

Exxon Valdez Oil Spill
Restoration Project Annual Report

PWSAC - PWS System Investigation -
Experimental Fry Release

Restoration Project 95320K
Annual Report

This annual report has been prepared for peer review as part of the *Exxon Valdez* Oil Spill Trustee Council restoration program for the purpose of assessing project progress. Peer review comments have not been addressed in this annual report.

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Study History: In support of the needs of the Sound Ecosystem Assessment (SEA) researchers, in 1994 and 1995 combined, Prince William Sound Aquaculture Corporation (PWSAC) released a total of approximately 27.1 million hatchery reared pink salmon fry which were previously reared to approximately 1.2 grams (Restoration projects 94320K and 95320K). Prior to release, the fry were coded wire tagged at known ratios of tagged to untagged fish.

SEA is an ongoing *Exxon Valdez* oil spill (EVOS) Trustee Council program which focuses on the processes and mechanisms that regulate losses of fry and juveniles to predators after emergence from nearshore natal habitats. Hatchery produced pink salmon fry and returning adults may provide a test of the influence of ocean-entry timing and of fry size at ocean entry on losses to predators.

Abstract: In 1995, Approximately 12.4 million pink salmon fry nurtured at PWSAC's Wally Noerenberg (WNH) and Armin F. Koernig (AFK) hatcheries were reared to a size of approximately 1.2 grams each and released on June 15th. Approximately 20,800 of the fry were coded wire tagged prior to release thereby making assessments of early marine growth, life stage mortality and migration patterns possible by other SEA researchers.

Key Words: *Exxon Valdez*, hatchery, marine survival, *Oncorhynchus gorbuscha*, pink salmon, Prince William Sound, Prince William Sound Aquaculture Corporation, Sound Ecosystem Assesment (SEA).

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TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	4
INTRODUCTION	4
OBJECTIVES	5
METHODS	5
RESULTS	6
DISCUSSION	6
CONCLUSIONS	6
LITERATURE CITED	7
TABLE	8

EXECUTIVE SUMMARY

The Experimental Release Project is an integral component of the Prince William Sound (PWS) Ecosystem Assessment (SEA) studies. Identifiable pink salmon *Oncorhynchus gorbuscha* are an excellent tool to test a central SEA recruitment hypothesis concerning time at ocean entry and fry size at ocean entry. Consequently, SEA researchers requested very large and late fry, relative to typical size and timing upon ocean entry, from the PWS Aquaculture Corporation (PWSAC). Additionally, by utilizing two release sites for the subject salmon fry, an increase in the spatial difference at ocean entry point allows researchers insight into subtle locational differences within the Sound.

Approximately 12.3 million pink salmon fry nurtured at PWSAC hatcheries were released in June 15, 1995 at an average size of approximately 1.2 grams each. About 20,800 large, pink salmon fry were marked and tagged, making assessments by other SEA researchers of early marine growth, life stage mortality and migration patterns possible at a highly reasonable cost.

The justification for the strategy is evidence from Alaska and elsewhere which suggests that fry size is an important determinant of salmon fry survival during early marine residence (Kaeriyama, 1989; Parker, 1971). Faster growing juveniles are thought to enjoy better marine survivals than slower growing fish. As in project 94320K, the fry in this project were targeted for recapture.

INTRODUCTION

The knowledge garnered by SEA researchers, subsequent to *Exxon Valdez* Oil Spill, in evaluating the changes occurring in the PWS ecosystem is vital to evaluating and defining the best approaches to efficiently, and effectively restore the many damaged marine resources and activities. The key to understanding the complex species interactions that occur during critical early marine life stages requires an immense amount of effort and team work by many institutions, agencies, groups, and private individuals. The ecosystem level information that is now being developed will aid the *Exxon Valdez* Oil Spill Trustee Council and others in their restorative tasks assisting injured pink salmon and herring populations in PWS, as well as forming predictive models which will benefit mariners of all stripes on into the future.

Identifiable, as to salt water entry point, time, and size, salmon fry are required by SEA researchers. Consequently, PWSAC has made available its facilities, personnel and expertise. Releases of restoration and enhancement facility-nurtured pink salmon fry is, as indicated by the full SEA proposal, providing "...a powerful test of the influence of ocean-entry timing and fry size at ocean entry on losses to predators".

targeted on released fry as deemed necessary by collaborating researchers' experimental designs and judgement.

RESULTS

Within the constraints of the state of the science and art of fishcultural technology, PWS pink salmon's genetically determined scope for growth, budgetary reality, and collaborating researchers' experimental designs/timing requirements, the results were as close to planned objectives as are currently feasible. Please see the Table for the exact dates, weights, numbers, number mark/tagged, codes, and untagged: tagged ratios.

DISCUSSION

PWSAC normally releases pink salmon fry in or near the peak of zooplankton biomass abundance after assisting with feeding and predator protection, thus closely emulating what PWS pink salmon fry do when unassisted. Consequently the test releases are not within the normal scope of PWSAC operational strategies. The project delineated herein, however, is intended to provide a tool for SEA researchers assisting increases in understanding of factors affecting survival of juvenile pink salmon fry in PWS.

CONCLUSIONS

Year to year variation in physical and biological oceanographic conditions in PWS are historically evidenced. That the saltwater entry of late, large-sized, marked and tagged pink salmon fry is of value to fellow SEA projects is evidenced by SEA resercher's requests that project 95320K be continued. Given the differences between inter-year PWS ecosystem comparisons, SEA projects require multi-years' data before reliable conclusions can be drawn concerning the many biotic and abiotic factors influencing PWS pink salmon survivals.

Salmon hatchery produced pink salmon fry are a viable tool to test hypotheses regarding the causes of mortality in juvenile pink salmon in PWS. PWSAC has ascertained feasibility of nuturing at least some of its pink salmon to 1.5 grams live weight for release by mid-June.

The feasibility of releasing a 1.0-1.5 gram pink salmon fry using current technology has been ascertained by the 1995 work reported on in this annual report. The objectives appear to be attainable, particularly at the Esther Island facility, allowing that required additional resources are secured and employed.

Project 95320K should be continued as a necessary and important support function to other SEA projects as multiple years of data are needed before reliable conclusions can be drawn concerning factors affecting mortality in PWS pink salmon stocks. With the understanding of the theoretical underpinnings on the dynamics of pink salmon stocks, and their interrelationships with abiotic

OBJECTIVES

The goal of this project is, through collaboration with the SEA program, to assist "to develop an ecosystem level understanding of the natural and man-caused factors influencing the production of pink salmon in PWS".

Specific objectives are:

A. Rear 8 million early emerging fry each at the Wally H. Noerenberg (WHN) hatchery on Esther Island and Armin F. Koernig hatchery (AFK) on Evans Island to 1.5 grams live weight for release in mid-June.

B. Determine the marine survivals of fry in experimental releases from coded wire-tagged individuals recovered in corporate escapement and common property fishery the following year.

C. Compare the marine survivals of late-released, larger fry with other releases at these same facilities.

METHODS

Project 95320K took place in PWS at the AFK facility located on Evans Island and the WHN facility sited on Esther Island. Site work commenced in February 1994.

Project pink salmon fry were designated from early outmigrants and weighed on average 0.23 grams, blotted wet weight, each. Volitional outmigration from PWSAC NOPAD incubators insured osmocompetence and optimum developmental fitness. After passing a bank of electronic counters (+/- 1% accuracy), fry were conveyed via flexible hose to 12m x 12m x 3m (432m³) saltwater rearing pens. Approximately three million fry were held in each of a total of four pens, two each at the two facility locations (Table).

Prior to release, 1/2mm Coded Wire Tags (CWT) were be applied to approximately 1 out of every 600 fry. Each pen of fry contained a unique code (Table 1). The CWT fry are integral to identification thus allowing tracking migration patterns of pink salmon fry, and estimation of growth and mortality patterns.

All fry were fed a standard commercial diet of soft, semi-moist fish food for between 75-87 days prior to release. Releases occurred on June 15th at the WHN and AFK facilities. Weights varied (Table) and were the maximum technically feasible given the requested release dates.

Close coordination and communication occurred between SEA researchers and the hatchery personnel during the field season, to assure SEA's sampling efforts were closely timed to releases of facility pink salmon fry. Releases were done in concert with shipboard sampling carried out by SEA research teams. Fry release data from the hatcheries was communicated to biologists stationed on board trawl and purse seine vessels. Thus, nearshore and open water sampling was

and biotic factors, comes the promise of garnering the ability of enduring ecosystem management, thus assuring biodiversity, as well as economic security on into the future.

LITERATURE CITED

Kaeriyama, M. 1989. Aspects of salmon ranching in Japan. *Physiol. Ecol. Japan, Spec. Vol. 1*: 625-638. (1989).

Parker, R.R. 1971. Size selective predation among juvenile salmonid fishes in a British Columbia inlet. *J. Fish. Res. Bd. Can.* 28:1503-1510.

TABLE. Project 95320K Results

	FACILITY	
Release Date	WNH	AFK
1st Pen	June 15	June 15
2nd Pen	June 15	June 15
Weights (g)		
1st Pen	1.06	1.35
2nd Pen	0.95	1.34
# Fry Released		
1st Pen	3,152,969	2,961,191
2nd Pen	3,162,135	3,024,130
# Fry Marked		
1st Pen	5,443	4,949
2nd Pen	5,346	5,056
Tag Code		
1st Pen	13-1-3-5-11	13-1-3-6-11
2nd Pen	13-1-3-5-12	13-1-3-6-12
Untagged/Tagged Ratio		
1st Pen	579:1	598:1
2nd Pen	591:1	598:1