



Exxon Valdez Oil Spill Trustee Council

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

Annual Project Reporting Form

Project Number: 24160111-F

Project Title: Herring surveys and age, sex, and size collection and processing

Principal Investigator(s): Jennifer Morella, Alaska Department of Fish and Game

Reporting Period: February 1, 2024 – January 31, 2025

Submission Date (Due March 1 immediately following the reporting period): March 1, 2025

Project Website: <https://gulfwatchalaska.org/>

<https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareapws.herring>

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.**

1. Summary of Work Performed:

The Alaska Department of Fish and Game (ADF&G) was funded for this project to conduct herring aerial surveys and to sample herring for age, sex, size, and sexual maturity (ASL). In addition to these two over-arching objectives, this project plays a central role in coordinating and collaborating survey and sampling efforts with all Herring Research and Monitoring (HRM) component projects within the Gulf Watch Alaska Long-term Monitoring Program (GWA-LTRM) program. We provide the R/V *Solstice* as a research platform, collect herring samples for multiple projects, provide logistical support for field work, travel, and sample shipment, and disseminate aerial and vessel survey observations in a timely manner. Spring aerial herring surveys and ASL sampling have been conducted by ADF&G in Prince William Sound (PWS) since the early 1970s. These two datasets are the longest continuous time-series records of herring in PWS and as such are critical inputs to age structured modeling and stock assessment efforts, and provide a basis for understanding the population dynamics, changing biomass, and



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biological processes that are happening in the population. Funding provided by the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) allows ADF&G to continue to conduct these surveys and collections and provides continuity for these two long-term datasets. Overall, this critical project serves as a foundation to the HRM component and directly assists, coordinates, or provides data and/or samples to every project within the HRM component.

We conducted 44 hours of spring aerial surveys of PWS during 19 flights from March 28 to May 1, 2024 (Fig. 1). The number of survey flights and total flight hours flown in 2024 were near the 2004-2023 averages of 42 hours and 20 flights. Herring data collected included location and linear extent of herring milt by flight, classification of herring milt (intensity), and herring school biomass. Data collected on other species included observations on the distribution and abundance of birds, sea lions, and other marine mammals. The 2024 PWS aerial spawn estimate of 29.9 statute mile-days-of-milt is an increase from the 2023 estimate and 49.5% above the 10-year average (2014–2023) of 20.0 mile-days-of-milt. Mile-days-of-milt in 2024 remain well below levels observed in the 1980s and early 1990s (Fig. 1). Spawn distribution and timing are displayed on the map below for reference (Fig. 2).

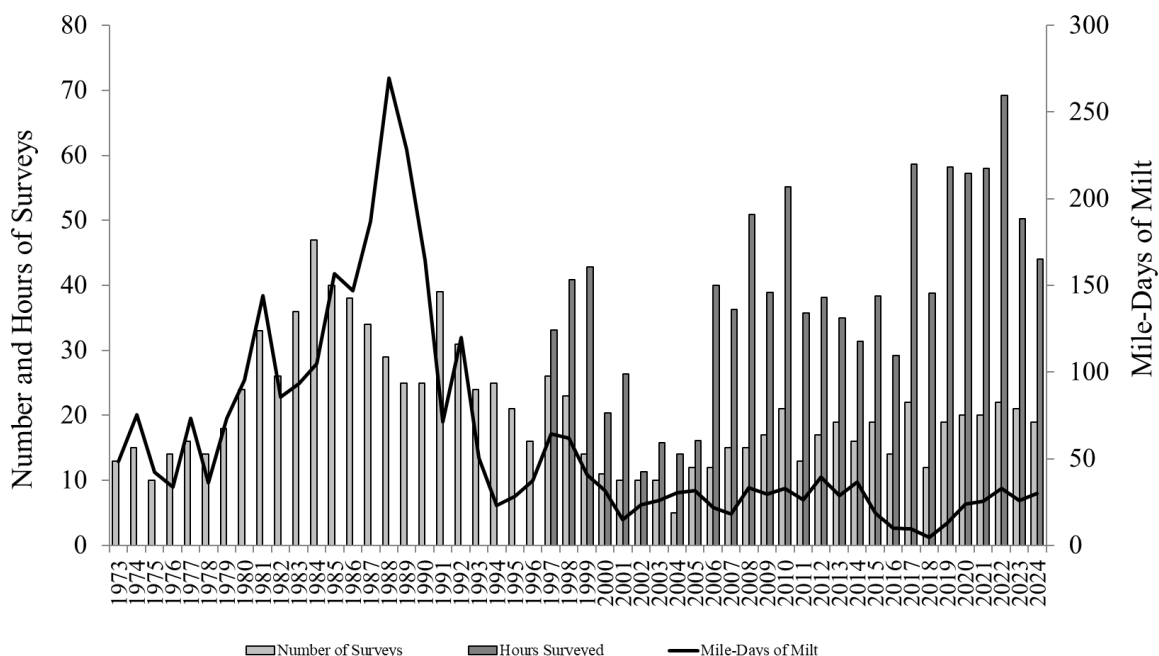


Figure 1. Prince William Sound herring aerial surveys, 1973-2023. Bars indicate the number and hours of surveys (left axis) and the line indicates mile-days of milt (right axis).



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The Kayak Island area is outside of this project’s study area, scope, and funding but has been included in this report due to the relevancy and overlap with this project. We conducted 9.75 hours of spring aerial surveys of the Kayak Island area during five surveys from April 14 to April 19, 2024. High winds prevented surveys on April 17 during a large spawning event, likely biasing estimates low. A total of 39.1 mile-days-of-milt were observed in the Kayak Island area. No Kayak Island area ASL samples were collected in 2024 due to funding and weather limitations.

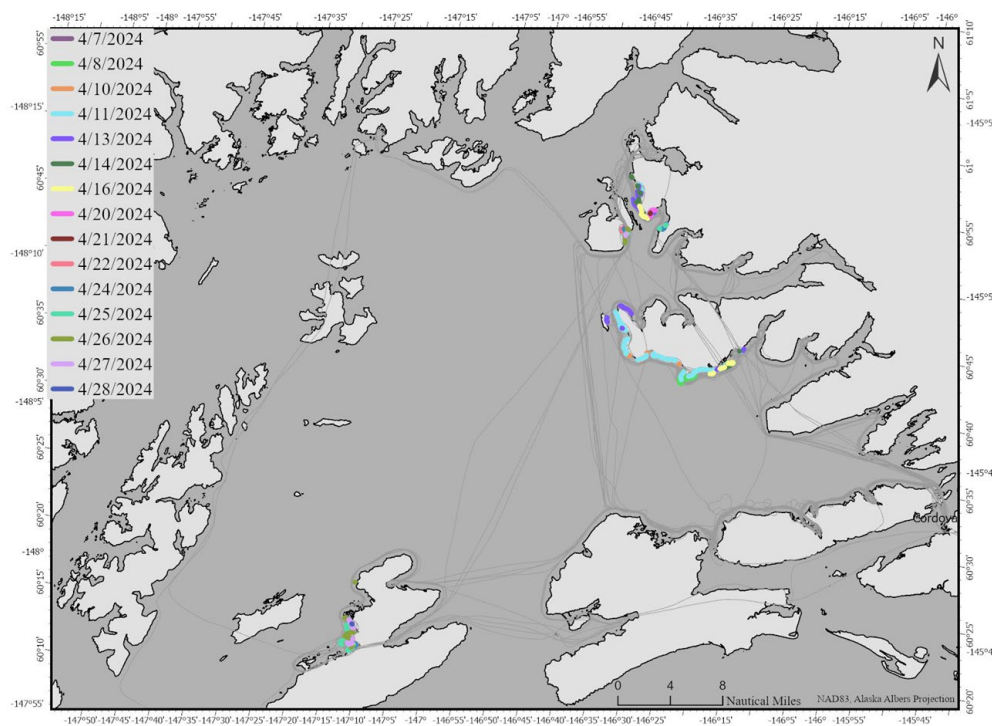


Figure 2. Prince William Sound herring spawn distribution by date for 2024.

We conducted R/V *Solstice*-based herring sampling surveys in 2024 and collected ASL samples from Humphrie’s Hole, Canoe Pass, Port Etches, Canoe Point, Port Etches, and Double Bay. The



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weighted age composition from 2,200 ages for the 2024 PWS spawning biomass was 10% age-3, 37% age-4, 31% age-5, 6% age-6, 5% age-7, 10% age-8, and <1% age-9+ (Fig. 3).

This work is performed by ADF&G commercial fisheries research and management personnel. The results of both the aerial surveys and age/size structure are critical to the management of herring commercial fisheries in PWS. The estimates of aerial biomass and age-structured assessment model outputs are central in evaluating the population in relation to regulatory thresholds set in the PWS Herring Management Plan (5 AAC 27.365). Results of these surveys are disseminated to all relevant ADF&G commercial fisheries management and research staff.

As part of the project objective to provide a platform for additional research aboard the R/V *Solstice*, this project received an amendment to allocate extra sea days for collecting gravid female pre-spawn pollock during the early spring of 2024 and 2025, in collaboration with U.S. Geological Survey (USGS). The R/V *Solstice* spent seven sea days in southwestern PWS and three sea days in eastern PWS for these collections. Although large schools of fish were identified—believed to be pollock based on location, sonar target strength, and communications with local trawlers—our methods of capture (electronic jigging machines and slinky pots) proved ineffective, and the target sample size of 50 gravid females was not achieved.

Following the unsuccessful collection efforts, ADF&G Cordova collaborated with ADF&G Kodiak to obtain commercially harvested pollock from processing facilities (typically all PWS and Kodiak pollock are processed in Kodiak due to the seasonal nature of these facilities). Fish were transported to USGS Marrowstone Lab via air cargo. This approach is not ideal because the samples are several days old by the time they reach the lab, and if they are stored at excessively low temperatures (e.g., in fish holds or during shipment), the *Ichthyophonus* parasite may be killed, rendering the samples unusable.

For the 2025 sampling, we plan to collaborate with the National Oceanic and Atmospheric Administration (NOAA) winter cruise aboard the R/V *Dyson*, which will facilitate the at-sea transfer of fresh samples directly to the R/V *Solstice*. As a backup plan, we will coordinate with commercial harvesters participating in state-managed fisheries to provide fresh samples, which will be transferred at sea to the R/V *Solstice*.



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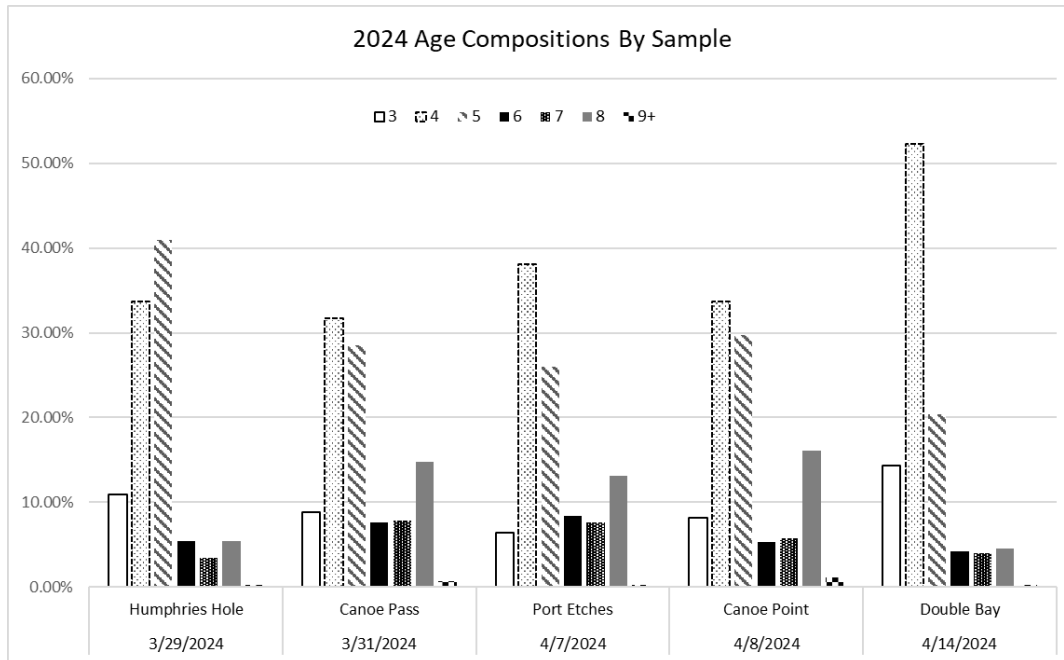


Figure 3. 2024 Prince William Sound herring spawning biomass age composition by sample location.

2. Products:

Peer-reviewed publications:

N/A

Reports:

Botz, J., H. Scannell, M. Olson, J. Morella, and R. Ertz. 2024. 2023 Prince William Sound area finfish management report. Alaska Department of Fish and Game, Fishery Management Report No. 24-15, Anchorage.

Morella, J., W. S. Pegau, C. L. Roberts and J. Zhaner. 2024. Prince William Sound herring. Pages 188-200 in B. E. Ferriss, editor. Ecosystem Status Report 2023: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report, North Pacific Fishery Management Council, Anchorage, Alaska.



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Popular articles:

N/A

Conferences and workshops:

Morella, J. 2024. Prince William Sound herring spawn and ASL, 2024. Oral presentation, Herring Research and Monitoring 2024 PI meeting, online, October 15, 2024.

Public presentations:

N/A

Data and/or information products developed during the reporting period:

2024 individual aerial survey maps (distributed to herring list serve within 24hrs of survey)

2008-2024 aerial herring biomass observations shapefiles

1973-2024 aerial herring spawn observations shapefiles

1997-2024 herring aerial survey routes shapefiles

2008-2024 aerial survey marine bird observations shapefiles

2008-2024 aerial survey marine mammal observations shapefiles

2008-2024 aerial survey sea lion observations

1973-2024 PWS herring age, sex size

Data sets and associated metadata:

Morella, J. 2024. Herring: ADFG surveys – aerial survey route, biomass, age sex length, and spawn. Gulf of Alaska Data Portal: <https://gulf-of-alaska.portal.aos.org/#metadata/35fd35d8-f6f1-4762-9cf0-8e2e970755c4/project/files>.

2024 individual aerial survey maps (distributed to herring list serve within 24hrs of survey)

Additional Products not listed above:

Alaska Department of Fish and Game. 2024. ADF&G Prince William Sound Herring Aerial Surveys (interactive map).
<https://experience.arcgis.com/experience/53d54699cbf54e72aa1a4daf405076b7>.



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3. Coordination and Collaboration:

The Alaska SeaLife Center or Prince William Sound Science Center

This project coordinates with Prince William Sound Science Center on a regular basis to attend meetings and hear updates from other projects and to coordinate with other HRM projects through the HRM component lead.

EVOSTC Long-Term Research and Monitoring Projects

This project coordinates and collaborates with all HRM component projects within the GWA-LTRM program. We provide daily aerial survey results and boat-based observations to all herring field programs. We provide the R/V *Solstice* (as well as ADF&G personnel) as a research platform for disease sampling (project 24120111-E). We age ~400 herring, collect organ samples, and provide transport logistics for the disease project (24120111-E). We provided 2024 herring ASL results and aerial survey and ASL results to the modeling and stock assessment project (project 24120111-C).

EVOSTC Mariculture Projects

N/A

EVOSTC Education and Outreach Projects

This project contributes content to the Herring Watch Facebook page. Contributions include maps from each survey, photos and descriptions of ASL sampling efforts, and updates such as mile-days of milt season totals, etc. The project also maintains an interactive website showing fish and marine mammal observations during aerial surveys.

Individual EVOSTC Projects

This project coordinates with the Data Management program to post data to the Gulf of Alaska data portal annually within required timeframes.

Trustee or Management Agencies

This work is performed by ADF&G commercial fisheries research and management personnel. The results of both the aerial surveys and age/size structure are critical to the management of herring commercial fisheries in PWS. The estimates of aerial biomass as well as age structured assessment model outputs are central in evaluating the population in relation to regulatory



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thresholds set in the PWS Herring Management Plan (5 AAC 27.365). Results of these surveys are disseminated to all relevant ADF&G commercial fisheries management and research staff.

Native and Local Communities

This project regularly engages native and local communities. The Native Village of Tatitlek receives herring survey maps after each survey and much of the community accesses survey maps through the ADF&G interactive map or the herring watch Facebook page. Herring are an important subsistence resource, and ADF&G's aerial observations are utilized by native and local communities to guide timing and location of subsistence harvest efforts. The Native Village of Tatitlek regularly shares their herring observations with us. Additionally, many PWS commercial herring permit holders live in Cordova and have an interest in PWS herring. PI Morella regularly meets with the local fishermen's organization to discuss herring; provide informational presentations at fishermen's meetings. In 2024, several community members aided in sample collection in collaboration with ADF&G staff.

4. Response to EVOSTC Review, Recommendations and Comments:

September 2024 EVOSTC Science Panel Comment:

The Alaska Department of Fish and Game (ADF&G) was funded to conduct herring aerial surveys and to sample herring for age, sex, size, and sexual maturity (ASL). In addition to these two overarching objectives, this project plays a central role in coordinating and collaborating survey and sampling efforts with all Herring Research and Monitoring (HRM) projects. This project seems to be on track and has shown very good success following a slow start. It is very important that they have observed significant spawning at Kayak Island. This activity was never included in previous herring surveys and could significantly alter estimates of biomass in PWS. Are the Kayak Island spawners a different "stock"? What evidence is there or what could be done to assess this?

Overall, the FY22 and FY23 annual reports are concise and well-presented. The two reports show broad collaboration with other projects and provide that basis for the production of excellent science and resource management. Note the typo error that incorrectly shows the reporting period for the FY23 annual report as 2022-23.



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For future reports we request clarification of some specific aspects of Kayak Island spawning from the FY22 annual report copied below, followed by Science Panel comments or questions. We emphasize that these questions should not be taken as criticisms of the work conducted in the last two years.

1. “We conducted 10.25 hours of aerial surveys during 5 surveys of Kayak and Wingham Islands. The 2022 Kayak Island area aerial spawn estimate is 41.1 statute mile-days-of-milt. Historically, Kayak Island has not had regular aerial survey coverage or sampling, and therefore was not included in the development of the age structured assessment (ASA) model and the minimum spawning biomass threshold for consideration of a commercial fishery.” We understand and agree with this cautionary approach. In the longer term, however, we wonder if there might be adequate reason to re-examine the conclusion about the status of Kayak Island.
2. “Additionally, Kayak Island herring stocks historically have not been commercially fished. Large spawning events have occurred at Kayak Island in 2021 and 2022, with total mile-days of milt at Kayak Island exceeding Prince William Sound.” We wonder why the term Kayak ‘stock’ is used and suggest that this terminology could be misleading. This is not a criticism, because we understand that, at this point in time, you must differentiate between Kayak and herring and herring from other locations (i.e., PWS) but suggest it would be wise to keep an open mind about whether herring that spawn on Kayak Island are, or are not, part of the same biological group (i.e. “stock”) as PWS herring.
3. “Historic estimates of Kayak Island spawn should be considered a minimum due to limited survey efforts and therefore are not comparable to recent data.” We were uncertain what was meant by ‘Historic’. Is it meant to imply that there are spawn data (or information) from Kayak Island that extend back in time, more than a decade?
4. “However, we believe spawn at Kayak Island has markedly increased in the past two years.” Is there evidence to support this and what are the ‘two’ years? Does this refer to 2021, 2022 or 2023?
5. “It is unlikely that spawning events of the magnitude of 2021 and 2022 would have gone unnoticed and unreported with local air and boat traffic (boats and planes often transit from Sitka to Cordova, traveling past Kayak Island, during this spawn timing). We collected an ASL sample from Kayak Island using a variable mesh gillnet aboard the F/V Redline. We also collected live herring for disease analysis and transported them back to Cordova where we processed them



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with US Geological Survey staff.” Is this statement meant to suggest that Kayak Island spawning, if it had occurred in years prior to 2021, was likely to have been observed? We note that there have been changes in herring spawn distribution within PWS, as reported in recent publications. Concurrently there have been changes in spawning distributions in other Northeastern Pacific herring. Therefore, we appreciate and applaud the effort to continue to monitor herring spawning events on Kayak Island, and elsewhere, that might differ from previously documented spawning locations.

The Science Panel has no concerns about this project.

PI Response:

The Science Panel notes a delayed start of this project however the timing of this work and associated reporting has not deviated from the schedule in the proposal or historical timelines of this project.

The PI and ADF&G share many of the same questions about the Kayak Island area herring as reflected in the Science Panel comments; however, Kayak Island area herring monitoring and stock assessment, is outside of this project’s study area, scope, and funding. The PI included summaries of recent Kayak Island aerial surveys and age sex length sampling in previous annual reports and PI presentations due to the relevancy to PWS herring and the extension of the collaboration with USGS Marrowstone Disease lab for Kayak Island area disease sampling.

The following responses correspond to the numbered Science Panel comments:

1. In December 2024 regulatory meetings, the Alaska Board of Fish took regulatory action to establish a Kayak Island Herring subdistrict and establish an exploratory fishery in this area. Although the population flow between these areas remains unknown, under this current regulatory framework, Kayak Island will be managed separately and not incorporated into the threshold for consideration of a commercial fishery or biomass estimate in the remainder of the regulatory area. Future research in whole genome sequencing, tagging studies, or other research may address these questions, which may warrant re-evaluation of this approach in the future.
2. Typically, the PI uses the term Kayak Island area herring as a differentiation because the level of population flow between the PWS and Kayak Island areas is unknown. The use of the term stock was an oversight.



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3. There are intermittent estimates of mile-days-of-milt in the Kayak Island area since 1982. Annual survey effort of Kayak Island area is not consistent or comprehensive. Surveys were flown opportunistically when excess funds, weather, and aircraft availability allowed. These estimates represent a minimum of mile days of milt that occurred and are not necessarily reflective of changes in annual in spawn in the Kayak Island area and therefore are not comparable annually or to PWS.
4. 2021 was the first year more mile days of milt were observed in the Kayak Island area than in PWS, this trend has continued each year through 2024.
5. This statement is meant to suggest that the magnitude of spawning observed during 2021-2024 is unlikely to have occurred regularly in previous years (1982-2020), when surveys were conducted intermittently. This suggestion is based on the premise that significant spawning events of such magnitude would likely have been observed in some capacity if they were common occurrences. The PI posits that earlier intermittent surveys—though limited—may have detected indicators such as large aggregations of herring schools, spawning events in the process of dissipating, and heightened bird and marine mammal activity, among other signs of significant spawning events. Furthermore, local air and boat traffic, including spotter plane flights between Sitka and Cordova (often traveling past Kayak Island during the typical spawning season) and vessels operating in the region, frequently report herring sightings. Notably, such events of large magnitude are also often visible from the daily 737 jet service to Cordova on clear days. While these observations are anecdotal and lack quantitative data, it has prompted the PI to seek greater monitoring of the Kayak Island Area, especially since recent research from other areas of Alaska and PWS suggests shifts in spawning locations.

2024 EVOSTC Executive Director Comments

I concur with the Science Panel. Funding for this project is managed by NOAA. The expenses on the annual reports are well documented and easy to track. The Fiscal Manager is responsive to budget questions. During FY23, a Proposal Amendment was submitted to add additional funding from the terminated project 22220203 to assist project 23120111-E in collecting pollack samples. Staff do not have any concerns at this time.

2024 EVOSTC PAC Comments

Stekoll asked about a spawn distribution map for PWS in 1988. Pegau stated ADF&G made all their historic distributions publicly available, and their interactive map can show distributions for every year. He suggested herring spawned throughout PWS before EVOS. In the years after the



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spill before 2000, the distribution was mostly along Montague Island. It then shifted around 2000, and there is now spawning on the east side.

Stephens asked about studies on herring sensitivity to petrochemicals and correlations with lingering oil. Pegau stated one reason for lingering oil is that it is not readily observed in the water column. Stekoll asked if herring spawned on oiled areas, and Pegau suggested that is consistent with how the 1989 class fared very poorly.

Whissel asked about vessel participation and the two fishing opportunities. Pegau stated no one applied, likely because it was expensive. Whissel introduced a motion to proceed with no concerns. Borer seconded, and there was no opposition. The motion passed unanimously.



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5. Budget:

When ADF&G submits proposals, the research vessel daily rate goes into the budget as contractual, given it is for vessel time. However, when the daily rate gets spent by ADF&G (since it is an in-house vessel) it gets spent across all line items for the actual expense of operating the vessel rather than a bill that would hit contractual (if the vessel was contracted to an outside entity). This is why the commodities line item appears overspent.

This project continues to be behind on spending in some categories, in part because the research vessel required maintenance in mid-April 2023, limiting vessel trips that year, and poor weather that impacted aerial surveys. Also, spending in the personnel line item was reduced because of vacant positions.

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT 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		\$72,526	\$80,489	\$82,397	\$84,302	\$80,055	\$399,768	\$196,982
Travel		\$1,560	\$1,599	\$2,139	\$2,180	\$1,722	\$9,200	\$1,506
Contractual		\$67,000	\$85,063	\$91,165	\$94,093	\$78,479	\$415,800	\$126,667
Commodities		\$2,600	\$2,665	\$6,732	\$2,800	\$2,870	\$17,666	\$58,159
Equipment		\$0	\$38,775	\$25,000	\$0	\$0	\$63,775	\$2,209
Indirect Costs	Rate = 0%	\$0	\$0	\$0	\$0	\$0	\$0	\$0
SUBTOTAL		\$143,686	\$208,590	\$207,432	\$183,375	\$163,125	\$906,209	\$385,523
General Administration (9% of subtotal)		\$12,932	\$18,773	\$18,669	\$16,504	\$14,681	\$81,559	N/A
PROJECT TOTAL		\$156,617	\$227,363	\$226,101	\$199,879	\$177,807	\$987,768	
Other Resources (In-Kind Funds)		\$55,030	\$56,405	\$57,815	\$59,261	\$60,742	\$289,253	
COMMENTS: ADF&G proposes the daily rate for the R/V Solstice as contractual, but the vessel daily rate is spent across all line items for the actual expense of operating the vessel, which is why commodities appears overspent. This project is behind on spending in some categories, in part because the research vessel required maintenance in mid-April 2023, limiting vessel trips, and poor weather impacted aerial surveys. Also, spending in personnel was reduced because of vacant positions. In-Kinds funds are from general fund payroll for permanent ADF&G staff associated with this project. This project leverages considerable existing ADF&G resources including R/V Solstice and other field and lab equipment as well as ADF&G long-term datasets.								
FY22-26		Project Number: 24170111-F Project Title: Spawning Surveys & ASL Primary Investigator: Morella (ADF&G)					TRUSTEE AGENCY SUMMARY PAGE	