

CHAPTER 7

94320-K Experimental Fry Releases

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EXXON VALDEZ OIL SPILL RESEARCH/MONITORING
FINAL REPORT

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Experimental Fry Release

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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 14.7 million pink salmon fry nurtured at PWSAC salmon restoration and enhancement facilities, were targeted to be released at a size of 1.5 grams each. Release dates were after the 10th of June. About 75,000 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 94320-L, the fry in this project were targeted for recapture. The performance of this group of large, late, saltwater entry salmon fry relative to other sized and timed saltwater entry fry will be described in other SEA project reports such as 94320-A (Sal. Growth and Mort.), 94320-E (Sal. Pred.), 94320-N (Nearshore Fish) and 94320-H (Zooplankton).

INTRODUCTION

The knowledge garnered by SEA researchers, subsequent to the 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".

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 (see Experimental Manipulation Project 94320-L description) at these same facilities.

METHODS

Project 94320-K took place in PWS at the AFK facility located on Evans Island and the WHN facility sited on Esther Island. Site work commenced on February 23, 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. Three to four million fry were held in 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 200 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 75-85 days prior to release. Releases occurred on June 11 and 13 at WHN and AFK facilities respectively. 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 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 researcher's requests that project 94320-K 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 restoration and enhancement facility-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 1994 work reported on in this final report. The objectives appear to be attainable, particularly at the Esther Island facility, allowing that required additional resources are secured and employed.

Other releases using differentially-sized and timed saltwater entry fry will be described in SEA co-project reports such as 94320-A (Sal. Growth and Mort.), 94320-E (Sal. Pred.), 94320-L (Experimental Manipulation), 94320-N (Nearshore Fish) and 94320-H (Zooplankton).

Project 94320-K 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 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 94320-K Results

	FACILITY	
Release Date	WNH	AFK
1st Pen	June 11	June 13
2nd Pen	June 11	June 13
Weights (g)		
1st Pen	1.46	1.09
2nd Pen	1.38	1.03
# Fry Released		
1st Pen	3,803,400	3,547,900
2nd Pen	3,905,600	3,496,400
# Fry Marked		
1st Pen	18,990	17,732
2nd Pen	19,469	17,481
Tag Code		
1st Pen	13-1-3-3-5	13-1-3-3-3
2nd Pen	13-1-3-3-6	13-1-3-3-4
Untagged/Tagged Ratio		
1st Pen	200:1	200:1
2nd Pen	201:1	200:1