Oregon Department of Fish and Wildlife
Marine Resources Program
Semi-annual update on Oregon Dungeness Crab Commission Fishery Improvement (FIP) work plan
Assessment Period: March 2024 – August 2024
Report Date: September 2024

Goal/Performance Indicator	Actions	Due Date	Responsibilities	Progress
2. Identify the main non-target species and provide information on the status of these species. PI 2.1.3, 2.2.3	C. Provide encounter rates and/or catch data (numbers) for out of scope species (non-ETP amphibians, reptiles, birds, mammals, e.g. orange sea pen, pelagic cormorant).	Aug 2024	Troy Buell (ODFW)	C – **Bycatch inside crab pots** - The Crab Fishery Management Plan describes ODFW's methods for sampling and assessment of bycatch in the ocean Dungeness crab fishery, pages 21, 23, 28-30. From 2010-2023 preseason ride-along trips 1,602 crab pots were sampled and no out-of-scope species were documented. From 2013-2023 in-season ride-along trips 2,929 crab pots were sampled and one out-of-scope species, a dead Pelagic cormorant (*Phalacrocorax pelagicus*), was documented. **Interactions with crab buoy lines** - Each year National Oceanic and Atmospheric Administration (NOAA) receives reports, verifies, documents, responds to and summarizes large whale interactions with fishing gear. The most recent summary is posted here. Since 2014, there has been an elevated number of marine life entanglements in fixed fishing gear along the U.S. West Coast. A graph of NOAA's attributed entanglements involving Oregon crab gear is posted here (slide 3). ODFW has implemented a series of measures specifically designed to reduce the risk of marine life entanglements. Key measures included a 20% reduction in pot limits across all ocean Dungeness crab permits, a requirement

				for an additional late-season buoy tag, and a prohibition on commercial crabbing outside of 40 fathoms, all starting on May 1 of each season. ODFW has also taken steps to improve fishery accountability to provide critical information for addressing a range of issues, including being better able to monitor the fishing gear involved in future entanglements. These measures are foundational to ODFW's draft conservation plan (CP) that lays out a strategy to minimize and mitigate the incidental entanglement of federally-protected humpback whales, blue whales, and leatherback sea turtles by the ocean commercial Dungeness crab fishery off Oregon to the maximum extent practicable. The CP is required to secure an incidental take permit under section 10 of the federal Endangered Species Act. More information on all these efforts is posted here.
5. Provide evidence that the fishery does not hinder recovery of ETP species. PI 2.3.1	A. Continue to participate in and support the Oregon Entanglement Advisory Committee (OEAC) to develop short- and long-term options for reducing whale entanglements in Dungeness crab fishing gear. B. Continue research to monitor whale distribution off the Oregon coast to identify whale hotspots.	Ongoing (through Aug 2025) Ongoing (through at least June 2025)	Crystal Adams (ODCC) Leigh Torres (OSU)	A – ODFW convened the OEAC in May 2024 to provide updates and discuss and get input on marine life entanglement issues. All meeting materials and a summary is posted here. B – ODFW and OSU continued work on a second Section 6 grant funded project titled 'Enhancing Co-occurrence Assessment of Whales and Fishing Gear in Oregon Waters through Incorporation of Prey Data and Residency Analysis.' This project is continued aerial whale surveys through June 2024, and work is now focused on expanding the initial modeling efforts by incorporating whale prey distribution for investigation of co-occurrence of whales and the crab fishery off Oregon. The

				most recent progress report is included as attachment A. Independent of Section 6 funding, ODFW and ODCC are jointly funding an additional year (July 2024-June 2025) of monthly aerial surveys for rorqual whales off Oregon.
	C. Continue to develop the Conservation Plan for endangered and threatened whales.	Aug 2025	Crystal Adams (ODCC) and Troy Buell (ODFW)	C – ODFW continues development of a comprehensive conservation plan (CP) to minimize the risk of marine life entanglement in commercial Dungeness crab gear. The CP will be the main supporting document in the application for an incidental take permit application to the National Marine Fisheries Service (NMFS). During this reporting period staff developed a line marking regulatory proposal for the Oregon Fish and Wildlife Commission, which if adopted, will be a critical component of ODFW's CP monitoring plan. Line marking has been identified across the West Coast as a key method for improving gear identification when buoys, pots, or tags are not visible, identifiable, or present. The proposal is a comprehensive line marking approach that will be implemented in phases to spread the cost of compliance over several seasons. The line marking proposal also includes prohibiting specific line marks or colored line that are required in any West Coast fishery from being used in other commercial and recreational fisheries. This will help prevent attributing line from entanglements to the wrong fishery. The OFWC hearing was held on Sept. 13 and materials for the meeting are posted here.
6. Demonstrate that there is a strategy	A. Develop and implement new technologies to monitor	Aug 2025	Crystal Adams (ODCC)	A - ODFW completed phase 2 of development of an integrated vessel tracking electronic

in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to the habitats. PI 2.4.2	crab vessel locations and compliance with closed areas.			logbook system with 14 captains successfully submitting electronic logbook data throughout the 2023-24 crab season. ODFW also worked with the developers to initiate and kick-off a third and final development phase to incorporate users feedback from phase 2, improve the performance of the application and incorporate a fourth VMS model. ODFW has also continued to work on integrating the new data stream into internal databases and with PSMFC to develop a data dashboard to view and use the data in near real-time. Also, in this reporting period ODFW developed a Fishery Information Systems (FIS) grant proposal to solicit funding for costs to finalize a production application and implement the system broadly within the Oregon crab fleet. ODFW remains committed to working with industry to test electronic monitoring (EM) systems for vessel tracking and developing procedures for how systems can be used to provide near real-time fishery data by the 2026-27 crab season (see Section 5.3.3.3 starting on page 94 of the draft CP titled "Electronic Monitoring").
7. Demonstrate that Information is adequate to determine the risk posed to the habitat by the fishery. PI 2.4.3	A. Continue research and monitoring of coastal habitats identified in the Oregon Nearshore Strategy, including: • Survey of seafloor structures and habitat composition • Examination of species, communities, and habitat relationships to habitat monitoring priorities.	Ongoing (through Aug 2025)	Scott Marion (ODFW)	A - Nearshore shallow rocky reef habitats in previously un-mapped regions of Rogue Reef, off Gold Beach, were surveyed in May and June 2024 using a multibeam sonar system. This work will continue in September 2024, with full-coverage, high-resolution bathymetry data for this major reef system available for the first time by July 2025. During the current reporting period, ODFW analyzed multispectral aerial imagery of kelp canopy along the central and southern coast, acquired in October 2022, to monitor changes in kelp canopy over time. This survey supports

				concurrent monitoring work of other nearshore species in decline (red sea urchin, red abalone, sunflower sea star).
10. Demonstrate that monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with. PI 3.2.3	A. Develop and implement new technologies to streamline logbook submittals and to monitor compliance with closed or restricted fishing areas (marine reserves).	Aug 2025	Crystal Adams (ODCC) Troy Buell (ODFW)	A - ODFW completed phase 2 of development of an integrated vessel tracking electronic logbook system with 14 captains successfully submitting electronic logbook data throughout the 2023-24 crab season. ODFW also worked with the developers to initiate and kick-off a third and final development phase to incorporate users feedback from phase 2, improve the performance of the application and incorporate a fourth VMS model. ODFW has also continued to work on integrating the new data stream into internal databases and with PSMFC to develop a data dashboard to view and use the data in near real-time. Also, in this reporting period ODFW developed a Fishery Information Systems (FIS) grant proposal to solicit funding for costs to finalize a production application and implement the system broadly within the Oregon crab fleet. ODFW remains committed to working with industry to test electronic monitoring (EM) systems for vessel tracking and developing procedures for how systems can be used to provide near real-time fishery data by the 2026-27 crab season (see Section 5.3.3.3 starting on page 94 of the draft CP titled "Electronic Monitoring").
	B. Work with fishermen to educate them on the importance of reporting whale entanglements.	Aug 2025	Crystal Adams (ODCC) Troy Buell (ODFW)	B. ODFW developed and widely distributed a marine life fleet advisory in August 2024 due to NOAA confirming a third humpback entanglement and large aggregations of humpbacks. Since the aggregation report was after the ocean commercial season closed for the season ODFW broadened the distribution to

				include recreational license holders and other active non-crab fixed gear fisheries. This notice is posted on here.

NOAA Species Recovery Grant Semi-Annual Progress Report

Grant number: NA22NMF4720105

Project title: Enhancing Co-occurrence Assessment of Whales and Fishing Gear in Oregon Waters through Incorporation of Prey Data and Residency Analysis

Grantee name: Oregon Department of Fish and Wildlife

Contact information for project managers:

Troy Buell
troy.v.buell@ odfw.oregon.gov
541-861-8135

Kelly Corbett
kelly.c.corbett@odfw.oregon.gov
541-270-5083

Dates of the award period: 7/1/2022-6/30/2025

Dates covered by the progress report: 1/1/2024-6/30/2024

Description of the tasks scheduled for the reporting period and tasks accomplished during the reporting period:

As described in the project proposal, the Oregon Department of Fish and Wildlife (ODFW) planned for most of the work under this award to be conducted by Oregon State University (OSU) under an Intergovernmental Agreement (IGA) establishing a contractual relationship between the two parties, which was executed on August 5, 2022. This report addresses tasks scheduled during the reporting period as outlined in *Figure 3. Milestone timeline of proposed project* of the project proposal.

Data collection and compilation

Step 1: Vessel-based endangered species survey and prey data collection

OSU collected cetacean sighting data from two survey voyages during the reporting period. This award funded one marine mammal observer (Lindsay Wickman) to attend the Northern California Current (NCC) cruise aboard the R/V *Bell M. Shimada* as part of OSU's collaboration with NOAA (chief scientist: Jennifer Fisher), conducted May 30–June 11. OSU also completed a research cruise between April 19–May 1 as part of the MOSAIC project (Marine Offshore Species Assessment to Inform Clean Energy; funded by the US Department of Energy) aboard the R/V Pacific Storm.

During these two cruises, a total of 11 different species of cetaceans were sighted (Table 1). Sightings of rorquals included fin whales (n=15), a blue whale (n=1), humpback whales (n=109), a sei whale (n=1), and unidentified baleen whales (n=114, Table 1, Figure 1). Rorqual sightings completed during suitable survey conditions during these cruises will contribute to Step 13 (Rorqual whale Species Distribution Models, SDMs).

Table 1: Number of individuals of each cetacean species sighted during the MOSAIC and NCC cruises (both on and off effort) during the Jan 1 - Jun 30 2024 reporting period.

	Number of individuals		
Species	MOSAIC_2024Apr	NCC_2024May	Total
Blue Whale		1	1
Fin Whale	13	2	15
Humpback Whale	59	50	109
Gray Whale	1		1
Unidentified Baleen Whale	78	36	114
Sei Whale		1	1
Pacific White-sided Dolphin	526	41	567
Dall's Porpoise	16	16	32
Northern Right Whale Dolphin	30	4	34
Harbor Porpoise	10	2	12
Killer Whale	4	4	8
Baird's Beaked Whale	6		6
Unidentified Dolphin	15	1	1
Unidentified Porpoise	1		1

OSU also leverages a collaboration with the Oregon Coast STEM-Hub to conduct "STEM cruises" aboard the R/V Pacific Storm within our study region. These cruises simultaneously collect occurrence and photographic data on rorqual whales while also educating high school

students about research at-sea. Five STEM cruises were scheduled to occur between May 6–17, however all were cancelled due to poor weather. These cruises have since been rescheduled for five new dates, scheduled between September 16–October 2, 2024.

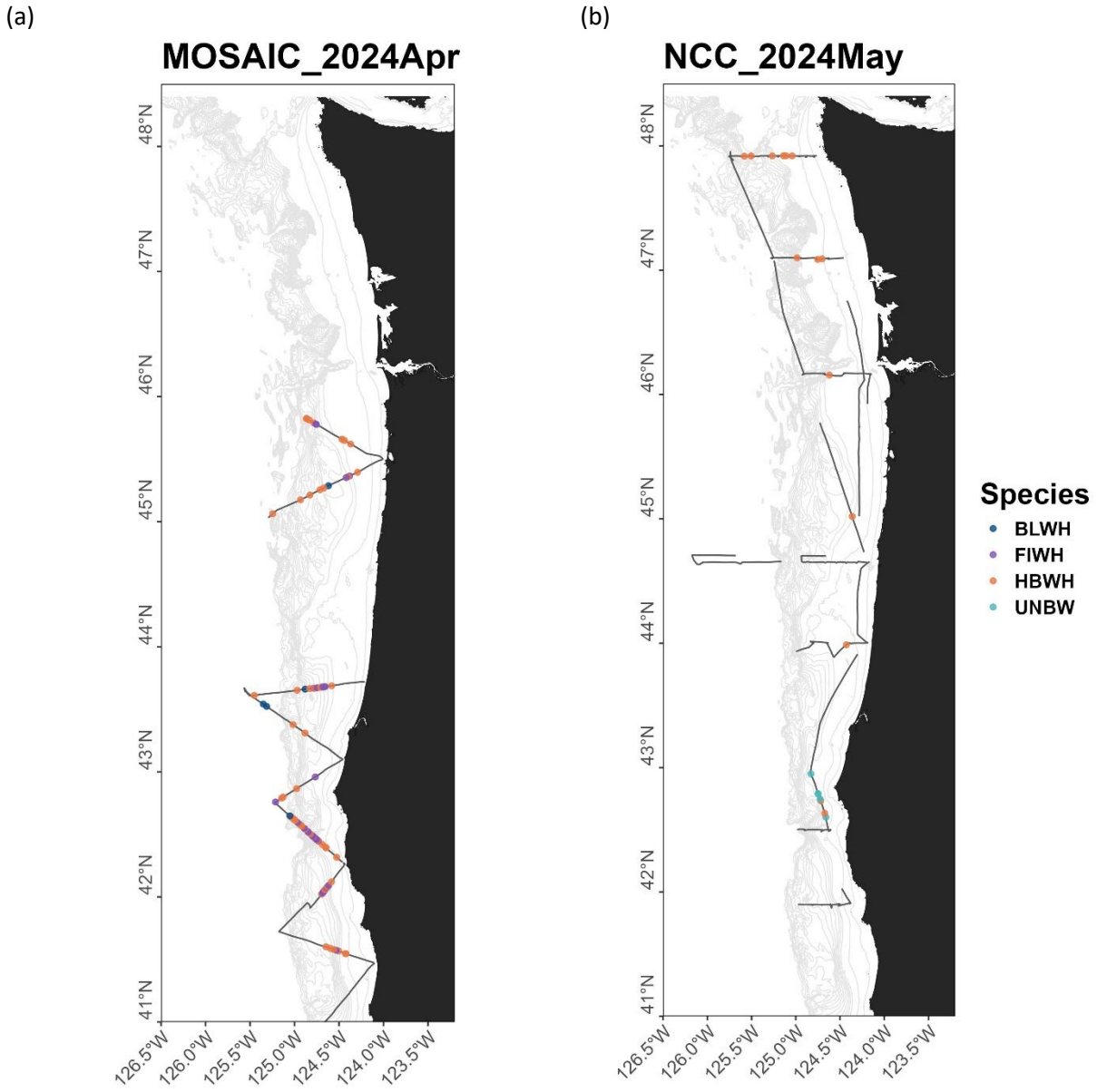


Figure 1: Locations of rorqual whale sightings (on effort) during the (a) MOSAIC and (b) NCC cruises completed between January 1–June 30, 2024. The black lines represent survey effort (*i.e.,* the trackline of the vessel). Species displayed include: BLWH=Blue whale; FIWH=Fin whale; HBWH=Humpback whale and UNBW=Unidentified baleen whale.

Step 2: Endangered species helicopter transects

Monthly helicopter surveys of Oregon coastal waters were continued through a partnership with the United States Coast Guard (USCG). Up to four 150 nm transects were flown each month out of USCG stations in North Bend (NB), Newport and Astoria/Warrenton, weather and USCG resources permitting. Survey methods are described by Derville et al. (2022).

A total of 12 cetacean surveys have been conducted aboard USCG helicopters since January 1, 2024 (Table 2). As of June 30, 2024, OSU conducted the following number of complete or partial surveys: NB-South = 3; NB-North = 3; Newport = 2; Warrenton = 4. During these surveys, a total of 7 species of cetaceans were recorded, with the following number of individuals (n): gray whales (n=6), humpback whales (n=14), fin whales (n=2), Pacific white-sided dolphins (n=23) and killer whales (n=3). In addition, 12 unidentified baleen whales were sighted.

A lower number of flights were completed in NB-South, NB-North, and Newport than expected due to a shortage of USCG helicopters available for flights (just one helicopter has been available between North Bend and Newport). Scheduled flights have also been cancelled due to mechanical issues (Warrenton – May 2024) and personnel shortages (North Bend – June 2024).

Table 2. Dates of cetacean surveys conducted aboard USCG helicopters off the Oregon coast, by month, and transect, between Jan 1 – Jun 30, 2024. Grey boxes indicate that the transect was not surveyed during that month, due to weather or helicopter mechanical issues. *Note: this flight (19-Mar, Warrenton) was flown for observer training purposes, and will not be incorporated into species distribution modelling efforts.

		NB, South	NB, North	Newport	Warrenton
2024	Jan	3-Jan	1-Jan		20-Jan
	Feb		22-Feb		
	Mar	4-Mar			19-Mar*
	Apr		29-Apr	16-Apr	16-Apr
	May	26-May			
	Jun			15-Jun	18-Jun

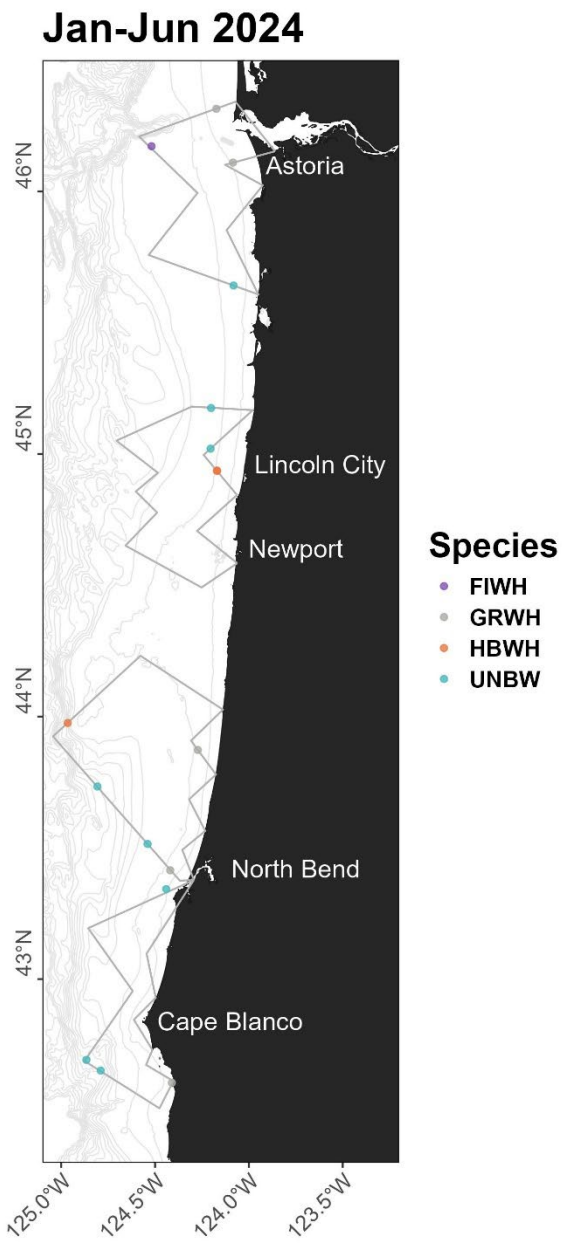


Figure 2: Locations of rorqual whale sightings (on effort) during US Coast Guard helicopter surveys completed between January 1–June 30, 2024. Species displayed include: BLWH=Blue whale; FIWH=Fin whale; HBWH=Humpback whale; and UNBW=Unidentified baleen whale.

Step 3: Fishery effort mapping

ODFW continued to collect and enter logbooks from Dungeness crab and other fixed gear fisheries and completed QA/QC for the 2021-2022 season crab logbook data. All crab logbook data expected to be available for this analysis now is, which adds two new seasons (2020-2021 and 2021-2022) and brings one previously sub-sampled season (2015-2016) up to full data entry relative to prior analyses. ODFW requested crab fish ticket and logbook data for the 2020-2021 and 2021-2022 seasons from Washington Department of Fish and Wildlife (WDFW) to incorporate data from vessels that deployed gear off Oregon but landed crab into Washington. Fish ticket data for both seasons was received and combined with previous data for analysis during the reporting period, but 2021-2022 logbook data is still outstanding until WDFW completes QA/QC.

ODFW reviewed and updated data processing R scripts that combine Oregon and Washington fish ticket, logbook, and permit data for the crab fishery. Substantial progress was made on updating the R script to generate crab fishery effort layers, although some work remains. ODFW continued to review logbook data from other fixed gear fisheries and began developing data processing and mapping methodology.

Production of fishery effort layers is anticipated to coincide with availability of rorqual whale SDMs during the next reporting period.

Step 4: Small boat surveys

One survey was conducted on June 29, 2024, between Depoe Bay and Seal Rock aboard the R/V Ruby 80-90 m. No rorqual whales were observed. OSU expects more small boat surveys to collect photo-ID and biopsy samples this summer, which will be reported for the following period.

Step 5: Compilation of environmental predictor variables

Compilation of environmental variables for inclusion in rorqual SDMs continued over this reporting period, building off previous work that included environmental conditions up to September 2021 (Derville et al., 2022). A custom Matlab / R code was produced, enabling the download of Regional Ocean Modeling System (ROMS) variables up to June 30, 2024. This step is completed, and analysis can now proceed with Step 13 (Generate rorqual SDMs).

Outreach and Engagement

Step 6: Promote reporting of whale sightings

ODFW distributed Whale Alert brochures at the Saltwater Sportsman's Show in Salem, Oregon (February 24-25, 2024) to promote reporting of whale sightings through the app in the marine

recreational fishing community. ODFW staff conducting research or sampling at sea continued to report whale sightings through Whale Alert.

The reporting of whale sightings continues to be promoted on OSU's website home page (https://mmi.oregonstate.edu/gemm-lab).

Fishermen engaged in another related research project led by OSU/MMI (SLATE: https://mmi.oregonstate.edu/gemm-lab/slate) are also directly reporting whale sightings through custom made data sheets and issued DSLR cameras. During this reporting period, seven sightings of humpback whales were reported by the F/V Dauntless, between May 21–June 15. OSU submitted photographs from these sightings to Happywhale (https://happywhale.com/; Cheeseman et al., 2023), an international database of humpback whale sightings. Five unique whales were identified, none of which had been recorded in Oregon by Happywhale before. Previous sightings of these five whales included locations in Mexico, Hawaii, and British Columbia.

Step 7: Develop and manage fleet alert system

OSU continued to provide monthly reports to ODFW on whale aggregations observed during surveys throughout the reporting period. OSU did not observe any whale aggregations or unusual distribution patterns warranting a fleet alert. ODFW tracked and evaluated fishery effort throughout the reporting period and similarly did not observe any unusual patterns. Therefore, no fleet alerts were issued during the reporting period. OSU did not observe any derelict gear on surveys during the reporting period.

Step 8: Develop R shiny app to predict whale distribution on a weekly scale

OSU currently has no progress to report. OSU anticipates this work to primarily occur toward the end of the project, once whale predictive models are being finalized.

Step 9: Raise awareness of issue and project

Scientific presentations:

OSU PhD student Rachel Kaplan (supervised by PI Torres and PI Bernard) gave a presentation entitled "Krill swarms provide variable energy density to predators in the Northern California Current Ecosystem" at the ICES-PICES 7th International Zooplankton Production Symposium in Hobart, Tasmania, in March 2024. Ms. Kaplan also presented "Season's eatings: Krill swarms offer variable energy density to humpback whales on the Northern California Current foraging grounds" at the Northwest Student Chapter of the Society of Marine Mammalogy in Seattle, WA, during May 2024. Ms. Kaplan's abstract was also accepted for presentation at the 25th Biennial Conference on the Biology of Marine Mammals in Perth, Australia (November 11-

15, 2024), entitled “Picky eaters: Sympatric rorqual species assort themselves relative to diverse krill swarm structures in the Northern California Current region.”

Dr. Solène Derville’s abstract submission, “Do krill and forage fish data improve the predictive performance of blue, fin, and humpback whale distribution models in the Northern California Current?” was accepted for presentation at the 25th Biennial Conference on the Biology of Marine Mammals in Perth, Australia (November 11-15, 2024).

Public outreach:

During Hatfield Marine Science Center’s annual Marine Science Day event (April 2024), Dr. Torres, Dr. Wickman, and Rachel Kaplan shared their research about Oregon krill and whales and led hands-on activities with over 2,000 visitors of all ages.

GEMM Lab members also wrote the following blog posts to share widely about research conducted under this award include:

https://blogs.oregonstate.edu/gemmlab/2024/05/13/good-enough-to-eat-dynamics-of-krill-prey-quality/

https://blogs.oregonstate.edu/gemmlab/2024/03/19/the-dark-side-of-upwelling-its-getting-harder-and-harder-to-breathe-off-the-oregon-coast/

https://blogs.oregonstate.edu/gemmlab/2024/01/22/oceanographic-alchemy-how-winds-become-whale-food-in-oregon/

https://blogs.oregonstate.edu/gemmlab/2024/05/20/disentangling-the-whys-of-whale-entanglement/

https://blogs.oregonstate.edu/gemmlab/2024/04/29/first-flight/

Instagram posts (by the account: @gemm_lab) related to this work were made on March 20, March 21, May 8, and April 4.

Spatial and ecological analysis of prey and whales

Step 11: Analysis of krill data

Spatial and temporal distribution of krill – OSU has progressed analysis and finalized models that predict fine-scale and year-round weekly krill abundance in the Northern California Current (NCC) using topographic and oceanographic predictors. This milestone is essential to incorporate predictive layers of krill prey into rorqual SDMs (Step 13). This work has been submitted to the journal *Progress in Oceanography* as a manuscript titled “A predictive krill distribution model for *Euphausia pacifica* and *Thysanoessa spinifera* using scaled acoustic backscatter in the Northern California Current”), which is currently in review (attached as an Appendix). The abstract of this manuscript is as follows:

A predictive krill distribution model for *Euphausia pacifica* and *Thysanoessa spinifera* using scaled acoustic backscatter in the Northern California Current

Derville, S.[1,2], Fisher, J.L. [3], Kaplan, R.L.[1,4], , Bernard, K.S.[4], Phillips, E.M.[5], Torres, L.G.[1]

[1] Geospatial Ecology of Marine Megafauna Lab, Marine Mammal Institute, Department of Fisheries, Wildlife and Conservation Sciences, Oregon State University, Newport, OR, United States

[2] UMR ENTROPIE (UR-IRD-IFREMER-CNRS-UNC), Nouméa, New Caledonia (present address)

[3] Fish Ecology Division, Northwest Fisheries Science Center, National Oceanic and Atmospheric Administration, Newport, OR, Unites States

[4] College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis, Oregon, United States

[5] Fishery Resource Analysis and Monitoring Division, Northwest Fisheries Science Center, National Oceanic and Atmospheric Administration, Seattle, WA, United States

Corresponding author: Solène Derville, solene.derville@ird.fr

ABSTRACT

Euphausiids (krill) are globally significant zooplankton prey for many commercially important or endangered predator species. In the productive upwelling system of the Northern California Current (NCC), two krill species, *Euphausia pacifica* and *Thysanoessa spinifera,* dominate the preyscape and constitute an important food resource for many seabirds, cetaceans, and fish. In this study, we use five years of hydroacoustic and net tow data collected in the NCC to develop integrative models predicting acoustic backscatter scaled for *E. pacifica* or *T. spinifera* separately. Boosted Regression Trees and Generalized Additive Models are applied in an original ensemble hurdle framework to predict krill presence and abundance from a diverse set of topographic and oceanographic predictors. Krill metrics had significant relationships with seabed depth, distance to submarine canyons, and variables indicative of dynamic ocean conditions (e.g., total deviance explained in acoustic data: 25% in the presence-absence model & 49% in the abundance model). Predictions of krill abundance at 5 km resolution averaged by month indicate differential habitat preferences between the two species: *T. spinifera* was constrained to the continental shelf, around and inshore of the 200 m isobath, whereas *E. pacifica* was found in greater abundances just offshore of the 200 m isobath and into offshore water in lower abundances. *E. pacifica* was generally more abundant than *T. spinifera* (10:1.3 ratio). Both species increased in abundance in the spring and summer, followed by a rapid decline in the fall, and lowest abundances in the winter. These models can produce fine-scale spatial and year-round weekly predictions of *E. pacifica* and *T. spinifera* abundance in the NCC, which will provide essential knowledge and new spatial layers about critical ecosystem components to support research and management.

Krill biomass calculation – OSU used krill community composition data collected via bongo net sampling aboard the R/V *Bell M. Shimada* (2018-2022) to characterize distributions of *E. pacifica* and *T. spinifera* krill, and calculated each species' seasonal length frequency distributions in four spatial "ecoregions" (onshore/offshore regions designated by the continental shelf break, and north and south regions delineated using the latitude of Cape Blanco). Using the resulting seasonal, spatial, and species-specific krill length frequencies, OSU applied a target strength model to convert acoustically detected krill backscatter during surveys on the R/V *Bell M. Shimada* to numerical abundance and biomass (Figure 3).

Krill prey descriptors – OSU integrated several data streams to calculate important descriptors of krill as prey, including swarm biomass, biomass catch per unit effort (CPUE), swarm mean energetic density, and the proportion of *E. pacifica* and *T. spinifera* krill in each swarm. Using Generalized Additive Models (GAMs), OSU analyzed humpback whale presence/absence relative to these prey metrics at a 5 km scale (Figure 4). Results from this analysis illustrate the tight relationships between humpback whale occurrence and krill quality and quantity at a 5 km scale. These results will inform efforts to include krill prey layers in humpback whale SDMs (Step 13). OSU is preparing a manuscript about this work and results for publication now.

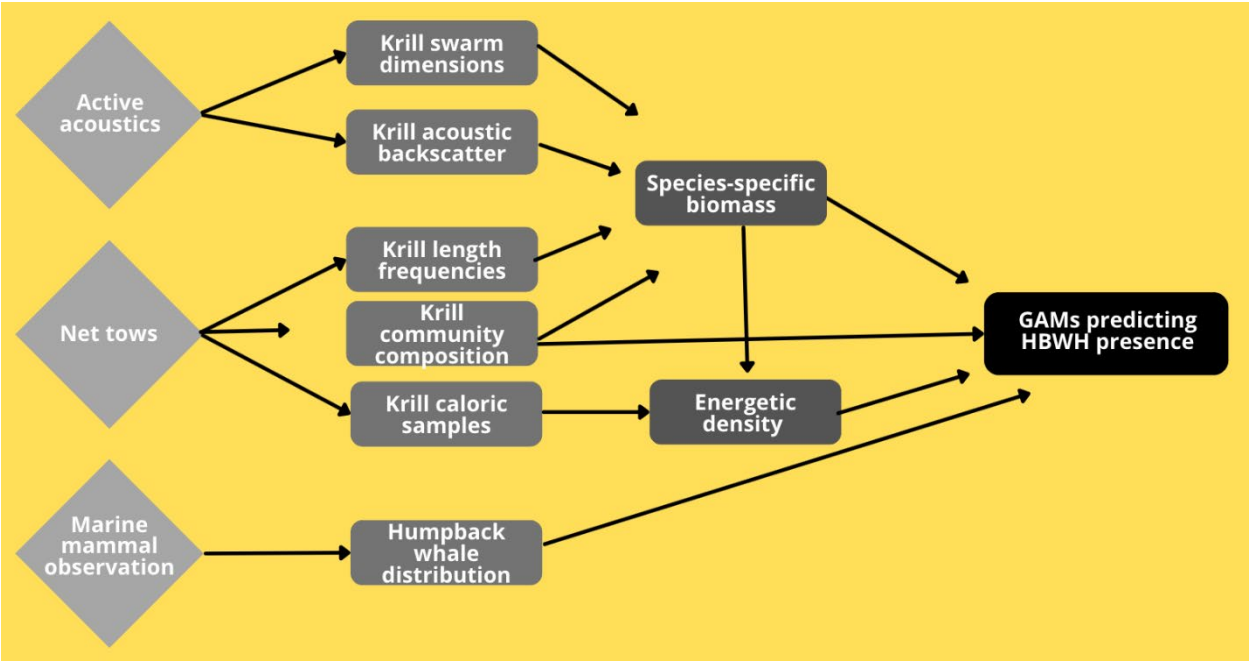


Figure 3. Schematic workflow showing the integration of several data streams to derive key metrics of krill as prey.

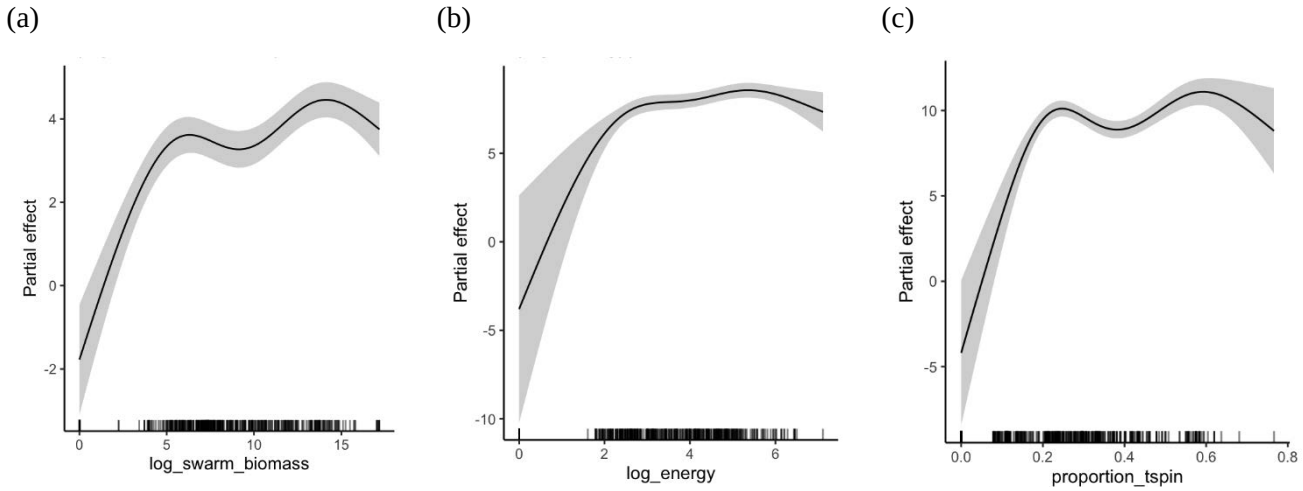


Figure 4. Partial effect plots from a Generalized Additive Model (GAM) illustrate the relationships between humpback whale presence and three descriptors of krill as prey: (a) swarm biomass (kg; logged), (b) swarm mean energy density (kilojoules; logged), and (c) swarm fraction composed of *T. spinifera* krill.

Step 13: Generate rorqual whale SDMs

During this reporting period, GPS data and sightings from all survey data sources (vessel-based surveys and helicopter surveys) up to June 30, 2024, were compiled and incorporated into the model framework by OSU. Therefore, all components necessary for the rorqual whale SDMs (whale sighting data, krill data, fish data, and ROMS environmental data) are now ready to complete Step 13. Generation and analysis of these rorqual SDMs will occur during the following reporting period.

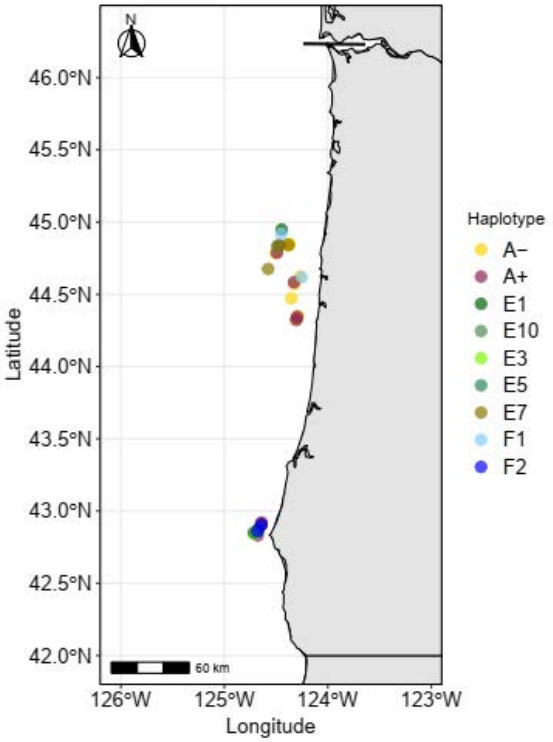
Humpback whale genetic and photo-ID analysis

Step 17: Humpback whale genetic DPS assignment

Thirty-two biopsy samples were collected from humpback whales during the 2023 field season. Total genomic DNA was extracted and a full DNA profile, consisting of a mtDNA haplotype, sex identification and 15 microsatellite loci, has now been generated for all samples by OSU (Figure 5; Table 3). Based on matching of DNA profiles, samples Mno23OR17 and Mno23OR32 were identified as replicates of Mno23OR09 and Mno23OR30, respectively. Matching of DNA profiles for the 30 individuals sampled in 2023 to a database of humpback whales sampled across the North Pacific identified three recaptures of previously sampled individuals. One was a recapture of a female sampled in Oregon in 2020; one was a recapture of a male sampled in California in 2005; and the final one was a recapture of a male previously sampled in Baja, Mexico in 2004. The overall sex ratio of individuals sampled in 2023 was close to unity (0.88:1, n = 30, p = 0.856). A postdoctoral scholar was appointed on the 1st of March (Dr. Franca Eichenberger,

under supervision of Dr. Scott Baker) and has now started analysis of population differentiation and DPS assignment.

(a) [N = 32 samples]



(b) [N = 30 individuals]

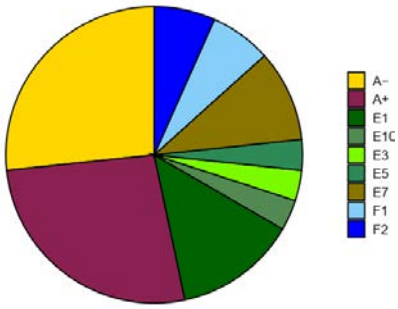


Figure 5. (a) The distribution of genetic sampling (N = 32 samples) and (b) frequencies of mitochondrial (mt) DNA haplotypes for humpback whales (N = 30 individuals) along the coast of Oregon in the North Pacific.

Table 3. Date, sex and mtDNA haplotype of N = 32 biopsy samples collected from humpback whales off the Oregon Coast during 2023. 'Genetic ID' is the individual ID as determined by DNA profiling and matching to a database of individual humpback whale sampled across the North Pacific.

Sample ID	Field ID	Date	Genetic ID	Sex	mtDNA
Mno23OR01	GEMM-Mn1-2023	2 Jun 23	gMno23OR01	F	A+
Mno23OR02	GEMM-Mn2-2023	2 Jun 23	gMno23OR02	M	A-
Mno23OR03	GEMM-Mn3-2023	2 Jun 23	gMno23OR03	M	A+
Mno23OR04	GEMM-Mn4-2023	2 Jun 23	gMno23OR04	F	E7
Mno23OR05	GEMM-Mn5-2023	2 Jun 23	gMno20OR22	F	E10
Mno23OR06	GEMM-Mn6-2023	2 Jun 23	gMno23OR06	F	E1
Mno23OR07	GEMM-Mn7-2023	2 Jun 23	gMno23OR07	F	F1
Mno23OR08	20230707GEMM_Mn1	7 July 23	gMno23OR08	M	E7
Mno23OR09	20230826GEMM_Mn1	26 Aug 23	gMno23OR09	F	A+
Mno23OR10	20230826GEMM_Mn2	26 Aug 23	gMno23OR10	M	E5
Mno23OR11	20230826GEMM_Mn3	26 Aug 23	gMno23OR11	F	E1
Mno23OR12	20230826GEMM_Mn4	26 Aug 23	gMno23OR12	M	E3
Mno23OR13	20230826GEMM_Mn5	26 Aug 23	gMno23OR13	F	F2
Mno23OR14	20230826GEMM_Mn6	26 Aug 23	gMnoBC04-59	M	E1
Mno23OR15	20230826GEMM_Mn7	26 Aug 23	gMno23OR15	F	E1
Mno23OR16	20230826GEMM_Mn8	26 Aug 23	gMno23OR16	M	F2
Mno23OR17	20230826GEMM_Mn9	26 Aug 23	gMno23OR09	F	A+
Mno23OR18	20230826GEMM_Mn10	26 Aug 23	gMno23OR18	F	A+
Mno23OR19	20230826GEMM_Mn11	26 Aug 23	gMno23OR19	F	A+
Mno23OR20	20230830GEMM_Mn1	30 Aug 23	gMno23OR20	F	E7
Mno23OR21	20230830GEMM_Mn2	30 Aug 23	gMno23OR21	F	A-
Mno23OR22	20230830GEMM_Mn3	30 Aug 23	gMno23OR22	M	A-
Mno23OR23	20230830GEMM_Mn4	30 Aug 23	gMno23OR23	M	A-
Mno23OR24	20230830GEMM_Mn5	30 Aug 23	gMno23OR24	M	A+
Mno23OR25	20230830GEMM_Mn6	30 Aug 23	gMno23OR25	M	A-
Mno23OR26	20230830GEMM_Mn7	30 Aug 23	gMno23OR26	F	A-
Mno23OR27	20230830GEMM_Mn8	30 Aug 23	gMno23OR27	F	F1
Mno23OR28	20230906GEMM_Mn1	6 Sept 23	gMno23OR28	M	A-
Mno23OR29	20230906GEMM_Mn2	6 Sept 23	gCA05-51884	M	A+
Mno23OR30	20230906GEMM_Mn3	6 Sept 23	gMno23OR30	M	A-
Mno23OR31	20230906GEMM_Mn4	6 Sept 23	gMno23OR31	M	A+
Mno23OR32	20230906GEMM_Mn5	6 Sept 23	gMno23OR30	F	A-

Step 18: Spatial Fidelity to Feeding Areas

To complete this step, OSU requires sighting histories of individual humpback whales that are as complete as possible. Therefore, for each humpback whale sighted in Oregon, OSU is compiling a list of other locations that whale was sighted through collaborations with Cascadia Research Collective and other contributors to Happywhale.

During the last reporting period, OSU progressed this data compilation by ensuring the GEMM (Geospatial Ecology of Marine Megafauna) Lab's complete collection of humpback whale photographs were uploaded into Happywhale. As of June 30, 2024, the GEMM Lab has uploaded 94 encounters from 17 surveys into Happywhale's database (remaining surveys

missing from Happywhale will be added in July 2024). OSU expects to complete spatial analyses of individual humpback whale occurrence in Oregon waters during the following reporting period, after they have completed our upload of data and contacted the required collaborators through Happywhale.

Explanation of any problems or delays in accomplishing planned activities:

Twelve planned helicopter transects were not completed during the reporting period. Helicopter surveys may be missed for a combination of reasons that are out of OSU's control and are often unpredictable. During this reporting period, only one helicopter was available between North Bend and Newport which limited scheduling opportunities, one flight was canceled due to mechanical issues, and one flight was canceled due to a USCG personnel shortage.

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