approached 1% per day. A previously unreported systemic fungal pathogen was documented as a principal cause of this mortality. Also responsible for considerable losses during fall and early winter months of 1983 were the approximately 25% maturing males in the population. Of the 2,790 mortalities, 1,172 were maturing males, and most of the remaining fish were infected with the new fungal disease. While losses to this pathogen have not stopped, percent mortality per day has declined. A

small number of 1980-brood fish succumbed to either an infectious anemia or bacterial kidney disease (BKD).

Currently, 4,090 1981-brood Snake River fall chinook salmon with an average weight of 200 g are in the net-pens at Manchester. The 1981-brood have been affected primarily by BKD (about 8% mortality) and only lightly by infections with the new fungal agent. Growth in these fish is similar to that in the 1980 brood (Figures 1 and 2).

The approximately 6,000 1982-brood chinook salmon have grown (15 g average weight) and survived in a manner similar to the 1981-brood fish. All of these fish are healthy and will be in marine net-pens by May 1984.

Supplementation of commercial rations with herring and krill was suspended in the fall of 1983 pending investigation of these as possible sources of the new systemic pathogen. One of the few systemic fungal pathogens reported in the literature (*Ichthyophonus hoferi*) is known to infect herring, and it can be transferred by using infected fish as food. Samples of herring used for diet supplements have been examined for the fungus, but as of December 1983 no evidence of the new pathogen has been found.

Results of the tests to determine the optimum method of transferring maturing fish back to fresh water indicated very little difference in the techniques tested, but the best method appeared to be the direct transfer to fresh water without acclimation in decreasing salinity gradients and without treatment with chemotherapeutics.

CONCLUSIONS

1. The extended freshwater rearing of Snake River chinook salmon

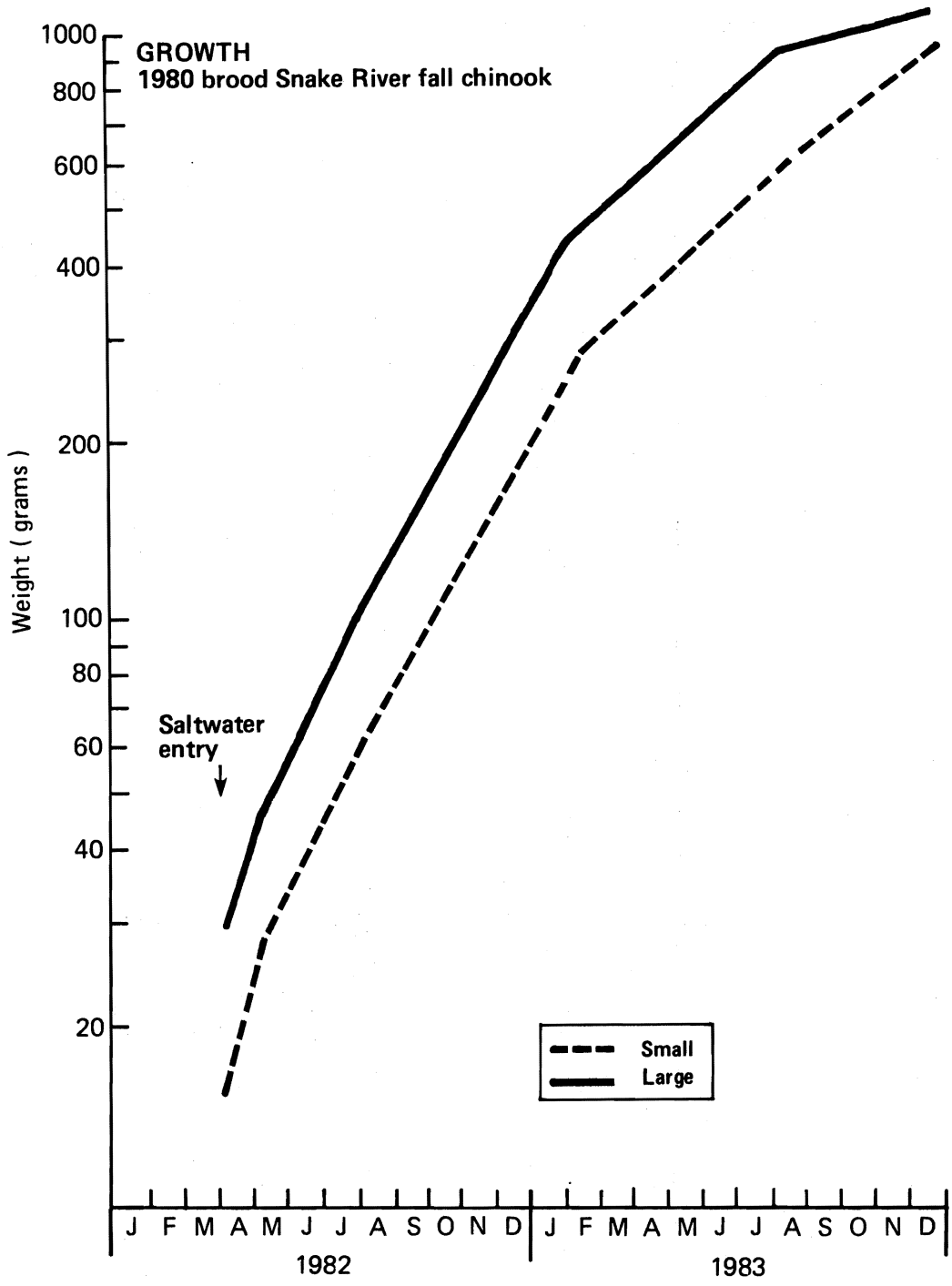

Figure 1.--Growth of 1980-brood Snake River fall chinook salmon in marine net-pens.

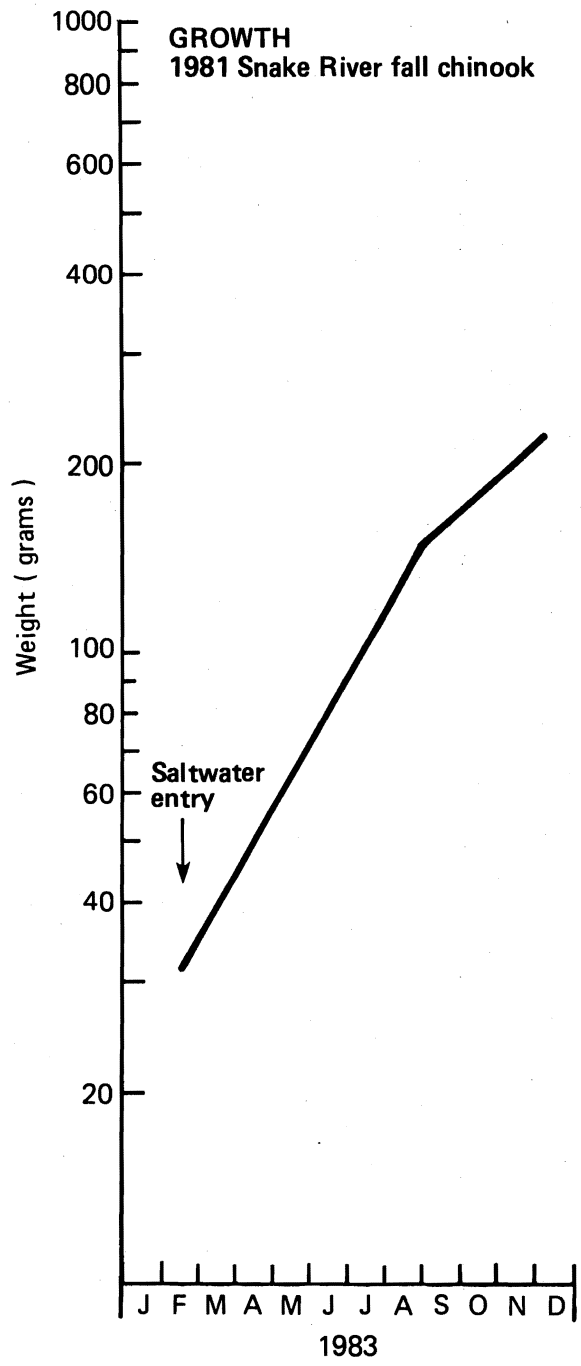

Figure 2.--Growth of 1981-brood Snake River fall chinook salmon in marine net-pens.

juveniles to 1+ years before they can be successfully transferred to marine net-pens is detrimental due to losses from freshwater disease.

2. Acclimation of pre-smolt/smolts to full strength seawater using increasing salinity gradients over a 5-7-day period greatly enhances survival during this critical stage of development.

3. After 3 years of rearing the 1980 broodstock, there remain unknown entities regarding the husbandry and health of these fish. This is particularly true for fish between 28 and 36 months of age held in seawater.

ACKNOWLEDGMENT

Support for this research came from the region's electrical ratepayers through the Bonneville Power Administration.

APPENDIX

Expenditure Information

A. Summary of expenditures

1.	Labor	$33,730	
2.	Travel of persons	3,723	
3.	Transportation of things	220	
4.	Rent, communications, and utilities	626	
5.	Printing and reproduction	191	
6.	Contract services	815	
7.	Supplies, materials, and equipment	37,386	
8.	SLUC	2,297	
9.	NOAA and DOC overhead	13,656	
	TOTAL		$92,644

B. Major property items:

1. None