Exxon Valdez **Oil Spill Trustee Council**

Long-Term Research and Monitoring, Mariculture, Education and Outreach

Annual Project Reporting Form

Project Number: 23220111-I

Project Title: Ecological interactions between Pacific herring and Pacific salmon in Prince William Sound, Alaska

Principal Investigator(s): Pete Rand and Rob Campbell, PWSSC; Kristen Gorman, UAF; Ron Heintz, SSSC

Reporting Period: February 1, 2023 – January 31, 2024

Submission Date: March 1, 2024

Project Website: https://gulfwatchalaska.org/

Please check all the boxes that apply to the current reporting period.

☒ **Project progress is on schedule.**

☐ **Project progress is delayed.**

☐ **Budget reallocation request.**

☐ **Personnel changes.**

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1. Summary of Work Performed:

As part of our effort at synthesizing past data, we have acquired some data collected as part of the U. S. Global Ocean Ecosystems Dynamics (US GLOBEC) project – specifically data collected on juvenile pink salmon in 1998 (from Jennifer Boldt, Fisheries and Oceans Canada) and 2001-2003 (from Wess Strasburger at National Oceanic and Atmospheric Administration [NOAA] Auke Bay Labs). These data include catches and length, weight, origin, and caloric density of juvenile pink salmon in western Prince William Sound. PI Gorman recruited a MS student (Alex Borsky, University of Alaska Fairbanks [UAF] Marine Biology program) during fall 2023 to assist the project on vector alignment search tool (VAST) analysis of past data to quantify where, when, and at what life stages pink salmon and herring might be interacting in Prince William Sound. We are working to identify and obtain additional datasets for Alex's MS thesis work such as the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC)-funded Sound Ecosystem Assessment (SEA), Gulf Watch Alaska (GWA), and Herring Research and Monitoring (HRM) programs; Alaska Department of Fish and Game (ADFG) salmon program; North Pacific Research Board (NPRB)-funded projects, and National Center for Ecological Analysis and Synthesis (NCEAS) projects. We are exploring distributional overlaps between

herring and pink salmon at specific life history stages, i.e., larval, age-0, age-1+ using VAST modeling approaches. We plan to have preliminary analysis on available data completed by the summer 2024 field season; however, Alex will be working on these analyses using all data for his MS thesis research, which should be completed in 2026.

We had a successful field season in 2023. We hired a seasonal field and lab technician, Lydia Shaw, at Prince William Sound Science Center (PWSSC) to assist in all aspects of our first field season and associated lab work at PWSSC. Alex Borsky joined our project officially in January 2024 (Gorman serves as primary advisor at UAF, Rand and Heintz are committee members). Alex has begun some laboratory work preparing 2023 field samples for isotope analysis at UAF.

Our research crew led four separate research cruises:

- 24-28 May 2023, *R/V Solstice*, crew: Pete Rand, Kristen Gorman, and Lydia Shaw
- 29 June – 1 July 2023, *R/V New Wave*, crew: Rob Campbell, Pete Rand, and Lydia Shaw
- 10-11 July 2023, *R/V New Wave*, crew: Rob Campbell, Pete Rand, and Lydia Shaw
- 11-14 September 2023, *R/V Solstice*, crew: Kristen Gorman and Lydia Shaw

We sampled 11 separate stations during the first cruise, 4 stations in the second and third cruises, and 3 stations during the final cruise (Figs. 1 and 2). We were planning on a total of 5 stations sampled during our final cruise but were unable to sample 2 sites due to poor weather. We logged total fish catch in each purse seine haul and surface trawl. A subsample of the catch was processed for disease (blood smears) and diets (guts extracted and preserved in buffered formalin or ethanol for later lab analysis) immediately following capture. Individuals of each species were labeled and frozen in whirlpaks on-board for later lab analysis. At each station where fish were collected, we carried out replicate bongo tows (500 and 333 μm mesh). We preserved one set of samples in buffered formalin (for later identification) and the other set of samples was frozen in water (for calorimetry and isotope analysis).

To date we have processed 36 separate plankton samples to identify and quantify prey (both 500 and 333 μm mesh, formalin-preserved samples from all four cruises). Data include subsample counts and expansions for 17 taxonomic prey groups.

To date we have processed 48 juvenile pink salmon and 302 Pacific herring (juveniles and adults) for diets. Data consist of stomach content mass and identification of stomach contents into 15 taxonomic prey groups.

We performed blood smears on 264 individual herring collected in May, 178 juvenile pink salmon collected in June and July, and 178 juvenile herring collected in September. Slides were

shipped to Dr. Paul Hershberger's U. S. Geological Survey Marrowstone Marine Field Station lab (Nordland, Washington), for disease sampling in early October 2023 with data received in January 2024.

We shipped ethanol preserved stomach samples (130 stomachs total: 81 adult herring and 49 juvenile pink salmon) to Dr. Wes Larson's NOAA genetics laboratory in Juneau for metabarcoding analysis of the fish prey contents with data received in late November 2023.

In late September 2023 we transferred a total of 277 individual juvenile pink salmon (labeled and frozen separately in whirlpaks) to Jennifer Morella, ADF&G Cordova office, for otolith extraction and reading to determine origin. These samples have since had otoliths removed and mounted and are in process for otolith readings for hatchery marks (February 2024).

We sent some voucher specimens of larval fish to Dr. Wess Strasburger at the NOAA Juneau lab to confirm identification of larval fishes we collected with the bongo net during May and June cruises. He positively confirmed collections of herring larvae during these cruises, and we intend to quantify densities based on expanded counts as outlined in our proposal.

At the UAF lab, we have freeze dried all fish collected during the September cruise (n=178) and are in the process of grinding these samples and selecting samples for bulk and compound-specific stable isotope analysis. The collected fish samples from May, June, and July will be shipped to UAF soon and we will continue processing these samples for stable isotope analysis. Our goal is to have these samples processed by the end of Spring semester 2024.

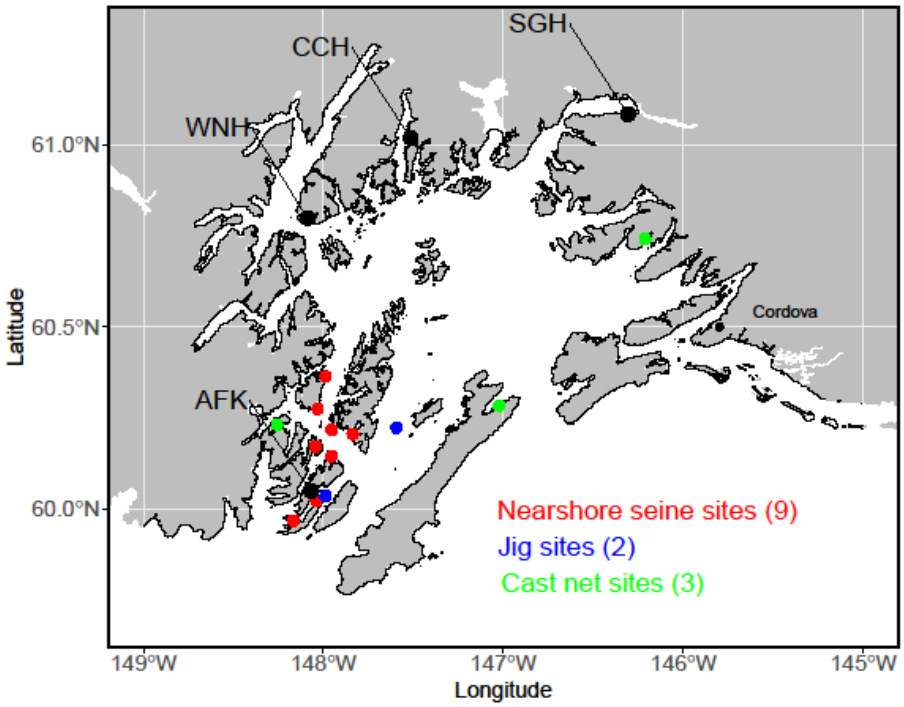

Figure 1. Location of sites sampled by the R/V Solstice during our 2023 field season. The filled red and blue circles were sites sampled during our May cruise (fish captured by purse seine and jigging), and the green filled circles are sites sampled by cast net during the September cruise. Locations of pink salmon hatcheries, Armin F. Koernig (AFK), Wally Noerenberg (WNH), Cannery Creek (CCH), and Solomon Gulch (SGH), are also shown (filled black circles).

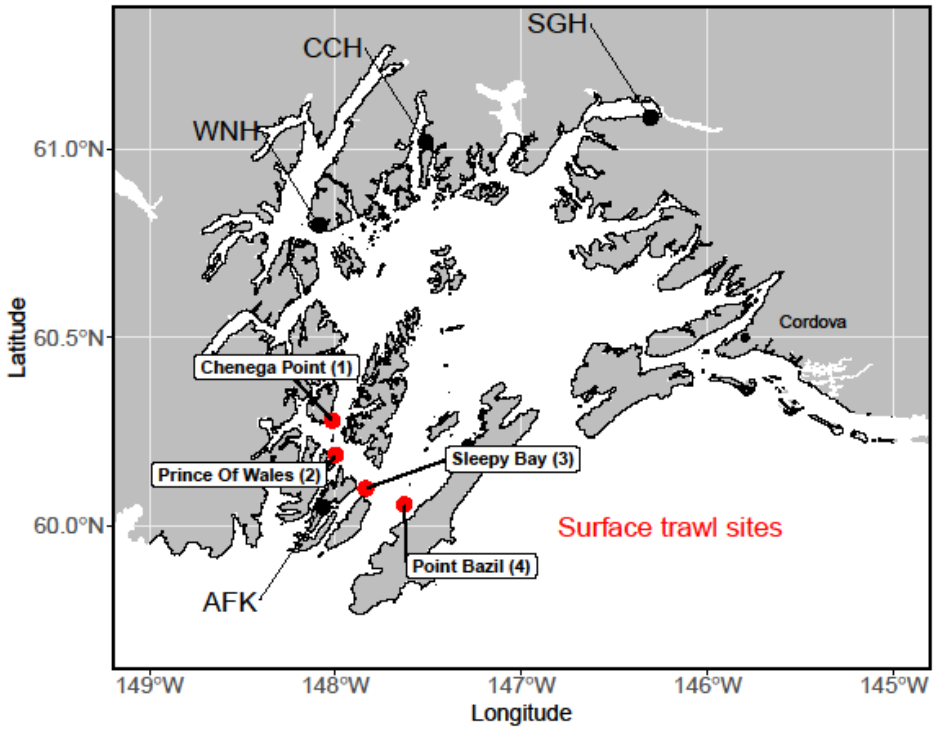

Figure 2. Location of sites sampled by the R/V New Wave during our 2023 field season. The filled red circles were sites sampled during our June and July cruises (fish captured by surface trawl). Locations of pink salmon hatcheries, Armin F. Koernig (AFK), Wally Noerenberg (WNH), Cannery Creek (CCH), and Solomon Gulch (SGH), are also shown (filled black circles).

We met all the major objectives for field work outlined in our proposal in 2023, and we are making good progress on generating lab results. We were unable to capture any juvenile pink salmon during our May cruise due to the timing of the survey. We conjectured that the juvenile salmon may have been closer to shore (i.e., not yet dispersed into deeper waters where they would be vulnerable to capture by our sampling gear) so we are considering shifting our May cruise approximately a week later in 2024. In addition, we were able to sample quite efficiently during our June and July cruises (we were able to sample all four of our sites during a two-day period). We are planning on carrying out a total of 3 cruises on the *R/V New Wave* (two in June and one in July) in 2024 to extend temporal coverage of our surface trawl sampling for capture of out-migrating juvenile pink salmon and larval herring.

2. Products:

This is a newly funded project and 2023 was the first field season. No publications, reports, presentations, or public outreach have been produced.

3. Coordination and Collaboration:

The Alaska SeaLife Center or Prince William Sound Science Center

PIs Rand and Campbell are staff at the PWSSC. In addition, this project is part of the NOAA grant for EVOSTC funds administered by PWSSC; PIs Gorman and Heintz are subawardees to PWSSC on the grant. Project team members also coordinate program meetings, reporting, and other activities through PWSSC.

EVOSTC Long-Term Research and Monitoring Projects

This project is part of the GWA-LTRM program funded by EVOSTC and in the HRM component. We are collaborating with Dr. Paul Hershberger (herring disease program, project 23120111-E) on the disease sampling in this project.

EVOSTC Mariculture Projects

Nothing to report at this time.

EVOSTC Education and Outreach Projects

We intend to engage in outreach through PWSSC on this project, including articles in Delta Sound Connections (planned for this spring's issue) and the PWSSC newsletter (Breakwater).

Individual EVOSTC Projects

Nothing to report at this time.

Trustee or Management Agencies

We established a co-op agreement with ADF&G to allow us to charter the *R/V Solstice* and to have juvenile pink salmon otoliths examined to determine origin in the ADF&G Cordova Otolith Lab. This work is on-going.

We had laboratory work performed on stomach contents of juvenile pink salmon and herring at the Genetics Program of the NOAA Alaska Fisheries Science Center in Juneau.

Native and Local Communities

Nothing to report at this time.

4. Response to EVOSTC Review, Recommendations and Comments:

No comments for FY23.

5. Budget:

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROGRAM BUDGET PROPOSAL AND REPORTING FORM

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5-YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$112,299	$201,472	$206,654	$185,064	$182,478	$887,967	$87,110
Travel	$11,223	$15,539	$14,459	$11,998	$10,764	$63,983	$10,584
Contractual	$61,706	$89,644	$91,119	$89,774	$88,674	$420,917	$97,241
Commodities	$16,050	$13,250	$13,250	$13,250	$12,250	$68,050	$4,295
Equipment	$22,000	$22,775	$23,913	$2,000	$0	$70,688	$7,900
Indirect Costs (varies by proposer)	$7,755	$22,032	$22,218	$16,441	$13,723	$82,168	$7,422
SUBTOTAL	$231,033	$364,711	$371,613	$318,527	$307,888	$1,593,773	$214,552
General Administration (9% of subtotal)	$20,793	$32,824	$33,445	$28,667	$27,710	$143,440	N/A
PROJECT TOTAL	$251,826	$397,535	$405,058	$347,194	$335,598	$1,737,212	
Other Resources (In-Kind Funds)	$0	$0	$0	$0	$0	$0	

Above is the combined cumulative spending budget for PIs Rand and Campbell, Gorman, and Heintz. Spending remains behind schedule because the delay in issuing the NOAA grant resulted in a loss of a field season. PI Heintz has not charged time or expenses to the project. In FY23, PIs Rand and Campbell requested to reallocate funds from contractual to supplies, which was approved by EVOSTC.