EVOSTC ANNUAL PROJECT REPORT

Recipients of funds from the *Exxon Valdez* Oil Spill Trustee Council must submit an annual project report in the following format by **Sept. 1 of each fiscal year** for which project funding is received (with the exception of the final funding year in which a final report must be submitted). **Please help ensure that continued support for your project will not be delayed by submitting your report by Sept. 1. Timely receipt of your report allows more time for court notice and transfer, report review and timely release of the following year's funds.**

Satisfactory review of the annual report is necessary for continuation of multi-year projects. Failure to submit an annual report by **Sept. 1** of each year, or unsatisfactory review of an annual report, will result in withholding of additional project funds and may result in cancellation of the project or denial of funding for future projects.

PLEASE NOTE: Significant changes in a project's objectives, methods, schedule, or budget require submittal of a new proposal that will be subject to the standard process of proposal submittal, technical review, and Trustee Council approval.

Project Number: 050758

Project Title: Management Applications: Implementing the SEA Pink Salmon Survival Model- Tagging Technology

PI Name: Steve Moffitt

Time period covered by report: FY05: 1 October 2004 – 30 September 2005

Date of Report: 30 September 2005

Report prepared by: Steve Moffitt

Project website address (if applicable): NA

Work Performed: Summarize work performed during the reporting period, including any results available to date and their relationship to the original project objectives. Explain deviations from the original project objectives, procedural or statistical methods, study area or schedule. Also describe any known problems or unusual developments, and whether and how they have been or can be overcome. Include any other significant information pertinent to the project.

This project had two major objectives: 1) Estimate PIT tag loss and tagging-induced mortality of juvenile pink salmon *Oncorhynchus gorbuscha* emigrating Prince William Sound (PWS) in July, and 2) Determine optimal configurations of PIT tag scanning equipment at each salmon processor in PWS and estimate tag detection rates at each processor. Beginning in July 2005 work was completed to meet these objectives as outlined below.

To estimate PIT tag loss and tagging-induced mortality, the Alaska Department of Fish and Game (ADF&G) research vessel *R/V Solstice* was used to capture juvenile salmon near Shelter Bay on 5 and 6 July 2005. An anchovy purse seine net (25 m deep with 1.5 cm stretch mesh) was deployed to capture fish, and the net was held open for 20 minutes each set. The total number of fish captured for each set were counted or estimated by species and life stage (juvenile or adult).

The first set (evening of 5 July) was used to test our capture and handling of juvenile salmon and practice implanting PIT tags. The seine was pursed and the net reduced in size until fish could be collected with a long-handled (~2 m), small mesh dip net. The web near the boat was kept about 2-3 m deep to allow jelly fish (Scyphozoa) to sink below the fish. Juvenile salmon were dip netted into 2 large coolers (121 liters) and 3 totes (68 liters) filled with salt water from the vessel's salt water wash pump. Salt water was pumped into two of the coolers and water was allowed to overflow out. The totes were filled with salt water and refreshed about every 15-30 minutes. Each container also had a battery powered air stone (aerator) that ran continuously.

The juvenile pink salmon were separated into a tote until 20 fish were available. The remaining fish were kept in the two coolers with circulating sea water and air stones and monitored for signs of stress. Two to four juvenile pink salmon at a time were placed in a tote with a solution of MS-222 (Finquil) and anesthetized. The fish were PIT tagged using procedures outlined by Prentice et al. (1990) and allowed to recover in a tote of sea water. After testing the anesthesia and tagging process with 20 juvenile pink salmon, all tagged fish were exposed to a lethal level of MS-222 and dissected to examine tag placement. All remaining live fish were released close to the capture site.

A second purse seine set (morning of 6 July) captured all the fish required for PIT tagging (n = 200 juvenile pink salmon). Juvenile salmon were dip netted into the coolers and many of the juvenile chum *O. keta* and coho *O. kisutch* salmon were separated and released. All tagging was completed with a 2 person crew. Four to five juvenile pink salmon at a time were anesthetized in a solution of MS-222, measured for snout to fork length to the nearest millimeter, and then tagged. The individually coded PIT tags (glass encased, 12 mm x 2.1mm, 125 kHz) were injected using a 12 gauge hypodermic needle and syringe just posterior of the right pectoral fin off the ventral midline. Needles were sterilized in isopropyl alcohol after each use and changed out if they became dull. An electronic PIT tag reader was used to scan each tag code into a file just prior to tagging. Additionally, the tag code, fish length, time of tagging (military time), and comments on the fish condition or tagging process were recorded on paper data forms. After tagging fish were allowed to recover in a tote with clean sea water and then transferred to an insulated fish tote (898 liters) covered with mosquito netting or a clean cotton sheet.

After all fish were tagged and transferred to the large tote, all remaining fish were released. An aerator circulation pump was used until all fish were in the large tote. The aerator circulation pump was then removed and the tote was constantly supplied with fresh sea water from the vessel wash pump and aeration was supplied by three battery powered air stones. The amount of water supplied by the pump was adjusted to keep the fish from swimming circles in the tank. Fish were kept in the tote on the deck of the *R/V Solstice* for 96 hours. Approximately every four hours the tote was examined for dead fish and the water temperature and salinity were measured and recorded. Dead fish were removed, scanned for a PIT tag and the time and tag number recorded. After tagging the fish were not feed for approximately the first 48 hours. From 48-72 hours, the fish were feed zooplankton from approximately 25 vertical tows (20 m) and 1 horizontal tow (300 m) made with a plankton net (200 micron mesh; 75 cm dia mouth opening). Commercial fish food was used for the last 24 hours.
Ninety-six hours after the last fish was tagged, all fish were exposed to a lethal level of MS-222 and then frozen. The fish were later thawed and checked for tag loss by scanning with an electronic tag reader. All fish were also examined for external injuries.

Approximately 600 juvenile salmon were captured in the first purse seine set on the evening of 5 July 2005. The procedures for identifying juvenile pink salmon, maintaining fish prior to tagging, and PIT tagging fish were practiced and examined for improvements. Twenty juvenile pink salmon were separated out and PIT tagged. All 20 fish were subsequently sacrificed to check for correct tag placement. Tag placement matched that suggested by Prentice et al. (1990); in the body cavity just posterior to pyloric caeca.

An estimated 500 juvenile pink and 300 juvenile chum salmon were captured in a purse seine set the morning of 6 July 2005. About 2 hours were required to sort out many of the chum salmon and release them. Tagging began at 1123 and was complete at 1659 with 25 minutes for lunch (~93 seconds per fish or 39 fish per hour). Tagged fish were from 66 to 129 mm snout to fork length (mean = 91 mm). About 42% of the fish tagged were between 80 and 90 mm (Figure 1).

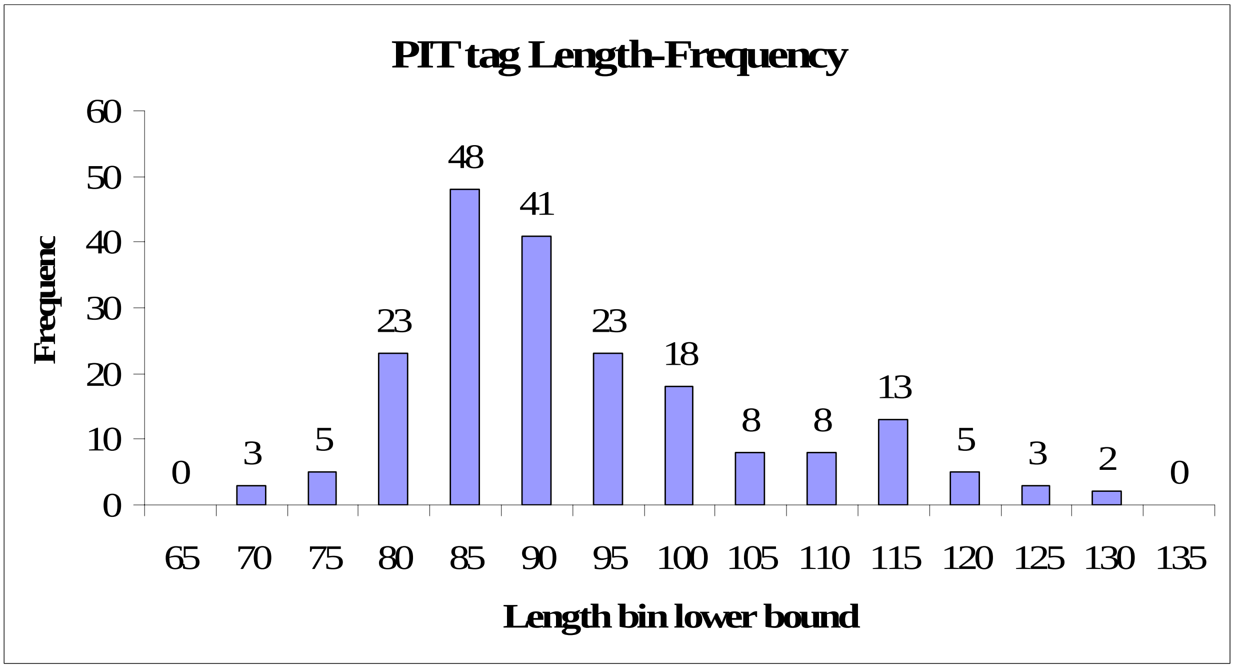

Figure 1. Length frequency of juvenile pink salmon PIT tagged (n=200).

One hundred and eighty-five fish (92.5%) survived to 96 hours; however, 2 more fish would have not have survived because of caudal fin erosion and external skin and scale loss. None of the remaining fish (n = 183) had obvious external injuries that would have affected their survival. Forty percent (6 of 15) mortalities in 96 hours were in the first 25 fish tagged. This suggests a lack of tagging and handling experience contributed to early mortalities. Cadual fin erosion and associated skin and scale loss were documented on 47% (7 of 15) of the mortalities. The cause of these injuries is unknown, but they are probably related to handling during the tagging process. They could also be related to damage from sea lice or from swimming near the sides of the tote; however, only one of the seven mortalities with external injuries had sea lice at the time of tagging and visual observations suggest the circulating sea water in the tote kept fish from swimming near the sides of the tote.

The mortality rate from handling and tagging should be able to be reduced with experience and some changes to the process. More experience separating pink and chum salmon juveniles would decrease the holding time of fish prior to tagging. Additionally, more experienced tagging personnel would probably decrease the mortality. A better designed workflow would have also decreased the handling of fish during the process and probably increased fish survival.

Two changes from the original project procedures were 1) MS-222 was used instead of clove oil and 2) the tagged fish were maintained in a tote on board the vessel instead of a net pen near Armin F. Koernig Hatchery. The tagging personnel had more experience using MS-222 and the fish were not to be released or used as food, so MS-222 was appropriate. The fish were maintained in a tote onboard the *R/V Solstice* because this allowed more control over the water parameters (temperature, salinity), food availability, and protection from predators.

The second objective of this project was to determine the optimal configurations of PIT scanning equipment at each salmon processor in PWS and estimate tag detection rates at each processor. This method of recovering PIT tagged fish was used by Willette et al. (2003) in Cook Inlet. However, they injected PIT tags into the cheek muscle of adult salmon and were able to scan at PVC chutes just after the heading machine while our objective was to test configurations for scanning of adult salmon with the PIT tag in the body cavity.

During July and early August 2005 we visually examined the Cordova processing plants for locations along the processing lines without excessive metal or electric motors that would interfere with tag detection. Unlike the experience of Willette et al. (2003) there did not appear to be processing line locations that would work without extensive modifications.

On 17 August 2005 we ran some PIT tag detection tests at the Ocean Beauty Seafoods plant in Cordova. We ran tests at two locations: 1) a nonmetal conveyor belt in an aluminum frame, and 2) an aluminum belt with plastic conveyor sides. These appeared to be locations that would have the least interference from metal or electric motors. Fifty-one commercially harvested adult pink salmon were injected with PIT tags (12 mm x 2.1 mm, 134.2 kHz) in the body cavity (described earlier for juvenile pink salmon). The fish were scanned with an electronic tag detector to ensure the tags were working. The fish were then placed on the moving conveyor, one at a time, and transported past a handheld racket antenna and electronic tag detector. The antenna power, distance from the fish, and location of the antenna (under the conveyor belt vs. over the conveyor belt) was varied with a small number of fish to find a configuration that maximized the antenna current. Two different electronic detectors and racket antennas were tried for multiple configurations. The antenna current was lower than suggested by manufacturer for all configurations examined.

Three tests with all 51 tagged fish were then completed and the numbers of tags detected were documented. The first test was completed on the nonmetal conveyor belt with a single antenna (100% antenna power) about 0.3 m above the belt. Only 7 of 51 PIT tags (14%) were detected. The next test was again on the nonmetal conveyor belt with a single antenna (70% antenna power) about 0.15 m above the belt. Only 12 of 51 PIT tags (24%) were detected. The third test was completed on the aluminum belt with plastic sides with a single antenna (70% antenna power) about 0.3 m above the belt. Only 3 of 51 PIT tags (6%) were detected. These results match our expectations given the low antenna currents with the configurations tested.

There were several changes from our original procedures outlined to meet this objective. Visual examination of processing plants in Cordova suggested that the detection rates would be too low without plant modifications. Because this was a one year project, it is unlikely that processing plants would make the necessary modifications to allow us to increase tag detection rates. Therefore no attempt was made to conduct detection tests at plants in Valdez or Seward. Additionally, we conducted our tests with 51 tagged fish rather than 100 fish as outlined in our procedures because our preliminary configuration testing suggested we would not get good detection rates.

If a large scale tagging study was conducted, processing plant modifications should allow a much higher tag detection rate than was documented in this study. For example, replacing the aluminum chutes that funnel fish to the line with heavy, food grade plastic chutes would provide an antenna location with less metal interference.

Prentice, E.F., T. A. Flagg, and C.S. McCutheon. 1990. Feasibility of using passive integrated transponder (PIT) tags in salmonids. Am. Fish. Soc. Symp. 7:317-322.;

Willette, T. Mark, Robert DeCino, and Nancy Gove. 2003. Mark-recapture population estimates of coho, pink, and chum salmon runs to upper Cook Inlet in 2002. Regional Information Report No. 2A03-20. Alaska Department of Fish and Game, Commercial Fisheries Division, Anchorage.

Future Work: Summarize work to be performed during the upcoming year, if different from the original proposal. Describe any proposed changes in objectives, procedural or statistical methods, study area or schedule. ***NOTE**: Significant changes in a project's objectives, methods, schedule or budget require submittal of a new proposal subject to the standard process of proposal submittal, technical review and Trustee Council approval.*

This was a one year project, and no further field work will be preformed.

Coordination/Collaboration: Describe efforts undertaken during the reporting period to achieve the coordination and collaboration provisions of the proposal, if applicable.

This project was originally outlined during a pink salmon predictive workshop held in Cordova in 2004 attended by local fishers, processors, nonprofit aquaculture association personnel, and agency investigators. The results of this study will be used in developing an implementation plan for the SEA pink salmon model. The preliminary results of the juvenile portion of this study were discussed with the R. Mullins and K. Adams and other people involved in the workshop.

Community Involvement/TEK & Resource Management Applications: Describe efforts undertaken during the reporting period to achieve the community involvement/TEK and resource management application provisions of the proposal, if applicable.

This project was originally outlined during a pink salmon predictive workshop held in Cordova in 2004 attended by local fishers, processors, nonprofit aquaculture association personnel, and agency investigators. The work for this project was completed by local Cordova employees.

Information Transfer: List (a) publications produced during the reporting period, (b) conference and workshop presentations and attendance during the reporting period, and (c) data and/or information products developed during the reporting period. ***NOTE:*** *Lack of compliance with the Trustee Council's data policy and/or the project's data management plan will result in withholding of additional project funds, cancellation of the project, or denial of funding for future projects.*

As outlined in the original proposal, the only publication from this feasibility project will be the final report.

Budget: Explain any differences and/or problems between actual and budgeted expenditures, including any substantial changes in the allocation of funds among line items on the budget form. Also provide any new information regarding matching funds or funds from non-EVOS sources for the project.
NOTE: *Any request for an increased or supplemental budget must be submitted as a new proposal that will be subject to the standard process of proposal submittal, technical review, and Trustee Council approval.*

ADF&G increased their cost-share contribution by providing 4 days of vessel time (*R/V Solstice*) at $2,500 per day ($10,000 total).

We can accept your annual report as a digital file (Microsoft Word or WordPerfect), with all figures and tables embedded. Acrobat Portable Document Format (PDF) files (version 4.x or later) are also acceptable; please do not lock PDF files or include digital signatures.

Please submit reports electronically to Carolyn Rosner at EVOSTC for posting to the EVOSTC website at www.evostc.state.ak.us/admin and uploading to the EVOSTC database. Also, please be sure to post your annual report on your own website, if you have one.

Thank you!

We appreciate your prompt submission of your annual report and thank you for your participation in and contribution.