

**EVOSTC FY17-FY21 INVITATION FOR PROPOSALS
FY21 (YEAR 10) CONTINUING PROJECT PROPOSAL SUMMARY PAGE**

Project Number and Title

Gulf Watch Alaska: Pelagic Component Project

21120114-O—Long-term Monitoring of Humpback Whale Predation on Pacific Herring in Prince William Sound

Primary Investigator(s) and Affiliation(s)

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Date Proposal Submitted

August 14, 2020

Project Abstract

The humpback whale monitoring project is part of the Gulf Watch Alaska (GWA) pelagic component’s integrated predator-prey survey. Humpback whale predation has been identified as a significant source of mortality on over-wintering Pacific herring in Prince William Sound (PWS) and a likely top-down force constraining their recovery. Humpback whales in PWS have a higher percentage of herring in their diet and forage longer on herring during non-summer months than their counterparts in Southeast Alaska. Currently, North Pacific humpback whales in the Gulf of Alaska may be experiencing nutritional stress and increased use of inland waters like PWS could result in increased predation on herring. We will continue to evaluate the impact by humpback whales foraging on Pacific herring populations in PWS following protocols established during 2007/08 and 2008/09 (*Exxon Valdez* Oil Spill Trustee Council project PJ090804). Prey selection by humpback whales is determined through acoustic surveys, visual observation, scat analysis, and prey sampling. Chemical analyses of skin and blubber biopsy samples provide a longer-term perspective on shifts in prey type (trophic level from stable isotopes) and quality (energy content). These data are combined in an updated bioenergetic model that allows us to assess the impact of recovering humpback whale populations on the PWS ecosystem. By integrating with the forage fish and fall/winter marine bird components, we contribute to a comprehensive understanding of bottom-up influences and top-down controls on the PWS herring population. The COVID-19 pandemic caused us to postpone our spring 2020 survey, rescheduling for later in the year. At this time, we are hoping to complete the fall Integrated Predator Prey survey as planned. However, COVID-19 related concerns may result in this survey being modified or cancelled. A decision will be made in late August or early September.

EVOSTC Funding Requested* (must include 9% GA)

FY17	FY18	FY19	FY20	FY21	TOTAL
\$161,900	\$155,000	\$187,400	\$184,400	\$177,000	\$865,700

Non-EVOSTC Funds to be used, please include source and amount per source: (see Section 6C for details)

FY17	FY18	FY19	FY20	FY21	TOTAL
\$220,000	\$220,000	\$120,000	\$127,000	\$127,000	\$814,000

1. PROJECT EXECUTIVE SUMMARY

Pelagic Component

The pelagic component research team proposed for FY17-21 to continue monitoring key pelagic species groups in Prince William Sound (PWS) by continuing the same five projects focused on killer whales, humpback whales, forage fish, and marine birds. However, modifications have been made to some projects for greater integration, increased precision of information, and achieving new goals. Ultimately, this will provide more information to the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC), agency resource managers, non-governmental organizations, and the public.

Thus, the two over-arching questions for the pelagic component to answer during this 5-year period are:

1. What are the population trends of key upper trophic level pelagic species groups in PWS – killer whales, humpback whales, marine birds, and forage fish?
2. How do predator-prey interactions, including interannual changes in prey availability, contribute to underlying changes in the populations of pelagic predators in PWS and Middleton Island?

Humpback Whale Predation on Herring Surveys in PWS

Monitoring humpback whales and their diets is important to understanding predator prey interactions in the pelagic waters of PWS. Because humpback whales are significant predators in the ecosystem, they may have the potential to control the distribution and abundance of forage fish. The humpback whale population in the North Pacific has rebounded from near extinction in the late 1960s to over 22,000 individuals (Barlow et al. 2011), and parallel increases in whale abundance have been documented in PWS. Over much of the same period the abundance of the dominant forage fish, Pacific herring, shifted from an abundant to a diminished state. The suspension of the commercial fishery in the early 1990s has not restored this population to their former abundance. Pacific herring were identified as an injured species following the *Exxon Valdez* oil spill. Understanding the mechanisms behind their failed recovery requires a comprehensive understanding of both top-down and bottom-up processes in the context of a changing ecosystem. Our previous work in PWS (EVOSTC project PJ090804) estimated that humpback whales are consuming 15% to 20% of the pre-spawning biomass of adult herring, roughly equivalent to the percentage of herring removed during the final years of the commercial herring fishery.

This study addresses the lack of recovery of Pacific herring in PWS and compares the influence of foraging humpback whales upon herring populations in the Gulf of Alaska. Information on whale distribution, abundance, diet, and the availability of herring as prey, are used to evaluate the relationship between overwintering herring and humpback whales.

The pelagic component integrated two predator studies (humpback whales [this project] and fall/winter marine birds [project 20120114-E) with the forage fish study (project 20120114-C) for one survey each year, known as the integrated predator-prey (IPP) survey. The IPP survey combines logistics, resources, and expertise during the fall survey.

For FY21 we propose to conduct the same two surveys (spring humpback whale survey and fall IPP survey) the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) has funded during the current 5-year funding cycle. The spring survey uses one chartered vessel focused on humpback whale abundance and predation on spawning herring. For the 10-day IPP survey, we propose to continue to use a second, chartered, vessel in addition to the US Geological Survey (USGS) research vessel R/V Alaskan Gyre. The R/V Alaskan Gyre is used for acoustic surveys,

fishing, and marine bird observations while the second vessel is used for humpback whale enumeration, biopsy, prey identification.

Humpback whale survey work in 2020 has been compromised by the novel coronavirus pandemic. Federal and state health mandates were put into place as planning for the spring survey was ongoing. We postponed the spring survey and hope to reschedule for later in the year, focusing on predation during fall or winter months, if the COVID-19 situation improves. At this time, we are hoping to complete the fall IPP survey as planned. However, travel restrictions and other COVID-19 concerns may result in this survey being modified or cancelled. A decision will be made in late August or early September.

In PWS, the spatial and temporal distribution of whales are synchronized with the formation of the large shoals of overwintering herring observed in the late fall and winter. Thus, it appears that humpback whales in PWS are maximizing the exploitation of over-wintering herring prior to their southbound migration to the breeding grounds. PWS has had the smallest biomass of herring but the most whales relative to Southeast Alaska (Moran et al. 2018). This makes the impact of predation potentially more severe in PWS, suggesting that top-down forcing may be limiting the recovery of herring in PWS. However, since 2013, major natural perturbations in the marine ecosystem (regime shift, Pacific Decadal Oscillation and marine heat waves) has occurred (Straley and Moran 2018). Warmer water temperatures over the past two years combined with seabird and marine mammal die-offs, emphasize that the Gulf of Alaska is still undergoing major perturbations that impact species at the population level. Counts of humpback whales have dropped in our recent surveys (Fig. 1). This is likely the result of reduced prey availability. Humpback whales will continue to have an impact on PWS herring but to what extent is unknown. There is a need to continue evaluating predation pressure on herring stocks in PWS and to understand the ecosystem impacts of a humpback whale population that has been functionally absent from the Gulf of Alaska for over 50 years, rebounded and now is in a potential decline. Although we saw a slight increase in September of 2019, humpback whale numbers within PWS have yet to return to their pre-heatwave abundance.

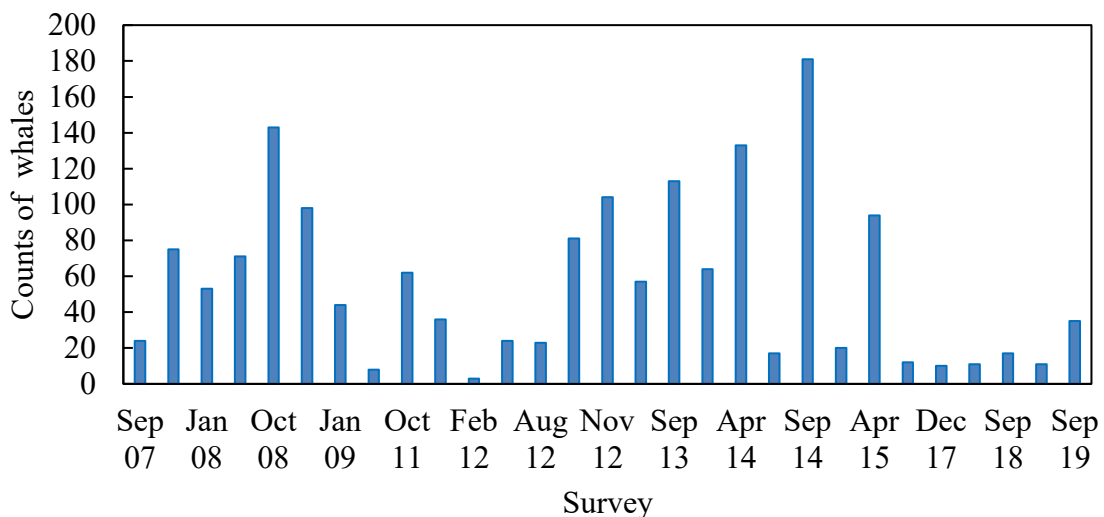


Figure 1. Counts of humpback whales in Prince William Sound provide an index of whale abundance, recent declines in whale numbers correspond to declines in herring biomass.

2. PROJECT STATUS OF SCHEDULED ACCOMPLISHMENTS

A. Project Milestones and Tasks

Table 1. This table breaks down project deliverables and their status into milestones and task progress by fiscal year and quarter, beginning February 1, 2017. C = completed, X = planned or not completed, V = cancelled due to COVID-19, P = partially completed, due to constraints of COVID-19. Fiscal year quarters: 1 = Feb 1 – April 30; 2 = May 1 – July 31; 3 = Aug. 1 – Oct. 31; 4 = Nov. 1 – Jan. 31.

Milestone/Task	FY17				FY18				FY19				FY20				FY21			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestone 1: Surveys																				
Integrated predator-prey surveys (EVOSTC funded)			C				C		C		C				X				X	
Alternate Survey schedule (with additional NOAA funds)	C		C		C															
Spring survey (EVOSTC funded)									C				P				X			
Milestone 2: Data Processing																				
Photographic analysis			C	C	C	C	C	C	C	C	C	C	V	V	X	X	X	X	X	X
Annual reports/data upload to portal					C				C				C				X			
Milestone 3: Analyses																				
Chemical analysis			C	C	C	C	C	C	C	C	C	C	V	V	X	X	X	X	X	X
Milestone 4: Reporting																				
Estimate whale impact																				X
Final report and publications																				X
Data management, QAQC, workspace upload				C	C			C	C			C	P			X	X			X
Annual PI meeting				C				C				C				X				X
FY Work Plan (DPD)			C				C				C				C					

In addition to the primary project deliverables in Table 1, during the past year we contributed to two chapters in the GWA Long-Term Monitoring Program Draft Synthesis report, contributed indicators for the 2019 Ecosystem Status Report to the North Pacific Fishery Management Council, contributed information on humpback whales to NOAA for rule-making and endangered species reports, initiated work on a publication for submission to a peer reviewed journal, and presented at several scientific conferences.

B. Explanation for not completing any planned milestones and tasks

Travel restrictions due to COVID-19 resulted in the spring survey being postponed, no data were collected. Chemical analysis of samples collected in September were not completed prior to the Auke Bay Laboratories being shut down under National Oceanic and Atmospheric Administration (NOAA) COVID-19 restrictions. Lab work is scheduled to resume in mid-August 2020.

C. Justification for new milestones/tasks

No new milestones or tasks proposed.

3. PROJECT COORDINATION AND COLLABORATION

A. Within an EVOSTC-funded Program

Gulf Watch Alaska

This study is part of the pelagic component of the integrated GWA-Long-term Monitoring of Marine Conditions and Injured Resources and Services. The GWA pelagic projects share research platforms and common goals of the IPP surveys that include this project, the wintering marine bird project (Bishop, project 20120114-E), and the forage fish project (Arimitsu and Piatt, project 20120114-C). Our project also collects data for the killer whale project (Matkin, project 20120114-N).

Herring Research and Monitoring

As part of the IPP surveys we opportunistically collected forage fish for principal investigator Kristen Gorman's herring age at maturity project (20170111-D). We are dependent on estimates of herring abundance developed through the age-structured assessment conducted by the Herring Research and Monitoring program.

Data Management

This project coordinates with the data management program by submitting data and preparing metadata for publication on the Gulf of Alaska Data Portal and DataONE within the timeframes required.

B. With Other EVOSTC-funded Projects

This project will coordinate with other EVOSTC-funded projects as appropriate by providing data, discussing the relevance and interpretation of data, and collaborating on reports and publications.

C. With Trustee or Management Agencies

The unique timing and focus of this project provides Trustee and Management Agencies with valuable data and platforms for both management and research. Data collected on humpback whale abundance will be of direct value to NOAA Protected Resource Division in the implementation of the De-Listing Monitoring Plan for humpback whales. NOAA is required by statute to evaluate the whale population to ensure that delisting was warranted.

Our collaboration within the GWA pelagic component is the only directed whale foraging and prey study in the Gulf of Alaska. Protected Resource Division (Aleria Jensen, NOAA Fisheries Alaska Regional Office) is funding the Survey of Population Level Indices for Southeast Alaska (SPLISH), a collaborative survey of humpback whales in northern Southeast Alaska. The objectives of this study are to establish baseline conditions for indices that are slated to be monitored for the 10-year post-delisting period. SPLISH builds on work conducted during Exxon Valdez Oil Spill Restoration Project: 100804 and compliment the GWA survey.

Data from the GWA surveys and SPLISH were provided to the Humpback Whale Critical Habitat Review Team (Lisa Manning, NOAA Fisheries/ Endangered Species Division) and are included in the North Pacific Fishery Management Council’s annual forage fish stock assessment.

During our surveys we collect eDNA from harbor porpoise to identify stock structure for the Marine Mammal Laboratory (Kim Parsons, NOAA Fisheries).

This project is also working with NOAA to develop a humpback whale index as an indicator in ecosystem assessments for reports to the North Pacific Fisheries Management Council (Stephani Zador, NOAA Fisheries). Collections of juvenile forage fish, particularly age-0 pollock, are of direct interest to the NOAA Alaska Fisheries Science Center, which is actively engaged in understanding how winter influences pollock survival (Recruitment Processes Alliance – Fisheries-Oceanography Coordinated Investigations, Ecosystem Monitoring and Assessment, Recruitment Energetics and Coastal Assessment, Resource Ecology and Fisheries Management programs). We anticipate working with the NOAA Alaska Fisheries Science Center when they conduct winter acoustic surveys in PWS as part of their normal pollock assessment work for the Gulf of Alaska.

During our surveys we will also photograph Steller sea lion brands whenever possible for Lauri Jemison (Alaska Department of Fish and Game). These data represent brand re-sights and are of interest to both the Alaska Department of Fish and Game and NOAA and are used in identifying movements and survival rates of Steller sea lions. We also collect data (location, number, species, and behavior) on all cetacean species sighted in PWS (Sadie Wright, NOAA Fisheries/Alaska Regional Office).

4. PROJECT DESIGN

A. Overall Project Objectives

This project directly addresses the following IPP survey objectives (see also Table 2):

1. Estimating trends in humpback whale abundance, diet, and distribution
2. Evaluate prey quality and trophic position through chemical analysis (using bomb calorimetry and stable isotopes)
3. Estimating the impact of humpback whale predation on herring

Table 2. Integrated predator-prey collaborations by objective. Bolded text highlights humpback whale objectives.

Objective	Index	Task	PI
a. Estimate humpback whale abundance, diet, and distribution			
	Whale counts by sub-region	Integrated Surveys: whale counts, biopsies	Moran (NOAA)/ Straley (UAS)
	Whale Identification	Integrated Surveys: Photo ID	Moran (NOAA)/ Straley (UAS)
	Whale Diet	Integrated Surveys: scales, scat, biopsies, visual observations, hydroacoustics	Moran (NOAA)/ Straley (UAS)/ Arimitsu & Piatt (USGS)
b. Estimate marine bird abundance and distribution in seasonally predictable predator aggregation areas			

Objective	Index	Task	PI
	Georeferenced marine bird counts, group size, behavior by species	Integrated Surveys: marine bird transects	Bishop (PWSSC)
b.i. Relate marine bird and humpback whale presence to prey fields identified during hydroacoustic surveys.			
	Spatial coherence of bird and whale presence/ absence, acoustic estimates of forage fish and euphausiid biomass	Integrated Surveys: hydroacoustic and marine bird transects, whale focal follows	Arimitsu & Piatt (USGS)/ Bishop (PWSSC)/ Moran (NOAA)/ Straley (UAS)
b.ii. Characterize marine bird-humpback whale foraging dynamics			
	Georeferenced marine bird and whale counts, group size, behavior by species	Integrated Surveys: marine bird transects; whale focal follows	Bishop (PWSSC)/ Moran (NOAA)/ Straley (UAS)/ Arimitsu & Piatt (USGS)
c. Estimate index of forage fish availability in seasonally predictable predator foraging areas			
	Species composition and biomass within persistent predator foraging areas	Integrated Surveys: hydroacoustic-trawl data	Arimitsu & Piatt (USGS)/ Moran (NOAA) Bishop (PWSSC)
	Density and depth distribution	Integrated Surveys: hydroacoustic-trawl data	Arimitsu & Piatt (USGS)
	Diet, energy density	Sample Analysis: forage fish	Moran (NOAA)
d. Estimate an index of euphausiid availability in seasonally predictable predator foraging areas			
	Species composition and biomass within persistent predator foraging areas	Integrated Surveys: hydroacoustic-trawl data	Arimitsu & Piatt (USGS)
	Density and depth distribution	Integrated Surveys: hydroacoustic-trawl data	Arimitsu & Piatt (USGS)
e. Relate whale, marine bird and forage fish indices to marine habitat			
	Oceanographic metrics and zooplankton biomass	Integrated Surveys: CTD and zooplankton samples	Arimitsu & Piatt (USGS)/ Moran (NOAA)/ Straley (UAS)/ Bishop (PWSSC)

B. Changes to Project Design and Objectives

We no longer conduct the December survey due to loss of in-kind funds for vessel support from NOAA. The spring survey is now funded by EVOSTC.

The 2020 spring survey has been postponed due to COVID-19; we hope to complete this survey later in the year.

5. PROJECT PERSONNEL – CHANGES AND UPDATES

There are no personnel changes or updates.

6. PROJECT BUDGET

A. Budget Forms (See GWA FY20 Budget Workbook)

Please see project budget forms compiled for the program.

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

Budget Category:	Proposed FY 17	Proposed FY 18	Proposed FY 19	Proposed FY 20	Proposed FY 21	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$6.0	\$0.6	\$0.6	\$0.6	\$0.6	\$8.4	
Travel	\$7.8	\$7.8	\$7.8	\$7.8	\$7.8	\$39.0	
Contractual	\$119.7	\$119.8	\$149.5	\$146.7	\$136.5	\$672.3	
Commodities	\$15.0	\$14.0	\$14.0	\$14.0	\$17.5	\$74.5	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
SUBTOTAL	\$148.5	\$142.2	\$171.9	\$169.1	\$162.4	\$794.2	\$0.0
General Administration (9% of	\$13.4	\$12.8	\$15.5	\$15.2	\$14.6	\$71.5	N/A
PROJECT TOTAL	\$161.9	\$155.0	\$187.4	\$184.4	\$177.0	\$865.7	
Other Resources (Cost Share Funds)	\$220.0	\$220.0	\$120.0	\$127.0	\$127.0	\$814.0	

B. Changes from Original Project Proposal

Our FY19 Work Plan requested funding from the EVOSTC to continue dedicated humpback whale surveys in the spring previously provided as in kind by NOAA. We thank EVOSTC for the additional funding (\$27K /year for FY19-21). The integrated predator-prey survey occurs each year in September and is a collaborative effort between USGS, NOAA, and the Prince William Sound Science Center that began in the second 5-year funding cycle. The R/V *Alaskan Gyre* has hull mounted acoustics and trawling capabilities that are consistent with other surveys in the Gulf of Alaska. This vessel is now available for the IPP survey.

At this time no reallocations are being requested, we are hoping to complete the September IPP survey and reschedule the postponed spring survey for later in the year.

C. Sources of Additional Project Funding

For FY19-21, NOAA will make the following in kind annual contributions: salary (\$77 K) for PI Moran (7 mos. GS-12), and all field and laboratory equipment required (camera equipment - \$10K, nets - \$10K, computers - \$5, CTD - \$5K, lab equipment - \$20K, for a total of \$50 K) for an annual total of \$120K.

Total in kind contribution by NOAA for the life of this project will now be \$814 K.

7. FY17-20 PROJECT PUBLICATIONS AND PRODUCTS

Publications

Moran, J.R., R.A. Heintz, J.M. Straley, and J.J. Vollenweider. 2018. Regional variation in the intensity of humpback whale predation on Pacific herring in the Gulf of Alaska. Deep Sea Research Part II. DOI: <http://dx.doi.org/10.1016/j.dsr2.2017.07.010>.

Moran, J.R., M.B. O'Dell., D.M.S. Dickson, J.M. Straley, and M.L. Arimitsu. 2018. Seasonal distribution of Dall's porpoise in Prince William Sound, Alaska. Deep Sea Research Part II. DOI: <https://doi.org/10.1016/j.dsr2.2017.11.002>.

Moran, J., and J. Straley. 2017. Data contributed to the NOAA Ecosystem Considerations Report 2017 for the Gulf of Alaska region. Full reports may be found at the following link: <https://access.afsc.noaa.gov/reem/ecoweb/Index.php>.

Moran, J.R., and J.M. Straley. 2018. Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound. Exxon Valdez Oil Spill Long-Term Monitoring Program (Gulf Watch Alaska)

Final Report (*Exxon Valdez* Oil Spill Trustee Council Project: 16120114-O), *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Moran, J.R., and J.M. Straley. 2018. Long-term Monitoring of Humpback Whale Predation on Pacific Herring in Prince William Sound). *Exxon Valdez* Oil Spill Long-Term Monitoring Program (Gulf Watch Alaska) Annual Report (*Exxon Valdez* Oil Spill Trustee Council Project: 17120114-O), *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Moran, J.R., and J.M. Straley. 2019. Long-term Monitoring of Humpback Whale Predation on Pacific Herring in Prince William Sound. *Exxon Valdez* Oil Spill Long-Term Monitoring Program (Gulf Watch Alaska) Annual Report (*Exxon Valdez* Oil Spill Trustee Council Project: 18120114-O), *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Moran, J., and J. Straley. 2019. Summer survey of population level indices for Southeast Alaska humpback whales and fall surveys of humpback whales in Prince William Sound in Zador, S.G., and E.M. Yasumiishi. 2018. Ecosystem Status Report 2018: Gulf of Alaska. Report to the North Pacific Fishery Management Council, 605 W 4th Ave, Suite 306, Anchorage, AK 99301.

<https://www.fisheries.noaa.gov/resource/data/2018-status-gulf-alaska-ecosystem>

Moran, J., and J. Straley. 2019. Fall Surveys of Humpback Whales in Prince William Sound in Zador, S.G., and E.M. Yasumiishi. 2019. Ecosystem Status Report 2018: Gulf of Alaska. Report to the North Pacific Fishery Management Council, 605 W 4th Ave, Suite 306, Anchorage, AK 99301

<https://access.afsc.noaa.gov/REFM/REEM/ecoweb/pdf/2019GOAecosys.pdf>

Moran, J., and J. Straley. 2019. Provide data and input for: Draft Biological Report for the Proposed Designation of Critical Habitat for the Central America, Mexico, and Western North Pacific Distinct Population Segments of Humpback Whales (*Megaptera novaeangliae*). Prepared by: National Marine Fisheries Service U.S. Department of Commerce National Oceanic and Atmospheric Administration May.

<https://www.fisheries.noaa.gov/action/proposed-rule-designate-critical-habitat-central-america-mexico-and-western-north-pacific>

Moran, J., and J. Straley. 2019. Provide data for: Endangered and Threatened Wildlife and Plants: Proposed Rule to Designate Critical Habitat for the Central America, Mexico, and Western North Pacific Distinct Population Segments of Humpback Whales. 9 October. <https://www.govinfo.gov/content/pkg/FR-2019-10-09/pdf/2019-21186.pdf>

Straley, J.M., J.R. Moran, K.M. Boswell, R.A. Heintz, T.J. Quinn II, B. Witteveen, and S. D. Rice. 2017. Seasonal presence and potential influence of foraging humpback whales upon Pacific herring wintering in the Gulf of Alaska. Deep Sea Research Part II. DOI: <http://dx.doi.org/10.1016/j.dsr2.2017.08.008>.

Straley, J.M., et al. In prep. Local collapse of a humpback whale population during a marine heatwave.

Published and updated datasets

DataONE Published Datasets

Moran, J.R., and J.M. Straley. 2017. Lipid Analyses for Pacific Herring, Invertebrates and Humpback Whales in the Gulf of Alaska, 2012-2015, Gulf Watch Alaska Pelagic Component. Dataset. *Exxon Valdez* Oil Spill Trustee Council Long-Term Monitoring program, Gulf Watch Alaska. Research Workspace.

<https://doi.org/10.24431/rw1k1q>.

Moran, J.R., and J.M. Straley. 2017. Significance of Whale Predation On Natural Mortality Rate of Pacific Herring in Prince William Sound, Alaska: 2006 - 2009, 2011-2015, Gulf Watch Alaska Pelagic Component. Dataset. *Exxon Valdez* Oil Spill Trustee Council Long-Term Monitoring program, Gulf Watch Alaska. Research Workspace. <https://doi.org/10.24431/rw1k1n>.

Moran, J.R., and J.M. Straley. 2017. Dall's and Harbor Porpoise Survey Data, Prince William Sound, Alaska: 2007 - 2008, 2011-2015, Gulf Watch Alaska Pelagic Component. Dataset. *Exxon Valdez* Oil Spill Trustee Council Long-Term Monitoring program, Gulf Watch Alaska. Research Workspace. <https://doi.org/10.24431/rw1k1p>.

Gulf of Alaska Data Portal Datasets

Moran, J.R., and J.M. Straley. 2019. Dall's and Harbor Porpoise Survey Data, Prince William Sound, Alaska: 2007-2008, 2011-2015, and 2017-2018, Gulf Watch Alaska Pelagic Component. Gulf of Alaska Data Portal. https://portal.aos.org/gulf-of-alaska#metadata/54adceab-74cb-4419-b02c-bacb6d2acb8b/project/folder_metadata/2660559

Moran, J.R., and J.M. Straley. 2019. Lipid Analysis for Pacific Herring, Invertebrates and Humpback Whales in the Gulf of Alaska, 2012-2018, Gulf Watch Alaska Pelagic Component. Gulf of Alaska Data Portal. https://portal.aos.org/gulf-of-alaska#metadata/54adceab-74cb-4419-b02c-bacb6d2acb8b/project/folder_metadata/4992914

Moran, J.R., and J.M. Straley. 2019. Whale survey and prey data, 2008-2018, Gulf Watch Alaska Pelagic Component. Gulf of Alaska Data Portal. https://portal.aos.org/gulf-of-alaska#metadata/54adceab-74cb-4419-b02c-bacb6d2acb8b/project/folder_metadata/2660555

Moran, J.R., and J.M. Straley, 2019. Castaway CTD Data, Prince William Sound, Alaska: 2017-2018, Gulf Watch Alaska Pelagic Component. Gulf of Alaska Data Portal. https://portal.aos.org/gulf-of-alaska#metadata/54adceab-74cb-4419-b02c-bacb6d2acb8b/project/folder_metadata/2852300

Research Workspace

Moran, J.R., and J.M. Straley, 2019. Humpback whale 2018 fluke ID catalog data. Research Workspace.

Moran, J.R., and J.M. Straley, 2019. Humpback whale 2018 energetic/stable isotope data. Research Workspace.

Moran, J.R., and J.M. Straley, 2019. Humpback whale 2018 whale survey data. Research Workspace.

Presentations

Arimitsu, M., M.A. Bishop, S. Hatch, R. Kaler, K. Kuletz, C. Matkin, J. Moran, D. Olsen, A. Schaefer, and J. Straley. 2018. Changes in marine predator and prey populations in the aftermath of the North Pacific Heat Wave: Gulf Watch Alaska Pelagic update 2017. Anchorage, Alaska. Alaska Marine Science Symposium. 21-28 January.

Arimitsu, M., M. Bishop, D. Cushing, S. Hatch R. Kaler, K. Kuletz, C. Matkin, J. Moran D. Olsen, J. Piatt, A. Schaeffer, and J. Straley. 2019. Changes in marine predator and prey populations in the Northern Gulf of Alaska: Gulf Watch Alaska Pelagic Update 2019. Poster Presentation. Alaska Marine Science Symposium, Anchorage, AK. 27-31 January.

- Boswell, K., R. Heintz, J. Vollenweider, J. Moran, and S. LaBua. 2020. The decline of acoustic backscatter associated with overwintering Pacific herring (*Clupea pallasii*) in Lynn Canal, Alaska. Poster Presentation. Alaska Marine Science Symposium, Anchorage, AK. 27-31 January.
- Lyman, E., R. Finn, J. Moran, K. Savage, C. Gabriele, J. Straley, N. Davis, F. Sharpe, J. Neilson, A. Jensen, D. Schofield, S. Wright, P. Cottrell, T. Rowles, S. Wilkin, M. Lammers, E. Zang. 2019. Are recent population level changes in the central North Pacific humpback whales, *Megaptera novaeangliae*, affecting entanglement threat and reporting rate? Poster Presentation. World Marine Mammal Conference, Barcelona, Spain. 9-12 December.
- Moran, J. 2018. A whale of an update. Auke Bay Laboratory Mini Seminar. Juneau, AK. 4 April.
- Moran, J. 2018. What do predators tell us about prey? Juneau Marine Naturalist Symposium. Juneau, AK. 10 May.
- Moran, J. 2019. Upper Trophic Conditions: Humpback whales. Spring PEEC 2019[Preview of Ecosystem and Economic Conditions] An Alaska IEA activity AFSC/PMEL, Seattle, WA. 6-7 June.
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